# FACULTY OF ENGINEERING

## Scheme of Instructions & Examination

## For

## Four Year Degree Programme of

# Bachelor of Engineering (B.E)
# in
# Electrical and Electronics Engineering

(Accredited by NBA)

(With effect from Academic Year 2022-23)

**Empower Women - Impact the World**


Issued by **Dean, Academics**

**STANLEY COLLEGE OF ENGINEERING & TECHNOLOGY FOR WOMEN (AUTONOMOUS)**

**(Affiliated to Osmania University)**

**(Accredited by NAAC with 'A' Grade)**

**Abids, Hyderabad - 500 001, Telangana**

| Abbreviation | Meaning |
|---|---|
| HS | Humanities, Social Sciences and Management |
| BS | Basic Sciences including Mathematics, Physics and Chemistry |
| ES | Engineering Sciences including Workshop, Drawing, Basic Electrical / Electronics |
| PC | Professional Core Courses |
| PE | Professional Elective Courses |
| OE | Open Elective Courses |
| PW | Project Work |
| MC | Mandatory Courses |
| AC | Audit Courses |
| PY | Philosophy |
| EC | Electronics and Communication Engineering. |
| CE | Civil Engineering, |
| MP | Mechanical / Production Engineering |
| IT | Information Technology |
| CS | Computer Science Engineering |
| EE | Electrical and Electronics Engineering |
| CM | Computer Engineering |
| AD | Artificial Intelligence and Data Science |
| L | Lecture |
| T | Tutorial |
| P | Practical |
| G | Grade |
| D | Drawing |
| CIE | Continuous Internal Evaluation |
| SEE | Semester End Evaluation |
| | Each contact hour is a clock hour |
| | The duration of the Practical class is two hours; however, it can be extended wherever necessary, to enable the student to complete the experiment. |

| Keywords | Definition |
|---|---|
| HS | Courses offered in the area of humanities and social sciences like communication & managerial skills. |
| BS | Courses of foundational nature in the areas of Mathematics, Physics, Chemistry, Biology etc. |
| ES | Courses belonging to the basic evolutionary aspects of a Particular Engineering from all other branches of Engineering. |
| PC | Courses that are fundamental and compulsory constituents of the respective engineering discipline. |
| PE | Courses those are discipline-specific to stream line the graduates to different emerging fields as per their choice. |
| OE | Courses of interdisciplinary nature offered to all the students of various programmes across the Institute. |
| PW | To make a perfect, Hands-on experienced Professionals. |
| MC | Compulsory non-credit courses that a student need to study to become a responsible citizen, as per supreme court guidelines. |
| AC | An audit course (Non-credit) facilitates the student to get awareness of different issues which enhance their skill sets to improve their employability. |

## III Semester

| Sl. No | Course Code | Course Title | Scheme of Instruction | | | | Scheme of Examination | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P/D | Contact Hrs per Week | CIE | SEE | See Duration in Hours | |
| **Theory Courses** | | | | | | | | | | |
| 1 | SBS301MT | Probability Theory and Stochastic Process | 3 | 1 | - | 4 | 40 | 60 | 3 | 4 |
| 2 | SPC301EE | Electrical Circuit Analysis | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 3 | SPC302EE | Electromagnetic Fields | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 4 | SPC303EE | Signals and Systems Analysis | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 5 | SPC304EC | Analog Electronics | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 6 | SAC904CS | Fundamentals of Computer Science | 3 | - | - | 3 | - | - | - | - |
| **Practical/Laboratory Courses** | | | | | | | | | | |
| 7 | SES311CS | Data Structures Lab | 2 | - | 2 | 4 | 40 | 60 | 3 | 3 |
| 8 | SPC311EE | Circuits & Simulation Lab | - | - | 4 | 4 | 40 | 60 | 3 | 2 |
| 9 | SPC312EC | Analog Electronics Lab | - | - | 3 | 3 | 40 | 60 | 3 | 1.5 |
| | | **TOTAL** | **20** | **1** | **9** | **30** | **320** | **480** | **24** | **22.5** |

## IV Semester

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Theory Courses** | | | | | | | | | | |
| 1 | SHS401EG | Effective Technical Communication | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 2 | SPC401EE | Electrical Machines – I | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 3 | SPC402EE | Control Systems | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 4 | SPC403EC | Switching Theory and Logic Design | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| 5 | SOE4xxxx | Open Elective – I | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| **Practical/Laboratory Courses** | | | | | | | | | | |
| 6 | SPC411EE | Electrical Machines - I Lab | - | - | 4 | 4 | 40 | 60 | 3 | 2 |
| 7 | SPC412EE | Control Systems Lab | - | - | 3 | 3 | 40 | 60 | 3 | 1.5 |
| 8 | SPC413EC | Switching Theory and Logic Design Lab | - | - | 3 | 3 | 40 | 60 | 3 | 1.5 |
| 9 | SPW511EE | Internship- 1 | The students have to undergo an Internship of 2 week duration after IV- Semester SEE | | | | 50 | - | - | 1 |
| | | **TOTAL** | **15** | **-** | **10** | **25** | **370** | **480** | **24** | **21** |

# III Semester Detailed Syllabus

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC303MT | Probability Theory and Stochastic Process | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| – | 3 | 1 | – | – | 40 | 60 | 4 |

**Course Objectives:**

1. To familiarize the fundamentals of probability and random variables.
2. To give insights of the distribution functions of random variables.
3. To introduce stochastic processes and their temporal characteristics.
4. To define spectral characteristics of stochastic processes.
5. To comprehend the concepts of statistics and linear regression.

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

1. Understand and use the concepts of probability and random variables.
2. Choose appropriate distribution functions for determination of probabilistic characteristics.
3. Apply stochastic processes and use their temporal characteristics.
4. Explain and apply spectral characteristics of stochastic processes.
5. Illustrate the concepts of statistics and linear regression.

**UNIT-I: Probability and Random Variable**

**Probability:** Concepts of Probability, Events, Conditional Probability, Bernoulli Trials, Bernoulli's Theorem, Total Probability, Bayes' Theorem.

**Random Variable:** Definition and types - Discrete, Continuous and Mixed Random Variables, Probability Mass Function (PMF) /Probability Density Function (pdf), Cumulative Distribution Function (CDF), Expectation, Moments.

**UNIT-II: Distribution Functions of Single Random Variable**

Binomial, Poisson, Uniform, Gaussian, Rayleigh –Properties, Mean, Variance, Moment Generating Function, Characteristic Function.

**Two Random Variables and operations:** Bi-variate Distributions, One Function of Two Random Variables, Joint Distribution and Density Function and their properties, Joint Moments, Joint Characteristic Functions, Conditional Distributions, Central Limit Theorem: statement and applications.

**UNIT-III: Stochastic Processes – Temporal Characteristics**

Concepts of stationarity-First and Second order- wide sense stationary and strict sense stationary, statistical independence, Time averages and ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Definition and Properties - Autocorrelation Function, Cross-Correlation Function, Covariance.

Linear System Response of Mean and Mean-squared Value.

Qualitative study of Gaussian and Poisson Random Processes.

**UNIT-IV: Stochastic Processes-Spectral Characteristics**

Power Spectral Density and its properties; Relationship - Power Spectrum and Autocorrelation Function; Cross-Power Spectrum and Cross-Correlation Function; Response to linear systems and stochastic inputs.

**UNIT-V: Statistics & Linear Regression**

Measures of Central Tendency, Moments. Curve fitting using Method of Least Squares: Fitting of straight line, second-degree parabolas, and power curves, Correlation, Rank correlation and Linear Regression.

**Reference Books:**

1. Peyton Z. Peebles, Probability, Random Variables & Random Signal Principles, 4th edition, Tata McGraw Hill, 2001.
2. Athanasius Papoulis and S. Unnikrishna Pillai, Probability, Random Variables and Stochastic Processes, 4th edition, McGraw Hill, 2006.
3. P. Ramesh Babu, Probability Theory and Random Processes, 1st edition, McGraw Hill Education (India) Private Limited, 2015.

**Suggested Readings:**

1. Henry Stark and John W. Woods, Probability and Random Processes with Application to Signal Processing, 3rd edition, Pearson Education, 2014.
2. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, 11th edition, S. Chand, 2006.
3. T. Veerarajan, Probability, Statistics and Random Processes, 3rd Edition, McGraw Hill Companies, 2010.
4. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham, V. S. S. N. Prasad, Mathematical Methods, S. Chand, 2010.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC301EE | Electrical Circuit Analysis | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| SES102EE | 3 | – | – | – | 40 | 60 | 3 |

**Course Objectives:**

1. To learn about AC resonance and different theorems applications
2. To understand the behaviour of DC and AC transients.
3. Application of Laplace transform in electric circuits and understanding of Two port networks.

**Course Outcomes:**

1. Obtain steady-state response and resonance of electrical circuits.
2. Apply network theorems for the analysis of electrical circuits.
3. Analyse solution of first and second order RL, RC and RLC networks.
4. Apply Laplace transforms for electrical circuits
5. Analyse the behavior of two port networks

**UNIT I – Sinusoidal steady state analysis**

AC circuit analysis, effective or RMS values, average power and complex power, series and parallel resonances. Analysis of three-phase circuits, analysis of magnetically coupled circuits with dot Convention.

**UNIT II – Network Theorems with DC and AC**

Superposition theorem, Thevenin's theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem Analysis with dependent current and voltage sources. Node and Mesh Analysis Concept of duality and dual networks.

**UNIT III – DC and AC Transients**

Initial and final conditions in network elements, forced and free response, time constants.
**DC Transients:** Analysis of series and parallel R-L, R-C, R-L-C circuits with DC excitation.
**AC Transients:** Analysis of series and parallel R-L, R-C, R-L-C circuits with AC excitation.

**UNIT IV – Electrical Circuit Analysis Using Laplace Transforms**

Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions.

**UNIT V – Two Port Network and Network Functions**

Two Port Network parameters, impedance, admittance, transmission hybrid and inter-relationship of parameters, interconnections of two port networks. Driving point and Transfer functions.

**Text Books:**

1. William Hart Hayt, Jack Ellsworth Kemmerly, Steven M. Durbin (2007), Engineering Circuit Analysis, 8th Edition, McGraw-Hill Higher Education, New Delhi, India, 2018.
2. Charles K. Alexander and Matthew N.O. Sadiku, Fundamentals of Electric Circuits,7th Edition, Tata McGraw Hill, New Delhi, 2015.
3. N. C. Jagan and C. Lakshminarayan, Network Theory, 2nd Edition, Anshan, 2005

**Reference Books:**

1. A. Sudhakar, Shyammohan S. Palli, Network Analysis, 4th Edition, Tata Mc Graw Hill, New Delhi, 2009.
2. A. Chakrabarthy (2010), Electrical Circuits, 5th Edition, Dhanpat Rai & Sons Publications, New Delhi,2010.
3. M. E. Van Valkenburg, Network Analysis, Pearson India Education Services Pvt. Ltd T hird edition, 2019.
4. Robert L Boylested, Introductory Circuit Analysis, Pearson, 2018.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC302EE | Electromagnetic Fields | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| SES102EE | 3 | – | – | – | 40 | 60 | 3 |

**Course Objectives:**

1. Understanding of vector calculus.
2. To learn about Electric and Magnetic static fields.
3. Understanding of Time varying fields and Electromagnetic waves.

**Course Outcomes:**

1. Understand the vector calculus for electromagnetism.
2. Obtain the electric fields for simple configurations under static conditions.
3. Analyse and apply the static magnetic fields.
4. Understand Maxwell's equation in different forms and different media.
5. Understand the propagation of EM waves

**UNIT I – Review of Vector Calculus**

Vector algebra-addition, subtraction, components of vectors, scalar and vector multiplications, triple products, three orthogonal coordinate systems (rectangular, cylindrical and spherical). Vector calculus-differentiation, partial differentiation, integration, vector operator del, gradient, divergence and curl, integral theorems of vectors. Conversion of a vector from one coordinate system to another.

**UNIT II – Static Electric Field and Conductors, Dielectrics and Capacitance**

Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.

Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Capacitance of a two-wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations with single variable.

**UNIT III – Static Magnetic Fields and Magnetic Forces, Materials and Inductance**

Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors.

Force on a moving charge, Force on a differential current element, Force between differential current elements, Nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuits, inductances and mutual inductances.

**UNIT IV – Time Varying Fields and Maxwell's Equations**

Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces. Electrical and Magnetic boundary conditions.

**UNIT V – Electromagnetic Waves**

Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane waves in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors, Skin effect. Poynting theorem.

**Text Books:**

1. W. Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2012.2. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.

**Reference Books:**

1. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009.
2. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.
3. W.J. Duffin, "Electricity and Magnetism", McGraw Hill Publication, 1990.
4. B. D. Popovic, "Introductory Engineering Electromagnetics", Addison-Wesley Educational Publishers, International Edition, 1971.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC303EE | Signals and Systems Analysis | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| SES102EE | 3 | – | – | – | 40 | 60 | 3 |

**Course Objectives:**

1. To understand the classification of continuous-time and discrete-time signals and systems
2. To develop ability to solve systems represented by differential equations and difference equations using analytical methods and Laplace and Z-transforms.
3. To acquire the knowledge of representing the signals in frequency domain using Fourier series and Fourier transform.

**Course Outcomes:**

1. Classify and analyze the continuous time signals and discrete time signals and systems.
2. Generate discrete time signals through sampling process and reconstruct them.
3. Determine the responses of continuous and discrete-time systems which are represented by differential equations and difference equations.
4. Analyze continuous time systems with the help of Laplace transform and discrete time system with Z-transform.
5. Analyze the continuous and discrete-time systems in frequency domain with the help of Fourier series and Fourier Transform.

**UNIT I – Introduction to Continuous and Discrete Time Signals**

Examples of signals and systems as seen in everyday life in relation to engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time- limited signals; Introduction to discrete-time signals - Sampling and Reconstruction: The Sampling Theorem and its implications. Spectra of sampled signals. Aliasing and its effects. Reconstruction: ideal interpolator, zero-order hold and first-order hold. Classification of discrete time signals.

**UNIT II – Behavior of Continuous and Discrete-time LTI systems**

System properties: linearity: additivity and homogeneity, shift-invariance, causality and stability. Linear time invariant system, properties convolution integral and convolution sum. System representation through differential equations and difference equations.

**UNIT III – Frequency Domain Representation of Continuous Time Signals**

Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, properties, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality.

**UNIT IV – Frequency Domain Representation of Discrete Time Signals**

The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

**UNIT V – Laplace Transforms and Z – Transforms**

Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior.

The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis and solution to difference equations.

**Text Books:**

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, Signals and systems, Prentice Hall India, 1997.
2. J. G. Proakis and D. G. Manolakis, Digital Signal Processing: Principles, Algorithms, andApplications, Pearson, 2006.

**Reference Books:**

1. H. P. Hsu, Signals and systems, Schaum's series, McGraw Hill Education, 2010.
2. S. Haykin and B. V. Veen, Signals and Systems, John Wiley and Sons, 2007.
3. A. V. Oppenheim and R. W. Schafer, Discrete-Time Signal Processing, Prentice Hall, 2009.
4. M. J. Robert, Fundamentals of Signals and Systems, McGraw Hill Education, 2007.
5. B. P. Lathi, Linear Systems and Signals, Oxford University Press, 2009.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC304EE | Analog Electronics | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| – | 3 | – | – | – | 40 | 60 | 3 |

**Course Objectives:**

1. To give insights of the diode characteristics in forward and reverse bias and diode applications.
2. To comprehend the construction and working of Bipolar Junction Transistor in various modes and JFET.
3. To familiarize with feedback concepts and its applications.
4. To describe various classes of power amplifies.
5. To give insights of the operation of OPAMP and its applications.

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

1. Interpret the characteristics and apply diode models to analyze various applications of diodes.
2. Discriminate the BJT configurations to recognize appropriate transistor configuration for any given application and design the biasing circuits with good stability.
3. Analyze and compare feedback amplifiers.
4. Distinguish various classes of Power Amplifiers.
5. Analyze the operation of OPAMP and its applications.

**UNIT-I**

**Basics of Semiconductors:** intrinsic and extrinsic semiconductors, Carrier transport, diffusion current, drifts current, mobility and resistivity. Generation and recombination of carriers, Poisson and continuity equations, Qualitative treatment of Hall Effect.

**Junction Diodes and Applications:**

P-N junction characteristics, V-I characteristics, Avalanche breakdown, Zener diode, Applications of Diodes as rectifiers. L and C Filters, LED, photodiode. Basic One level Clipping and clamping circuits using diodes.

**UNIT-II**

**Bipolar Junction Transistor and Applications –** BJT construction and V-I characteristics and configurations of CE, CB, CC**,** JFET construction, its V-I **-** characteristics and configurations of CS, CG, CD. Small signal models of BJT and JFET. MOSFET.

**Transistor Biasing:** Fixed bias, collector to base bias, self-bias, thermal stability.

**BJT Applications:** Analysis of BJT as an amplifier, estimation of voltage gain, current gain, input resistance, output resistance, Analysis of transformer coupled amplifier in mid frequency, Low frequency and high frequency regions with BJT.

**UNIT-III**

**Feedback Amplifiers with Qualitative treatment:** The Positive and negative feedback concept, negative feedback topologies: Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback amplifiers, effect of negative feedback on input and output impedances, gain, bandwidth etc., and concept of stability

**UNIT-IV**

**Oscillators:** Concept of positive feedback, Barkhausen criterion, RC oscillators: phase shift, Wien bridge, LC oscillators: Hartley, Colpitt, Qualitative treatment of Crystal Oscillator,

**Power Amplifiers:** Qualitative treatment for Various classes of operation: Class A, B, and AB, their power efficiency and distortion.

**UNIT-V**

**Operational Amplifiers and its Applications:**

OP-AMP Block diagram, Ideal OP-AMP, DC and AC Characteristics, Inverting and Non-Inverting Amplifiers, Adder/Subtractor, Integrator, Differentiator, Comparator, Zero crossing detector, Square and Triangular wave generators, Sample and Hold circuit.

**Reference Books:**

1. Jacob Millman, Christos C. Halkias, and Satyabrata Jit, Electronic Devices and Circuits, 3rd ed., McGraw Hill Education, 2010.
2. S Salivahanan, N Kumar, and A Vallavaraj, Electronic Devices and Circuits, 2nd ed., McGraw Hill Education, 2007.
3. Jacob Milliman and Herbert Taub, "Pulse, Digital and Switching Waveforms", 3rd Edition.

**Suggested Readings:**

1. A. Anand Kumar "Pulse and Digital circuits".
2. Ramakanth A. Gayakwad, "Op-Amps and Linear Integrated Circuits" Pearson, 2018, 4th Edition.

| Course Code | Course Title | | | | | | Core/Elective/Audit |
|---|---|---|---|---|---|---|---|
| SP–AC | Fundamentals of Computer Science | | | | | | Audit |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| – | 2 | – | – | – | 50 | – | – |

**Course Objectives:**

1. Describe various types and services of operating system.
2. To become familiar with different types of data structures and their applications and learn different types of algorithmic techniques and strategies.
3. Introduce the basics of computer networks to students through a study of layered models of computer networks and applications.

**Course Outcomes:**

1. Explain the basic of an operating system viz. system programs, system calls, user mode and kernel mode.
2. Analyze the Information Systems as socio-technical systems, its need and advantages as compared to traditional file-based systems.
3. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies, sub-netting and routing mechanism.
4. Understanding the problem and corresponding requirement for development of software and describe the various phases of the system development life cycle.
5. Use the Internet to send mail and surf the World Wide Web

**UNIT – I: Overview of Operating Systems (10 Periods)**

Definition of Operating Systems, Types of Operating Systems, Operating System Services, User operating system interface, System Calls, Types of System Calls, System Programs, Operating System Structure, Virtual Machine, Benefits of Virtual Machine.

**UNIT – II: Overview of Database Management Systems (10 Periods)**

Basic concepts, Advantages of a DBMS over file processing system, Data Abstraction, Database Languages, Data Independence. Components of a DBMS and overall structure of a DBMS. Three views of Data (External View, Conceptual View, Internal View), Three level architecture of DBMS, Data Independence, Client Server Architecture.

**UNIT – III: Overview of Computer Networks (10 Periods)**

Introduction: Organization of the Internet, ISP, Network criteria, Categories of networks, Network performance and Transmission Impairments. Network Devices, OSI Model, TCP/IP Protocol Suite, layering principles, Line Encoding, Switching technique and Multiplexing.

**UNIT–IV: Introduction to Software Engineering (10 periods) System Concepts:**

**Types of systems :** (open, closed, static and dynamic systems). Introduction, Programmes v/s Software Products

**Emergence of Software Engineering:** Early Computer Programming, High-level Language Programming, Control flow based Design, Data Structure Oriented Design, Object Oriented Design. Concept of Testing, Testing type cycle (V-Model), Verification v/s Validations, Unit Testing, Black Box Testing, White Box Testing, Integration testing, System testing, Configuration management, Overview of test cases.

**UNIT – V: Fundamentals of Internet (12 Periods)**

Concepts of computer Network, Client Server Model, Peer to Peer Model, Networking Devices: Switch, Router, Hub, Bridge, Gateway, LAN, MAN, WAN, Topology, Internet, Intranet, Extranet, internet service provider and its relevance, role of the modem in accessing the internet, installation procedure of a modem using control panel, purpose of web browser software, URL,URI, URN, WWW, FTP,HTTP,RDC(Remote Desktop Connection), Telnet, Email, process of sending and receiving e-mail, transmission modes, IP address and its format, MAC Address, DNS, search engines, social network sites, internet security, Firewall, Cloud Computing and its services

**Text Books**

1. Silberschatz A., Galvin B. P. and Gagne G., Operating System Concepts, John Wiley & Sons Inc (2013) 9th Edition.
2. Silverschatz A., Korth F. H. and Sudarshan S., Database System Concepts, Tata McGraw Hill (2010) 6th Edition.
3. Forouzan A. B., Data communication and Networking, McGraw Hill (2012) 5th Edition.
4. Software Engineering: A Practitioner's Approach, Roger S Pressman, 9th Edition TMH, and Bruce Maxim ISBN10: 1259872971, ISBN13: 9781259872976
5. Fundamentals of Computer by E Balagurusamy,T ata McGraw Hill Education Pvt.Ltd, New Delhi

**Reference Books:**

1. Stallings W., Operating Systems Internals and Design Principles, Prentice Hall (2018) 9th Edition.
2. Elmasri R. and Navathe B. S., Fundamentals of Database Systems, Pearson (2016) 7th Edition.
3. Tanenbaum S. A. and Wetherall J. D., Computer Networks, Prentice Hall (2013) 5th Edition.
4. Pankaj Jalote's Software Engineering: A Precise Approach, Wiley publications
5. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SES311CS | Data Structures Laboratory | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| SES101CS | – | – | – | 2 | 40 | 60 | 1 |

**Course Objectives:** The course should enable the students to:

1. Understand various data representation techniques in the real world.
2. Implement linear and non-linear data structures.
3. Analyze various algorithms based on their time and space complexity.

**Course Outcomes:** The student will have the ability to:

1. Understand the concept of data structures, C Programming and apply algorithm for solving problems like Sorting, searching, insertion and deletion of data.
2. Understand linear data structures for processing of ordered or unordered data.
3. Explore various operations on dynamic data structures like single linked list, circular linked list and doubly linked list.
4. Explore the concept of non linear data structures such as trees and graphs.
5. Understand the binary search trees, hash function, and concepts of collision and its resolution methods.

**1. Write a C program that uses functions to perform the following:**

a. Create a singly linked list of integers.
b. Delete a given integer from the above linked list.
c. Display the contents of the above list after deletion.
d. Check whether two given lists are containing the same data.

**2. Write a C program that uses functions to perform the following:**

a. Create a double linked list of integers.
b. Delete a given integer from the above double linked list.
c. Display the contents of the above list after deletion.
d. Find the largest element in a given doubly linked list.

**3.** a. Write a C program to implement stack using linked list.
b. Write a C program that uses stack operations to convert a given infix expression into its postfix equivalent, implement the stack using an array.
c. Write a C program to reverse the elements of the stack using recursion.

**4. Write C programs to implement a double ended queue ADT using**

a. Array b. Double linked list

**5. Write a C program that uses functions to perform the following:**

a. Create a binary search tree of characters.

b. Traverse the above binary search tree recursively in post order.

c. Count the number of nodes in the binary search tree.

**6. Write a C program that uses functions to perform the following:**

a. Create a binary search tree of integers

b. Traverse the above binary search tree non recursively in inorder

**7. Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order.**

a. Insertion sort b. Merge sort

**8. Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order.**

a. Quick sort b. Selection sort

**9. Write a C program to perform the following operation:**

a. Insertion into a B-Tree b. Heap Sort

**10. Write a C program to implement all the functions of a dictionary (ADT) using hashing.**

**11. Write a C program for implementing Knuth-Morris-Pratt pattern matching algorithm.**

**12. Write C programs for implementing the following graph traversal algorithms:**

a. Depth first traversal b. Breadth first traversal

**List of Reference Books:**

1. Gilberg and Forouzan, Data Structure- A Pseudo code approach with C, Thomson publication
2. Data Structure in C, Tanenbaum,PHI publication/Pearson Publication.
3. Pai, Data Structures & Algorithms; Concepts, Techniques & Algorithms, Tata McGraw Hill.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC311EE | Circuits and Simulation Lab | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| SPC301EE | – | – | – | 4 | 40 | 60 | 2 |

**Course Objectives:**

1. To Train the Students for acquiring practical knowledge in time response and frequency response of series / parallel RC, RL and RLC Circuits.
2. To prepare the students for finds out parameters of a given two port network.
3. To make the students for understanding the verification of theorems.

**Course Outcomes:**

1. Evaluate the time response and frequency response characteristics of R, L, C series and parallel circuits.
2. Able to validate the network theorems.
3. Able to find various parameters of a two-port network.
4. Able to simulate electrical circuits.
5. Analyze the measurement of power in balanced and unbalanced circuits.

**Suggested List of Experiments / Demonstrations:**

**Hardware Experiments**

1. Frequency Response of a series RLC circuit.
2. Frequency Response of a parallel RLC circuit.
3. Parameters of Two Port Network.
4. Series, Parallel and Cascade Connection of Two Port Networks.
5. Verification of Thevenin's and Norton's Theorems.
6. Verification of Superposition and Maximum Power Transfer Theorems.
7. Verification of Compensation and Reciprocity Theorems.
8. Measurement of Power by using Two Wattmeter Method.

**Simulation Experiments**

1. Simulation of series and parallel resonance.
2. Simulation of Thevenin's and Norton's theorems with dependent sources.
3. Simulation of Maximum Power Transfer theorem with DC & AC.

**Note:** Minimum Ten experiments should be conducted from hardware and simulation experiments.

**Contents Beyond the Syllabus**

1. Simulation of Millman's and Tellegen's theorems.
2. Simulation of balanced and unbalanced 3-phase power measurement.
3. Simulation of interrelation of two port network parameters.

**Text Books:**

1. William Hart Hayt, Jack Ellsworth Kemmerly, Steven M. Durbin (2007), Engineering Circuit Analysis, 8th Edition, McGraw-Hill Higher Education, New Delhi, India, 2018.
2. Agam Kumar Tyagi, MATLAB and Simulink for Engineers, Oxford, 2011.
3. Muhammad H. Rashid, Introduction to Pspice Using Orcad for Circuits and Electronics, Prentice-Hall of India Pvt. Ltd, 2003.

**Reference Books:**

1. A. Chakrabarthy (2010), Electrical Circuits, 5th Edition, Dhanpat Rai & Sons Publications, New Delhi, 2010.
2. M. E. Van Valkenburg, Network Analysis, Pearson India Education Services Pvt. Ltd T hird edition, 2019.
3. Robert L Boylested, Introductory Circuit Analysis, Pearson, 2018.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC312EC | Analog Electronics Lab | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| – | – | – | – | 3 | 40 | 60 | 1.5 |

**Course Objectives:**

1. To give insights of the design of basic circuits of rectification with and without filters using diodes and wave shaping circuit using diodes.
2. To explain the basic design of single and multistage amplifier circuits.
3. To demonstrate negative feedback in amplifier circuits.
4. To demonstrate positive feedback in oscillators.
5. To familiarize with waveform generation using OPAMP.

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

1. Calculate ripple factor, efficiency and % regulation of rectifier circuits
2. Analyze feedback amplifiers and op-amp oscillator circuits
3. Design single, and multi-stage amplifier, wave shaping and controller circuits
4. Understand the characteristics of electronics devices
5. Design using basic op-amp based applications.

**List of Experiments:**

1. Characteristics of Silicon, Germanium and Zener Diode in forward bias and reverse bias
2. Application of diode as a full wave rectifier with and without filters. Calculation of Ripple factor, voltage regulation and efficiency with various loads
3. Static characteristics of BJT in CE configuration
4. Frequency response of Single BJT amplifier in CE configuration
5. Inverting amplifier using op-amp.
6. Non-inverting amplifier using op-amp.
7. Design of integrator and differentiator using op-amp.
8. RC Phase Oscillator using op-amp.
9. Wein Bridge Oscillator using op-amp

10. Clipping circuits
11. Voltage multiplier using op-amp
12. Generation of triangular and square wave using op-amp.

**Note:** Any TEN experiments should be conducted in the semester.

**Suggested Readings:**

1. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, Basic Electronics, A text-Lab Manual, 7th Edition. Mc-Graw-Hill Higher Education 2001.
2. D Roy Chaudhary, Shail B Jain, Linear Integrated circuits, New Age International Publishers, 2007.
3. Analog Electronics laboratory manual of Stanley college of Engineering and Technology for Women.
4. Datasheets of Devices.

# IV Semester Detailed Syllabus

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC401EG | Effective Technical Communication | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| – | 3 | – | – | – | 40 | 60 | 3 |

**Course Objectives:** On successful completion of the course, the students should be able to:

1. Overcome the barriers of communication.
2. Handle technical and business communication effectively.
3. Build any kind of business correspondence.
4. Draft efficient reports.
5. Acquire adequate skills of manual writing

**Course Outcomes:**

1. To understand the process and barriers of communication
2. To learn the aspects of communication and presentation.
3. To comprehend the types of business correspondence
4. To analyze the techniques of report writing
5. To get the knowledge of basics of manual writing

**UNIT I – Introduction to Communication**

1. Definition and process of communication
2. Channels of Communication
3. ABC of Written Communication
4. Barriers of Technical Communication

**UNIT II – Aspects of Communication**

1. Importance of listening and types of listening.
2. Verbal communication and non-verbal communication (proxemics, kinesics)
3. Persuasive techniques
4. Presentation skills

**UNIT III – Manual Writing**

1. Types of manuals
2. User manual
3. Product and Process manual
4. Operations manual

**UNIT IV – Business Correspondence**

1. Email etiquette and Mobile etiquette
2. Agenda, Minutes of the Meeting and 1OM (Inter Office Memorandum)
3. Business letters (enquiry and response; complaint and adjustment; and sales)
4. Business proposals

**UNIT V – Report Writing**

1. Types of reports (Informative, analytical, periodic and special, formal and informal)
2. Structure of a report
3. Feasibility report
4. Progress report

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC401EG | Electrical Machines I | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| SES102EE | 3 | – | – | – | 40 | 60 | 3 |

**Course Objectives:**

1. To understand the concepts of magnetic circuits.
2. To understand electrical principle, laws, and working of DC Generators and Motors.
3. To understand working of transformer and also conduct various tests on the transformer.

**Course Outcomes:**

1. Understand the concepts of magnetic circuits.
2. Understand electrical principle, laws, and working of DC machines.
3. Analyse the construction and characteristics and application of various types of DC generators.
4. Analyse the construction and characteristics and application of various types of DC motors and testing of motors.
5. Understand electrical principle, laws, and working of transformer and losses and also conduct various tests on the transformer.

**UNIT I – Fundamentals of Electromechanical Energy Conversions**

Introduction, Flow of Energy in Electromechanical devices, Energy in Magnetic Systems, Singly Excited System, Determination of Mechanical Force, Mechanical Energy, Torque Equation, Doubly Excited System, energy stored in magnetic field, Electromagnetic Torque, Generated EMF in Machines, Torque in Machines with Cylindrical air-gap, General classifications of Electrical Machines.

**UNIT II – DC Machines: Generators**

Basic construction of a DC machine, Principle of operation, Windings, Armature Reaction, Commutation, EMF Equation, Types of field excitations–separately and self-excited, shunt, series and compound. Open circuit characteristic of separately excited DC generator, generated

EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed, characteristics of DC generators, Parallel operation.

**UNIT III – DC Machines: Motors**

Armature circuit equation for motoring, Back EMF equation, torque-speed characteristics of separately excited, shunt, series motors and compound motors. Speed control methods. Losses and efficiency, Testing - brake test, Swinburne's test, Hopkinson's test and Field's test.

**UNIT IV – Single Phase Transformers**

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses, all day efficiency calculation, advanced testing of transformers.

**UNIT V – Auto Transformers and Three Phase Transformers**

Autotransformers - construction, principle, applications and comparison with two winding transformer. Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap changing of transformers, Three-winding transformers.

Three-phase transformer - construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers.

**Text Books:**

1. I. J. Nagrath and D. P. Kothari, Electric Machines, McGraw Hill Education, 2010.
2. A. E. Fitzgerald and C. Kingsley, Electric Machinery, New York, McGraw Hill Publisher, 2013.
3. P. S. Bimbhra, Electrical Machinery, Khanna Publishers, 2011.

**Reference Books:**

1. A. E. Clayton and N. N. Hancock, Performance and design of DC machines, CBS Publishers,2004.
2. M. G. Say, Performance and Design of AC Machines, CBS Publishers, 2002.
3. Smarajit Ghosh, Electrical Machines, Pearson Education, 2018.
4. P. Satish Kumar, G. Sridhar, Electrical Machines – A Practical Approach, De Gruyter Publication, Germany, 2020.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC402EE | Control Systems | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| – | 3 | – | – | – | 40 | 60 | 3 |

**Course Objectives:**

1. To develop basic skills of utilizing mathematical tools needed to analyze and design classical linear control systems.
2. To understand the stability analysis in time and frequency domains.
3. To understand and develop the state space representation of control systems.

**Course Outcomes:**

1. Understand the concept of the terms control systems, feedback, Mathematical modeling of Electrical and Mechanical systems.
2. Explain the time domain and frequency response analysis of control systems.
3. Acquire the knowledge of various analytical techniques used to determine the stability of control systems.
4. Able to understand the importance of design of compensators.
5. Able to demonstrate controllability and observability of modern control systems.

**UNIT I – Introduction to Control Systems**

Classification of control systems. Feed-Back Characteristics, Effects of feedback - Mathematical modeling of Electrical and Mechanical systems -Transfer function- Transfer function of Potentiometer, synchro, AC servo motor, DC servo motor - Block diagram reduction technique - Signal flow graph, Mason's gain formula.

**UNIT II – Time Domain Analysis**

Standard test signals - Time response of first order systems - Transient response of second order system for unit step input, Time domain specifications - Steady state response - Steady state errors and error constants - Effects of P, PD, Pl and PID controllers.

**UNIT III – Stability Analysis**

The concept of stability - Routh's stability Criterion, Absolute stability and relative stability, Limitations of Routh's stability. Root Locus Technique: The root locus concept, Construction of root loci, Effects of adding poles and zeros on the root loci.

**UNIT IV – Frequency Response Analysis**

Introduction to frequency response - Frequency domain specifications – Bode plot - Stability analysis from Bode plots - Determination of transfer function from the Bode Diagram – Polar Plots, Nyquist Plots, Stability Analysis, Gain margin and phase margin. Control System Design: Introduction - Lag, Lead and Lag-Lead Compensator design in frequency Domain.

**UNIT V – State Space Analysis**

Concepts of state, State variables and state model, Derivation of state models of linear time invariant systems - Controllable, Observable and Diagonal state models - State transition matrix - Solution of state equation - Concepts of Controllability and Observability.

**Text Books:**

1. Nagrath I.J. and Gopal.M, Control System Engineering, Wiley Eastern, 2003.
2. K. Ogata, Modern Control System, Prentice Hall of India, 4th Edition, 2002.

**Reference Books:**

1. B.C.Kuo, Automatic Control Systems, Wiley India, 7th Edition, 2002.
2. Norman N Nise, Control Systems Engineering, John Wiley & Sons, Inc. 605 Third Ave. New York, NY, United States, 5th Edition, 2008.
3. N.C.Jagan, Control Systems, B.S Publications, 2nd Edition, 2008.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC403EE | Switching Theory and Logic Design | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| – | 3 | – | – | – | 40 | 60 | 3 |

**Course Objectives**

1. To develop Boolean algebra and arithmetic circuits.
2. To describe combinational digital circuits for logic functions
3. To build sequential digital circuits for logic functions
4. To study the A/D and D/A converters
5. To design Semiconductor memories and Programmable logic devices.

**Course Outcomes** On successful completion of the course, the students would be able to

1. understand and apply the Boolean algebra, including CMOS gates and arithmetic circuits.
2. apply combinational digital circuits for logic functions
3. use the concepts of Boolean Algebra for the analysis & design of sequential logic circuits
4. design various A/D and D/A converters
5. design various logic gates starting from simple ordinary gates to complex programmable logic devices and arrays.

**UNIT- I**

**Fundamentals of Digital Systems and logic families:** Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital lCs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.

**UNIT-II**

**Combinational Digital Circuits:** Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD

arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/ drivers for display devices-M method of function realization.

**UNIT-III**

**Sequential circuits and systems:** A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J, K, T and D-type flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple(Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

**UNIT-IV**

**A/D and D/A Converters(Qualitative Analysis Only):** Digital to analog converters: weighted resistor/converter, R-2R Ladder digital to analog converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, Analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter.

**UNIT-V**

**Semiconductor memories and Programmable logic devices:** Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

**Reference Books:**

1. M. M. Mano, Digital logic and Computer design, Pearson Education India, 2016.
2. A. Kumar, Fundamentals of Digital Circuits, Prentice Hall India, 2016.

**Suggested Readings:**

1. R. P. Jain, Modern Digital Electronics, McGraw Hill Education, 2009.
2. David A., Bell Operational Amplifiers & Linear ICs,2e, Oxford Publication.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC901CS | OOP Using JAVA | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| – | 3 | – | – | – | 40 | 60 | 3 |

**Course Objectives:** Student will be able to

1. Develop java applications using OO concepts and packages write multi-threaded programs with synchronization
2. Implement real world applications using java collection frame work and I/O classes
3. Write Event driven GUI programs using AWT/Swing

**Course Outcomes**

1. To introduce fundamental object oriented concepts of Java programming Language such as classes, inheritance, packages and interfaces
2. To introduce concepts of exception handling and multi-threading
3. To use various classes and interfaces in java collection framework and utility classes
4. To understand the concepts of GUI programming using AWT controls
5. To introduce Java I/O streams and serialization

**UNIT – I**

**Object Oriented System Development:** understanding object oriented development, understanding object oriented concepts, benefits of object oriented development.

**Java Programming Fundamentals:** Introduction, overview of Java, data types, variables and arrays, operators, control statements.

**UNIT – II**

**Java Programming OO concepts:** classes, methods, inheritance, packages and interfaces. Exceptional Handling, Multithreaded Programming.

**UNIT – III**

I/O Basics, Reading Console Input and Output, Reading and Writing Files, Print Writer Class, String Handling Exploring Java. Lang, Collections Overview, Collection Interfaces, Collection Classes, Iterators, Random Access Interface, Maps, Comparators, Arrays, Legacy Classes and Interfaces, String Tokenizer.

**UNIT – IV**

**Introducing AWT working with Graphics:** AWT Classes, Working with Graphics.

**Event Handling:** Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces

**AWT Controls:** Control Fundamentals, Labels, Using Buttons, Applying Check Boxes, Check Box Group, Choice Controls, Using Lists, Managing Scroll Bars, Using Text Field, Using Text Area, Understanding Layout Managers, Menu bars and Menus, Dialog Boxes, File Dialog, Handling events by Extending AWT Components, Exploring the controls, Menus and Layout Managers.

**UNIT – V**

Java I/O Classes and Interfaces, Files, Stream and Byte Classes, Character Streams, Serialization.

**Suggested Reading:**

1. Herbert Schildt, The Complete Reference JAVA, Tata McGraw Hill, 7thEdition, 2005
2. James M Slack, Programming and Problem Solving with JAVA, Thomson learning, 2002
3. C.Thomas Wu, An Introduction to Object-Oriented Programming with Java, Tata McGraw Hill, 5th Edition, 2005.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC902CS | Python Programming | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| – | 3 | – | – | – | 40 | 60 | 3 |

**Course Objectives:**

1. To learn to solve problems using Python conditionals and loops.
2. To define Python functions and use function calls to solve problems.
3. To use Python data structures – lists, tuples, dictionaries to represent complex data.

**Course Outcomes:** Upon completion of the course, students will be able to

**CO1:** Develop and execute simple Python programs.

**CO2:** Write simple Python programs using conditionals and looping for solving problems.

**CO3:** Decompose a Python program into functions.

**CO4:** Represent compound data using Python lists, tuples, dictionaries etc.

**CO5:** Read and write data from/to files in Python programs.

**UNIT I :**

**Python Overview:** History of python, python features, python installation and Local Environment Set-up, python basic syntax.

**Variable types and basic operations:** Assign value to a variable, multiple assignments, standard data types in python, type of operators, arithmetic operator, comparison operator, assignment operator, bitwise operator, logical operator, membership operator, identity operator, mathematical functions in python

**Decision making:** if statement, if-elif-else statements,nested if statements, single statement suites.

**UNIT II**

**Loops:** While loop, for loop,nested loop, loop control statements,break and continue statement, pass statement, iterator and generator

**Functions:** Defining a function, calling a function, Return statement, Pass by Reference vs Value, Function Arguments, Required Arguments, keyword Arguments, Default Arguments, Variable length Arguments, global Vs local variables. The Anonymous Functions

**Strings:** Accessing values in string, updating string, escape charters, string special operators, string formatting operator, built-in string functions and methods, string module

**UNIT III**

**Lists:** Python list, accessing values in list, basic list operations, list indexing, slicing and matrixes, built-in list functions and methods, list aliasing, list cloning, list comprehension

**Tuples:** Accessing values in Tuples, updating tuples,delete Tuple elements, basic Tuples operations, indexing slicing and matrixes, built-in Tuple functions

**Dictionaries:** Accessing values in Dictionary, updating dictionary,delete dictionary elements, Properties of Dictionary Keys, Built-in Dictionary Functions & Methods

**UNIT IV: FILES, MODULES, PACKAGES**

**Modules:** The import Statement, The from...import Statement, The from ...import * Statement, Executing Modules as Scripts, Namespaces and Scoping, The globals() and locals() Functions,Packages in Python.

**Files I/O:** Printing to the Screen, Reading Keyboard Input, The input Function Opening and Closing Files, The file Object Attributes, The close() Method, Reading and Writing Files, The write() Method, The read() Method.

**UNIT-V: Exceptions Handling**

**Exceptions Handling:** Standard Exceptions, Assertions in Python .What is Exception?, Handling an Exception, The except Clause with No Exceptions, The except Clause with Multiple Exceptions, The try-finally Clause, Argument of an Exception, Raising an Exception, User-Defined Exceptions

**Regular Expressions:** The match Function, The search Function, Matching Versus Searching, Search and Replace, Regular Expression Modifiers: Option Flags, Regular Expression Patterns, Regular Expression Examples, Character classes

**Text Books:**

1. Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O’Reilly Publishers, 2016.
2. Karl Beecher, “Computational Thinking: A Beginner's Guide to Problem Solving and programming”, 1st Edition, BCS Learning & Development Limited, 2017.

**References:**

1. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, “Computational Thinking: A Primer for Programmers and Data Scientists”, 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data“, Third Edition, MIT Press

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC411EE | Electrical Machines – 1 Lab | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| SPC401EE | – | – | – | 4 | 40 | 60 | 2 |

**Course Objectives:**

1. To learn operation and performance characteristics of D.C. machines by conducting various experiments and tests practically.
2. To understand the operation and performance characteristics of transformers by conducting various experiments and tests.
3. To learn about simulation of DC machine performance considering different faults.

**Course Outcomes:**

1. Estimate the efficiency and voltage regulation of D.C. generator and transformers under various loading conditions.
2. Acquire the knowledge of efficiency and speed regulation D.C. Motors under various loading conditions.
3. Able to understand the speed control of DC motor by conducting different experiments
4. Analyze the transformer performance by performing different tests.

**UNIT – I**

**Suggested List of Experiments/Demonstrations:**

1. Magnetization characteristics of a separately excited D.C. generator.
2. Determination of the load characteristics of shunt and compound generators.
3. Determination of the performance characteristics of series, shunt and compound motors.
4. Separation of iron and friction losses and estimation of parameters in D.C. machine.
5. Speed control of D.C. Shunt motor using field control and armature control methods.
6. Swinburne's test.
7. Hopkinson's test.
8. Retardation test.
9. Separation of core losses in a single phase transformer.
10. Open circuit and short circuit and load test on a single phase transformer.
11. Sumpner's test on two identical transformers.

12. Testing of transformers: Polarity test, High voltage test and double voltage and double frequency test.
13. Three phase transformer connections

**Note: Minimum Ten experiments should be conducted.**

**Contents Beyond the Syllabus**

1. Simulation of D.C. Machine considering short circuit and open circuit faults.
2. Simulation of Three Phase Transformer by connecting different three phase loads.
3. Simulation of converting three phases into two phase by using Scott connection.

**Text Books:**

1. P. S. Bimbhra, Electrical Machinery, Khanna Publishers, 2011.
2. A. E. Fitzgerald and C. Kingsley, Electric Machinery, New York, McGraw Hill Publisher, 2013.

**Reference Books:**

1. I. J. Nagrath and D. P. Kothari, Electric Machines, McGraw Hill Education, 2010.
2. A. E. Clayton and N. N. Hancock, Performance and design of DC machines, CBS Publishers, 2004.
3. M. G. Say, Performance and Design of AC Machines, CBS Publishers, 2002.
4. Smarajit Ghosh, Electrical Machines, Pearson Education, 2018.
5. P. Satish Kumar, G. Sridhar, Electrical Machines – A Practical Approach, De Gruyter Publication, Germany, 2020.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC412EE | Control Systems Lab | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| SPC402EE | – | – | – | 3 | 40 | 60 | 1.5 |

**Course Objectives:**

1. To develop basic skills of utilizing mathematical tools needed to analyze and design classical linear control systems.
2. To learn about design of different controllers.
3. To understand and develop the state space representation of control systems.

**Course Outcomes:**

1. Understand the concept of the terms control systems, feedback, Mathematical modeling of Electrical and Mechanical systems.
2. Explain the time domain and frequency response analysis of control systems.
3. Acquire the knowledge of various analytical techniques used to determine the stability of control systems.
4. Able to understand the importance of design of compensators.
5. Able to demonstrate controllability and observability of modern control systems.

**UNIT – I**

**Suggested List of Experiments/Demonstrations:**

1. Frequency response of second order system.
2. Step response of second order system.
3. Characteristics of synchro's.
4. D.C. Position control system.
5. A.C. Position control system.
6. Performance of P, PI and PID Controller on system response.
7. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB.
8. State space model for classical transfer function using MATLAB.

9. Transfer function of DC Motor
10. Design of lag and lead compensation.
11. Characteristics of D.C. and AC. Servomotor and their transfer function.
12. Simulation of Transfer function of DC Generator.

**Note: Minimum Ten experiments should be conducted in the semester.**

**Contents Beyond the Syllabus**

1. Simulation of Integrator and Differentiator.
2. Simulation of mathematical modelling of DC Motor.
3. Simulation of PI Control design to maintain Stability.

**Text Books:**

1. Nagrath I.J. and Gopal.M, Control System Engineering, Wiley Eastern, 2003.
2. K. Ogata, Modern Control System, Prentice Hall of India, 4th Edition, 2002.

**Reference Books:**

1. B.C.Kuo, Automatic Control Systems, Wiley India, 7th Edition, 2002.
2. Norman N Nise, Control Systems Engineering, John Wiley & Sons, Inc. 605 Third Ave. New York, NY, United States, 5th Edition, 2008.
3. N.C.Jagan, Control Systems, B.S Publications, 2nd Edition, 2008.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPC413EE | Switching Theory and Logic Design Lab | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| Switching Theory and Logic Design (SPC403EC) | – | – | – | 3 | 40 | 60 | 1.5 |

**Course Objectives:**

1. To comprehend the concepts of digital logic design.
2. To design and implement the logic circuits using Combinational and Sequential Circuits.
3. To define the design and simulation method Logic Circuits, error detecting encoder/ decoder using VHDL/Verilog/Multisim.
4. To study functional characteristics of digital circuits using Verilog HDL.
5. To explain the design of counters.

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

1. Understand working of logic families and logic gates.
2. Design and implement Combinational and Sequential logic circuits.
3. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
4. Use PLCs to implement the given logical problem.
5. Analyze synchronous and asynchronous counters.

**List of Experiments**

1. Realization of different logic gates
2. Realization of inverter using different logic families
3. Multiplexer application for logic realization and parallel to serial Conversions
4. Synchronous counters
5. Asynchronous counters
6. Half adder, full adder and subtractor and realization of combinational logic
7. A / D converters and D / A converters
8. Experiment on Sample and hold circuit

9. Simulation of error detecting codes using VHDL/Verilog/Multisim
10. Simulation of encoder/decoder using VHDL/Verilog/Multisim
11. Simulation of flip/flops using VHDL/Verilog/Multisim
12. Experiment on programmable logic devices (ROM/RAM/PLA/PAL/FPGA)

**Note:** Any **TEN** experiments should be conducted in the semester.

**Suggested Readings:**

1. R. P. Jain, *Modern Digital Electronics*, McGraw Hill Education, 2009.
2. M. M. Mano, *Digital logic and Computer Design*, Pearson Education India, 2016.
3. A. Kumar, *Fundamentals of Digital Circuits*, Prentcice Hall India, 2016.
4. Switching Theory and Logic Design Lab Manual, SCETW.
5. Data sheets of the electronic devices.

| Course Code | Course Title | | | | | | Core / Elective |
|---|---|---|---|---|---|---|---|
| SPW511EE | Internship – 1 | | | | | | Core |
| Prerequisite | Contact hours per week | | | | CIE | SEE | Credits |
| | L | T | D | P | | | |
| – | – | – | – | 4 | 50 | – | 1 |

**Course Objectives:**

1. To give an experience to the students in solving real life practical problems with all its constraints.
2. To give an opportunity to integrate different aspects of learning with reference to real life problems.
3. To enhance the confidence of the students while communicating with industry engineers and give an opportunity for useful interaction with them and familiarize with work culture and ethics of the industry.

**Course Outcomes:**

1. Design/develop a small and simple product in hardware or software.
2. Complete the task or realize a pre-specified target, with limited scope, rather than taking up a complex task and leave it.
3. Learn to find alternate viable solutions for a given problem and evaluate these alternatives with reference to pre-specified criteria.
4. Implement the selected solution and document the same.
5. Able to write a technical report and present it to appropriate audience.

Summer Internship is introduced as part of the curriculum for encouraging students to work on problems of interest to industries. A batch of two or three students will be attached to a person from an Electronics Industry / R & D Organization / National Laboratory for a period of two to four weeks. This will be during the summer vacation following the completion of the IV Semester course. One faculty member will act as an internal guide for each batch to monitor the progress and interacts with the Industry guide.

After the completion of the summer internship, students will submit a brief technical report on the internship executed and present the work through a seminar talk to be organized by the department. Award of sessional are to be based on the performance of the student at the work place to be judged by industry guide and internal guide (25 Marks) followed by presentation before the committee constituted by the department (25 Marks). One faculty member will co-ordinate the overall activity of Summer Internship.

***Students have to undergo summer internship of Two to Four Weeks duration at the end of IV semester and One Credit will be awarded in the V Semester after evaluation.**