**VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD**
**B.TECH. II YEAR**
**(ELECTRONICS AND INSTRUMENTATION ENGINEERING)**

**III SEMESTER** **R19**

| Course Code | Title of the Course | L | T | P/D | Contact Hours/ Week | Credits |
|---|---|---|---|---|---|---|
| 19BS1MT08 | Complex Analysis and Special Functions | 3 | 0 | 0 | 3 | 3 |
| 19PC1EI01 | Electronics Circuits – I | 3 | 1 | 0 | 4 | 4 |
| 19PC1EI02 | Sensors and Signal Conditioning | 3 | 0 | 0 | 3 | 3 |
| 19PC1EI03 | Electronic Measurements | 3 | 0 | 0 | 3 | 3 |
| 19PC1EC04 | Signals and Systems | 3 | 0 | 0 | 3 | 3 |
| 19PC2EI01 | Electronics Circuits – I Laboratory | 0 | 0 | 3 | 3 | 1.5 |
| 19PC2EI02 | Sensors and Measurements Laboratory | 0 | 0 | 3 | 3 | 1.5 |
| 19PC2EC02 | Basic Simulation Laboratory | 0 | 0 | 2 | 2 | 1 |
| **Total** | | **15** | **1** | **8** | **24** | **20** |
| 19MN6HS03 | Gender Sensitization | 0 | 0 | 2 | 2 | 0 |

**IV SEMESTER** **R19**

| Course Code | Title of the Course | L | T | P/D | Contact Hours/ Week | Credits |
|---|---|---|---|---|---|---|
| 19HS1MG02 | Engineering Economics and Accountancy | 3 | 0 | 0 | 3 | 3 |
| 19PC1EI04 | Electronic Circuits – II | 3 | 1 | 0 | 4 | 4 |
| 19PC1EI05 | Linear IC Applications | 3 | 0 | 0 | 3 | 3 |
| 19PC1EE05 | Control Systems | 3 | 0 | 0 | 3 | 3 |
| 19PC1EC03 | Digital System Design | 3 | 0 | 0 | 3 | 3 |
| 19PC2EI03 | Electronics Circuits – II Laboratory | 0 | 0 | 3 | 3 | 1.5 |
| 19PC2EI04 | IC Application Laboratory | 0 | 0 | 3 | 3 | 1.5 |
| 19PC2IT02 | Python Programming Laboratory | 0 | 0 | 2 | 2 | 1 |
| **Total** | | **15** | **1** | **8** | **24** | **20** |

L – Lecture T – Tutorial P – Practical D – Drawing

**VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY**

| **B.Tech. III Semester** | **L** | **T/P/D** | **C** |
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| | **3** | **0** | **3** |

**(19BS1MT08) COMPLEX ANALYSIS AND SPECIAL FUNCTIONS**
**(Common to ECE & EIE)**

**COURRSE PREREQUISITES:** Integral and Differential Calculus

**COURSE OBJECTIVES:** To Learn
- Analytic function and their properties
- Concept of complex integration
- Classifications of Singular points and residues
- The notion of Conformal mapping
- The ways of finding the solutions of Bessel and Legendre equations

**COURSE OUTCOMES:** After completion of the course, the student should be able to
**CO-1:** Apply Cauchy-Riemann equations to study analyticity of functions
**CO-2:** Evaluate contour integrals using Cauchy's integral theorems
**CO-3:** Evaluate contour integrals using residue theorem
**CO-4:** Analyze the image of the given curve under the given transformation
**CO-5:** Solve ordinary differential equations using the notion of Bessel's equations

**UNIT – I:**
**Functions of Complex Variables:** Functions of a complex variable, Continuity, Differentiability, Analyticity, Singular point, Cauchy-Riemann equations in Cartesian and polar coordinates, Harmonic and conjugate harmonic functions, Milne – Thompson method. Analyticity of Exponential, trigonometric, hyperbolic functions and their properties.

**UNIT – II:**
**Integration of Complex Function, Power Series:** Line integral, evaluation along a path and by indefinite integration. Cauchy's integral theorem, Cauchy's integral formula. Expansion of Taylor's series and Laurent series (without proofs).

**UNIT – III:**
**Residues and Real Integrals:** Classifications of singular points: Isolated singular point, removable, pole of order m, essential singularity. Residues – Evaluation of residue by formulae, Residue theorem, Evaluation of real integrals (applications).

**UNIT – IV:**
**Conformal Mapping:** Definition of Conformal mapping, transformation of e z , log(z), z2 , Sin z, cos z, z + a/z. Basic transformations-Translation, rotation, inversion. Bilinear transformation - fixed point, cross ratio, properties, invariance of circles, determination of bilinear transformation mapping three given points to three assigned points.

**UNIT – V:**
**Special functions- Bessel function:** Bessel functions, Recurrence relations, properties. Generating function and Orthogonal properties.

**UNIT – VI:**
**Special functions- Legendre function:** Legendre polynomials, Properties, Rodrigue's formula, Recurrence relations Generating function, and Orthogonal properties.

**TEXT BOOKS:**


1. Higher Engineering Mathematics-B.S.Grewal, Khanna publishers, 36th Edition-2010
2. Higher Engineering Mathematics – B.V. Ramana; Publisher:Tata McGraw Hil, New Delhi,11th Reprint-2010
3. Complex Variables & Its Applications- Churchill and Brown, (1996), International Edition, McGraw Hill


**REFERENCES:**


1. Advanced Engineering Mathematics-Erwin Kreyszig, 9th Edition; Publisher: John Wiley
2. Advanced Engineering Mathematics – Peter 'O' Neil, publisher: Cengage Learning

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**(19PC1EI01) ELECTRONIC CIRCUITS-I**

**COURSE PREREQUISITES:** Engineering Physics

**COURSE OBJECTIVES:**
- To learn principle of operation, construction and characteristics of various electronic devices
- To study the applications of various electronic devices
- To understand the concepts of amplifiers and oscillators
- To provide the concepts involved in developing of electronic circuits

**COURSE OUTCOMES:** After completion of the course, the student should be able to
**CO-1:** Understand the operation and characteristics of various electronic devices
**CO-2:** Understand the need of biasing and stabilization
**CO-3:** Develop few applications using electronic devices
**CO-4:** Design & analyze amplifiers and oscillators

**UNIT – I:**
**P-N Junction Diode and Applications:** Review of P-N Junction as a Diode, Diode Equation, Volt-Ampere Characteristics, Temperature dependence of V-I characteristics, Ideal and Practical Diode Equivalent Circuits, Transition and Diffusion Capacitances. Breakdown Mechanisms in Semi-Conductor Diodes, Zener Diode Characteristics.
Half wave Rectifier, Full wave rectifier, Bridge Rectifier, Harmonic components in a Rectifier Circuit, Capacitor filters, π- section filters, Zener diode as Voltage Regulator.

**UNIT – II:**
**Bipolar Junction Transistor, Biasing and Stabilization:** The Bipolar Junction Transistor(BJT), Transistor Current Components, Transistor Construction, BJT Operation, Common Base, Common Emitter and Common Collector Configurations, Limits of operation, BJT as an Amplifier, BJT Specifications.
The DC and AC Load lines, Quiescent operating point, Need for Biasing, Analysis of Fixed Bias, Collector Feedback Bias, Emitter Feedback Bias, Collector-Emitter Feedback Bias, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against variations in VBE, β and ICO, Thermal Runaway, Thermal Stability.

**UNIT – III:**
**Field Effect Transistor, Biasing:** Construction and operation of Junction Field Effect Transistor (JFET), Volt-Ampere characteristics- Drain and Transfer Characteristics, FET as Voltage Variable Resistor, FET Biasing, Construction and operation of MOSFET, MOSFET characteristics in Enhancement and Depletion modes.

**UNIT – IV:**
**Small Signal Low Frequency Amplifiers:** BJT Amplifiers: Small signal low frequency transistor amplifier circuits: h-parameter representation and analysis of single stage CE, CC, CB amplifiers - Computation of voltage gain, current gain, Input impedance and Output impedance; Comparison of CB, CE and CC amplifiers.

**UNIT – V:**

**Frequency Response of BJT Amplifiers:** Analysis at low and high frequencies, Effect of coupling and bypass capacitors, Hybrid-π Common Emitter transistor model, CE short circuit gain, CE current gain with resistive load, Single-stage CE transistor amplifier response.

**UNIT – VI:**

**Feedback Amplifiers and Oscillators:** Concept of feedback, Types of feedback, general characteristics of negative feedback amplifiers, voltage series, voltage shunt, current series and current shunt feedback configurations and their analysis(BJT version), Illustrative problems.

Classification of oscillators, Conditions for oscillations, RC phase shift oscillator, Generalized analysis of LC oscillators – Hartley and Colpitts oscillators, Piezoelectric crystal oscillator, Stability of oscillators.

**TEXT BOOKS:**


1. Electronic Devices and Circuits – J. Millman, Halkias and Satyabratha Jit, Tata McGraw- Hill, 2nd Edition, 2007
2. Electronic Devices and Circuits – R. L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 11th Edition, 2006


**REFERENCES:**


1. Integrated Electronics - J. Millman, Christos. C. Halkias, and Satyabratha Jit, Tata McGraw-Hill, 2nd Edition, 2008
2. Electronic Devices and Circuits – T.F. Bogart Jr., J. S. Beasley and G. Rico, Pearson Education, 6th Edition, 2004
3. Electronic Devices and Circuits – David A. Bell, Oxford University Press, 5th Edition, 2008

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**(19PC1EI02) SENSORS AND SIGNAL CONDITIONING**

**COURSE PREREQUISITES:** Physics, Mathematics

**COURSE OBJECTIVES:**

- To provide basic knowledge in transduction principles, sensors and transducer technology and measurement systems
- To provide better familiarity with the Theoretical and Practical concepts of Transducers
- To provide familiarity with different sensors and their application in real life
- To provide the knowledge of various measurement methods of physical parameters like velocity, acceleration, torque, pressure, flow, temperature etc., and their relevance to Industry

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Identify suitable sensors and transducers for real world applications such as level, temperature, vibration, light etc.,

**CO-2:** Translate theoretical concepts into working models

**CO-3:** Design the experimental applications to engineering modules and practices

**CO-4:** Design engineering solution to the Industry/Society needs and develop products

**UNIT – I:**

**Introduction to Measurement Systems:** General concepts and terminology, measurement systems, sensor classifications: Analog Input and Output, Digital Input and Output, General input-output configuration, methods of correction.

**UNIT – II:**

**Passive Sensors – I:**

**Resistive Sensors:** Potentiometers, Strain Gauges, Resistive Temperature Detectors (RTDs): Three wire and Four wire, Thermistors, Light-dependent Resistors (LDRs), Resistive Hygrometers.

**UNIT – III:**

**Passive Sensors – II:**

**Capacitive Sensors:** Variable capacitor and Differential capacitor, Capacitive Touch sensors.

**Inductive Sensors:** Reluctance variation sensors, Eddy current sensors, Linear Variable Differential Transformers (LVDTs), Magneto elastic sensors, Electromagnetic Sensor based on Faraday's law of Electromagnetic induction-search coil magnetometers. Introduction to proximity sensors.

**UNIT – IV:**

**Self-generating Sensors:**

**Thermoelectric Sensors:** Thermocouples-Thermo electric effects, Common thermocouples, Practical thermocouple laws, Cold junction compensation in thermocouple circuits. Thermowell.

**Piezoelectric Sensors:** Piezoelectric effect, piezoelectric materials, applications. Pyroelectric Sensors: Pyroelectric effect, pyroelectric materials, Radiation laws: Plank, Wein and Stefan-Boltzmann, Applications.
**Photovoltaic Sensors:** Photovoltaic effect, materials and applications. Hall Effect Sensors

**UNIT – V:**
**Digital Sensors:** Position Encoders, Incremental position encoders, absolute position encoders, Variable frequency sensors-Quartz digital thermometers, vibrating cylinder sensors, SAW sensors.
Introduction to Smart Sensors: Introduction to MEMS Sensors.

**UNIT – VI:**
**Signal Conditioning:** Voltage dividers, Wheatstone bridge, Instrumentation amplifier, Programmable gain amplifier, linearization of resistive bridge sensor, Electrostatic shield, Noise elimination using filters, Introduction to Synchros and Resolvers.

**TEXT BOOKS:**

1. Sensors and Signal Conditioning, Ramon Pallas-Areny, John G. Webster, 2nd Edition
2. Sensors and Transducers, D. Patranabis, TMH, 2003


**REFERENCES:**

1. Sensor Technology Hand Book, Jon Wilson, Newne 2004
2. Instrument Transducers, An Introduction to their Performance and Design – Herman K. P. Neubrat, Oxford University Press
3. Measurement System: Applications and Design, E. O. Doeblin, McGraw-Hill Publications
4. Electronic Instrumentation, H. S. Kalsi
5. Microsensors, MEMS and Smart Devices, Julian Garder, Vijay K. Varadan, John Wiley & Sons Ltd., 2006

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**(19PC1EI03) ELECTRONIC MEASUREMENTS**

**COURSE OBJECTIVES:**

- To understand different measurement methods and errors associated with them
- To know the different standards and calibration methodologies adopted in the measurement systems
- To know different AC and DC bridges for the measurement of R, L and C
- To know different types of Oscilloscopes and Analyzers (Analog and Digital)
- To acquire clear concepts about the DC and AC voltage and current measurements

**COURSE OUTCOMES:** After completion of the course, the student should be able to
**CO-1:** Understand the different methods of measurement
**CO-2:** Calibrate different instruments
**CO-3:** Find the unknown values of R, L and C through bridges circuits
**CO-4:** To display the waveforms in an oscilloscope and analyze any complex waveforms through analog and digital techniques

**UNIT – I:**
**Introduction to Measuring System:** Static Characteristics, Error in measurement, Type of static errors, Dynamic characteristics, Statistical analysis, Probability of errors, Limiting errors, Standards - International standards, Primary standards, Secondary standards, Working standards.

**UNIT – II:**
**Bridge Circuit and Measurements:** Bridge Measurement – Wheatstone bridge, Kelvin bridge, AC bridges - Conditions for bridge balance, Maxwell's bridge, Anderson bridge, Hays bridge, Schering bridge, Wien bridge, Wagner ground connection, Q-meter, Vector impedance meter.

**UNIT – III:**
**Voltage, Current and Power Measurements:** DC Ammeters and DC Voltmeters, AC voltmeter using rectifier, True RMS responding voltmeters, Electronic multimeters, Digital Voltmeters - General characteristics, Ramp type DVM, Integrating type DVM, Successive approximation type DVM, Calibration of voltmeter and ammeter, Wattmeter for power measurement, Watt-hour meter (Energy Meter), Power factor meters.

**UNIT – IV:**
**Frequency and Time Measurements:** Digital Frequency Meter: Principle of operation, Basic circuit of digital frequency meter, frequency measurement, High frequency measurements, Digital measurement of Time-Time base selector, Period measurement, Ratio and multiple ratio measurements, Electronic Counter - Totalizing, Frequency mode, Ratio mode, Period mode, Time interval mode.

**UNIT – V:**

**Analyzers:** Basic Wave Analyzer - Frequency selective wave analyzer and Heterodyne wave analyzer, Harmonic distortion analyzer - Tuned circuit and heterodyne, Spectrum analyzer, Logic analyzers.

**UNIT – VI:**

**Oscilloscope and Some Display Devices:** Oscilloscopes: Basic CRO circuits, Lissajous patterns, Multi input oscilloscopes - Dual trace and Dual beam, Sampling oscilloscopes, Storage oscilloscope - Analog and Digital.

**Display Devices:** Segmental Display - 7 segment, 14 segment and Dot Matrix, LED and LCD.

**TEXT BOOKS:**


1. Electronic Instrumentation and Measurements Techniques by Helfrick and W.D. Cooper, PHI Publications
2. Network Analysis by A. Sudhakar, Shyammohan Palli, McGraw-Hill Company
3. Electronic Instrumentation by H. S. Kalsi, Tata McGraw-Hill, 2004


**REFERENCES:**


1. Electrical and Electronic Measurements by Shawney, Khanna Pub
2. Electronic Measurements and Instrumentation by Bernard Oliver, John Cage
3. Principles of Measurement Systems by John P. Bentley: 3rd Edition, Addison Wesley Longman, 2000
4. Electronic Instrumentation and Measurements: David A. Bell, 2nd Edition, PHI, 2003
5. Electronic Instruments and Instrumentation Technology by M. M. S. Anand, Prentice-Hall of India

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**(19PC1EC04) SIGNALS AND SYSTEMS**
**(Common to ECE & EIE)**

**COURSE PRE-REQUISITES:** Calculus for Engineers (19BS1MT01), Linear Algebra and Advanced Calculus (19BS1MT04)

**COURSE OBJECTIVES:**
- To understand various fundamental characteristics of signals and systems
- To study the importance of transform domain
- To analyze and design various systems
- To study the effects of sampling
- Understand Laplace and Z-transforms their properties for analysis of signals and systems

**COURSE OUTCOMES:** After completion of the course, the student should be able to
**CO-1:** Classify the signals and implement various operations on signals
**CO-2:** Analyze the spectral characteristics of signals and systems
**CO-3:** Understand the conditions for physical realizability of a system
**CO-4:** Identify the significance of sampling types and applications of correlation functions
**CO-5:** Discover the significance of LT, ZT and their relation

**UNIT – I:**
**Representation of Signals:** Continuous time and Discrete Time signals, Classification of Signals – Periodic and aperiodic, even and odd, energy and power signals, deterministic and random signals, causal and non-causal signals, complex exponential and sinusoidal signals. Concepts of standard signals. Various operations on Signals.

**UNIT – II:**
**Signal Analysis:** Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Closed or complete set of orthogonal functions.
**Fourier Series Representation of Periodic Signals:** Dirichlet conditions, Representation of Continuous time periodic signals using Trigonometric and Exponential Fourier series, Complex Fourier spectrum, Gibb's Phenomenon.

**UNIT – III:**
**Fourier Transform:** Fourier transform from Fourier series, Fourier transform of standard signals and periodic signals, properties of Fourier transform with proof, Inverse Fourier Transform.
**Laplace Transform:** Concept of Region Of Convergence (ROC) for Laplace transform, Properties of ROC, Inverse Laplace Transform, Relation between Laplace Transform and Fourier transform of a signal. Introduction to Hilbert Transform and its properties.

**UNIT – IV:**

**Signal Transmission through Linear Systems:** Classification of Continuous time and discrete time Systems, impulse response, Response of a linear system, Transfer function and Filter characteristics of an LTI system, Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley -Wiener criterion for physical realization.

**UNIT – V:**

**Convolution and Correlation of Signals:** Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Properties of Convolution, Concepts of correlation, properties of correlation. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation.

**Sampling Theorem:** Representation of continuous time signals by its samples - Sampling theorem – Reconstruction of a Signal from its samples, aliasing – discrete time processing of continuous time signals, sampling of band pass signals.

**UNIT – VI:**

**Z –Transform:** Basic principles of z-transform, region of convergence, properties of ROC, Properties of z-transform with proofs, Poles and Zeros. Inverse z-transform – Power series method, Residue Theorem method, Convolution Method and Partial fraction expansion method.

**TEXT BOOKS:**


1. Signals, Systems and Communications - B.P. Lathi, BS Publications, 2009
2. Signals and Systems – Alan V.Oppenheim, Alan S.Willsky and S.Hamid Nawab, 2nd Edition, PHI ,1997


**REFERENCES:**


1. Signals and Systems- A.Anand Kumar, 2nd Edition, PHI, 2012
2. Signals and Systems -Simon Haykin and Barry Van Veen, 2nd Edition, John Wiley, 1998

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**(19PC2EI01) ELECTRONIC CIRCUITS-I LABORATORY**

**COURSE OBJECTIVES:**

- To identify various active and passive components
- To understand the functionality of various measuring instruments
- To know the characteristics of various active devices

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Understand the specifications of various devices and measuring equipment

**CO-2:** Analyze the characteristics of various semiconductor devices

**CO-3:** Appreciate the effect of feedback on the systems' performance

**PART A: (Only for viva-voce examination)**

**ELECTRONIC WORKSHOP PRACTICE (in 2 lab sessions):**

1. Identification, specification, testing of R,L,C components (color codes), Potentiometers (SPDT, DPDT and DIP), Coils, Gang Condensers, Relays, Bread Board, PCB.
2. Identification, specification, testing of active devices : Diodes, BJT, Low power JFET, MOSFET, Power Transistors, LED, LCD, SCR, UJT.
3. Study and operation of:
   a) Multimeters (Analog and Digital)
   b) Function Generator
   c) Regulated Power Supplies
   d) CRO

**PART B:**

1. V-I characteristics of PN junction diode under forward and reverse bias.
2. V-I characteristics of Zener diode and voltage regulator using Zener Diode.
3. Full-wave Rectifier without filter and with π filter: Computation of Ripple factor and Regulation efficiency
4. Transistor as a switch
5. Input and Output characteristics of CE transistor configuration and computation of h- parameters.
6. Input and Output characteristics of CB transistor configuration and computation of h- parameters.
7. Input and Output characteristics of CC transistor configuration and computation of h- parameters.
8. Characteristics of FET under CS configuration.
9. Frequency response of CE Amplifier.
10. Frequency response of CS Amplifier.
11. Frequency response of Voltage shunt feedback amplifier.
12. Colpitt's Oscillator using transistors.

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| **B.Tech. III Semester** | **L** | **T/P/D** | **C** |
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**(19PC2EI02) SENSORS AND MEASUREMENTS LABORATORY**

**COURSE OBJECTIVES:**

- To make student acquire hands on experience in active and passive sensors/transducers
- To make students understand different signal conditioners
- To make students design basic measuring devices like bridges

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Appreciate the use of sensors

**CO-2:** Identify the sensors required for any specific application

**CO-3:** Design and develop a simple measuring device employing appropriate sensors

**LIST OF EXPERIMENTS:**

1. Measurement of Load using Strain Gauge bridge and obtain the strain gauge characteristics.
2. Measurement of Temperature using Thermistor and RTD and obtain the temperature Vs Resistance Characteristics
3. Measurement of Temperature using Thermocouple and obtain the temperature Vs Voltage Characteristics.
4. Measurement of Displacement using LVDT and obtain the displacement Vs Voltage Characteristics of LVDT.
5. Measurement of Liquid level using capacitive transducer.
6. Measurement of Resistance using Wheatstone bridge.
7. Measurement of Low Resistances using Kelvin Bridge.
8. Measurement of Capacitance using Schering Bridge.
9. Measurement of Inductance using Maxwell's Bridge.
10. Measurement of L, C and R using Q-Meter.
11. Obtain the Characteristics of Opto-Electric Transducers - Photo Transistor and Photo Diode.
12. Obtain the Characteristics of LDR.
13. Pressure measurement using Bourdon Tube and obtain the characteristics.
14. Measurement of temperature using optical Pyrometers.

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**(19PC2EC02) BASIC SIMULATION LABORATORY**

**COURSE PRE-REQUISITES:** Calculus for Engineers (19BS1MT01), Linear Algebra and Advanced Calculus (19BS1MT04)

**COURSE OBJECTIVES:** Using simulation tool

- To understand the simulation of generation of Various (Continuous/Discrete) signals
- To study various arithmetic operations on signals and various transforms applied for signals
- To understand the characteristics of LTI system and to find its response for various excitations
- To study about the mathematical tools for signal estimation in the presence of noise

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Synthesize the given waveform using standard test signals and sequences and to find the symmetry of the signal

**CO-2:** Classify the given system based on its characteristics

**CO-3:** Analyze the effect of various transformations applied on independent and dependent variables of signals

**CO-4:** Determine the spectral and temporal characteristics of random processes

**The experiments are to be software simulated using suitable software.**

1. Basic Operations on Matrices
2. Generation of various signals and sequences (Periodic and Aperiodic), such as unit Impulse, step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc and random signals.
3. Operations on signals and sequences such as Addition, Multiplication, Scaling, Shifting, Folding. Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal / Sequence and Real and imaginary parts of Signal.
5. Convolution between (i) Signals (ii) Sequences.
6. Auto Correlation and Cross Correlation of (i) Signals (ii) Sequences.
7. Computation of Unit sample, Unit step and sinusoidal responses of the given LTI system and Verifying its Physical realizability and stability properties.
8. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
9. Verification of Gibb's Phenomenon.
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Verification of Sampling Theorem.
12. Verifying the applications of Correlation:
    i. Estimating the period of a periodic signal masked by noise
    ii. Removal of Noise from the combination of signal and noise
13. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew, Kurtosis and PSD, Probability Distribution Function.
14. Checking a Random Process for Stationary in Wide sense.

**Experiments over and above the curriculum:**

1. Verification of the properties of FS and FT.
2. Verification of Wiener-Khinchine relation.

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**(19MN6HS03) GENDER SENSITIZATION**

**COURSE DESCRIPTION:**
This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features a number of exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development

**ACTIVITIES:**
Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments

**COURSE OBJECTIVES**:
- To sensitize students on issues of gender in contemporary India
- To provide a critical perspective on the socialization of men and women
- To expose the students to debates on the politics and economics of work
- To enable students to reflect critically on gender violence
- To expose students to more egalitarian interactions between men and women

**COURSE OUTCOMES**: After completion of the course, the student should be able to
**CO-1:** Understand important issues related to gender in contemporary India
**CO-2:** Attain a finer grasp of how gender discrimination works in our society and how to counter it
**CO-3:** Acquire insight into the gendered division of labour and its relation to politics and economics
**CO-4:** Respond to put an end to gender violence
**CO-5:** Equipped to work with the other gender treating them as equals

**MODULE 1: Introduction to Gender**
- Definition of Gender
- Basic Gender Concepts and Terminology
- Exploring Attitudes towards Gender
- Social Construction of Gender

**MODULE 2: Gender Roles and Relations**
- Types of Gender Roles
- Gender Roles and Relationships Matrix

 Gender-based Division and Valuation of Labour

**MODULE 3: Gender Development Issues**
 Identifying Gender Issues
 Gender Sensitive Language
 Gender, Governance and Sustainable Development
 Gender and Human Rights
 Gender and Mainstreaming

**MODULE 4: Gender-based Violence**
 The concept of violence
 Types of Gender-based violence
 The relationship between gender, development and violence
 Gender-based violence from a human rights perspective

**MODULE 5: Gender and Culture**
 Gender and Film
 Gender and Electronic Media
 Gender and Advertisement
 Gender and Popular Literature

**MODULE 6: Gender and Studies**
 Knowledge: Through the Lens of Gender Point of View, Gender and the Structure of Knowledge
 Whose History: Questions for Historians and Others, Reclaiming a Past, Writing Other Histories

**TEXT BOOK:**
1. "Towards a World of Equals: A Bilingual Textbook on Gender", A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu, Telugu Akademi, Telangana Government, 2015

**REFERENCES:**

1. "More than One Million Women are Missing" by Sen, Amartya, New York Review of Books 37.20 (20 December 1990), Print 'We Were Making History' Life Stories of Women in the Telangana People's Struggle, New Delhi: Kali for Women, 1989
2. "By the Numbers: Where Indian Women Work" Women's Studies Journal (14 November 2012), by Tripti Lahiri, Available online at: http: // blogs.wsj.com/ India real time/2012/11/14/by-the-numbers-where-India-women-work/&gt
3. "I Fought For My Life ...and Won " by Abdulali Sohaila, Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal
4. The Violence of Development: The Politics of Identity, Gender and Social Inequalities in India, by K. Kapadia, London: Zed Books, 2002
5. Just Development: Beyond Adjustment with a Human Face, by T. Banuri and M. Mahmood, Karachi: Oxford University Press, 1997

**VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY**

| **B.Tech. IV Semester** | **L** | **T/P/D** | **C** |
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## (19HS1MG02) ENGINEERING ECONOMICS AND ACCOUNTANCY

(Common to EEE, EIE, CSE and IT)

**COURSE OBJECTIVES:**

- To explain the basic nature of pure economics and to analyse certain concepts of both Micro & Macro Economics and to know the role of managerial economics in solving problems of business enterprises
- To understand different forms of organizing private-sector and public-sector business enterprises and problems which have been encountered by public enterprises in India
- To describe each stage of product life cycle with the help of different costs and their role in maintaining optimum cost of production and overall profitability by considering different market competitions
- To analyse the process involved in preparation of project proposals, to estimate capital required to commerce and carryon business projects, to know the various sources of mobilizing required amount of capital and to evaluate investment opportunities
- To apply the basic accounting concepts & conventions and to analyse financial position of business enterprise

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Perform decision making function effectively in an uncertain framework by applying the concepts of economics, manage demand efficiently and plan future course of action

**CO-2:** Select suitable form of business organization which meets the requirements of business

**CO-3:** Fix the right price which can best meet the pre-determined objectives of the business under different market conditions

**CO-4:** Identify the best source of mobilising capital, select most profitable investment opportunity, carry out & evaluate benefit/cost, life cycle and Break-even analysis on one or more economic alternatives

**CO-5:** Analyze overall position of the business enterprise, therefore, take appropriate measures to improve the situation.

**UNIT – I:**

**Introduction to Economics & Managerial Economics:** Introduction to Economics: Definition, nature, scope and types of Economics. Concepts of Macro-Economics: Gross Domestic Product (GDP), Gross National Product (GNP), National Income (NI) & Rate of Inflation.

**Managerial Economics:** Definition, nature, scope & significance.

**Elements of Managerial Economics:** Demand Analysis, Law of Demand, Elasticity of Demand and Demand Forecasting.

**UNIT – II:**

**Forms of organizing Private and Public-Sector Business Enterprises:**

**Private Sector Business Enterprises:**

**(i)** Sole Proprietorship - Definition, features, merits, limitations & suitability.

**(ii)** Partnership - Definition, Partnership Act, features, types, merits, limitations, suitability.
**(iii)** Joint-Stock Company - Definition, Companies Act, features, types, merits, limitations, suitability.
**Public Sector Business Enterprises:** Definition, features, objectives, merits, problems.

**UNIT – III:**
**Market Structures, Product Life-Cycle (PLC), Pricing and Financial Accounting:** Market Structures: Definition & common features of market and classifications of markets. Evaluation of market structures-Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly.
**Product Life-Cycle and Pricing:** Definition, various stages of PLC, and Life-Cycle Costs; objectives and methods of pricing.
**Introduction to Financial Accounting:** Definition, basic principles and double-entry book- keeping, practice of accounting process-Journal, ledger, trial balance and final accounts (simple problems)

**UNIT – IV:**
**Financial Analysis through Ratios:** Meaning, computation of ratios
**(i) Liquidity Ratios:** Current Ratio and Quick Ratio,
**(ii) Solvency Ratios:** Interest Coverage Ratio and Debt- Equity Ratio,
**(iii) Activity Ratios:** Stock/Inventory Turnover Ratio and Debt Turnover Ratio,
**(iv) Profitability Ratios:** Gross Profit Ratio, Net Profit Ratio & Earning Per Share(EPS) Ratio.

**UNIT – V:**
**Management Accounting:** Definition & nature of Management Accounting.
**Capital:** Types of capital, factors influencing capital requirements, sources of mobilising Fixed and Working Capital.

**UNIT – VI:**
**Cost Accounting:** Cost Accounting: Definition, Types of costs – Opportunity cost, Explicit/Out-of-Pocket cost, Implicit/Imputed cost, Fixed cost, Variable cost, Semi-Variable cost, Differential cost, Sunk cost, Total cost, Average cost & Marginal cost. Break- Even/Cost-Volume-Profit (CVP) Analysis (Simple Problems).

**TEXT BOOKS:**

1. Managerial Economics and Financial Analysis by Aryasri, 2009; Tata McGraw-Hill
2. Managerial Economics by Varshney & Maheswari, 2009; Sultan Chand
3. Principles of Marketing: A South Asian Perspective by Kotler Philip, Gary Armstrong, Prafulla Y. Agnihotri and Eshan ul Haque, 2010, 13th Edition, Pearson Education/ Prentice Hall of India


**REFERENCES:**

1. Indian Economy by Misra S. K. and Puri, Himalaya Publishers
2. Textbook of Business Economics by Pareek Saroj, Sunrise Publishers
3. Financial Accounting for Management: An Analytical Perspective by Ambrish Gupta, Pearson Education
4. Managerial Economics by H. Craig Peterson & W. Cris Lewis; Prentice Hall of India
5. Guide to Proposal Writing by Jane C. Geever & Patricia McNeill, Foundation Centre


**Website:**
https://www.amazon.com/exec/obidos/tg/detail/-/0879547030/ref=ase_learnerassoci-20/102-4728473-7056968?v=glance&s=books

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**(19PC1EI04) ELECTRONIC CIRCUITS – II**

**COURSE PREREQUISITES:** Electronic Devices and Circuits

**COURSE OBJECTIVES:**
- To understand the principle of multi stage amplification
- To understand the difference between Power amplification and voltage amplification
- To study the principle and working of various electronic devices
- To understand the principle and applications of SCR
- To understand the various processes required for industrial applications

**COURSE OUTCOMES:** After completion of the course, the student should be able to
**CO-1:** Design and implement cascade stage of amplifiers and their coupling mechanisms
**CO-2:** Appreciate the design considerations of various large signal amplifiers
**CO-3:** Apply the knowledge of various electronic devices
**CO-4:** Apply the knowledge of deferent industrial processes to real time industry applications

**UNIT – I:**
**Linear and Non-Linear Wave Shaping:** High pass, Low pass RC circuits and their response for sinusoidal, step, pulse, square inputs. RC network as differentiator and integrator. Attenuators.
Diode clippers, clipping at two independent levels, Transfer characteristics of clippers, clamping operation, clamping circuits, Clamping circuit theorem.

**UNIT – II:**
**Multistage Amplifiers:** Introduction, Methods of inter-stage coupling, BJT: n-stage RC coupled amplifier, Equivalent circuits, Miller's Theorem, Amplifier analysis, Darlington Pair.

**UNIT – III:**
**Power Amplifiers:** Classification of power amplifiers, Series-fed and Transformer coupled Class A audio power amplifier, Efficiency of Class A amplifier , Class B amplifier, Transformer-coupled Class B push-pull amplifier, Complementary-symmetry Class B push-pull amplifier, Efficiency of Class B amplifier, Distortion in power amplifiers, Heat sinks.

**UNIT – IV:**
**Special Purpose Electronic Devices:** Principle of Operation and Characteristics of Tunnel Diode (with the help of Energy Band Diagram), Varactor Diode and Schottky barrier diode. Principle of Operation and Characteristics of UJT, UJT Relaxation Oscillator. Principle of Operation of SCR, Schockley diode DIAC and TRIAC. Principle of Operation of Semiconductor Photo Diode, PIN Diode, Photo Transistor, LED and LCD.

**UNIT – V:**

**SCR, Thyristor and its Applications:** Triggering of Thyristors, Commutation Techniques of Thyristors—Classes A, B, C, D, E and F, Ratings of SCR. Static circuit breaker, Protection of SCR, Inverters—Classification, Single Phase inverters, Converters – single phase Half wave and Full wave.

**UNIT – VI:**

**Industrial Applications:** Industrial timers -Classification, types, Electronic Timers – Classification, RC and Digital timers, Time base Generators. Electric Welding – Classification, types and methods of Resistance and ARC wielding, Electronic DC Motor Control. High Frequency heating – principle, merits, applications, High frequency Source for Induction heating. Dielectric Heating – principle, material properties, Electrodes and their Coupling to RF generator, Thermal losses and Applications. Ultrasonic – Generation and Applications.

**TEXT BOOKS:**


1. Pulse, Digital and Switching Waveforms J. Millman and H. Taub, McGraw-Hill, 1991
2. Integrated Electronics - Jacob Millman and Christos C. Halkias, Tata McGraw-Hill Education, 2008
3. Industrial and Power Electronics – G. K. Mithal and Maneesha Gupta, Khanna Publishers, 19th Edition, 2003


**REFERENCES:**


1. Electronic Circuit Analysis - S. Salivahanan, N. Suresh Kumar, Tata McGraw-Hill Education, 2nd Edition, 2012
2. Thyristors and Applications – M. Rammurthy, East-West Press, 1977
3. Integrated Circuits and Semiconductor Devices – Deboo and Burroughs, ISE
4. Micro Electronic Circuits–Sedra and Smith, Oxford University Press, 5th Edition, 2009

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**(19PC1EI05) LINEAR IC APPLICATIONS**

**COURSE OBJECTIVES:**

- To study about electrical properties of analog ICs like Op-Amps, IC 555 timer, PLL
- To analyze and know the design concepts of various applications of ICs
- To describe the analog to digital and digital to analog techniques
- To study the design concepts of analog circuits using ICs and its applications

**COURSE OUTCOMES:** After completion of the course, the student should be able to
**CO-1:** Analyze the characteristics of Op-Amps & ICs
**CO-2:** Design linear and non-linear applications of Op-Amps
**CO-3:** Design applications using linear ICs
**CO-4:** Design A/D and D/A Converters using ICs

**UNIT – I:**
**Integrated Circuits:** Differential Amplifier- DC and AC analysis of Dual input Balanced output Configuration, Properties of other differential amplifier configuration (Dual Input Unbalanced Output, Single Ended Input – Balanced/ Unbalanced Output), DC Coupling and Cascade Differential Amplifier Stages, Level translator.

**UNIT – II:**
**Characteristics of Op-Amps & Integrated Circuits:** Types, Classification, Package Types and Temperature ranges, Power supplies, Op-amp Block Diagram, ideal and practical Op-amp Specifications, DC and AC characteristics, 741 op-amp & its features, Op-Amp parameters & Measurement, Input & Out put Off set voltages & currents, slew rate, CMRR, PSRR, drift, Frequency Compensation techniques.

**UNIT – III:**
**Linear and Non-linear Applications of Op-Amps:** Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers. Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log Amplifiers.

**UNIT – IV:**
**Active Filters, Analog Multipliers and Modulators:** Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters. Four Quadrant Multiplier, IC 1496, Sample & Hold circuits.

**UNIT – V:**
**Timers & Phase Locked Loops:** Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger; PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of VCO (566).

**UNIT – VI:**

**Digital to Analog and Analog to Digital Converters:** Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC.DAC and ADC Specifications, Specifications AD 574 (12 bit ADC).

**TEXT BOOKS:**


1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition, 2003
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987
3. Operational Amplifiers – C. G. Clayton, Butterworth Company Public Ltd / Elsevier, 1971


**REFERENCES:**


1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma; S. K. Kataria & Sons; 2nd Edition,2010
2. Design with Operational Amplifiers & Analog Integrated Circuits – Sergio Franco, McGraw-Hill, 1988
3. OP AMPS and Linear Integrated Circuits Concepts and Applications, James M. Fiore, Cengage Learning India Ltd
4. Operational Amplifiers & Linear Integrated Circuits– R. F. Coughlin & Fredrick Driscoll, PHI, 6th Edition
5. Operational Amplifiers & Linear ICs – David A. Bell, Oxford Uni. Press, 3rd Edition

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**(19PC1EE05) CONTROL SYSTEMS**
**(Common to ECE and EIE)**

**COURSE PREREQUISITES:** Ordinary Differential Equations and Laplace Transform

**COURSE OBJECTIVES:**
- To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
- To assess the system performance using time domain analysis and methods for improving it
- To assess the system performance using frequency domain analysis and techniques for improving the performance
- To design various controllers and compensators to improve system performance

**COURSE OUTCOMES:** After completion of the course, the student should be able to
**CO-1:** Analyze the system steady state and transient performance
**CO-2:** Evaluate the effects of feedback on system performance
**CO-3:** Obtain the transfer function/ state space models
**CO-4:** Design suitable controller and compensator for the improvement of system performance

**UNIT – I:**
**Introduction to Control Problem:** Open-Loop and Closed-loop systems, benefits of Feedback. Mathematical models of physical systems. Transfer function models of linear time-invariant systems –RLC Circuits, DC and AC servo motors. Block diagram algebra and Signal Flow Graphs.

**UNIT – II:**
**Time Response Analysis:** Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorems. Design specifications for second-order systems based on the time-response.

**UNIT – III:**
**Stability and Root Locus:** Concept of Stability, Routh-Hurwitz Criterion, Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

**UNIT – IV:**
**Frequency-Response Analysis:** Relationship between time and frequency response. Bode plots- transfer function from bode plot-phase and gain margins- stability analysis. Polar and Nyquist plots, Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margins.

**UNIT – V:**
**Introduction to Controller Design:** Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design- Application of Proportional, Integral and Derivative

Controllers. Design specifications in frequency-domain. Frequency domain methods of design- Lead and Lag compensators.

**UNIT – VI:**

**State Space Analysis:** Concepts of state variables. State space model - RLC circuits and DC motors. State Transition Matrix and its properties- Transformations: State space to Transfer function and vice versa. Eigenvalues and Stability Analysis. Concept of controllability and observability.

**TEXT BOOKS:**


1. "Control Systems Engineering", by J. Nagrath and M. Gopal, New Age International, 2009
2. "Modern Control Engineering", by K. Ogata, Prentice Hall, 1991


**REFERENCES:**


1. "Modern Control Systems" by Richard C. Dorf and Robert H. Bishop
2. "Automatic Control System", by B. C. Kuo, Prentice Hall, 1995
3. "Control Systems: Principles and Design", M. Gopal, McGraw-Hill Education, 1997

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| **B.Tech. III Semester** | **L** | **T/P/D** | **C** |
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**(19PC1EC03) DIGITAL SYSTEM DESIGN**
**(Common to ECE, EEE & EIE)**

**COURSE PRE-REQUISITE:** Linear Algebra and Advanced Calculus (19BS1MT04)

**COURSE OBJECTIVES:**
- To understand and analyze the logic families
- To understand the different ways of number representation and simplification of Boolean functions with reference to digital circuit design
- To understand the design principles of combinational and sequential circuits
- To understand the role of state machine in digital system designs
- To introduce the principles involved in implementing a digital system using PLDs

**COURSE OUTCOMES:** After completion of the course, the student should be able to
**CO-1:** Identify suitable logic family for the implementation of digital ICs
**CO-2:** Apply the fundamental concepts of digital logic in the design of digital system
**CO-3:** Analyze and design combinational and sequential logic building blocks of a digital system
**CO-4:** Apply state machines in the design of digital systems
**CO-5:** Implement digital systems using various programmable logic devices

**UNTI – I:**
**Digital Logic Families:** TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing
**Number Systems and codes:** Number Systems, Representation of unsigned and Signed Numbers – Binary Arithmetic, Binary Codes, Code Conversions

**UNIT – II:**
**Switching Functions and Logic Simplification:** Boolean Algebra postulates and theorems, Algebraic Simplification, Digital logic gates, Multilevel NAND/NOR realizations, Boolean function representations: Canonical and Standard forms, Karnaugh map up to 5 variables, Don't care combinations.

**UNIT – III:**
**Combinational Circuits:** Half Adder, Full Adder, Ripple Carry Adder, Half Subtractor, Full Subtractor, Binary Adder/Subtractor, BCD adder, 4-bit Magnitude Comparator, Encoder, Priority Encoder, Decoder, Multiplexer, De- Multiplexer, Barrel shifter.

**UNIT – IV:**
**Sequential Circuits:** Classification of sequential circuits, Latches and Flip Flops, SR, JK,D, T and Master-Slave JK Flip Flops, Flip-Flop Conversions, Ripple and Synchronous Counters, Shift Registers, Sequence generator and sequence detector, Introduction to Finite State Machines(Mealy and Moore).

**UNIT – V:**
**Algorithmic State Machine Charts:** Introduction to ASM charts, system Design using data path and control subsystems, ASM charts for Binary Multiplier and Dice Game Controller.

**UNIT – VI:**

**Programmable Logic Devices:** Logic implementation using Programmable Logic Devices (PLDs): Read Only Memory (ROM), Programmable Logic Array (PLA), Programmable Array Logic (PAL).

Basic architectures of CPLD and FPGA, FPGA Programming Technologies: SRAM, Antifuse, EPROM

**TEXT BOOKS:**


1. Digital Design – Morris Mano, 3rd Edition, PHI, 2006
2. Modern digital Electronics- R P Jain, 4th Edition, Tata McGraw Hill, 2009
3. Digital Fundamentals-Floyd and Jain, 8th Edition, Pearson Education, 2009


**REFERENCES:**


1. Digital Systems- Ronald J Tocci, Neal S Widmer, Gregory L Moss, 10th Edition, Pearson Education, 2009
2. Digital Principles and Applications- Donald P Leach, Albert Paul Malvino and Goutam Saha, 8th Edition, McGraw Hill, 2014
3. Fundamentals of logic design - Charles H. Roth Larry L. Kinney, 7th Edition, Cengage, 2015

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## (19PC2EI03) ELECTRONIC CIRCUITS - II LABORATORY

**COURSE OBJECTIVES:**

- To understand the linear and non-linear wave shaping
- To explain the operation, design and Analysis of multistage amplifiers using BJT and MOS
- To develop power amplifiers and controlled rectifiers with desirable efficiency

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Design linear and nonlinear wave shapers for desired specifications

**CO-2:** Design multistage amplifiers to suit impedance and gain parameters requirements

**CO-3:** Design power amplifiers and controlled rectifiers for suitable efficiencies

Design and simulation of the following circuits using simulation software and implementation through hardware.

1. Linear wave shaping.
2. Non Linear wave shaping – Clippers.
3. Non Linear wave shaping – Clampers
4. Two stage RC coupled BJT Amplifier
5. Darlington pair.
6. Cascode amplifier
7. Characteristics of UJT and UJT Relaxation Oscillator.
8. Class A power Amplifier (Transformer less and with transformer load).
9. Class B Complementary Symmetry Amplifier.
10. Class C Tuned Amplifier.
11. MOS Amplifier.
12. SCR characteristics.

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**(19PC2EI04) IC APPLICATION LABORATORY**

**COURSE OBJECTIVES:**

- To understand the application of OP-AMP and manipulate the signals
- To understand to generate controlled oscillations using OP-AMP
- To understand the procedure to select IC that can chose any required inputs at any instances and generate required output voltage

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Design different signal manipulators using OP-AMP

**CO-2:** Design oscillators using OP-AMP and other ICs to suit both various modes of operations

**CO-3:** Design systems using OP-AMP to yield high input impedance and controlled oscillations

1. Verification of Logic Gates, Flip flops, Counters and Multiplexers
2. Adder, Subtractor and Comparator using IC 741 OP-AMP
3. Integrator and Differentiator using IC 741 OP-AMP
4. Square Wave Generator and Triangular Wave Generator using OP-AMP
5. Low pass and High Pass Filtersusing IC 741 OP-AMP
6. Wien Bridge Oscillators using IC 741 OP-AMP
7. 4-bit Digital to Analog converter using OP-AMP
8. Schmitt Trigger circuits using IC 741
9. Mono-stable Multivibrator using IC 555
10. AstableMultivibrator using IC 555.
11. Three terminal voltage regulators-7805, 7809, 7912.
12. Instrumentation Amplifier
13. Voltage controlled oscillator

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**(19PC2IT02) PYTHON PROGRAMMING LABORATORY**
**(Common to CSE, ECE, EIE, IT & AME)**

**COURSE OBJECTIVES:**

- To install and run the Python interpreter
- To learn control structures
- To Understand Lists, Dictionaries in python
- To Handle Strings and Files in Python

**COURSE OUTCOMES:** After completion of the course, the student should be able to
**CO-1:** Develop the application specific codes using python
**CO-2:** Understand Strings, Lists, Tuples and Dictionaries in Python
**CO-3:** Verify programs using modular approach, file I/O, Python standard library
**CO-4:** Implement Digital Systems using Python

**Exercise 1 Basics**
Running instructions in Interactive interpreter and a Python Script
Write a program to purposefully raise Indentation Error and correct it

**Exercise 2 Operations**
Write a program to compute GCD of two numbers by taking input from the user
Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

**Exercise - 3 Control Flow**
Write a Program for checking whether the given number is even number or not.
Write a program using for loop that loops over a sequence.
Python Program to Print the Fibonacci sequence using while loop
Python program to print all prime numbers in a given interval (use break)

**Exercise – 4 Lists**
Find mean, median, mode for the given set of numbers in a list.
Write a program to convert a list and tuple into arrays.
Write a program to find common values between two arrays.

**Exercise – 5 Dictionary**
Write a program to count the numbers of characters in the string and store them in a dictionary data structure
Write a program combine_lists into a dictionary.

**Exercise – 6 Strings**
Write a program to check whether a string starts with specified characters.
Write a program to check whether a string is palindrome or not

**Exercise -7 Strings Continued**
Python program to split and join a string
Python Program to Sort Words in Alphabetic Order

**Exercise - 8 Files**
Write a program to print each line of a file in reverse order.
Write a program to compute the number of characters, words and lines in a file.
Write a program to count frequency of characters in a given file.

**Exercise - 9 Functions**
Simple Calculator program by making use of functions
Find the factorial of a number using recursion
Write a function dups to find all duplicates in the list.
Write a function unique to find all the unique elements of a list.

**Exercise - 10 Functions - Problem Solving**
Write a function cumulative_ product to compute cumulative product of a list of numbers.
Write a function reverse to print the given list in the reverse order.
Write function to compute GCD, LCM of two numbers

**Exercise- 11 Multi-D Lists**
Write a program that defines a matrix and prints
Write a program to perform addition of two square matrices
Write a program to perform multiplication of two square matrices

**Exercise - 12 - Modules**
a) Install NumPypackage with pip and explore it.

**Exercise - 13**
Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
Write a program to implement Half Adder, Full Adder, and Parallel Adder

**TEXT BOOKS:**
1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Learning Python, Mark Lutz, Orielly

**REFERENCES:**
1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson
3. Introduction to Python, Kenneth A. Lambert, Cengage