CURRICULUM

for the Academic year 2018 – 2019

DEPARTMENT OF
ELECTRICAL & ELECTRONICS
ENGINEERING

III & IV Semester B. E.

RAMAIAH INSTITUTE OF TECHNOLOGY
(Autonomous Institute, Affiliated to VTU)
BANGALORE – 54
About the Institute

Ramaiah Institute of Technology (RIT) (formerly known as M. S. Ramaiah Institute of Technology) is a self-financing institution established in Bangalore in the year 1962 by the industrialist and philanthropist, Late Dr. M S Ramaiah. The institute is accredited with “A” grade by NAAC in 2016 and all engineering departments offering bachelor degree programs have been accredited by NBA. RIT is one of the few institutes with prescribed faculty student ratio and achieves excellent academic results. The institute was a participant of the Technical Education Quality Improvement Program (TEQIP), an initiative of the Government of India. All the departments have competent faculty, with 100% of them being postgraduates or doctorates. Some of the distinguished features of RIT are: State of the art laboratories, individual computing facility to all faculty members. All research departments are active with sponsored projects and more than 150 scholars are pursuing PhD. The Centre for Advanced Training and Continuing Education (CATCE), and Entrepreneurship Development Cell (EDC) have been set up on campus. RIT has a strong Placement and Training department with a committed team, a good Mentoring/Proctorial system, a fully equipped Sports department, large air-conditioned library with over 1,35,427 books with subscription to more than 300 International and National Journals. The Digital Library subscribes to several online e-journals like IEEE, JET etc. RIT is a member of DELNET, and AICTE INDEST Consortium. RIT has a modern auditorium, several hi-tech conference halls and all are air-conditioned with video conferencing facilities. It has excellent hostel facilities for boys and girls. RIT Alumni have distinguished themselves by occupying high positions in India and abroad and are in touch with the institute through an active Alumni Association. RIT obtained Academic Autonomy for all its UG and PG programs in the year 2007. As per the National Institutional Ranking Framework, MHRD, Government of India, Ramaiah Institute of Technology has achieved 60th rank in 2018 among the top 100 engineering colleges across India.

About the Department:

The department was started in the year 1962 along with the establishment of the college. In 2003, the Department was recognized as a Research Centre by Visvesvaraya Technological University, Belagavi and offers Ph.D and MSc.(Engg.) by research programs. The Department also started a PG program in Computer Applications in Industrial Drives, in 2004. Our UG programme is accredited by NBA for five years with effect from July 2015.

The department has 18 well-qualified faculty members. The entire faculty holds postgraduate degree in either Power Systems / Power Electronics. Six of the faculty members are doctorates. Dr. Premila Manohar is Ph.D in HVDC transmission (from HVE, IISc, 1991), Dr. Pradipkumar Dixit is specialized in High Voltage Engineering (Ph.D from Visvesvaraya Technological University, Belgaum, 2009), Dr. Chandrashekar Badachi is specialized in High Voltage Engineering (Ph.D from Jain University, Bengaluru, 2016), Dr. Likith Kumar M V is specialized in Distribution System Optimization (Ph.D from Visvesvaraya Technological University, Belagavi, 2016), Dr. Swati Narula is specialized in Power Electronics (Ph.D from IIT Delhi, 2015) and Dr. Naveen Vijayan Mekhileri is specialized in Bio-engineering (Ph.D from University of Otago, 2017). In addition, Dr. G. R. Nagabhushana, with a long record of service (Retired Professor from HVE, IISc, Bangalore) is with the department as Professor Emeritus.
VISION OF THE INSTITUTE

To be an Institution of International Eminence, renowned for imparting quality technical education, cutting edge research and innovation to meet global socio economic needs

MISSION OF THE INSTITUTE

MSRIT shall meet the global socio-economic needs through

1. Imparting quality technical education by nurturing a conducive learning environment through continuous improvement and customization
2. Establishing research clusters in emerging areas in collaboration with globally reputed organizations
3. Establishing innovative skills development, techno-entrepreneurial activities and consultancy for socio-economic needs

QUALITY POLICY

We, at M. S. Ramaiah Institute of Technology, strive to deliver comprehensive, continually enhanced, global quality technical and management education through an established Quality Management System complemented by the synergistic interaction of the stakeholders concerned.

VISION OF THE DEPARTMENT

To excel in engineering education and research, inculcating professional ethics in students and emerge as leaders in the country in the field of electrical & electronics engineering.

MISSION OF THE DEPARTMENT

The mission of the department is to produce graduates who are capable of taking leadership positions. Our graduates:

- Understand the basic principles of modern electrical & electronics technology.
- Are able to apply their knowledge to solve problems arising in whatever career path they choose.
- Are sensitive to societal issues and are committed to professional ethics.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

PEO 1: Produce graduates who will have the ability to apply the knowledge of basic sciences engineering sciences and electrical engineering to excel in professional career.

PEO 2: Produce graduates who will continue to enhance their knowledge.

PEO 3: Produce graduates who are confident to take up diverse career paths.

PEO 4: Produce graduates who will provide leadership and demonstrate the importance of professional integrity.
PROGRAM OUTCOMES (POs):

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: Identify, formulate, analyze, design and implement—electrical and electronics circuits, control systems, drives, power systems and power electronic systems.

PSO2: Use modern tools to solve problems in diverse and multidisciplinary environment.

PSO3: Understand the impact of engineering solutions in societal and environmental context, commit to professional ethics, lifelong learning and communicate effectively.

PSO4: Apply project management techniques to electrical/electronic(s) systems, exhibiting team work.
## Curriculum Course Credits Distribution

<table>
<thead>
<tr>
<th>Semester</th>
<th>Humanities &amp; Social Sciences (HSS)</th>
<th>Basic Sciences (BS)/Lab</th>
<th>Engineering Sciences (ES)/Lab</th>
<th>Professional Subjects (Hard core, soft core, Lab)-Core</th>
<th>Professional Subjects (PS)-Electives</th>
<th>Other Electives (Open Electives)</th>
<th>Project Work</th>
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### SCHEME OF TEACHING
#### III SEMESTER

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<th>Sl. No.</th>
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<td>Microcontrollers: Programming &amp; Interfacing</td>
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L : Lecture    T : Tutorial    P: Practical    S: Self Study
ENGINEERING MATHEMATICS-III

Course Code: EE31  Course Credits: 4:0:0:0
Prerequisite: Engineering Mathematics I and II (MAT101 & MAT201)  Contract Hours: 56

Unit I

Numerical solution of Algebraic and Transcendental equations: Method of false position, Newton - Raphson method.
Statistics: Curve fitting by the method of least squares, fitting a linear curve, fitting a parabola, fitting a Geometric curve, Correlation and Regression.

Unit II

Linear Algebra: Elementary transformations on a matrix, echelon form of a matrix, rank of a matrix, consistency of system of linear equations, Gauss elimination and Gauss – seidal method to solve system of linear equations, eigen values and eigen vectors of a matrix, Rayleigh power method to determine the dominant eigen value of a matrix, diagonalization of a matrix, system of ODEs as matrix differential equations.

Unit III

Complex Variables-I: Functions of complex variables, analytic function, Cauchy-Riemann equations in cartesian and polar coordinates, consequences of Cauchy-Riemann equations, Construction of analytic functions.
Transformations: Conformal transformation, discussion of the transformations - \( w = z^2, w = e^z, \) and \( w = z + \frac{a^2}{z} \ (z \neq 0), \) bilinear transformation.

Unit IV

Complex Variables-II: Complex integration, Cauchy theorem, Cauchy integral formula. Taylor and Laurent series (statements only). Singularities, poles and residues, Cauchy residue theorem (statement only).

Unit V

Fourier series: Convergence and divergence of infinite series of positive terms. Periodic function, Dirchlet conditions, Fourier series of periodic functions of period \( 2\pi \) and arbitrary period, half range series, Fourier series and half range Fourier series of periodic square wave, half wave rectifier, full wave rectifier, saw-tooth wave with graphical representation, practical harmonic analysis.

Text Books
Reference Books


Course Outcomes:

At the end of the course, students will be able to:

1) Solve the problems of algebraic, transcendental and ordinary differential equations using numerical methods and fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data. (PO-1,2)

2) Analyze the concept of rank of a matrix and test the consistency of the system of equations and solution by Gauss Elimination and Gauss Seidel iteration methods. Solve the system of ODE’s by matrix differential equations. (PO-1,2)

3) Analyze functions of complex variable in terms of continuity, differentiability and analyticity. Apply Cauchy-Riemann equations and harmonic functions to solve problems related to Fluid Mechanics, Thermo Dynamics and Electromagnetic fields and geometrical interpretation of conformal and bilinear transformations. (PO-1,2)

4) Find singularities of complex functions and determine the values of integrals using residues. (PO-1,2)

5) Apply the knowledge of Fourier series and expand a given function in both full range and half range values of the variable and obtain the various harmonics of the Fourier series expansion for the given numerical data. (PO-1,2)
ANALOG ELECTRONIC CIRCUITS

Subject Code : EE32  
Prerequisites : Nil  
Course Coordinator/s: Sri. Narasimpur Tushar Suresh  
Credits : 3: 0: 0:1  
Contact Hours: 56

Unit I

Diode Circuits: Piecewise linear diode model, clipping circuits, clipping at two independent levels, clammers.

Transistor Biasing and Stabilization: Operating point, bias stability, self-bias or emitter bias, stabilization factors.

Self-Study: Bias compensation.

Unit II

Transistors at Low Frequencies: Two-Port devices and hybrid model, Transistor hybrid model of CE, CC, CB configuration, determination of hie, hre, hfe & hoe. Analysis of a transistor amplifier circuit using h parameters, analysis of CE amplifier.

Millers theorem and its dual.

Self-Study: Conversion formulas for the parameters of the three configurations

Unit III

Emitter follower, Comparison of transistor configuration, Darlington emitter follower, bootstrapped Darlington circuit.

Feed Back Amplifier: Feedback concept, transfer gain with feedback, general characteristics of negative feedback amplifiers, input resistance, output resistance, advantages.

Self-Study: Oscillators: Barkhausen criterion, conditions for sustained oscillations – RC phase shift, Colpitt’s and Hartley, Wein bridge oscillator

Unit IV

Power Amplifier: Class A large-signal amplifiers, second harmonic distortion, higher-order harmonic generation, transformer coupled audio power amplifier, efficiency, class B amplifiers, class AB operation.

Multistage Amplifier: Classification of amplifiers, distortion in amplifiers, frequency response of an amplifier, RC coupled amplifier

Self-Study: Push-pull amplifier

Unit V

Field Effect Transistors: Junction field effect transistor, Pinch off voltage, JFET volt-amp characteristics, D-MOSFET & its Characteristics, EMOSFET & its characteristics, digital switching, power FETs.

Self-Study: Special purpose diodes: optoelectronic devices, Schottky diodes, varactor, varistors, tunnel diode, PIN diode
Text Books:

Reference Books:

Course Outcomes:
Students completing this course should be able to:
1. Design biasing and compensation circuits.
   (PO-3) (PSO-1)
2. Analyze effects of feedback in transistor amplifier.
   (PO-1) (PSO-1)
3. Analyze transistor circuits using hybrid model and amplifier’s distortion, Design clipper and clamper
   (PO-1) (PSO-1)
4. Enumerate working, salient features and usage of JFETs, MOSFETs, and special purpose diodes.
   (PO-1) (PSO-1)
5. Design Oscillator Circuits
   (PO-3) (PSO-1)
FIELD THEORY

Subject Code: EE33
Prerequisites : Nil
Contact Hours Required: 56
Course Coordinator/s: Dr. Pradipkumar Dixit & Sri. Victor George

Unit I
Coulomb’s Law, electric field intensity, field of a line charge, sheet of charge, electric flux density, Gauss’s law, divergence, Maxwell’s first equation (Electrostatics), applications

Unit II
Vector operator $\nabla$ and divergence theorem, definition of potential difference and potential, potential field of a point charge and system of charges, potential gradient, current and current density, continuity of current, applications

Unit III
Boundary conditions for perfect dielectrics, derivations of Poisson’s and Laplace’s equations, examples of the solutions of Laplace’s and Poisson’s equations. Capacitance, examples, Biot-Savart law, Ampere’s circuitual law, Curl, Applications

Unit IV
Magnetic flux and flux density, scalar and vector magnetic potentials, force on a moving charge and differential current element, force between differential current elements, force and torque on a closed circuit, applications.

Unit V
Magnetic boundary conditions, Potential energy, Inductance, Examples, Faraday’s law, Displacement current, Maxwell’s equation in point and integral form, retarded potentials, applications.

Text Book:

Reference Books:

Course Outcomes:
A student completing this course should be able to:
1. Determine force, electric filed, potential and potential gradient due to different charges. (PO-1, PSO-1).
2. Understand the application of divergence and estimation of current and current density. (PO-1, PSO-1)
3. Comprehend boundary relations and application of Laplace’s & Poisson’s equations (PO-1, PSO-1).
4. Realize application of Biot-Savart, Ampere’s law and curl (PO-1, PSO-1).
5. Gain concept of displacement current and time varying magnetic field (PO-1, PSO-1).
ELECTRIC NETWORKS

Subject Code: EE34  
Prerequisites: Nil  
Course Coordinator/s: Sri. Vinayaka V Rao/Dr. Naveen Vijayan Mekhileri  
Credits: 3: 1: 0:0  
Contact Hours Required: 70

Unit I

Introduction: Practical sources, source transformation, network reduction using start-delta transformation, loop and node analysis with linearly dependent and independent sources for DC and AC network, concepts of super node and super mesh.

Unit II

Network theorems: Superposition, reciprocity, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Millman's theorem

Unit III

Two port network parameters: short circuit admittance parameters, open circuit impedance parameters, transmission parameters, hybrid parameters, relationship between parameter sets, calculation of these parameters for a given network

Unit IV

Transient behavior and initial conditions: Behavior of circuit element under switching condition and their representation, evaluation of initial and final conditions in RL, RC and RLC circuit for AC and DC excitations, problem solving using Laplace transforms.

Unit V

Resonant circuits: Series and parallel resonance, frequency response of series and parallel circuits, Q factor and bandwidth. 
Three phase circuits: Analysis of balanced and unbalanced three phase systems, measurement of active and reactive power (with balanced system), advantages of poly-phase system over single phase system.

Text Books:

Reference Books:
Course Outcomes:

A student completing this course should be able to:

1. Obtain solution to problems in electrical network using network reduction techniques and source transformations
   (PO-1, 2) (PSO 1)

2. Obtain solution to problems in electric circuits by applying network theorems.
   (PO-1, 2) (PSO 1)

3. Represent the two port network by Z, Y, ABCD and h Parameters.
   (PO-1, 2) (PSO 1)

4. Analyze the network under transient condition due to switching and able to apply the Laplace transforms.
   (PO-1, 2) (PSO 1)

5. Solve problems on frequency response and analyze poly phase balanced and unbalanced circuits.
   (PO-1, 2) (PSO 1)
ELECTRICAL MACHINES – I

Subject Code: EE35
Prerequisites: Nil
Course Coordinator/s: Dr.Chandrashekhar Badachi/Dr.Swati Narula

Credits: 4: 0: 0: 0
Contact Hours: 56

Unit I

DC Generator – Review of basics, types of excitation, no-load & load characteristics, armature reaction, commutation – types, difficulties.

DC Motors - Torque equation, back emf, characteristics of shunt, series, compound motors, Speed control of shunt and series motors, applications of DC machines

Unit II

Testing of DC Machines - Necessity of starters, types of starters, losses in DC machines, efficiency, direct & indirect method of testing for shunt & series DC machines, permanent magnet DC motors and brushless DC motors.

Unit III

Synchronous Generator – Review of construction, EMF equation, effect of distribution of winding, use of chorded coils, harmonics – causes, effects, reduction, regulation by EMF, MMF, ZPF, ASA method, two reaction theory, slip test

Unit IV

Parallel Operation of Synchronous Generator - Synchronizing to infinite bus bars, parallel operation of synchronous generators, operating characteristics, power angle characteristics, (excluding armature resistance), operation at constant load with variable excitation and vice versa for generating mode & motoring mode, V curve of synchronous machine, compounding curves of synchronous generator, capability curves of synchronous generator.

Unit V

Synchronous Motor - Power flow equations of non-salient pole machines, hunting in synchronous machines, damper windings, starting methods of a synchronous machine to run as a motor, synchronous condenser, salient pole synchronous machines- power flow equations and power angle diagram, line start permanent magnet synchronous motor.

Text Books:

Reference Books:
Course Outcomes

On successful completion of this course, the students will be able to
1. Describe and analyze the characteristics of DC generator and DC motor and solve problems based on the method of speed control of DC motor
   (PO-1, 2) (PSO-1)
2. Analyze the performance of DC machines
   (PO-1, 2) (PSO-1)
3. Describe and analyze the construction and emf equation of alternator
   (PO-1, 2) (PSO-1)
4. Describe and analyze the regulation and parallel operation of alternator
   (PO-1, 2) (PSO-1)
5. Describe the starting of synchronous motor, use of damper windings, hunting in synchronous motor
   (PO-1, 2) (PSO-1)
LOGIC DESIGN

Subject Code: EE36
Prerequisites: Nil
Course Coordinator/s: Smt. S. Dawnee

Credits: 3: 0: 0: 0
Contact Hours: 42

Unit I
Design of Combinational Logic: Review of Boolean algebra and basic gates, Definition of combinational logic, Canonical forms, Generation of switching equations from truth table, Karnaugh maps-3,4 variables, Map entered variables, Incompletely specified functions, Simplifying max term equations

Analysis and Design of Combinational Logic I: General approach, Decoders-BCD decoders, encoders

Unit III
Analysis and Design of Combinational Logic II: Digital multiplexers-using multiplexers as Boolean function generators, adders & subtractors, Comparators

Unit IV
Sequential Circuits I: Basic bistable elements, SR latch, applications, Gated SR latch, D, T, JK flip flops, Master/Slave JK flip-flop, Edge triggered flip flop, conversion of one flip flop to another.

Unit V
Sequential Circuits II: Characteristics equations, Register, Counters, Asynchronous (ripple counters), Synchronous binary counters, Design of synchronous counters using different flip-flops, Shift registers, Counters using shift registers.

Text Books:
1. Thomas L Floyd, Digital Fundamentals, TMH, 8th edition

Reference Books:

Course Outcomes:
The course enables the students to,
1. Analyze the given design specification and formulate the solution in the form of Boolean equations.
   (PO-1)(PSO 1)
2. Develop combinational logic circuits using logic gates.
   (PO-1)(PSO 1)
3. Design digital circuits using multiplexers, decoders and other ICs.
   (PO-1)(PSO 1)
4. Develop sequential logic circuits using flip-flops.
   (PO-1)(PSO 1)
5. Design cost effective digital electronic systems with different digital components.
   (PO-1)(PSO 1)
ANALOG ELECTRONIC CIRCUITS LAB

Subject Code: EEL37
Prerequisites: Nil
Course Coordinator/s: Sri. Narasimpur Tushar Suresh

Credits: 0: 0: 1:0
Contact Hours Required: 28

List of Experiments

1. Design, build and test diode clipping (single & double ended) circuits Design, build and test of clamping circuits (positive clamping & negative clamping)
2. Design, build and test RC coupled single stage FET/BJT amplifier and determination of the frequency response, input & output impedances.
3. Design of BJT emitter follower, Darlington emitter follower (with & without bootstrap) and determination of the gain, input & output impedance
4. Design and testing of BJT R-C phase shift oscillator
5. Design and testing of BJT / FET Hartley oscillators
6. Design and testing of BJT Colpitt’s oscillators
7. Design of a voltage series feedback amplifier and determine the gain, input & output Impedance
8. Design & testing of Class A, transformer coupled power amplifier
10. Design and simulation of Amplifier circuits and clippers.
11. Design and simulation of clamps and oscillators

Course Outcomes:

A student completing this course should be able to:
1. Design the biasing circuits for establishing the Q point of a transistor amplifier.
(PO-3,4) (PSO-1)
2. Design, Simulate (using PSpice), build and test clipper, clamper, zener voltage regulator, oscillators, voltage series feedback amplifier, RC coupled amplifier and power amplifier.
(PO-3,4) (PSO1)
LOGIC DESIGN LAB.

Subject Code: EEL38  
Prerequisites: Nil  
Course Coordinator/s: Smt. S. Dawnee

Credits: 0: 0: 1:0  
Contact Hours Required: 28

List of Experiments

1. Simplification, realization of Boolean expressions using logic gates
2. Realization of half/full adder and half/full subtractor using logic gates
3. Realization of parallel adder/subtractor using 7483 chip and BCD to Excess 3 code conversion and vice versa
4. Realization of binary to gray code converter and vice versa
5. Use of MUX/DEMUX for arithmetic circuit and code converter
6. Realization of one/two bit comparator and study of 7485 magnitude comparator
7. Truth table verification of flip-flops (JK, T and D type)
8. Realization of 3-bit counters as a sequential circuit and mod-n counter design
9. Shift left and shift right, SIPO, SISO, PISO, PIPO operations using 7495
10. Design and testing of Ring Counter/Johnson counter
11. Design of sequence generator

Course Outcomes:

The course enabled the students to,

1. Learn functioning, design and implement digital circuits using logic gates, decoders, multiplexers, flip-flops etc.
   (PO-4) (PSO-1)
2. Enhance their technical and communication skills and demonstrate team spirit with mini project.
   (PO-9,10) (PSO-4)
ENGINEERING MATHEMATICS-IV

Course Code: EE41  Course Credits: 4:0:0:0
Prerequisite: Engineering Mathematics I and II (MAT101 & MAT201)  Contract Hours: 56

Unit I

Finite Differences and Interpolation: Forward, Backward differences, Interpolation, Newton-Gregory Forward and Backward Interpolation, formulae, Lagrange interpolation formula and Newton divided difference interpolation formula (no proof).


Unit II

Fourier Transforms: Infinite Fourier transform, Infinite Fourier sine and cosine transforms, properties, Inverse transform, Convolution theorem, Parseval identity (statements only). Fourier transform of rectangular pulse with graphical representation and its output discussion, Continuous Fourier spectra-Example and physical interpretation.


Unit III

Random Variables: Random Variables (Discrete and Continuous), Probability density function, Cumulative distribution function, Mean, Variance, Moment generating function.

Probability Distributions: Binomial and Poisson distributions, Normal distribution, Exponential distribution, Gamma distribution, Uniform distribution, Joint probability distribution (both discrete and continuous), Conditional probability, Conditional expectation, Simulation of random variables.

Unit IV


Unit V

Series Solution of ODEs and Special Functions: Series solution, Frobenius method, Series solution of Bessel differential equation leading to Bessel function of first kind, Orthogonality of Bessel functions. Series solution of Legendre differential equation leading to Legendre polynomials, Rodrigues's formula.
Text Books:

Reference Books:

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

1. Use a given data for equal and unequal intervals to find a polynomial function for estimation. Compute maxima, minima, curvature, radius of curvature, arc length, area, surface area and volume using numerical differentiation and integration. (PO-1,2)
2. Evaluate Fourier transforms, Fourier sine and Fourier cosine transforms of functions and apply the knowledge of z-transforms to solve difference equations. (PO-1,2)
3. Apply the concept of probability distribution to solve Engineering problems. (PO-1,2)
4. Apply the stochastic process and Markov Chain in predictions of future events. (PO-1,2)
5. Obtain the series solution of ordinary differential equations. (PO-1,2)
ELECTRICAL & ELECTRONICS MEASUREMENTS

Subject Code: EE42  
Prerequisites: Nil  
Course Coordinator/s: Sri. Narasimpur Tushar Suresh / Smt.Mamatha G M  
Credits: 3: 0: 0: 1  
Contact Hours: 42

Unit I
Review of fundamental and derived units, SI units, Dimensional equation, Standards. Requirements of instruments, Definition of Accuracy & Precision and resolution of overshoot.
DC Bridges: Wheatstone bridge, Limitations, Kelvin double bridge.
AC Bridges: Maxwell’s Bridge, Anderson Bridge & Schering Bridge.
Self-Study Component: Earth resistance measurement using megger, Shielding of bridges.

Unit II
Introduction to Ammeter and Voltmeter, Extension of Instrument Ranges - shunt & multipliers.
Instrument Transformers: Construction & theory of Instrument transformer, Ratio and phase angle error of CT and PT, Silsbee’s method of testing CT.
Self-Study Component: Difference between CT and PT, Means to reduce error is CT & PT.

Unit III
Construction and operation of electrodynamometer single phase PF meter, Weston frequency meter and phase sequence indicator.
Introduction to electronic Instrumentation & ADC, True RMS responding voltmeter, Digital voltmeters (DVM) - Ramp type DVM, Integrating type DVM, and Successive - approximation DVM, Q-meter.
Self-Study Component: Electronic Multimeter, Continuous – balance DVM.

Unit IV
Wattmeter: Construction and theory of electrodynamometer wattmeter, Errors, LPF wattmeter, Induction type energy meter, Construction, Theory, Errors, adjustments and calibration,
Self-Study Component: Principle of electronic energy meter.

Unit V
Classification and Selection of Transducers, Strain Gauge, LVDT, RTD, Thermistors, Thermocouples. Introduction to Data Acquisition Systems, Components of Digital and Analog Data Acquisition Systems.
Self-Study Component: Photovoltaic cells, interfacing resistive transducers to electronic circuits.

Text Books:
2. 2. David A Bell, Electronic Instrumentation and Measurements, PHI, 2nd Edition.

Reference Books:
Course Outcomes

After completion of this course the students will be able to

1. Derive units of any physical parameters based on the equations governing that physical parameter.
   (PO – 1) (PSO-1)

2. Find the values of Unknown Resistance, Inductance and Capacitance by using different methods.
   (PO – 1) (PSO-1)

   (PO – 1) (PSO-1)

4. Determine the accuracy of measuring instruments.
   (PO – 1,4,12) (PSO-1)

5. Decide the type of transducer and measuring devices to be selected for any particular process.
   (PO -1,7,12 ) (PSO-3)
SIGNALS AND SYSTEMS

Subject Code: EE43
Prerequisites: Nil
Course Coordinator/s: Sri. Victor George & Smt. Kusumika Krori Dutta

Credits: 3: 1: 0:0
Contact Hours: 70

Unit I
Introduction: Definitions of signals and a system, Classification of signals, Basic operations on signals, Elementary signals viewed as interconnections of operations. Relation between the elementary signals, specific systems, Properties of systems

Unit II

Unit III
Block diagram representation, direct form I and direct form II, Differential and difference equation representation, Solution of Differential and difference equation, Sampling theorem, quantization, digitization, difference between discrete and digital.

Unit IV

Unit V

Text Books:

Reference Books:

Course Outcomes
After completion of this course, the students will be able to

1. Perform various operations on elementary signals and identify its properties. (PO-1) (PSO-1)
2. Represent Linear Time Invariant (LTI) system through different techniques. (PO-1) (PSO-1)
3. Analyze the relation between the input and output of an LTI system through its impulse response properties. (PO-1) (PSO-1)
4. Determine the response of an LTI system using different techniques. (PO-1) (PSO-1)
5. Apply various properties of transform techniques in the analysis of signals and systems. (PO-1) (PSO-1)
MICROCONTROLLERS: PROGRAMMING & INTERFACING

Subject Code: EE44  
Prerequisites: Nil  
Contact Hours: 56  

Unit I

Introduction to Microcontrollers: Comparison of microcontroller and microprocessors, microcontroller types, general resources available in microcontrollers, RISC and CISC architecture.

Review of numbering systems and binary arithmetic.

8051Basics: Architecture, pin configuration, oscillator and clock, internal and external memory, program counter, data pointer, CPU registers, Program Status Word (PSW), flags, stack, stack pointer, special function registers.

Unit II

8051-Assembly Language Programming: Addressing modes, Instruction Set - data movement instructions, arithmetic & logic instructions, and program control instruction. Programming tools and techniques, simple programs.

Unit III

8051 Programming in C: Data types, time delay, I/O programming, logic operations, data conversion programs, accessing memory, simple programs.

Unit IV

8051 Peripheral’s Programming: Timer programming, counter programming, serial port programming, interrupt programming in assembly & C language.

Unit V

Interfacing: I/O port pin interfacing, seven segment display interfacing, keypad interfacing, external memory interfacing, ADC/DAC interfacing.

Applications: Function generation, speed control of a small DC motor, speed control of a stepper motor.

Brief overview of ARM7, Motorolla68HC11, PIC16 series microcontrollers.

Text Books:

Reference Books:

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

1. Identify the different functional units of a microcontroller and explain their functionality.(PO-1) (PSO-1)
2. Develop algorithm and write assembly language programs for a given specification.(PO-2) (PSO-1)
3. Develop algorithm and write 8051-C programs for a given specification.(PO-2) (PSO-1)
4. Describe the function of 8051 peripherals and use it for their system design requirements.(PO-1,3)(PSO-1)
5. Design interfacing circuitry to interface basic input/output devices and design 8051 based systems using these interfacing circuitry.(PO-3,12) (PSO-1)
ELECTRICAL MACHINES – II

Subject Code: EE45
Prerequisites: Nil
Course Coordinator/s: Dr.Chandrashekhar Badachi / Dr. M V Likith Kumar

Credits: 4: 0: 0: 0
Contact Hours: 56

Unit I

Transformers: Principle of transformer action for voltage transformation, Constructional details of shell type and core type single phase and three transformers, Types of transformers-Power distribution, Constant voltage transformer, Constant current transformer, Variable frequency and auto transformers, Tap changing transformers, Ideal and practical transformers on no-load, EMF equation, Transformers on load, Vector diagrams

Unit II

Single phase transformers: Analysis & performance, - Equivalent circuit, Losses, Power and all-day efficiency, Regulation, Parallel operation and load sharing

Unit III

Three phase transformers: Types of 3 phase transformers, Connections including open delta choice of connection, Phase conversion-Scott connection, three phases to two phase conversion, Labeling of three phase transformers terminals and applications
Autotransformers: Advantages/ disadvantages of 3 winding transformers, saving of copper in autotransformers

Unit IV

Induction machines: Basic concepts: Concept of rotating magnetic field, Operating principle, Construction, Classification and types.
Analysis & Performance of 3 phase induction motor: Induction motor on no load & load, Efficiency and losses, Vector diagram, Equivalent circuit, Performance (hp, torque, efficiency, Current and power factor evaluation, Slip torque characteristics covering regions of motoring, Generating and braking induction generator.

Unit V

Computation and circle diagrams: No load and blocked rotor tests, Circle diagram and performance evaluation, Cogging and crawling equivalent circuit and performance of double cage and deep bar motor
Starting & Control: Need for starter, DOL, star-delta, Auto transformer starting, Rotor resistance starting, Electronics starter (any one type), Speed control-voltage, Frequency and rotor resistance variations
Single Phase induction motor: Double revolving field theory and principle of operation, Types-split phase capacitor, Shaded pole motors

Text Books:
Reference Books:

Course Outcome:
At the end of the course students are able to
1. Explain the principle and construction of transformers
   (PO-1) (PSO-1)
2. Evaluate the performance of single phase transformers
   (PO-1) (PSO-1)
3. Differentiate three phase transformers and auto-transformers
   (PO-1) (PSO-1)
4. Analyse the performance of induction motors
   (PO-1) (PSO-1)
5. Illustrate starting and control of induction motors.
   (PO-1) (PSO-1)
FUNDAMENTALS OF MODERN VLSI DEVICES AND FABRICATION

Subject Code: EE46
Prerequisites: Nil
Course Coordinator/s: Dr. Chandrashekhar Badachi

Credits: 3: 0: 0: 0
Contact Hours: 42

Unit I
Introduction: Evolution of VLSI Device Technology, Modern VLSI Devices, CMOS transistors, Bipolar Transistors

Basic Device Physics: Electrons and holes in Silicon, Energy bands, n-type and p-type Silicon, Carrier transport, basic equations for device operation, p-n junctions, built-in potential and applied potential.

Unit II
Fabrication Technology: Introduction, Why silicon, Purity of Silicon, Czochralski growing Process, Fabrication processes, Planar PN Junction diode fabrication, Fabrication of resistors and capacitors in ICs.

Metal Oxide Silicon Systems: Introduction, Energy band diagrams, Band-bending and the effect of bias voltages, Threshold Voltage, Oxide charges in MOS Capacitor

Unit III
Metal Oxide Semiconductor FET: Introduction, Construction and basic operation, Structure, Regions of operation: Cut-off, Linear, and Saturation regions, types of MOSFETs, control of threshold voltage- external biasing, V-I Characteristics.

Unit IV
CMOS Design and Fabrication: CMOS structure, Transistor Design Methodology, Hierarchy, Circuit Design example, Design styles and Packaging, CMOS Fabrication- Twin well CMOS process.

Unit V
Bipolar Junction Transistors: Introduction, structure and basic operation, Fabrication of bipolar IC transistor, Terminology, Symbols and regions of operation, comparison between MOSFET & BJT

Text Books:

Reference Books:

Course Outcomes:
The course enables the students to,
1. Illustrate the basic device physics associated with p-n junctions. (PO-1) (PSO 1)
2. Analyze the metal oxide silicon systems with specific focus on MOSCAP. (PO-1) (PSO 1)
3. Elucidate the design and analysis of MOSFET vis a vis CMOS design. (PO-1) (PSO 1)
4. Develop a comparative analysis of different VLSI devices- MOSFET vs BJT. (PO-1) (PSO 1)
5. Interpret and compare the fabrication technologies of different VLSI devices. (PO-1) (PSO 1)
List of Experiments
1. 8051 assembly language programs for data movement (between A register, SFR, internal RAM locations, external ROM locations) using basic instructions.
2. 8051 assembly language programs for manipulating (AND, OR, NOT and other logical operations) bit data and byte data.
3. 8051 assembly language programs for data movement (using conditional statements and loop structures)
4. 8051 assembly language programs for manipulating port data.
5. 8051 assembly language programs for sorting numbers, finding largest numbers in a series and for converting numbers.
6. 8051 assembly language programs for generating waveforms (square and triangular).
7. 8051 C language programs for reading and manipulating port data.
8. 8051 C language programs for sorting numbers, finding largest numbers in a series and for converting numbers.
9. Hardware implementation of blinking LED program using 8051 microcontroller.
10. Hardware implementation of switch/LED program using 8051 microcontroller.
11. Hardware implementation of 9V DC motor control using 8051 microcontroller
12. Hardware implementation of seven segment display control using 8051 microcontroller

Course Outcomes:
At the end of the course, the students will be able to
1. Develop an algorithm that will enable the student to write 8051 programs.
   (PO-1,2,4) (PSO 1, 2)
2. Write, simulate and debug 8051 programs in assembly language for a given problem statement.
   (PO-1,2,4) (PSO 1, 2)
3. Write, simulate and debug 8051 programs in 8051-C for a given problem statement.
   (PO-1,2,4) (PSO 1, 2)
4. Create a hex file, program the microcontroller and conduct a hardware experiment.
   (PO-1,4) (PSO 1, 2)
5. Design and implement a simple 8051 microcontroller based system, in a group, to solve an engineering design problems.
   (PO-3,4) (PSO 4)
ELECTRICAL MACHINES - I LAB.

Subject Code: EEL48  
Credits: 0: 0: 1:0
Prerequisites: Nil  
Contact Hours:28
Course Coordinator/s: Dr.Chandrashekhar Badachi, Sri. C. Ravindra Kumar

List of Experiments

1. No load characteristics of DC Generator.
2. Load test on DC Shunt Generator.
3. Load test on DC Shunt Motor.
4. Speed control of DC Shunt Motor.
5. Swinburne’s test on DC Motor.
6. Hopkinson’s test on a pair of identical DC Machines.
7. Speed control of DC Motor by ward Leonard method.
8. Slip test on 3- Φ Alternator.
11. Predetermination of % regulation of 3-Φ Alternator by ZPF method.

Course Outcomes:

At the end of the course students are able to
1. Predetermine and determine the performance of dc machines.  
   (PO-1,4) (PSO 1)
2. Predetermine the regulation of an alternator by various methods.  
   (PO-1,4) (PSO 1)