JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For UG – R20

B. TECH – ELECTRONICS AND INSTRUMENTATION ENGINEERING

(Applicable for batches admitted from 2020-2021)

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II B.Tech - I Semester

S. No.	Subjects	Category	L	T	P	Credits
1	Electronic Devices and Circuits	PC	3	1	0	3
2	Signals and Systems	PC	3	1	0	3
3	Switching Theory and Logic Design	PC	3	1	0	3
4	Electronic Measurements and Instrumentation	PC	3	1	0	3
5	Mathematics-III	BS	3	1	0	3
6	Electronic Devices and Circuits Lab	LC	0	0	3	1.5
7	Electronic Measurements and Instrumentation Lab	LC	0	0	3	1.5
8	Digital System Design Lab	LC	0	0	3	1.5
9	Skill oriented course *(Computational Techniques using MATLAB and Lab VIEW)		1	0	2	2
	Total Credits					**21.5**

II B.Tech - II Semester

S. No.	Subjects	Category	L	T	P	Credits
1	Electronic Circuits Analysis	PC	3	1	0	3
2	Linear Control Systems	ES	3	1	0	3
3	Microprocessor and Microcontrollers	PC	3	1	0	3
4	Integrated Circuits and applications	PC	3	1	0	3
5	Managerial Economics and Financial Analysis	HS	3	0	0	3
6	Electronic Circuit Analysis LAB	LC	0	0	3	1.5
7	Microprocessor and Microcontrollers Lab	LC	0	0	3	1.5
8	Integrated Circuits and applications Lab	LC	0	0	3	1.5
9	Skill Course (Python Programming)		1	0	2	2
	Total Credits					**21.5**

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II Year - I Semester		L	T	P	C
		3	1	0	3
ELECTRONIC DEVICES AND CIRCUITS					

OBJECTIVES:

The main objectives of this course are

- To learn and understand the basic concepts of semiconductor physics.
- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
- Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
- To learn and understand the purpose of transistor biasing and its significance.
- Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compares different configurations.

UNIT-I:

Review of Semi-Conductor Physics: Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors.

Junction Diode Characteristics: energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.

UNIT-II:

Special Semiconductor Devices: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode, UJT, PN-PN Diode, SCR. Construction, operation and V-I characteristics.

Rectifiers and Filters: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter (Series inductor), Capacitor filter (Stunt inductor), π-Filter, comparison of various filter circuits in terms of ripple factors.

UNIT- III:

Transistor Characteristics:

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.

FET: FET types, construction, operation, characteristicsμ, gm, rd, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

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UNIT- IV:

Transistor Biasing and Thermal Stabilization: Need for biasing, operating point, load line analysis biasing- methods, basic stability, fixed bias, collector to base bias, self-bias, Stabilization against variations in V_{BE}, Ic, and β, Stability factors, (S, S', S''), Bias compensation, Thermal runaway, Thermal stability, FET Biasing- methods and stabilization.

UNIT- V:

Small Signal Low Frequency Transistor Amplifier Models:

BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

TEXT BOOKS:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, SecondEdition,2007
2. Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications,2006
3. Electronics devices & circuit theory- Robert L. Boylestad and LouiNashelsky, Pearson/PrenticeHall, tenth edition,2009

REFERENCES:

1 Integrated Electronics- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition, 2009
2. Electronic Devices and Circuits-K. Lal Kishore, BS Publications, Fourth Edition,2016.
3. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, 4^{th}Edition,2008.

OUTCOMES:

At the end of this course the student will be able to:

- Apply the basic concepts of semiconductor physics.
- Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
- Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
- Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.
- Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
- Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

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II Year - I Semester		L	T	P	C
		3	1	0	3
SIGNALS and SYSTEMS					

OBJECTIVES:

The main objectives of this course are given below:

- To study about signals and systems.
- To analyze the spectral characteristics of signal using Fourier series and Fourier transforms.
- To understand the characteristics of systems.
- To introduce the concept of sampling process
- To know various transform techniques to analyze the signals and systems.

UNIT- I:

INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions. Related Problems.

UNIT–II:

FOURIER SERIES AND FOURIERTRANSFORM: Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform. Related Problems.

UNIT-III:

ANALYSIS OF LINEAR SYSTEMS: Introduction**,** Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system, Related problems. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and risetime.

UNIT –IV:

CORRELATION: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

SAMPLING THEOREM: Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling, Related problems.

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UNIT –V:

LAPLACE TRANSFORMS: Introduction**,** Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.Ts, Inverse Laplace transform, Relation between L.Ts, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

Z–TRANSFORMS: Concept of Z- Transform of a discrete sequence. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z transforms.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications,2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI,2ndEdn,1997
3. Signals & Systems - Simon Haykin and Van Veen, Wiley,2ndEdition,2007

REFERENCES:

1. Principles of Linear Systems and Signals – BP Lathi, Oxford UniversityPress,2015
2. Signals and Systems – T K Rawat, Oxford Universitypress,2011

OUTCOMES:

At the end of this course the student will able to:

- Differentiate the various classifications of signals and systems.
- Analyze the frequency domain representation of signals using Fourier concepts.
- Classify the systems based on their properties and determine the response of LTI Systems.
- Know the sampling process and various types of sampling techniques.
- Apply Laplace and z-transforms to analyze signals and Systems (continuous &discrete).

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II Year - I Semester		L	T	P	C
		3	1	0	3
SWITCHING THEORY and LOGIC DESIGN					

OBJECTIVES:

Course Objectives:

- To solve a typical number base conversion and analyze new error coding techniques.
- Theorems and functions of Boolean algebra and behavior of logic gates.
- To optimize logic gates for digital circuits using various techniques.
- Boolean function simplification using Karnaugh maps and Quine-McCluskey methods.
- To understand concepts of combinational circuits.
- To develop advanced sequential circuits.

UNIT – I

REVIEW OF NUMBER SYSTEMS & CODES:

Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members. Gray code ,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

BOOLEAN THEOREMS AND LOGIC OPERATIONS:

Boolean theorems, principle of complementation & duality, De-morgan theorems. Logic operations; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX- NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits. Study the pin diagram and obtain truth table for the following relevant ICs 7400,7402,7404,7408,7432,7486.

UNIT – II

MINIMIZATION TECHNIQUES:

Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables) and tabular method (Quine-McCluskey method) with only four variables and single function.

COMBINATIONAL LOGIC CIRCUITS DESIGN:

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams.

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UNIT – III

COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI:

Design of encoder, decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder. . Study the relevant ICs pin diagrams and their functions 7442,7447,7485,74154.

INTRODUCTION OF PLD's:

PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.

UNIT – IV

SEQUENTIAL CIRCUITS I:

Classification of sequential circuits (synchronous and asynchronous), operation of NAND & NOR latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip- flop. Design of 5ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift, register.

Study the following relevant ICs and their relevant functions 7474,7475,7476,7490,7493,74121.

UNIT – V

SEQUENTIAL CIRCUITS II:

Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa. Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping).

TEXT BOOKS:

1. Switching and finite automata theory Zvi.KOHAVI,Niraj.K.Jha 3rdEdition,Cambridge UniversityPress,2009
2. Digital Design by M.MorrisMano,Michael D Ciletti,4th editionPHIpublication,2008
3. Switching theory and logic design by Hill and Peterson**,** Mc-Graw Hill TMH edition, 2012.

REFERENCES:

1. Fundamentals of Logic Design by Charles H. Roth Jr,JaicoPublishers,2006
2. Digital electronics by R S Sedha.S.Chand&companylimited,2010
3. Switching Theory and Logic Design by A. AnandKumar,PHI Learningpvtltd,2016.
4. Digital logic applications and design by John M Yarbough, Cengagelearning,2006.
5. TTL 74-Seriesdatabook.

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Course Outcomes:

- Classify different number systems and apply to generate various codes.
- Use the concept of Boolean algebra in minimization of switching functions
- Design different types of combinational logic circuits.
- Apply knowledge of flip-flops in designing of Registers and counters
- The operation and design methodology for synchronous sequential circuits and algorithmic state machines.
- Produce innovative designs by modifying the traditional design techniques.

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DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

II Year - I Semester		L	T	P	C
		3	1	0	3
ELECTRONIC MEASUREMENTS AND INSTRUMENTATION					

OBJECTIVES:
The main objectives of this course are:

- Learn and understand functioning of various measuring system and metrics for performance analysis.
- Acquire knowledge of principle of operation, working of different electronic Instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
- To Compare various measuring bridges and their balancing conditions.
- Learn and understand the use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

UNIT-I:
PERFORMANCE CHARACTERISTICS OF INSTRUMENTS,
STATICCHARACTERISTICS: Accuracy, Resolution, Precision, expected value, Error, Sensitivity. Dynamic Characteristics; speed of response, Fidelity, Lag and Dynamic error. Types of errors in measurements and their analysis. Design of multi-range AC, DC meters (voltmeter &ammeter) and ohmmeter (series &shunt type) using D'arsonval movement. True rms meter.

UNIT-II:
SPECIFICATIONS AND DESIGNING ASPECTSOF SIGNALGENERATORS- AF sine and square wave signal generators, Function Generators, Random noise generators, Arbitrary waveform generators. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT-III:
OSCILLOSCOPES- general purpose CROs; block diagram, functions and implementation of various blocks, specifications, various controls and their functions, types of probes used in CROs. Measurement of frequency and phase difference using Lissajous patterns.
Special purpose CROs; sampling oscilloscope, analog storage oscilloscope, digital storage oscilloscope.

UNIT-IV:
Bridge circuits, Wheat stone bridge, measurement of very low resistance, Measurement of inductance-Maxwell's bridge, Anderson Bridge. Measurement of capacitance - Schering Bridge. Wien Bridge, Errors and precautions in using bridges.
Q-meter; principle of operation, measurement methods and sources of errors.
Counters: principle of operation -modes of operation- totalizing mode, frequency mode and time period mode- sources of errors.

UNIT-V:
Transducers- active & passive transducers: Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers.
Measurement of physical parameters temperature, force, pressure, velocity, acceleration and displacement.

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TEXTBOOKS:

1. Electronic instrumentation, second edition - H. S. Kalsi, Tata McGrawHill,2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition,2002.

REFERENCES:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, Edition.
2. Electrical and Electronic Measurement and Instrumentation A.K. Sawhney. Dhanpat Rai &Co.

OUTCOMES:

At the end of this course the student can able to:

- Select the instrument to be used based on the requirements.
- Understand and analyze different signal generators and analyzers.
- Understand the design of oscilloscopes for different applications.

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II Year – I Semester		L	T	P	C
		3	1	0	3
MATHEMATICS - III (BS1203) **(Common to all Branch for I Year B. Tech)**					

OBJECTIVES:
The main objectives of this course are:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

Unit – I: Vector calculus: (10hrs)
Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential. Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

Unit –II: Laplace Transforms: (10hrs)
Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (without proof).
Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

Unit –III: Fourier series and Fourier Transforms: (10hrs.)
Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.
Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

Unit –IV: PDE of first order: **(8hrs.)**
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types)equations.

UNIT V: Second order PDE and Applications: (10hrs.)
Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS

term of the type e^{ax+by},sin($ax+by$), cos($ax+by$), $x^m y^n$.
Applications of PDE: Method of separation of Variables – Solution of One-dimensional Wave, Heat and two-dimensional Laplace equation.

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Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference:

1. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10thEdition, Wiley-India.
2. **Dean. G. Duffy,** Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRCPress.
3. **Peter O' Neil,** Advanced Engineering Mathematics, Cengage.
4. **Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford UniversityPress.

OUTCOMES:
At the end of the course, the student will be able to

- Interpret the physical meaning of different operators such as gradient, curl and divergence(L5)
- Estimate the work done against a field, circulation and flux using vector calculus(L5)
- Apply the Laplace transform for solving differential equations(L3)
- Find or compute the Fourier series of periodic signals (L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms(L3)
- Identify solution methods for partial differential equations that model physical processes(L3)

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II Year - I Semester		L	T	P	C
		0	0	3	1.5
ELECTRONIC DEVICES AND CIRCUITS LAB					

Note: The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

Electronic Workshop Practice:

1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Coils, Gang Condensers, Relays, Breadboards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR,UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. P-N Junction Diode Characteristics
   Part A: Germanium Diode (Forward bias& Reverse bias)
   Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics
   Part A: V-I Characteristics
   Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with c-filter)
   Part A:Half-waveRectifier
   Part B: Full-wave Rectifier
4. BJT Characteristics (CE Configuration)Part A: Input Characteristics
   Part B: Output Characteristics
5. FET Characteristics(CS Configuration)
6. Part A: Drain Characteristics
   Part B: Transfer Characteristics
7. SCR Characteristics
8. UJT Characteristics
9. Transistor Biasing
10. CRO Operation and its Measurements
11. BJT-CE Amplifier
12. Emitter Follower-CC Amplifier
13. FET-CS Amplifier

Equipment required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multi-meters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

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		0	0	3	1.5
ELECTRONIC MEASUREMENTS AND INSTRUMENTATION LAB					

(Minimum 10 experiments should be conducted)

1. RTD –characteristics
2. Thermocouple –characteristics
3. LVDT –characteristics.
4. Displacement measurement using inductive pickup/ capacitive pickup.
5. Inductive and capacitive transducers.
6. RPM indicator using Strobotron/Gyroscope
7. Acceleration transducer.
8. Pressure measurement using Bourdon tube
9. Piezoelectric transducer.
10. Measurement of R, L and C using bridge circuits.
11. Measurement of Level using Capacitance Transducer.
12. Measurement of Humidity.
13. Measurement of strain using strain gauge

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II Year – I Semester		L	T	P	C
		0	0	3	1.5
DIGITAL SYSTEM DESIGN LAB					

List of Experiments: (Minimum of Twelve Experiments has to be performed)

1. Verification of truth tables of Logic gates
Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR
2. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit
3. Verification of functional table of 3 to 8 line Decoder /De-multiplexer
4. 4 variable logic function verification using 8 to 1multiplexer.
5. Design full adder circuit and verify its functional table.
6. Verification of functional tables of
   (i) J K Edge triggered Flip –Flop
   (ii) J K Master Slave Flip – Flop
   (iii)D Flip -Flop
7. Design a four bit ring counter using D Flip – Flops / JK Flip Flop and verify output
8. Design a four bit Johnson's counter using D Flip-Flops / JK Flip Flops and verify output
9. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip- Flops and Test it with a low frequency clock and sketch the output waveforms.
11. Design MOD – 8 synchronous counter using T Flip-Flop and verify the result and sketch the output waveforms.
12. (a) Draw the circuit diagram of a single bit comparator and test the output
    (b) Construct 7 Segment Display Circuit Using Decoder and 7 Segment LED and test it.

ADD on Experiments:
1. Design BCD Adder Circuit and Test the Same using Relevant IC
2. Design Excess-3 to 9-Complement convertor using only four Full Adders and test the Circuit.
3. Design an Experimental model to demonstrate the operation of74154 De-Multiplexer using LEDs for outputs.

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II Year – I Semester		L	T	P	C
		1	0	2	2
Skill Oriented Course*(Computational Techniques using MATLAB &Lab VIEW)					

Unit I Introduction to MATLAB

Brief Introduction-Installation of MATLAB – History-Use of MATLAB- Key features-MATLAB window-Command window – Workspace-Basic Commands-Assigning variables - Operations with variables

Unit II MATLAB Software

Data files and Data types - Character and string-Arrays and vectors, Arithmetic Operations-Logical Operators-Solving arithmetic equations-Matrix operations-M files Working with script tools - Writing Script file – Executing script files - The MATLAB Editor - Saving m files – Plots, Plot labelling, curve labelling and editing - Figure Windows - Displaying Multiple Plots in One Figure – Subplots - Introduction of Graphical User Interface

Unit III MATLAB Programming

Automating commands with scripts - Writing programs with logic and flow control - Writing functions - Control statement Programming-Conditional Statement Programming, Examples-Control Flow Conditional Control if,else, switch- Loop Control for, while, continue, break- Program Termination return- Functions - Writing user defined functions- Built in Function, Function calling- Return Value - Types of Functions- Global Variables

UNIT IV Virtual Instrumentation: An introduction

Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, Active X programming.

UNIT V Virtual Instrumentation (VI)programming techniques:

VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

Text Books:

1. MATLAB Programming for Engineers by Stephen J. Chapman, 6th edition- Cengage Learning, 2020.
2. MATLAB for Engineers by Holly Moore, Third Edition – Pearson Publications.
3. LabVIEW Graphical Programming by Gary Johnson**,** Second edition, McGraw Hill, Newyork, 1997.

Reference:

1. Matrices and MATLAB: A Tutorial by Marvin Marcus, First Edition, Prentice Hall, 2010.
2. LabVIEW for everyone by Lisa K. wells & Jeffrey Travis, Third edition Prentice Hall, 2006.
3. MATLAB getting started guide by Math works.

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DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

II Year - II Semester		L	T	P	C
		3	1	0	3
ELECTRONIC CIRCUITS ANALYSIS					

OBJECTIVES:
The main objectives of this course are:

- To learn hybrid-pi parameters at high frequency and compare with low frequency parameters.
- Learn and understand the purpose of cascading of single stage amplifiers and derive the overall voltage gain.
- Analyze the effect of negative feedback on amplifier characteristics and derive the characteristics.
- Learn and understand the basic principle of oscillator circuits and perform the analysis of different oscillator circuits.
- Compare and analyze different Power amplifiers like Class A, Class B, Class C, Class AB and other types of amplifiers.
- Analyze different types of tuned amplifier circuits.

UNIT-I:

Small Signal High Frequency Transistor Amplifier models:

BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductance's, Hybrid π capacitances, validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.
FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

UNIT-II:

Multistage Amplifiers: Classification of amplifiers, methods of coupling**, c**ascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Differential amplifier using BJT.

UNIT -III:

Feedback Amplifiers: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

UNIT-IV:

Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wien bridge oscillators with BJT and FET and their analysis, generalized analysis of LC Oscillators, Hartley and Colpitts's oscillators using BJT, Frequency and amplitude stability of oscillators.

UNIT-V:

Power Amplifiers: Classification of amplifiers (A to H), Class A power Amplifiers, Class B Push-pull amplifiers, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks.

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Tuned Amplifiers: Introduction, Q-Factor, small signal tuned amplifier, capacitance single tuned amplifier, double tuned amplifiers, staggered tuned amplifiers

TEXT BOOKS:

1. Integrated Electronics- J. Millman and C.C. Halkias, Tata McGraw-Hill,1972.
2. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition,2009.
3. Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications,2006

REFERENCES:

1. Electronic Circuit Analysis and Design – Donald A. Neaman, McGraw-Hill,2010.
2. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition, 2011.
3. Electronic Circuit Analysis-B.V. Rao, K.R.Rajeswari, P.C.R. Pantulu, K.B.R.Murthy, Pearson Publications.

OUTCOMES:

At the end of this course the student can able to

- Design and analysis of small signal high frequency transistor amplifier using BJT and FET.
- Design and analysis of multistage amplifiers using BJT and FET and Differential amplifier using BJT.
- Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.
- Know the classification of the power and tuned amplifiers and their analysis with performance comparison.

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DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

II Year - II Semester		L	T	P	C
		3	1	0	3
LINEAR CONTROL SYSTEMS					

OBJECTIVES:

The main objectives of this course are:

- To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts of feedback.
- To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis.
- To develop the acquaintance in analyzing the system response in time-domain and frequency domain in terms of various performance indices.
- To analyze the system in terms of absolute stability and relative stability by different approaches.
- To design different control systems for different applications as per given specifications.
- To introduce the concepts of state variable analysis, design and also the concepts of controllability and observability.

UNIT-I

INTRODUCTION: Concepts of System, Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems.

UNIT-II

TRANSFER FUNCTION REPRESENTATION: Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra– Representation by Signal flow graph - Reduction using mason's gain formula.

TIME RESPONSE ANALYSIS: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants.

UNIT-III

STABILITY ANALYSIS IN S-DOMAIN: The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability 100

ROOT LOCUS TECHNIQUE: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT-IV

FREQUENCY RESPONSE ANALYSIS: Introduction, Correlation between time and frequency response, Polar Plots, Bode Plots, Nyquist Stability Criterion.

UNIT-V

CLASSICAL CONTROL DESIGN TECHNIQUES: Compensation techniques -Lag, Lead, Lead-Lag Controllers design infrequency Domain, PID Controllers. State Space Analysis of Continuous Systems Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and its Properties – Concepts of Controllability and Observability.

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TEXTBOOKS:

1. Automatic Control Systems 8th edition– by B. C. Kuo 2003–John Wiley andson's.
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New AgeInternational(P) Limited, Publishers, 2ndedition.

REFERENCES:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems by A. Nagoor kani, RBA publications,3 Edition.
3. Control Systems by A. Anand Kumar, PHI, 2Edition.

OUTCOMES:

At the end of this course the student can able to:

- This course introduces the concepts of feedback and its advantages to various control systems.
- The performance metrics to design the control system in time-domain and frequency domain are introduced.
- Control systems for various applications can be designed using time-domain and frequency domain analysis.
- In addition to the conventional approach, the state space approach for the analysis of control systems is also introduced.

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II Year- II Semester		L	T	P	C
		3	1	0	3
MICROPROCESSOR AND MICROCONTROLLERS					

OBJECTIVES:
The main objectives of this course are

- To acquire knowledge on microprocessors and microcontrollers.
- To select processors based on requirements.
- To acquire the knowledge on interfacing various peripherals, configure and develop programs to interface peripherals/sensors.
- To develop programs efficiently on ARM Cortex processors and debug.

UNIT–I
Introduction: Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, CISC and RISC architectures.
8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT–II
8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT-III
8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT-IV
Intel 8051 MICROCONTROLLER
Architecture, Hardware concepts, Input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts.
Assembly language programming: Instructions, addressing modes, simple programs.
Interfacing to 8051: A/D and D/A Convertors, Stepper motor interface, keyboard, LCD Interfacing, Traffic light control.

UNIT–V
ARM Architectures and Processors: ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, functions and interfaces.
Programmers Model – Modes of operation and execution, Instruction set summary, System address map, write buffer, bit-banding, processor core register summary, exceptions.
ARM Cortext-M3 programming – Software delay, Programming techniques, Loops, Stack and Stack pointer, subroutines and parameter passing, parallel I/O, Nested Vectored Interrupt Controller – functional description and NVIC programmers' model.

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TEXTBOOKS:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited,3rd Edition.
2. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; Pearson 20112-Edition.
3. The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by Joseph You

REFERENCES:

1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr.Alexander G. Dean, Published by Arm Education Media.
2. Cortex -M3 Technical Reference Manual

OUTCOMES:

At the end of this course the student will be able to:

- Understand the architecture of microprocessor/ microcontroller and their operation.
- Demonstrate programming skills in assembly language for processors and Controllers.
- Analyze various interfacing techniques and apply them for the design of processor/Controller based systems.

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DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

II Year- II Semester		L	T	P	C
		3	1	0	3
INTEGRATED CIRCUITS AND APPLICATIONS					

OBJECTIVES:
The main objectives of this course are given below:

- To understand the basic operation &performance parameters of differential amplifiers.
- To understand & learn the measuring techniques of performance parameters of Op-Amp
- To learn the linear and non-linear applications of operational amplifiers.
- To understand the analysis & design of different types of active filters using op-amps
- To learn the internal structure, operation and applications of different analog ICs
- To Acquire skills required for designing and testing integrated circuits

UNIT-I:
Introduction: Internal Block Diagram of various stages of Op-Amp and Roll of each Stage. Differential Amplifier using BJTs and With R_E DC and AC Analysis, Basic Current Mirror Circuit, Improved Version of current mirror circuit, current repeated circuit, Wilson current source. OP-Amp Block Diagram (Symbolic Representation), Characteristics of Op-Amp, Ideal and Practical Op- Amp specifications, DC and AC Characteristics, Definitions of Input and Output Off-set voltage and currents slow rate, CMRR, PSRR.etc., Measurements of Op-Amp Parameters.
Three-Terminal Voltage Regulators 78xx& 79xx Series, current Booster, adjustable voltage, Dual Power Supply with 78xx &79xx.

UNIT-II:
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, Precision rectifiers.

UNIT-III:
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-IV:
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).

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UNIT-V:

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-bitADC).

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. Linear Integrated Circuits by Salivahan-3rd-Edition, McGrawHill,2018

REFERENCES:

1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma; SK Kataria& Sons; 2nd Edition,2010
2. Operational Amplifiers & Linear Integrated Circuits–R.F. Coughlin&Fredrick Driscoll, PHI, 6th Edition,2000.
3. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition,2011.
4. Linear Integrated Circuits, by Ganesh Babu T.R and Suseela B. Scitech, 5th Edition,2014.

OUTCOMES:

At the end of this course the student will be able to:

- Design circuits using operational amplifiers for various applications.
- Analyze and design amplifiers and active filters using Op-amp.
- Diagnose and trouble-shoot linear electronic circuits.
- Understand the gain-bandwidth concept and frequency response of the amplifier configurations.
- Understand thoroughly the operational amplifiers with linear integrated circuits.

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DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3
MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS					

OBJECTIVES:
The main objectives of this course are:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation.
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

UNIT-I
Introduction to Managerial Economics and demand Analysis:
Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT – II:
Theories of Production and Cost Analyses:
Theories of Production function- Law of Variable Proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost – Volume-Profit Analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

UNIT – III:
Introduction to Markets, Theories of the Firm & Pricing Policies:
Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles: Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT – IV:
Introduction to Accounting & Financing Analysis:
Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

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UNIT -V:

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (payback period, accounting rate of return) and modern methods (Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index).

REFERENCES:

1. Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & CompanyLtd.
2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition.
3. N.P Srinivasan and M. Sakthivel Murugan, Accounting for Management, S. Chand & Company Ltd.
4. Maheswari S.N, An Introduction to Accountancy, Vikas Publishing House PvtLtd.
5. I.M Pandey, Financial Management, Vikas Publishing House PvtLtd.
6. V. Maheswari, Managerial Economics, S. Chand & Company Ltd.

OUTCOMES:

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

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product.
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- The Learner is able to prepare Financial Statements and the usage of various accounting tools for Analysis.
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

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II Year - II Semester		L	T	P	C
		0	0	3	1.5
ELECTRONIC CIRCUIT ANALYSIS LAB					

Note: The students are required to design the circuit and perform the simulation using Multisim/ Equivalent Industrial Standard Licensed simulation software tool**.** Further they are required to verify the result using necessary hardware equipment.

List of Experiments :(Minimum of Ten Experiments has to be performed)

1. Determination of f_T of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitts Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

Equipment required:

Software:

i. Multisim/ Equivalent Industrial Standard Licensed simulation software tool.
ii. Computer Systems with required specifications

Hardware Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Mustimeters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components.

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II Year- II Semester		L	T	P	C
		0	0	3	1.5
MICROPROCESSOR AND MICROCONTROLLERS LAB					

LIST OF EXPERIMENTS:

PART- A: (Minimum of 5 Experiments has to be performed)

8086 Assembly Language Programming and Interfacing

1. Programs for 16 -bit arithmetic operations (using Various Addressing Modes).
   a. Addition of n-BCD numbers.
   b. Multiplication and Division operations.
2. Program for sorting an array.
3. Program for Factorial of given-numbers.
4. Interfacing ADC to8086
5. Interfacing DAC to8086.
6. Interfacing stepper motor to8086.

PART-B (Minimum of 5 Experiments has to be performed)

8051 Assembly Language Programming and Interfacing

7. Finding number of 1's and number of 0's in a given8-bitnumber
8. Average of numbers.
9. Program and verify Timer/ Counter in 8051.
10. Interfacing Traffic Light Controller to8051
11. UART operation in8051
12. Interfacing LCD to8051.

PART-C (Minimum of 2 Experiments has to be performed)

Conduct the following experiments using ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM

13. Write an assembly program to multiply of 2 16-bit binary numbers.
14. Write an assembly program to find the sum of first 10 integer numbers.
15. Write a program to toggle LED every second using timer interrupt.

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II Year- II Semester		L	T	P	C
		0	0	3	1.5
INTEGRATED CIRCUITS AND APPLICATIONS LAB					

PART A: Digital IC Applications:

1. Verification of truth tables of Logic gates
   Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR.
2. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit
3. Verification of functional table of 3 to 8line Decoder /De-multiplexer
4. Verification of functional tables of
   (i) J K Edge triggered Flip –Flop
   (ii) J K Master Slave Flip – Flop
   (iii)D Flip –Flop
5. Design a four-bit ring counter using D Flip – Flops / JK Flip Flop and verify Output.
6. Construct 7 Segment Display Circuit Using Decoder and 7 Segment LED and test it.

PART-B: Linear IC Applications

1. OP AMP Applications – Adder, Subtractor, Comparator Circuits
2. Integrator and Differentiator Circuits.
3. Waveform Generator using single OP-AMP with variable duty cycle
4. IC 555 Timer – Monostable Operation Circuit, A stable Operation Circuit
5. IC 566 – VCO Applications.
6. Design of Dual Power Supply using 78XX and 79XX (use full wave Bridge Rectifier with shunt capacitance filters).

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II Year - II Semester		L	T	P	C
		1	0	2	2
SKILL COURSE (PYTHON PROGRAMMING)					

OBJECTIVES:
The main objectives of this course are:

- To develop a basic understanding of programming and Python programming language.
- Learn to apply the programming concepts to fundamental problems.
- To get exposure to various problems solving approaches.
- To acquire knowledge about Scripting Language.
- To expose students to application development and prototyping using Python.

UNIT-I:
INTRODUCTION: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. Types - Integers, Strings, Booleans.

UNIT-II:
OPERATORS AND EXPRESSIONS: Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations
Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.

UNIT-III:
CONTROL FLOW: - if, if-elseif-else, for, while, break, continue, pass.
Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

UNIT-IV:
MODULES: Creating modules, import statement, from import statement, name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions, Object Oriented Programming OOP in Python: Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data Hiding,

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UNIT-V:

BRIEF TOUR OF THE STANDARD LIBRARY: Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multi-Threading, GUI Programming, Turtle Graphics

TESTING: Why testing is required? Basic concepts of testing, Unit testing in Python, Writing Test cases, Running Tests.

TEXT BOOKS:

1. Python Programming: A Modern Approach, VamsiKurama, Pearson.
2. Learning Python, Mark Lutz, Orielly.

REFERENCES:

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

OUTCOMES:

At the end of this course the student can able to:

- Analyze the programming concepts with an interpreted Language.
- Build software applications for real needs.
- Acquire knowledge for prior Introduction to testing software
- Making Software easily right out of the box.