Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Engineering
SoE & Syllabus 2014
3 to 8 Semester
Electronics Engineering

Update on 25.04.2018

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.E. SCHEME OF EXAMINATION 2014

Electronics Engineering

Sl. No.	Course Code	Course Title	Contact Hours				Credits	% Weightage				ESE Duration Hrs.
			L	T	P	Total Contact Hours		MSE-I	MSE-II	TA	ESE	
THIRD SEMESTER												
1	GE1201	Engineering Mathematics - III	3	1	0	4	4	15	15	10	60	3
2	EE1201	Electronic Devices	3	1	0	4	4	15	15	10	60	3
3	EE1202	**Lab:** Electronic Devices	0	0	2	2	1			40	60	
4	EE1203	Digital Circuits	4	0	0	4	4	15	15	10	60	3
5	EE1204	**Lab:** Digital Circuits	0	0	2	2	1			40	60	
6	EE1205	Electronic Measurement & Instrumentation	3	0	0	3	3	15	15	10	60	3
7	EE1206	**Lab:** Electronic Measurement & Instrumentation	0	0	2	2	1			40	60	
8	EL1201	Network Analysis	3	1	0	4	4	15	15	10	60	3
9	EL1202	**Lab:** Network Analysis	0	0	2	2	1			40	60	
			16	**3**	**8**	**27**	**23**					
FOURTH SEMESTER												
1	GE1204	Advance Mathematical Techniques	3	1	0	4	4	15	15	10	60	3
2	EE1207	Electromagnetic Fields	3	1	0	4	4	15	15	10	60	3
3	EE1208	Electronic Circuit Analysis	3	1	0	4	4	15	15	10	60	3
4	EE1209	**Lab:**Electronic Circuit Analysis	0	0	2	2	1			40	60	
5	EL1217	Control System Engineering	4	0	0	4	4	15	15	10	60	3
6	EE1210	Microprocessor & Interfacing	3	0	0	3	3	15	15	10	60	3
7	EE1211	**Lab:**Microprocessor & Interfacing	0	0	2	2	1			40	60	
8	EE1212	Simulation Laboratory	0	0	2	2	1			40	60	
			16	**3**	**6**	**25**	**22**					

Chairperson	**Dean (Acad. Matters)**	**1.00**	**May 2015**
		Version	**Date of Release**
		Applicable for AY 2015-16 Onwards	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.E. SCHEME OF EXAMINATION 2014

Electronics Engineering

S no.	Sub Code	Subject	Contact Hours				Credits	% Weightage				ESE Duration
			L	T	P	Total		MSE - I	MSE - II	TA	ESE	
FIFTH SEMESTER												
1	GE1311	Fundamental of Management	3	0	0	3	3	15	15	10	60	
2	EE1301	Analog Communication	4	0	0	4	4	15	15	10	60	3 Hrs
3	EE1302	**Lab.:** Analog Communication	0	0	2	2	1			40	60	
2	EE1306	Signals and Systems	3	1	0	4	4	15	15	10	60	3 Hrs
4	EE1308	Analog Integrated Circuit & its Application	3	1	0	4	4	15	15	10	60	3 Hrs
5	EE1309	**Lab.:** Analog Integrated Circuit & its Application	0	0	2	2	1			40	60	
6	**Professional Elective-I**		3	0	0	3	3	15	15	10	60	3 Hrs
	EE1304	PE I: Power Electronics										
	EE1305	PE I: Advanced Instrumentation										
	EE1307	PE I: Switching Theory & Finite Automata										
	EE1324	PE I: Computer Organisation										
7	EE1310	**Lab.:** Electronics workshop	0	0	2	2	1			40	60	
8	EE1311	Seminar	0	0	2	2	1			100		
9	**Open Elective-I**		3	0	0	3	3	15	15	10	60	3 Hrs
	EE1320	OE I: Data Acquisition & Signal Conditioning										
	EE1322	OE I: Microporcessor & Microcontroller										
	EE1323	OE I: Consumer Electronics										
Total			**19**	**2**	**8**	**29**	**25**					

SIXTH SEMESTER

1	GE1312	Fundamental of Economics	3	0	0	3	3	15	15	10	60	3 Hrs
2	EE1303	Transmission Lines & Wave Guides	4	0	0	4	4	15	15	10	60	
3	EE1314	Digital Signal Processing	3	1	0	4	4	15	15	10	60	
4	EE1315	**Lab.:** Digital Signal Processing	0	0	2	2	1			40	60	
5	EE1316	Digital System Design	3	1	0	4	4	15	15	10	60	3 Hrs
6	EE1317	**Lab.:** Digital System Design	0	0	2	2	1			40	60	
7	EE1326	Microcontroller & Interfacing	3	1	0	4	4	15	15	10	60	
8	EE1327	**Lab.:** Microcontroller & Interfacing	0	0	2	2	1			40	60	
9	**Open Elective-II**		3	0	0	3	3	15	15	10	60	3 Hrs
	EE1328	OE II: Fuzzy Logic & Neural Network										
	EE1329	OE II: Basics of Analog and Digital Communication										
	EE1330	OE II: Biomedical Instrumentation										
Total			**19**	**3**	**6**	**28**	**25**					

Chairperson	**Version**	**1.00**	**Applicable for AY 2016-17 Onwards**
Dean (Acad. Matters)	**Date of Release**	**May 2016**	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.E. SCHEME OF EXAMINATION 2014

Electronics Engineering

S no.	Sub Code	Subject	Contact Hours				Credits	% Weightage				ESE Duration
			L	T	P	Total		MSE - I	MSE - II	TA	ESE	
SEVENTH SEMESTER												
1	**Professional Elective-II**		3	1	0	4	4	15	15	10	60	3 Hrs
	EE1401	PE II: Embedded Systems										
	EE1403	PE II: Digital CMOS Circuits										
	EE1405	**PE II:** Algorithm & Data Structures										
2	**Lab Professional Elective-II**		0	0	2	2	1	40			60	
	EE1402	**Lab. :** PE II: Embedded Systems										
	EE1404	**Lab. :** PE II: Digital CMOS Circuits										
	EE1406	**Lab. :** PE II**:** Algorithm & Data Structures										
3	EE1407	Electronics Circuit Design	3	1	0	4	4	15	15	10	60	3 Hrs
4	EE1408	**Lab. :**Electronics Circuit Design	0	0	2	2	1			40	60	
5	EE1409	Digital Communication	3	0	0	3	3	15	15	10	60	
6	EE1410	**Lab.:** Digital Communication	0	0	2	2	1			40	60	
7	EE1434	RF & Microwave	4	0	0	4	4	15	15	10	60	
8	EE1435	**Lab.:** RF & Microwave	0	0	2	2	1			40	60	
9	EE1412	Project Phase-I	0	0	4	4	4			40	60	
10	EE1413	Industrial Training / CRT	0	0	0	0	2			100		
Total			**13**	**2**	**12**	**27**	**25**					
EIGHTH SEMESTER												
1	**Professional Elective-III**		3	0	0	3	3	15	15	10	60	3 Hrs
	EE1414	PE III: Computer Communication Network										
	EE1415	PE III: Operating System Concepts										
	EE1436	PE III: RADAR Enginneering										
	EE1437	PE III: Micro Electro Mechanical Systems										
	EE1439	PE III: Display Technology										
2	**Professional Elective-IV**		4	0	0	4	4	15	15	10	60	3 Hrs
	EE1417	PE IV: Soft Computing										
	EE1419	PE IV: Analog VLSI Design										
	EE1427	PE IV: Digital Image Processing										
	EE1423	PE IV: Object Oriented Programming										
3	**Lab:Professional Elective-IV**		0	0	2	2	1	n		40	60	
	EE1418	**Lab. :** PE IV: Soft Computing										
	EE1420	**Lab. :** PE IV: Analog VLSI Design										
	EE1428	**Lab. :** PE IV: Digital Image Processing										
	EE1424	**Lab. :** PE IV: Object Oriented Programming										
4	**Professional Elective-V**		3	0	0	3	3	15	15	10	60	3 Hrs
	EE1416	PE V: Biomedical Instrumentation & its Applications										
	EE1421	PE V: Optical Communication										
	EE1425	PE V: Wireless Communication										
	EE1438	PE V: Mechatronics										
5	EE1433	**Lab.:** Electronics Design Automation	0	0	2	2	1			40	60	
6	EE1430	Comprehensive Viva-voce	0	0	0	0	3				100	
7	EE1431	Extra/Co-Curricular / Competitive Examinations	0	0	0	0	2			100		
8	EE1432	Project Phase-II	0	0	8	8	8			40	60	
Total			**10**	**0**	**12**	**22**	**25**					

Chairperson	**Version**	**1.01**	**Applicable for AY 2017-18 Onwards**
Dean (Acad. Matters)	**Date of Release**	**Dec. 2017**	

3rd Semester

GE1201	Engineering Mathematics-III		L= 3	T=1	P=0	Credits=4
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
The aim of this paper is to integral transform namely Laplace ,Z-transform and their methods of solution and partial differential equation with simple applications and to introduce the essential concepts of optimization techniques.	1. With the completion of this syllabus students will be familiar with Laplace ,Z-transform and their methods of solutions and partial differential equation with simple applications and essential concepts of optimization techniques and use these mathematical techniques in variety of technical, business, industry optimization problems.

UNIT-1: : Finite Differences (a,e) [8 hrs]
Difference table; Operators E and Δ, Central differences, Factorials notation Numerical differentiation and integration, Difference equations with constant coefficients.

UNIT- 2 : Laplace Transform (a,e) [7 hrs]
Laplace Transforms: Laplace transforms and their simple properties(with proof), Unit step function Heaviside unit step function and inverse, convolution theorem, , Applications of Laplace transform to solve ordinary differential equations including simultaneous equations.

UNIT-3 : Z-transform (a,e) [8 hrs]
Z-Transform definition and properties (with proof), inversion by partial fraction decomposition and redidue theorem, , Applications of Z-transform to solve difference equations with constant co-efficient.

UNIT-4 :Matrices (a,e) [9 hrs]
Inverse of matrix by adjoint method and its use in solving simultaneous equations, rank of a matrix (by partitioning method) consistency of system of equation, Inverse of matrix by partitioning method Linear dependence, Linear and orthogonal transformations. Characteristics equations, eigen values and eigenvectors.Reduction to diagonal form, Cayley Hamilton Theorem (without proof) statement and verification, Sylvester's theorem, Association of matrices with linear differential equation of second order with constant coefficient.

UNIT-5 : Fourier Series and Partial Differential Equation (a,e,h) [8 hrs]
Fourier Series – Periodic Function and their Fourier series expansion, Fourier Series for even and odd function, Change of interval, half range expansions.
Partial Differential Equations – PDE of first order first degree i.e. Lagrange's form, linear homogeneous equations of higher order with constant coefficient. Application of variable separable method to solve forst and second order partial differential equations.

UNIT-6 : Fourier Transform (a,h) [6 hrs]
Definition : Fourier Integral Theorem, Fourier sine and cosine integrals, Finite Fourier sine & cosine Transform Parseval's Identity, convolution Theorem.

Text books:

1	Advance Engineering Mathematics	9th Edition (September 2009)	Kreyszig.	Wiley
2	Higher Engineering Mathematics	40th edition, (2010)	B.S. Grewal	Khanna Publishers (2006)
3	Advanced Engineering Mathematics	8th revised edition, 2007	H.K. Dass	Publisher: S.Chand and Company Limited

Reference books:

1	Mathematics for Engineers	19th edition, (2007)	Chandrika Prasad.	John wiley& Sons
2	Advanced Mathematics for Engineers	4th edition, (2006)	Chandrika Prasad	John wiley& Sons
3	Applied Mathematics for Engineers	3rd edition, (1970)	L.A. Pipes and Harville	McGraw Hill.
4	A text Book of Applied Mathematics	3rd edition, (2000)	P.N. and J.N. Wartikar	Pune VidyarthiGrihaPrakashan

3rd Semester

EE1201	Electronic Devices	L= 3	T = 1	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Course Outcomes
• The purpose of this course is to present a clear consistent picture of the internal physical behaviour of many electronic devices so that their studies of electronic circuit and system will be meaningful. • The purpose of this course is to introduce to the students the basics of biasing transistor circuits, feedback amplifiers, rectifiers, & analyzing different two terminal devices.	Students will 1. Understand the working of PN junction diodes, circuit applications and special purpose diodes. 2. Understand the basic working of BJT, configurations and circuit applications. 3. Understand the stability concept of BJT. 4. Understand the basic working of FET and MOSFET with biasing techniques. 5. Understand the frequency analysis of BJT and circuit applications. 6. Understand the amplification using FET.

Unit I: Overview of Diodes:
PN junction diode, Clipping, Clamping, Rectifier, Junction-Diode Characteristics, The Current Components in a p-n Diode, The Volt-Ampere Characteristics, The Temperature Dependence of the Characteristics, Diode Resistance, Junction-Diode Switching Times, Breakdown mechanisms of Zener Diodes, Tunnel Diode, Schottky Barrier(Hot-Carrier) Diodes, Varactor (Varicap) Diodes.

(7 Hours)

Unit II: The bipolar Junction Transistor:
Transistor Current Components, The Transistor as an Amplifier, Transistor Construction, The Common-Base Configuration, The Common-Emitter Configuration, The CE Cutoff region, The CE Saturation Region , Typical Transistor –Junction Voltage Values, Common-Collector Configuration, Analytical Expressions for Transistor Characteristics, Maximum Voltage Rating.

(7 Hours)

Unit III: Transistor Biasing and Stabilization:
The Operating Point, Bias Stability, Self-Bias, Emitter Bias with voltage divider, Stabilization against Variations in I_{co}, V_{BE}, and β, Collector-Current Stability, Thermal Runaway, Thermal Stability, Bias Compensation Thermistor and Sensistor Compensation.

(6 Hours)

Unit IV: FET and MOSFET:
Field-effect Transistors, The Junction Field-effect Transistor, The Pinch-off Voltage V_p, The JFET Volt-Ampere Characteristics, MOSFET Device Structure and Physical Operation of MOSFET, Derivation of the I_D versus V_{DS}Relationship, Characteristics of the MOSFET, Biasing the FET, The FET as a Voltage-Variable Resistor, MOSFET biasing by Fixing V_{GS} ,Biasing by Fixing $V_G$and Connecting a Resistance in the Source, Biasing Using a Drain-to-Gate Feedback Resistor, Biasing Using a Constant-Current Source.

(7 Hours)

Unit V: The Transistor at Low Frequencies:
Graphical Analysis of the CE Configuration, Transistor Hybrid Model, Analysis of a Transistor Amplifier Circuit Using h Parameters, The Emitter Follower with & without Emitter resistance, Linear Analysis of a Transistor Circuit, Miller's Theorem and its Dual, Cascading Transistor Amplifiers, Simplified Common-Emitter Hybrid Model.

(7 Hours)

Unit VI: FET Amplifier:
MOSFET Amplifier, Basic FET Amplifier Configuration, Common-Source Amplifier, Common-Drain (Source-Follower) Amplifier, Common-Gate Configuration, Small signal equivalent circuits. (6 Hours)

Text Books:
1) Integrated Electronics, MillManHalkias, Tata McGraw Hills 3rd reprint, 2007.
2) Microelectronics Circuits, Sedra Smith, Oxford Uni. Press, sixth edition.

Reference Books:
1) Electronic Devices and Circuits Theory, BoyleStad, Nashelsky, Prentice Hall of India.
2) Power Electronics, Muhammad H. Rashid, 3rd edition, Pearson, 2006.
3) Microelectronics Circuit Analysis and Design, Donald Neaman, 4th Edition, McGraw Hills, 2010.

3rd Semester

EE1202	Lab.: Electronic Devices	L = 0	T = 0	P = 2	Credits= 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcomes
➢ The purpose of this course is to study basic concepts, DC circuits, AC circuits, semiconductors, semiconductor devices, power supply, bipolar and field effect transistor amplifiers, frequency response of amplifier and Power devices.	1. Graduates will have a fair practical knowledge about the working of PN junction diodes and zener diodes. 2. Graduates will understand the basic working rectifiers and biasing of transistors. 3. Graduates will understand the Working of FET & MOSFET. 4. Graduates will understand the fundamentals of amplifiers & power devices.

Expt. No.	Name of Experiment
1	To plot the V- I characteristics of PN junction diode (Silicon and Germanium) and perform simulation in Microcap.
2	Zener shunt regulator and perform simulation in Microcap.
3	Half wave and full wave rectifier with and without capacitive filter and perform simulation in Microcap.
4	To plot I/P & O/P Characteristics of Common Base Transistor Configuration. Find I/P& O/P Resistance and Current Gain.
5	To plot I/P & O/P Characteristics of Common Emitter Transistor Configuration. Find I/P& O/P Resistance and Current Gain.
6	Fixed Bias circuit of transistor.
7	Self Bias circuit of transistor
8	The Drain and Transfer characteristics of Field Effect Transistor (FET) in CS mode.
9	The Drain and Transfer characteristics of Metal Oxide Semiconductor Field Effect Transistor (MOSFET) in CS mode.
10	Frequency response of Feedback Amplifier.

3rd Semester

EE1203	Digital Circuits	L= 4	T = 0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

• The purpose of this course is to develop a strong foundation of digital electronics. • Understand concepts of combinational and sequential circuits. • Analyze the synchronous and asynchronous logic circuits.	Students will be able to 1. Simplify combination logic circuits using Boolean algebra. 2. Understand and demonstrate the various codes and illustrate the application of logic family 3. Simply and exhibit the methods to solve logical functions using K-map and Quine McClauskey methods 4. Understand combination logic circuits used in various digital systems. 5. Design and analyze Synchronous and Asynchronous sequential Circuits. 6. Design and demonstrate sate machines.

Unit I:
Logic gates, Switching Algebra & simplification of Boolean expressions, Boolean algebraic theorems, DeMorgan's theorem, SOP, POS, Canonical forms of Boolean expression. Implementations of Boolean expressions using logic gates, Functions & its implementation using Multiplexer, Demultiplexer, Encoder, Decoder.

(8 Hours)

Unit II:
Error detection and correction, Parity codes, Hamming's code. Representation of negative numbers, BCD arithmetic, Floating-point representation, Introduction to Logic families & their characteristics such as Fan-In, Fan-out, Propagation delay, Power dissipation, Noise Margin, Timing.

(7 Hours)

Unit III:
Minimization methods: Karnaugh map, QuineMcClauskey methods, incompletely specified functions, Static & Dynamic Hazards in combinational circuits.

(6 Hours)

Unit IV:
Design ofArithmetic circuits: Half & Full adders, Half & Full Subtractions, Multi-bit parallel adders Carry Propagate adder & Carry Look ahead adder, Comparators, Multi-bit Application designs, Formation of switching functions from word statements, ALU & Combinational circuits design using MSI and LSI chips.

(8 Hours)

Unit V:
Sequential circuits: Concept of Timing & Clocking: Rise time, fall time, Clock skew, Edge & Level triggers, Binary cell, Latches and flip-flops: RS-FF, D-FF, JK-FF, Master-Slave JK-FF & T-FF's, Excitation & Truth Table, Flip-flop conversions, Shift registers. Introduction to Synchronous, Counters: Ring counter, Johnson counter, Ripple counter,Design of synchronous counter: single mode and multi-mode counters

(6 Hours)

Unit VI:
Classification of synchronous machines, Design of synchronous sequential machines using Moore & Mealy circuits: Sequence detector, State diagram, State reduction (Method of Partitioning) and implementation. Asynchronous sequential Circuits.

(8 Hours)

Text Books:
1) Digital Circuits & Microprocessors, Hebert Taub, McGraw Hill, 1988.
2) Switching Theory & Finite Automata, ZviKohavi, McGraw Hill, 2nd edition, 2004.

Reference Books:
1) Modern Digital Electronics ,RP Jain, Tata McGraw Hill, 3rd Edition
2) Fundamentals of Logic Design, C.H.Roth, Public Work & Services,3rd edition 2007.
3) Engg Approach to Digital Design, Fletcher, Prentice Hall of India 1993.
4) Digital Design, M. Morris Mano, Third Edition, Prentice Hall of India,4th edition 2008.

3rd Semester

EE1204	Lab.: Digital Circuits	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcomes
➢ Student will understand basic digital circuit design and testing on breadboard using digital ICs and Electronic Components. ➢ Student will understand digital components and circuits characteristics, analysis and interpretation.	1. Students will be aware of Digital IC's and it's experimentation. 2. Students will be able to design and evaluate circuit performance on breadboard. 3. The student will be able to analyze and interpret more experiments relating to theoretical knowledge received during lecture hours.

Expt. No.	Name of Experiment
1	Display the voltage transfer characteristics of logic gates and find the following characteristics a) Noise margin s of a gate. b) Propagation delay of a gate.
2	Verify the Truth table for the basic logic gates and universal gates.
3	Verify Boolean Expression using Basic Logic Gates.
4	To verify Multiplexer and Demultiplexer functionality.
5	To Implement Boolean function using multiplexer/demultiplexer.
6	To Implement BCD to Seven segment Display combinational circuit.
7	To Implement & verify Half adder and full adder circuit.
8	To Implement & verify Half subtractor and full subtractor circuit.
9	To Implement & Verify 4bit binary adder circuit.
10	To verify the truth table of Master-slave J-K flip-flop.
11	To Design 2/3/4 bit binary synchronous/asynchronous counter.
12	To Design Finite State Machine using decoder IC.
13	Mini Project.

3rd Semester

EE1205	Electronic Measurement & Instrumentation	L= 3	T = 0	P = 0	Credits = 3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcomes
• The primary aim of this subject is to acquaint the students with the basic principles of measuring instruments and show how each of them can be exploited for the measurement of large number of variables.	Student will able to 1. Identify the various methods for measurement of resistance, capacitance and inductance. 2. Identify & apply specific electronics instrumentation and measurement system. 3. Use the different types of meters like digital multimeter, LCR meter. 4. Define usage of transducers, sensors, DAC / ADC, signal generator systems 5. Understand the concept of signal conditioning 6. Understand the concept of virtual instrumentation

UNIT I:
Introduction, Traceability of standards, Important terms in measurement such as accuracy, precision, sensitivity, Types of errors & their sources, Importance of calibration, Instrument calibration standards, Static & dynamic characteristics of measurement system, AC & DC Bridges.

(7 Hours)

UNIT II:
Amplified DC meters, AC Voltmeter, TRUE/RMS voltmeter, Electronic Multimeter, Digital Multimeter, Digital Voltmeter, Q-meter, LCR meter, Power & Voltage measurement.

(6Hours)

UNIT III:
AF Generator, Pulse Generators, Signal Generator, Function Generator, Sweep Frequency Generator, Wave analyzer, Spectrum analyzer, Digital logic analyzer Distortion analyzer, Frequency and time measurement.

(7 Hours)

UNIT IV:
Strain Gauges, Load Cells, Proximity sensors, Light Sensors, LVDT, Digital optical encoder, Selection of sensors, Classification of transducers, transducers actuating mechanisms, resistive, capacitive, and inductive transducers, thermoelectric & photoelectric transducers.

(7 Hours)

UNIT V:
General Measurement system components, process adopted in signal conditioning, amplification & electrical signal conditioning, Functions of signal conditioning equipments, AC/DC Conditioning systems, Amplification: overview of types of amplifiers, attenuators and filters, Generalized data acquisition system: single channel and multi-channel, Data conversion: ADC, DAC.

(7 Hours)

UNIT VI:
Concept of Virtual Instrumentation, Introduction & Basics of Virtual Instrumentation Programming, Concept of Sub VI, and Introduction to DAQ Card to build sensor application: Temperature measurement. Transducer application: strain measurement. Overview of Instrument driver model, types of Instrument drivers.

(6 Hours)

Text books:
1. Measurement Systems: Application & Design, Ernest O. Doebelin ,Fifth Edition, TATA McGRAW HILL Edition56'.
2. Elements of Electronic Instrumentation and Measurement, Joseph J. Carr, Third Edition, Pearson Education.

Reference books:
1. Electrical & Electronic measurement & Instrument, A. K. Sawhney, DhanpatRai& Co.,18th edition 2008.
2. Modern Electronic Instrumentation and Measurement Techniques, Albert D. Helfrick, William D. Cooper, Prentice Hall of India Publication.
3. Sensors, transducers &LabVIEW: an Application approach to Virtual Instrumentation, Barry E. Paton, Bernard M. Goodwin ,PHI Publication.
4. Instrumentation Devices &System,C.S.Ranga , McGraw Hill,1992.
5. Learning with Labview, Robert Bishop ,Pearson education,2005.
6. Theory & Design for Mechanical Measurement, Richard S. Figliola, Donald S. Beasley, 4th Edition,1991.

3rd Semester

EE1206	**Lab.: Electronic Measurement & Instrumentation**	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcomes
1. To learn basic measurement concepts and related instrumentation requirement as vital ingredients of electronics.	1. Students will be able to identify the various methods for measurement of R, L & C. **2.** Graduate will be able to use the different types of measuring instruments. 3. Will able to demonstrate the practical based on virtual instrumentation.

Expt. No.	Name of Experiment
1	To measure the medium resistance using Wheatstone bridge method.
2	To measure the low resistance using Kelvin's Double Bridge method.
3	To measure the inductance using Maxwell's inductance capacitance bridge method.
4	To measure the capacitance using Schering Bridge method.
5	To measure the value of unknown resistance using Post Office Box Trainer kit.
6	Virtual instrumentation based Digital Multimeter using NI ELVIS kit.
7	Virtual instrumentation based Oscilloscope and a Function Generator using NI ELVIS kit.
8	Virtual instrumentation based Variable Power Supply and Impedance Analyzer using NI ELVIS kit.
9	Measurement of parameters like temperature using LABVIEW.
10	Study of Cathode ray Oscilloscope.

3rd Semester

EL1201	Network Analysis	L= 3	T=1	P=0	Credits=4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Course Objective	Course Outcome
➢ To understand basic of circuits elements and energy sources ➢ To know the fundamental theory and mathematics for the analysis of electrical circuits.	Upon successful completion of this course, students should be able to: 1. Analyze electrical circuits with nodal analysis. 2. Analyze electrical circuits with Mesh analysis. 3. Apply network theorems to analyze electrical circuits. 4. Evaluate the initial and final values of current and voltage of electric circuits and to know basic of Laplace Transform. 5. Understand Laplace Transform of various types of signals and able to determine the time response from pole zero plot. 6. Apply the concept of two – port networks to find different two-port parameters.

UNIT-1: **Nodal Analysis of Electric Circuits**
Basics of electric circuits, circuit elements and their voltage – current relationship, classification of circuit elements, sources - their types and characteristics, concept of equivalent sources, source transformation, concept of supernode and V – shift, nodal analysis of circuits containing resistors, inductors, capacitors, transformers, and both independent and dependent sources to determine current, voltage, power, and energy.

UNIT-2:: **Mesh Analysis of Electric Circuits**
Concept of supermesh and I – shift, mutual inductance, coefficient of coupling, dot convention, dot marking in coupled coils, meshanalysis of circuits containing resistors, inductors, capacitors, transformers, and both independent and dependent sources to determine current, voltage, power, and energy.

UNIT-3 :**Network Theorem**
Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem.

UNIT-4: Initial and Final Conditions, Impedance Functions and Circuit Analysis with Laplace Transform
Concept of initial and final conditions, behavior of resistor, inductor and capacitor at t = 0- and at t = 0+, procedure for evaluating initial and final conditions.
Review of Laplace Transform, concept of complex frequency, transform impedance and admittance, s – domain impedance and admittance models for resistor, inductor and capacitor, series and parallel combinations of elements. Time response of electrical network with and without initial conditions by Laplace transform.

UNIT-5 : Transforms of other Signal Waveforms, Network Functions, Poles and Zeros of network functions
Unit step, ramp and impulse functions with and without time delay, their Laplace transform.
Terminal pairs or ports, network functions for one port and two port networks, definition and physical interpretation of poles and zeros, pole-zero plot for network functions, restrictions on pole and zero locations for driving point and transfer functions.

3rd Semester

EL1201	Network Analysis	L= 3	T=1	P=0	Credits=4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

UNIT-6: Two Port Parameters

Standard reference directions for the voltages and currents of a two – port network, defining equations for open circuit impedance, short circuit admittance, transmission, inverse transmission, hybrid and inverse hybrid parameters, relationships between parameter sets, conditions for reciprocity and electrical symmetry in terms of two – port parameters.

Text books:

1	Network Analysis	3rd Edition	M. E. Van Valkenburg	PHI Learning Private Limited
2	Engineering Circuit Analysis	8th Edition	William H. Hayt, Jack E. Kemmerly, Steven M. Durbin	McGraw – Hill
3	Linear Circuit Analysis	2nd Edition	Decarlo, Lin	Oxford Univ. Press

Reference books:

1	Schaum's 3000 Solved Problems In Electric Circuits Book 1 & 2	1st Edition	Syed A. Nasar	McGraw - Hill
2	Schaum's Outline Series: Theory and Problems of Electric Circuits	5th Edition	Joseph A. Edminister	McGraw - Hill
3	Basic Circuit Theory	3rd Edition	Lawrence P. Huelsman	PHI Learning Private Limited

3rd Semester

EL1202	Lab. : Network Analysis	L= 0	T=0	P=2	Credits=1

Evaluation Scheme	TA	ESE	Total	ESE Duration
	40	60	100	----

Minimum Eight Practical are to be performed from the following list.

Expt. No.	Name of Experiments
1.	Introduction To PSPICE Software.
2.	Verification of Kirchhoff's law.
3.	Perform nodal analysis on complex electrical circuits
4.	Perform mesh analysis on complex electrical circuits.
5.	Verification of Superposition Theorem.
6.	Verification of Thevenin's Theorem.
7.	Verification of Norton's theorem.
8.	Verification of Maximum power transfer theorem.
9.	Determinations of Transfer function of Two port network.
10.	Determination of Z & Y parameters of Two port Network.

4th Semester

GE 1204	Advanced Mathematical Techniques		L= 3	T=1	P=0	Credits=4
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
The objective of this paper is to study numerical methods and their methods of solution and statistics and probability with simple applications and to introduced fuzzy sets and logics	With the completion of this syllabus students will be familiar with study numerical methods and their methods of solutions and fuzzy sets and logics with simple applications and essential concepts of probability and statistics and use these mathematical techniques to provide the solution to variety of technical, business, industry optimization problems.

UNIT-1: [9 hrs]

NUMERICAL METHODS FOR ALGEBRAIC AND TRANSCENDENTAL EQUATIONS: Errors in numerical calculation, Errors in series approximation. Rounding of error solutions of algebraic and transcendental equations. Iteration method, Bisection method, False position method, Newton Rapphson method and their convergence

NUMERICAL METHODS SYSTEM OF ALGEBRAIC EQUATIONS: Solution of System of linear equation, Gauss elimination method, Gauss -Jordan method, Gauss- Seidel method, Crouts method & relaxation method.

UNIT-2: [8 hrs]

NUMERICAL METHODS FOR DIFFERENIAL EQUATIONS: Numerical solution of ordinary differential equation by Taylor's series method, Picard's method, Runge's second and third order method, Runge-Kutta 4th order method, Euler's method, Euler's modified method, Milne's Predictor and Corrector method. Numerical methods of solving 1st order simultaneous ordinary differentials equations

UNIT-3 : Optimization Techniques (a,h) [6 hrs]

Definition of basic concepts of LPP, Formulation of LPP and its Solution by graphical, simplex methods and Big M method,

UNIT-4 [7 hrs]

Random variable and probability distribution: Random variable: discrete and continuous; probability density function; Probability distribution function for discrete, and continuous random variable Joint distributions, conditional distributions.

UNIT-5: [8 hrs]

Mathematical Expectation: Definition of mathematical expectation, functions of random variables, The variance and standard deviations, moment generating function other measures of central tendency and dispersion, Skewness and Kurtosis.

UNIT-6 [6 hrs]

FUZZY SETS AND FUZZY LOGIC ; Fuzzy sets and systems, crisp sets, overview of fuzzy logic and classical logic, fuzzy compliment, fuzzy union, fuzzy intersection and combinations of these fuzzy sets operations crisp and fuzzy relations.

Text books:

1	Computer based Numerical and Statistical Techniques	Paperback Firstedition 2003	M. Goyal	Laxmi Publication
2	Numerical Methods	Fourth Edition(2004)	S.S. Sastri	PHI Publishers
3	Fuzzy Engineering	Softcover edition (2005)	Bari Kosko	Prentice Hall PTR
4	Optimization Techniques	Year-2009.First Edition	C.Mohan and Kasum Deep	New Age International Publication

Reference books:

1	Advanced Engineering Mathematics	4th edition 2006	H.K.Dass	S. Chand Group
2	Advanced Engineering Mathematics	9th Edition-2007	Kreyszig	JOHN WILEY & SONS
3	Mathematics for Engineers	19th edition 2007	Chandrika Prasad.	JOHN WILEY & SONS
4	Advanced Mathematics for Engineers	4th edition 2006	Chandrika Prasad	JOHN WILEY & SONS
5	Higher Engineering Mathematics	40 edition 2010	B S Grewal	Khanna Publishers

4th Semester

EE1207	Electromagnetic Fields	L= 3	T = 1	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcomes
➢ The primary aim of this subject is to provide the students of engineering with a clear and logical presentation of basic concepts and principles of electromagnetic. ➢ To understand the basic laws applicable to electric and magnetic field.	Students will understand and analyze concept of 1. Vector calculus and coordinate system. 2. Electrostatics. 3. Energy and potential. 4. Static Magnetic Field. 5. Time varying Magnetic field 6. Understand concept of wave theory.

Unit I:
Orthogonal coordinate systems: Cartesian, cylindrical, spherical and transformations, Gradient of a Scalar Field, Divergence of a Vector Field, Curl of a Vector Field, Laplacian Operator, Irrotational and solenoidal field.

(7 Hours)

Unit II:
Coulomb's law, Electric field intensity for different charge distribution, point, line surface, volume, Concept of electric flux, Gauss's law, Application of Gauss's law: Some Symmetrical Charge Distributions, Differential Volume element, Divergence, Maxwell's First equation (Electrostatics), The Vector Operator▼ and the Divergence Theorem.

(7 Hours)

Unit III
Energy & Potential: Energy Expended in Moving a Point charge in an Electric Field, The Line Integral, Definition of Potential Difference and Potential, Potential field of a point charge, Potential field of a System of charges :Conservative Property, Potential Gradient, The Dipole, Energy Density in the Electrostatic Field. Poisson's and Laplace's equation and its examples of solutions, Uniqueness of electrostatic solution.

(7 Hours)

Unit IV
Biot-Savart's law and applications to infinite and finite current filament, Ampere's Circuital law and applications to line charge, coaxial transmission cables, uniform current sheet charge, solenoid, toroid, Stoke's Theorem, Magnetic flux and magnetic flux density, Scalar and vector magnetic potential.

(8 Hours)

Unit V:
Faraday's law, Maxwell's equations for static and time varying fields with physical significance, displacement current, Magnetic Boundary conditions.

(7 Hours)

Unit VI:
Uniform plane wave, wave propagation in free space, in dielectric, Poynting's Theorem and Wave Power, Propagation in Good Conductors: Skin Effect. Reflection & Refraction of Electromagnetic waves.

(7 Hours)

Textbook:

1) Engineering Electromagnetics,Seventh Edition, William H. Hayt, Tata McGraw – Hill,2006 reprint.
2) Electromagnetics , J D Kraus, McGraw – Hill,3rd edition 1984.

References:

1) Electromagetism: Theory and application, AshutoshPramanik, Prentice Hall,2nd edition august 2009.
2) Elements of Electromagnetis, M. N. O. Sadiku, Oxford Press ,4th edition 2007.
3) Field and Wave Electromagnetics, David K. Cheng, Second Edition, Addison Wesley.

4th Semester

EE1208	Electronic Circuit Analysis	L= 3	T = 1	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcomes
➢ To understand Transistor parameters at high frequency and the small signal equivalent circuit of amplifiers employing devices like BJT, MOSFET, etc. ➢ To develop circuit analysis capabilities using Network Theory principles. ➢ To analyze various feedback amplifiers for signal gains, input and output impedances etc. ➢ Introduction to design insights offered by circuit analysis skills.	Students will understand the 1. High frequency analysis of BJT, MOSFET. 2. Types of amplifier, frequency response and analysis. 3. Feedback topology and analysis. 4. Differential amplifier, AC and DC analysis. 5. Power amplifier stages, distortions and circuit applications. 6. Oscillators and analysis.

UNIT I:
Review of low frequency small signal h-parameters, The Hybrid-pi model of common emitter BJT amplifier, Various Hybrid-pi parameters, Single stage CE Transistor Amplifier Response, Gain Bandwidth Product, Unity Gain Frequency f_T of a transistor, Introduction to MOSFET parameters, Common Source Equivalent Circuit, High frequency model of MOSFET and Unity Gain frequency f_T.

(7 Hours)

UNIT II:
Classification of Amplifiers, Distortion in Amplifiers, Bode Plots, Single and two pole transfer functions, 3dB frequencies, Step and Pulse Response, Squarewave Testing of Amplifiers, High frequency Response of Single and Two Stage CE amplifiers, Miller Approximation of interacting stages, Introduction to Noise in Amplifiers.

(8 Hours)

UNIT III:
General Feedback Structure, Various properties of Negative and positive Feedback, Basic Feedback Topologies, Voltage, Current, Trans Conductance, Trans Resistance Amplifiers, Analysis of Voltage-Series, Voltage-Shunt, Current- Shunt and Current series feedback amplifiers, Effect of feedback on amplifier bandwidth, Method of analysis of Feedback Amplifiers.

(8 Hours)

UNIT IV:
Differential Amplifier, configurations, DC & AC Analysis, Differential amplifier using swamping resistor, constant current bias, current mirror, cascaded differential amplifier.

(7 Hours)

UNIT V:
Classification of Output Stages, Class A, Class B, and Class AB output stages, Power Efficiency, Power Dissipation, Cross-Over Distortion in Class AB Circuits, Class A Transformer Coupled Power Amplifier, Design with Darlington Matched Pairs for Class AB Power Stage, Harmonic Distortion due to Large Signal operation, Thermal Resistance and Heat Sinks.

(8 Hours)

UNIT VI: Oscillators: LC & RC, Barkhausen's criterion, classification of oscillators, RC phase shift oscillators, Wein bridge, LC,Hartley, colpitts, crystal Oscillators.

(7 Hours)

Text Book:
1) Integrated Electronics, MillmanHalkias, Tata McGraw Hills, 43rd reprint, 2007.
2) Op-amps and linear integrated circuits, R. A. Gayakwad, 3rd edition, PHI, 1995.

Reference books:
1. Microelectronics Circuits, Sedra Smith, Oxford Uni. Press.
2. Electronics Devices and Circuits Theory, Boyle Stad, Nashelsky, Prentice Hall of India.

4th Semester

EE1209	Lab.: Electronic Circuit Analysis	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcomes
➢ To deduce the external characteristics of each device which allow students to exploit the device as a circuit element and to determine its large signal (non-linear) behavior. ➢ To analyze and features many different devices and circuits.	1. Students will able to determine the h-parameter of transistors. 2. Students will able to determine the frequency response of amplifier with and without feedback. 3. Students will able to determine the distortions in amplifiers. 4. Students will able to determine the voltage regulator using different regulator devices.

Expt. No.	Name of Experiment Experiments based on hardware and simulation.
1	Evaluation of Small Signal Parameters: BJT, MOSFET, Output & Transfer Characteristics of Enhancement MOSFET.
2	Frequency Response of Single Stage RC Coupled CE Amplifier.
3	Two Stage Direct Coupled Amplifier with Voltage Series Feedback.
4	Positive Feedback Amplifier: evaluation of Gain & Phase Margin.
5	Demonstration of Amplitude and Phase Distortion in Amplifiers.
6	Transformer Coupled Class A Power Amplifier.
7	Class B Push Pull Power Amplifier: Cross Over Distortion and Efficiency.
8	Class AB Power Amplifier with Class A Driver Stage.
9	Series Voltage Regulator: Line and Load Regulation.
10	Improved Series Voltage Regulator with Pre-Regulator.
11	Variable Voltage Regulator using 3-Terminal Monolithic Regulator.
12	RC Phase shift oscillator.

4th Semester

EL1217	Control System Engineering	L= 4	T = 0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Course Learning Objectives	Course Outcomes
This is a first course in feedback control of dynamic systems. The main goal is to introduce and familiarize students with dynamic systems modeling and analysis techniques that can be employed on a large variety of engineering systems. Being an interdisciplinary course, students will learn: 1 the role of a control engineer in multi-disciplinary teams. 2 to apply the knowledge gained in basic mathematics, physical sciences and engineering courses to derive mathematical models of typical engineering processes. 3 to use transfer function and state space models for control system analysis in time and frequency domain. 4 the basic concepts of proportional, integral, and derivative (PID) control. 5 the importance of stability in control systems and the various methods to determine it. 6 to construct root locus plot and frequency response plots such as polar plot, Bode plot, Nyquist plot etc.	Upon successful completion of this course, students should be able to: 1. Identify the basic elements and structures of feedback control systems. 2. understand the use of block diagram and signal flow graph as a modeling tool. Be able to manipulate block diagrams for systems of interconnected components. 3. develop models (differential equations, transfer functions, state space,) for a variety of dynamic physical systems. 4. understand the role of feedback in control systems. 5. have a good understanding of the response characteristics of basic first- and second-order dynamic systems. Be able to correlate time-domain responses with damping ratio and pole locations. 6. have an introductory knowledge of PID controllers. Be able to design PID controllers to meet simple specifications. 7. understand BIBO stability and its connection with pole locations. Be able to use Routh's criterion for absolute and relative stability analysis. 8. evaluate transfer function, stability and time response of control systems using state space techniques. 9. construct and recognize the properties of root-locus and its role in the analysis of control systems. 10. obtain frequency response indices. Be able to draw frequency response plots such as polar plot, Bode plot etc.

UNIT I : Introduction to Control Systems: History of control system, Basic Components of Control System, Open loop control and close loop control with examples, classification of control systems.
Transfer Function, Block Diagram and Signal Flow Graph : Transfer function and gain, Order of a system, block diagram algebra & reduction techniques, signal flow graph, its constructions and Mason's gain formula.
Mathematical Modelling of physical systems: Mathematical modelling of physical system such as – electrical, mechanical, electro-mechanical, thermal, hydraulic, pneumatic etc., Analogous systems.

UNIT II: Characteristics of Feedback Control Systems :Effect of negative feedback compared to open loop system such as – sensitivity to parameter variation, speed of time response, bandwidth, disturbance rejection and linearizing effect, Effect of positive feedback.

UNIT III:Time Domain Analysis of Control Systems: Concept of transient response, Steady state response and time response, standard test signals, Time response of first order systems, Transfer function of second order system, Time response of second order system, Time response specifications of second order system, steady state error (e_{ss}) analysis, static error constants and system type, dominant poles, Approximation of high order systems by low order systems, Relation between roots of characteristic equation, damping ratio and transient response, effect of proportional(P), Integral (I) and derivative (D) controllers on the time response concept of transportation lag.

4th Semester

EL1217	Control System Engineering	L= 4	T = 0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

UNIT IV: **Stability of Linear Control Systems :** Concept of stability, stable, unstable and marginally stable system, Absolutely stable and conditionally stable system, Necessary conditions for stability, method to determine stability, Routh-Hurwitz stability criterion with special cases, relative stability analysis.

State Variable Analysis : Concept of state, state variables and state model, state model of linear systems, state model using physical variables, phase variables and canonical variables, state model from differential equations, block diagram and signal flow graph, transfer function from state model, stability of systems modeled in state variable form, solution of state equations, state transition matrix, its properties and computation.

UNIT V: Root LocusTechnique : Definition, magnitude and angle criteria, properties of root locus, construction rules for root locus plot of negative feedback systems, determining the gain from root locus plot, effect of addition of poles and zeros of G(s)H(s).

UNIT VI: Frequency domain analysis of control systems: Concept of frequency response and sinusoidal transfer function, resonant frequency, resonant peak, cut off frequency, bandwidth, correlation between time and frequency response, polar plot, inverse polar plot, bode plot, all pass and minimum – phase system, log magnitude versus phase plot.
Stability in Frequency domain : Principle of argument, Nyquist stability criterion, Assessment of relative stability using Nyquist criterion, concept of gain margin and phase margin and its computation using polar plot and log magnitude versus phase plot.

Text books:

1	Control system engineering	5TH Edition	I. J. Nagrath& M. Gopal	New Age International
2	Automatic control systems	7th Edition	B. C. Kuo	PHI Learning Private Limited

Reference books:

1	Sigma Series: Control Systems	1st Edition	Ashok Kumar	McGraw - Hill
2	Control systems : Principles and design	4th Edition	M. Gopal	McGraw - Hill
3	Modern control engineering	5th Edition	Katsuhiko Ogata	PHI Learning Private Limited

4th Semester

EE1210	Microprocessor &Interfacing	L= 3	T =0	P = 0	Credits = 3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcomes
➢ To understand the architecture, programming concept and addressing modes of Intel 8085A ➢ To understand various interfacing concepts like 8255,8253,8259,ADC etc. for designing Microprocessor based applications	Students 1. Will understand the architecture of 8085 microprocessor 2. Will understand mnemonics and programming logic 3. Will interface I/O devices and apply knowledge of ADC, DAC, Stepper motor interfacing & programming. 4. Will design the Circuit where the applications of timer and counter are used. 5. Will develop the technique of interrupt I/O technique 6. Will develop the circuit where the serial communication is used

Unit I
Intel 8085A Architecture pins, Generation of control signals, Demultiplexing of Address and Data bus Memory mapping, absolute and linear decoding.

(7 Hours)

Unit II
Instruction set, addressing modes, timing diagram, flag register branching instructions, stack related instructions, programming, and Call instructions Delay programming.

(7 Hours)

Unit III
PPI 8255,Architecture ,command word register ,I/O and BSR modes Interfacing and programming for keyboard ,keyboard matrix,7 segment display,7 segment displays in multiplexed mode ,ADC,DAC ,Stepper motor.

(7 Hours)

Unit IV
PIT 8253 different modes, interfacing and programming. Real time clock design, Design of interrupt alarm system.

(7 Hours)

Unit V
Interrupt structure of 8085, RIM AND SIM instructions generation of RST n instructions, management of interrupt requests from 8 different I/O devices.PIC 8259 Interfacing with 8085, cascade mode, ICWS OCWS, programming.

(7 Hours)

Unit VI
8251 USART block diagram and pins, Mode select command byte, control select command byte status register, interfacing and programming.

(7 Hours)

Text Book:

1) Microprocessors and Interfacing; 2E; D. V. Hall; McGraw Hill.

Reference Books:

1. Microprocessor: Architecture, Programming & applications with 8085; Ramesh S.Gaonkar; Penram International Publication, 5th Edition.
2. Microcomputer systems: the 8086/8088 family: architecture, programming, and design; Yu-cheng Liu, Glenn A. Gibson; Prentice-Hall.
3. The 8051 Microcontroller and Embedded systems , Muhammad Ali Mazidi , J.G. Mazidi, 2nd edition Pearson Education, Prentice Hall of India

4th Semester

EE1211	**Lab.: Microprocessor & Interfacing**	L = 0	T = 0	P = 2	Credits= 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcomes
1. To understand the concept and addressing modes of Intel 8085A 2. To understand various interfacing concepts like 8255,8253,8259,ADC etc. for designing Microprocessor based applications	1. Graduates will understand architectural details of microprocessors 2. Will be able to demonstrate the microprocessor based system design 3. Will be able to interface various devices with microprocessor

Expt No.	Name of the Experiment
1	To determine the opcodes,addressing modes, no of bytes the instructions required
2	Add data bytes in the block
3	Determine the maximum data bytes in a block
4	To find no of negative data bytes in the block
5	Replace the leading zeros with blanks
6	Find the length of ASCII String
7	Compare two strings of ASCII charecters
8	Add two multiple byte binary nos
9	Adc interface
10	Dac interface

4th Semester

EE1212	Simulation Laboratory	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcomes
1. To acquaint student with various computing schemes using mathematical software tools.	1. Graduates will be able to understand the concept of Mathematical modeling of systems. 2. Will be able to apply concept of Mathematical modeling for various applications. 3. Graduates will be able to understand the concept circuit analysis & designing using SPICE programming.

Unit I:
Introduction: matrix creation and matrix operations, Matrix arithmetic, linear equations, eigen values, singular values, and matrix factorizations, Basic data structures: two-dimensional matrix and multidimensional array (plus scalar, vector, and empty matrices), Data types: numeric, logical, characters, dates, structures, cell arrays, function handles, Programming components: principal building blocks, programming- variables, keywords, special values, operators, expressions, regular expressions, comma-separated lists, control statements, symbols.

Unit II:
Scripts and functions, Making calls to calls to functions, handle argument data, and use function handles, Data import Export: import and export of data, including text, spreadsheet, graphics, and audio/video files, Error Handling: error checking in programs, and identify, handle, and possibly recover from errors that occur, Using message identifiers to better identify the source of an error, and selectively display or ignore warning messages. Improving performance and memory usage: Profiling.

Unit III:
Data visualization. Graphics: Plotting Tools, Data Exploration tools, Annotating Graphs, Basic Plotting Commands, Creating specialized plots, Mesh, surface, feather plot, pie chart, bar graph, shading techniques, Printing and exporting, Figure and axes properties. Creating Graphical User Interface: Creating GUI, Laying out GUIs and Setting Properties, Programming GUI, GUI applications.

Unit IV:
Control system analysis- LTI Models, Operations on LTI models, Model analysis tools. Signal Processing Toolbox- vector and matrix representation of signals, generation of periodic and aperiodic waveforms, sequences (impulse, step, and ramp), impulse response, frequency response, zero-pole analysis.

Unit V:
Spice fundamentals, various circuit analysis methods, Spice device models, Data visualization.

5th Semester

GE1311	Fundamentals of Management	L= 3	T=0	P=0	Credits=3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
Principle of Management	To familiarize the students with the basic concepts and principles of management. The students should clearly understand the definitions of different areas of management. This course will facilitate students to understand and describe specific theories related to perception, motivation, leadership. This will help the students to demonstrate effective management skill by knowing the various functions of management like planning, organising, directing, coordinating and controlling.
Legal Aspects of Management	The present course aims at familiarizing the students with various legal aspects of business, contract, partnership and companies. It aims at providing a rich fund of contemporary knowledge, time tested principles, basic concepts, emerging ideas and practices in the field of law in a comprehensive way.
Human Resource Management	The objective of this course is to endow the student with a broad perspective on themes and issues of Human Resource Management, Human Resource Development, Training and Development activities, Job Analysis, Performance Appraisal, disciplinary and grievance procedure. It will help the students to build up and refine decision making skills so that they can help organizations effectively manage employee relations.
Project Management	The course is intended to develop the knowledge of the students in the management of projects, special emphasis will be provided on project formulation as also on various tools and techniques for project appraisal and control so that they are able to draft the project proposal in any area of management and evaluate the projects.
Marketing Management	This course intends to provide an experienced-based approach to marketing concept and its practical application. The course is designed to enable the students to learn the basic of marketing, customer behaviour, marketing research & sales promotion. Topics of the syllabus shall be addressed and discussed from an application oriented perspective
Financial Management	The present course aims at familiarizing the participants with the skills related to basic principles, tools and techniques of financial management. This will help the students to demonstrate their skill in understanding the budgets and budgetary control, balance sheet, and profit and loss statement.

Mapped Program Outcomes:

5th Semester

GE1311	Fundamentals of Management	L= 3	T=0	P=0	Credits=3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

UNIT-1: Principles of Management
Evolution of Management Thought : Scientific, Classical, Neo Classical and Modern Theory of Management, Defintion Meaning and Concept of Management, Functions of Managment : Planning, Organizing, Directing Coordinating and Controlling. Motivation Theory, Leadership

UNIT-2: Legal Aspects of Management
The Indian Contract Act, 1872 – Formation of Valid Contract, Discharge of Contract, Quasi Contract, Indemnity and Guarantee. The Indian Partnership Act, 1932- Essentials of Partnership, Types of Partners, Right and Duties of Partners, Registration and Dissolution of firm, The Companies Act – Nature and Definition of Company, Registration and Incorporation, Memorandum and Article of Association, Kinds of companies, Directors : Powers and duties, Winding up of the Company

UNIT-3: Human Resource Management
Human Resource Management-Meaning, Nature and Scope, Principles of HRD, Human Resource Planning, Job Analysis – Job Description and Job Specification, Job Enrichment, Job Rotation, Training and Development – Purpose and Methods, Performance Appraisal- Purpose, Procedure and Techniques, Discipline and Grievance Procedure.

UNIT-4 Project management
Concept, Classification and Characteristics of Project, Project Life Cycle, Project Proposal, Project Management, Tools and Techniques of Project Management, SWOT Analysis, Project Risk Analysis, Project cost, Project Planning, Project Control, Network techniques - Introduction and Use of CPM &PERT for planning.

UNIT-5 Marketing Management:-
Marketing Management - Definition & scope, Selling & Modern Concepts of Marketing, Market Research, Rural Marketing, Marketing Environment, Customer Behaviors, Product Launching, Sales Promotion, Pricing, Channels of Distribution, Advertising, Market Segmentation, Marketing Mix, Positioning, Targeting

UNIT-6 Financial Management:-
Definition & Functions of Finance department, Sources of finance , Financing organizations, Types of capital, Profit maximization vs. Wealth maximization, Functions of Finance Manager in Modern Age, Concept of Risk and Return , Break Even Analysis, Budgets & Budgetary Control, Make or Buy Analysis, Introduction to financial statement – profit and loss A/c and Balance Sheet

TEXT BOOKS:

1. S.C.Saxena, Business Management and Administration, SahityaBhawan Publication
2. P. SubbaRao, Management -- Theory and Practice (Text and Cases) (Himalaya Publication)
3. Kuchhal M.C. - Business Law (Vikas Publication, 4 th Edition)
4. P.S Rao , Essentials of Human Resource Managemen& IR, Himalaya , Mumbai
5. AvrahamShtub and Jonathan F. Bard, Project Management: Processes, Methodologies, and Economics (2nd Edition)
6. Kotler, Keller, Koshy&Jha, Marketing Management, Pearson, New Delhi
7. R.K. Sharma, Shashi K Gupta, Management Accounting,.Kalyani Publishers.

5th Semester

GE1311	Fundamentals of Management	L= 3	T=0	P=0	Credits=3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

TEXT BOOKS FOR REFERENCE:

1) Harold Koontz Ramchandra, Principles of Management, Tata McGrow hills
2) Bare Acts – Indian Contract Act, Indian Partnership Act and Company Law
3) Dr. V.S.P.Rao - Human Resource Management - Text and Cases
4) C.B.Mamoria and S.V.Gankar, A Text book of Human Resource Management,

5) Lock, Gower - Project Management Handbook
6) Ramaswamy V.S. and Namakumari S - Marketing Management: Planning, Implementation and Control (Macmillian, 3rd Edition).
7) RajanSaxena: Marketing Management, Tata McGraw Hill.
8) Fabozzi - Foundations of Financial Markets and Institutions (Pretice hall, 3rd Ed.)
9) Parameswaran- Fundamentals of Financial Instruments (Wiley India)
10) Bhole L M - Financial Institutions and Markets (Tata McGraw-Hill, 3rd edition, 2003)
11) Khan M Y - Financial Services (Tata McGraw Hill, 1998)

5th Semester

EE1301	Analog Communication	L= 4	T = 0	P = 0	Credits =4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcomes
➢ To Study different modulation techniques. ➢ To understand transmitter &receivers communication systems. ➢ To learn the concept of PPM, PAM, PWM & PCM. ➢ To learn basics of noise, types of noise & various propagation layers, spectrum of electromagnetic waves.	Students will be able to 1. Demonstrate and analyze various amplitude modulation techniques. 2. Demonstrate and analyze various angle modulation techniques. 3. Understand various types of receivers in communication system. 4. Analyze various types of noise in communication system and investigate noise parameters. 5. Understand pulse modulation techniques. 6. Study antenna theory with its various types.

UNIT-1:
Amplitude Modulation: Need for modulation, mathematical Analysis, modulation index, frequency spectrum, power requirement of AM, DSB-SC, Balanced Modulator for carrier suppression, SSB, Methods of SSB Generation, ISB, VSB transmissions, Generation of AM system.

(7 Hours)

UNIT-2:
Angle Modulation: Frequency Modulation (FM), mathematical Analysis, modulation index, frequency spectrum, power requirement of FM, narrowband & wideband FM, noise triangle in FM, pre-emphasis & de-emphasis techniques, phase modulation, noise reduction characteristics of angle modulation, FM Transmitter.

(8 Hours)

UNIT-3
Receivers: Basic receiver (TRF), Super heterodyne receiver, performance parameters for receiver such as sensitivity, selectivity, fidelity, image frequency rejection etc., AM detectors, FM discriminators, AGC technique, double-spotting effect.

(7 Hours)

UNIT-4
Noise: External Noise, internal Noise, Noise Calculations, Addition of Noise due to several sources, Addition of Noise due to several amplifiers in cascade, Noise in reactive circuits, Definition of Noise figure, signal to noise ratio, calculation of noise figure, Noise figure from equivalent resistance, Noise Temperature.

(8 Hours)

UNIT-5:
Pulse Modulation: Generation and demodulation of PAM, PWM, PPM, Time division Multiplexing, Frequency division multiplexing, Pulse code modulation

(8 Hours)

UNIT-6:
Introduction to antenna, radiation in spaceTerms&definitions in antenna, effects of ground on antennas, antenna with parabolic reflectors, Horn antenna,Yagi antenna

(7 Hours)

Text books:

1	Electronic Communication System	Fourth Edition, 1999	Gorge Kennedy	Tata McGraw-Hill
2	Digital and analog communication systems	Fifth Edition,2003	K. Sam Shanmugam	John Wiley & Sons
3	Modern Television Practice	Third Edition,2007	R.R.Gulati	New Age International publishers

5th Semester

EE1301	**Analog Communication**	L= 3	T = 0	P = 0	Credits =3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Reference books:				
1	Electronic Communication Systems	Second Edition, 1993	Frank R. Dungan	Delmar Publishers
2	Communication Electronics	Third Edition, 2007	Louis Frenzel	McGraw-Hill
3	Television & Video Engineering	2001	Dhake Arvind M	Tata Mgraw Hill

5th Semester

EE1302	Lab. : Analog Communication	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	Continuous Evaluation	ESE		Total	ESE Duration
	40	60		100	

Objective	Outcome
To Demonstrate all the types of modulation and demodulation methods. To perform Double side band and single side band modulation system. To analyze pulse modulation and digital modulation techniques.	Students 1. Will be able to demonstrate different modulation techniques & the ability to calculate power & current in modulation techniques. 2. Will be able to demonstration the demodulation techniques. 3. Will be able to perform the time division multiplexing.

Expt. No.	Name of Experiment
1	To verify the Generation of Amplitude Modulation using transistor. Calculate modulation index for different values of modulating amplitude.
2	To verify the Generation of Amplitude Demodulation using Envelop Detector.
3	To verify the Generation of Frequency Modulation using IC 8038 function generator.
4	To perform Frequency Demodulation using IC 565 PLL.
5	Generation of SSB-SC using balanced modulator.
6	Generation of SSB-SC using balanced de-modulator.
7	Generation of DSB-SC.
8	Generation of PWM signal using IC 555.
9	To perform Pulse Width Demodulation
10	Generation of PPM signal using IC 555.
11	Generation of Pulse Position Demodulation.
12	Generation of Pulse Amplitude Modulation using IC 555 & IC 4016.
13	To perform Time Division Multiplexing (TDM).

5th Semester

EE1306	Signals & Systems	L= 3	T = 1	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcomes
➢ The objective of this course is to have an introduction to approaches of signals & systems analysis with an increased emphasis on the frequency response and Analysis of system with continuous signal and discrete time signal. ➢ To enable the students to understand the fundamentals of Signals, their Time & Frequency characteristics.	Students will be able to 1. Identify and categorize continuous time signals & systems. 2. Analyze periodic continuous time signals in frequency domain. 3. Analyze aperiodic continuous time signals in frequency domain. 4. Analyze continuous time signals in complex plane. 5. Understand sampling and reconstruction process and classify discrete time signals & systems. 6. Analyze periodic and aperiodic discrete time signals & systems in frequency domain.

UNIT-1:
Continuous time signals (CT signals), Step, Ramp, Pulse, Impulse, Exponential, Classification of CT signals- Periodic and Aperiodic, random signals, CT systems, Classification of systems - Linear Time invariant systems, Convolution integral, correlation.

(8Hours)

UNIT-2: The Response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-Time Periodic Signals, Convergence of the Fourier Series. Properties of Continuous-Time Fourier series, Filtering. Examples of Continuous-Time Filters Described by Differential Equations.

(7 Hours)

UNIT-3:
The Continuous-Time Fourier Transform, Representation of Aperiodic Signals: The Continuous-Time Fourier Transform, The Fourier Transform for Periodic Signals, Properties of the Continuous-Time Fourier Transform, Systems Characterized by Linear Constant-Coefficient Differential Equations.

(8 Hours)

UNIT-4:
The Laplace Transform, The Region of Convergence for Laplace Transforms, The Inverse Laplace Transform, Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot, Properties of the Laplace Transform, Analysis and Characterization of LTI Systems Using the Laplace Transform, System Function Algebra and Block Diagram Representations, The Unilateral Laplace Transform, State equations and Matrix.

(7 Hours)

UNIT-5 –
Discrete-Time Processing of Continuous-Time Signals, Sampling Theorem, Reconstruction, Aliasing of signal, discrete time signals (DT signals)-Classification of DT signal, classification of DT system, Convolution sum, correlation.

(8 Hours)

UNIT-6:
Fourier series Representation of Discrete-Time Periodic Signals, Properties of Discrete-Time Fourier series, Fourier series and LTI Systems, Examples of Discrete-Time Filters Described by Difference Equations, The Discrete-Time Fourier Transform**,** Representation of Aperiodic Signals: The Discrete-Time Fourier Transform, The Fourier Transform for Periodic Signals, Properties of the Discrete-Time Fourier Transform, Systems Characterized by Linear Constant-Coefficient Difference Equations, State variable equation and Matrix.

(7 Hours)

5th Semester

EE1306	Signals & Systems	L= 3	T = 1	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Text books:

1	Signals and Systems	2/E, 1996	Alan V. Oppenheim, Alan S. Willsky, with S. Hamid	Prentice Hall
2	Digital signal processing –Principles, algorithms and applications	3rd Edition, 1996	J. G. Proakis, D. G. Manolakis	PHI

Reference books:

1	Outline of Signals and Systems	1st, 1995	HweiHsu,Schaum's	McGraw-Hill
2	Signals & Systems	2nd Edition, 2002	Simon Haykin and Van Veen	Wiley
3	Signals & Systems Analysis Using Transformation Methods & MAT Lab	2003	Robert	TMH
4	Signals, Systems and Transforms	3rd Edition, 2004.	C. L. Philips, J.M.Parr and Eve A.Riskin	Pearson education
5	Signals & Systems	2001.	I. J. Nagrath, S.N.Sharan, R.Ranjan, S.Kumar	

5th Semester

EE1308	Analog Integrated Circuits and its Application	L= 3	T = 1	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcomes
➢ The objective of this course is to analyze and design a wide variety of operational amplifier / integrated circuits based applications and to have a firm grasp of basic principle of these to adapt to a changing technology as the new devices appear on the market.	Students will be able to 1. Acquire knowledge of the fundamentals and internal structure of the operational amplifier. 2. Acquire knowledge about noise & the different Parameters of the operational amplifier. 3. Analyze and design the linear applications of the operational amplifier. 4. Analyze and design active Butterworth filters using operational amplifier. 5. Analyze and design the non-linear applications of the operational amplifier. 6. Understand the working and applications of DAC and ADC.

UNIT-1:
OPERATIONAL AMPLIFIER FUNDAMENTALS: Amplifier Fundamentals, Ideal Op-Amp, OPAMP parameters, Basic Op-Amp Configurations: Open loop, Feedback in OPAMP circuit: Inverting, Non-inverting, voltage follower.
(8 Hours)

UNIT-2:
OP AMP LIMITATIONS- STATIC and DYNAMIC: Simplified Op Amp Circuit Diagram, Input Bias and Offset Current, Input Bias and Offset voltages, input offset error Compensation, open loop and closed loop response, Transient response, gain bandwidth product (GBP) & its effect, frequency compensation. OPAMP Noise : Noise properties, Sources of noise, Noise Dynamics, Noise in OPAMP.
(7 Hours)

UNIT-3
LINEAR APPLICATIONS : Summer, difference amplifier, integrator, differentiator, Current-to-Voltage Converter, Voltage-to-CurrentConverter, Instrumentation Amplifiers, Instrumentation Applications, Transducer, Bridge amplifiers.
(7 Hours)

UNIT-4:
ACTIVE FILTERS: Transfer function, first order filter, Standard second order response, higher order filter, KRC Filters, Multiple feedback filters, second order Butterworth filter design.
(8 Hours)

UNIT-5
NONLINEAR CIRCUITS: Precision Rectifiers, Voltage Comparators, Comparator Applications, Peak Detectors, Schmitt Triggers: Inverting & Non-inverting, Sample-and-Hold Circuits, clipper, clamper, Log/Antilog amplifiers, PLL WAVEFORM GENERATORS, Sinusoidal Oscillators, multivibrators, monolithic timers, triangular wave generator.
(7 Hours)

UNIT-6:
D-A AND A-D CONVERTERS: Performance Spécifications, D-A Converters (DACs), A-D Converters (ADCs), D-A Conversion Techniques, A-D Conversion Techniques.
(8 Hours)

Text books:				
1	Design with Operational Amplifiers and Analog Integrated Circuits	3rd Edition	Sergio Franco	McGraw-Hill

Reference books:				
1	Linear Integrated Circuits	3rd Edition	D. Roy Chaudhuri, Shail Jain	New Age International
2	Linear Integrated Circuits	S. Salivahanan, V. S. Bhaaskaran		TMH

5th Semester

EE1309	Analog Integrated Circuits and its Application Laboratory	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration	
	40	60	100		

Objective	Outcome
➢ The purpose of the course is to teach students how to build circuits on bread boards using operational amplifier IC, resistors, capacitors and diodes and how to use digital multimeters, signal generators, frequency meters and oscilloscopes to test these circuits. ➢ In addition, students must learn to write well-organized reports.	Students 1. Will be able to construct breadboard circuits. 2. Will be able to use standard electronic test equipment such as oscilloscopes, function generators, digital multimeters and power supplies. 3. Will be able to analyze a circuit and compare theoretical performance to actual performance. 4. Will be able to present an organized written engineering analysis on electronic testing of a circuit.

Expt. No.	Name of Experiment
1	IC 741 OP-AMP as a inverting amplifier / non-inverting amplifier with frequency response.
2	Different OPAMP parameters: CMRR, Slew rate of OP-AMP.
3	IC 741 OP-AMP as a Integrator.
4	IC 741 OP-AMP as a Differentiator.
5	IC 741 OP-AMP as a Low pass filter.
6	IC 741 OP-AMP as a High pass filter.
7	OP-AMP IC 741 as AstableMultivibrator.
8	OP-AMP IC 741 as a MonostableMultivibrator.
9	OP-AMP IC 741 as a Schmitt trigger.
10	Instrumentation amplifier.
11	Precision Rectifier.
12	ADC/ DAC.

5th Semester

EE1304	PE I : Power Electronics		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ To make familiar with the SCR & other power devices. ➢ To study power controller, various techniques of improving power factor, different methods of commutation. ➢ To understand uncontrolled and controlled converters. ➢ To describe function of various types of an inverter. ➢ To explain operation of choppers.	Students 1. Will be able to study the characteristics of various devices. 2. Will understand how the semiconductor devices are used as a converter and how they satisfy the requirement of load. 3. Will help to develop the concept of resonant inverter. 4. Will come to know that a dc chopper can be used as a dc transformer to step up or step down a fixed dc voltage.

UNIT-1:
Power Semiconductor Diodes and Circuits, control Characteristics of power devices, power modules, power diodes, reverse recovery, series, shunt connected diodes, Diode Rectifiers-single phase, three phase rectifiers, bride rectifiers, design of rectifiers.

(8 Hours)

UNIT-2:
Power Transistors, Switching characteristics of BJT, Power MOSFETs, IGBTs, limitations, Power Thyristors.

(7 Hours)

UNIT-3
Pulse-width Modulated Inverters: Principle, single phase, multiple phase, PWM Forced commuted inverters, current source inverters, design of inverter, DC-DC Converters, Step up, stepdown, SMPS, thyrister Choppers, design of choppers.

(8 Hours)

UNIT-4:
Resonant Pulse Inverters-Series, parallel, resonant inverters, Class E resonant inverter, Zero voltage/current Switching resonant inverter, Multilevel Inverters.

(7 Hours)

UNIT-5
Controlled Rectifiers: phase control converter, single phase, three phase converters, power factor improvement, AC Voltage Controllers. Principle of ON-OFF control, Phase control, Single phase controllers, three phase controllers, cyclo-converters.

(8 Hours)

UNIT-6:
Power Supplies, SMPS, SMAC power supplies, power factor conditioning Gate Drive Circuits- Protection of Devices and Circuits Snubber, reverse recovery transients, protection devices varisters, Introduction to AC and DC drives.

(7 Hours)

Text books:

1	Power Electronics:Circuits,Devices and Applications	2nd edition 1993	M. Rashid	PHI

Reference books:

1	Power Electronics and its application	2nd Edition 2004	Alok Jain	Penram International Publishing Pvt Ltd

5th Semester

EE1305	PE I : Advanced Instrumentation	L= 3	T = 0	P = 0	Credits =3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ This course is intended for exposing the students to some of the advanced topics in instrumentation. Topics covered are humidity, time & voltage measurement, smart sensors, common instrument interfaces, and basics of biomedical instrumentation.	Students will be able to 1. Understand different electrical transducers. 2. Understand basics of digital measurement. 3. Understand and Classify different liquid level measurement techniques. 4. Describe voltage measurement digitally and its applications. 5. Learn different networking standards for programmable instruments. 6. Understand the basics of Biomedical Instrumentation.

UNIT-1:
Measurement of Humidity: dry and wet bulb psychrometer, different methods of moisture measurement, Measurement of density, liquid density measurement–gas densitometers, Conductivity measurement, Smart sensors-block diagram, Smart transmitter, Recent trends in sensor technology**,** Semiconductor sensors**,** Film sensors-MEMS-Nanosensors.
(7 Hours)

UNIT-2:
Time measurement using digital techniques, Small time interval measurement, Periodic time, Time interval between two events defined by voltage levels, time constant, Phase measurement, Capacitance measurement, Quality factor of a ringing circuit Frequency measurement using digital techniques, Ratio of two frequencies, High frequency, Power system frequency deviation, Low frequency, Time reciprocating circuit, Peak frequency.
(8Hours)

UNIT-3
Level Measurement: Glass techniques coupled with photoelectric readout system, Float type level indication, Different schemes, Level switches, level measurement using displacer and torque tube, Electrical types of level gauges using resistance, capacitance, nuclear radiation and ultrasonic sensors. Introduction to digital transducers.
(7 Hours)

UNIT-4:
Voltage measurement using digital techniques, Input circuits of digital voltmeter, auto zero circuit, bipolar operation, buffer circuit, protection, auto ranging, tracking method, Ratiometric Measurements, Applications, Measurement of modulation index, Q of a coil (any one method), Noise in instrumentation systems, electromagnetic interference, methods of noise coupling, noise sources, grounding.
(8 Hours)

UNIT-5
Common Instrument Interfaces – RS232C, USB, General Purpose Interface Bus (GPIB), Standard Commands for Programmable Instrumentation (SCPI), PLC,SCADA
(7 Hours)

UNIT-6:
Introduction of Biomedical Instrumentation &measurements, Bioelectric potentials, examples (ECG, EEG), Blood pressure measurements, indirect measurement, sphygmomanometer, direct measurement techniques, Recent trends in biomedical instrumentation
(8 Hours)

Text books:				
1	Principles of Industrial Instrumentation	3rd ed, 1996	D. Patranabis	Tata McGraw Hill
2	Medical Instrumentation Application and Design	3rd ed, 1998	J. G. Webster	John Wiley & Sons
3	Senors and transducers	2nd ed.2003	D. Patranabis	PHI Learning Pvt. Ltd

5th Semester

EE1305	PE I : Advanced Instrumentation	L= 3	T = 0	P = 0	Credits =3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Reference books:				
1	Digital Measurement Techniques	2nd ed, 2004	T. S. Rathore	Narosa Publishing House
2	Introduction to Biomedical Equipment Technology	4th ed, 2001	J. J. Carr and J. M. Brown	Pearson Education

5th Semester

EE1307	**PE I : Switching Theory & Finite Automata**	L= 3	T = 0	P = 0	Credits = 3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ To acquaint students with various sequential logic design methods, Analysis of logic circuits and optimization techniques to minimize gate count. ➢ To acquaint students with fault diagnosis, threshold logic, analysis and design of sequential machines.	Students will be able to 1. Understand and Synthesis multilevel logic networks. 2. Design and analyze the faults models. 3. Design and analyze the synchronous sequential circuits. 4. Design and analyze the asynchronous sequential circuits. 5. State assignments for optimization of finite state machines. 6. Identify and test the sequential machines with experiments.

UNIT-1:
Multi-level logic synthesis, Technology-independent synthesis, Technology mapping, Threshold logic for nanotechnologies, Introductory concepts, Synthesis of threshold networks.

(8Hours)

UNIT-2:
Testing of combinational circuits, Fault models, Structural testing, *IDDQ* testing, Delay fault testing, Synthesis for testability, Testing for nanotechnologies.

(7 Hours)

UNIT-3
Introduction to synchronous sequential circuits and iterative networks, Sequential circuits: introductory example, The finite-state model: basic definitions, Memory elements and their excitation functions, Synthesis of synchronous sequential circuits, An example of a computing machine, Iterative networks, Capabilities, minimization, and transformation of sequential machines,The finite-state model: further definitions, Capabilities and limitations of finite-state machines, State equivalence and machine minimization, Simplification of incompletely specified machines.

(8Hours)

UNIT-4:
Asynchronous sequential circuits,Modes of operation, Hazards, Synthesis of SIC fundamental-mode circuits, Synthesis of burst-mode circuits.

(7 Hours)

UNIT-5
Structure of sequential machines:Introductory example, State assignments using partitions, The lattice of closed partitions, Reduction of the output dependency, Input independency and autonomous clocks, Covers and the generation of closed partitions by state splitting, Information flow in sequential machines, Decomposition, Synthesis of multiple machines.

(8 Hours)

UNIT-6:
State-identification experiments and testing of sequential circuits**,** Experiments, Homing experiments, Distinguishing experiments, Machine identification, Checking experiments, Design of diagnosable machines, Alternative approaches to the testing of sequential circuits, Design for testability, Built-in self-test (BIST).

(7 Hours)

Text books:				
1	Switching & Finite Automata Theory	Third Edition 2010	Zvi Kohavi, Niraja K. Jha	Cambridge University Press
2	Fundamentals of Digital Logic With VHDL Design	Second Edition, 2007	Stephen Brown	TMH
Reference books:				
1	Digital System Design using VHDL	Fifth Edition, 1998/2007	C.H.Roth	PWS
2	Digital logic testing and simulation	Second Edition, 2000	Alexander Miczo	John Wiely& Sons

5th Semester

EE1324	PE I : Computer Organisation	L= 3	T = 0	P = 0	Credits = 3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ Acquire knowledge of various Computer architecture. ➢ To understand Processor level design, controller design of processor. ➢ To understand memory organization of computer. ➢ To Learn about DMA operation, parallel processing architecture.	Students will be able to 1. Identify the various hardware design level components of a computer system. 2. Investigate the methods required for processor organization and representation of information. 3. Understand the various hardware control unit design 4. Understand the basic organization of the memory. 5. Acquire the knowledge of the input/output mechanisms used to connect computers to their external environments. 6. Understand importance of instruction pipelining for enhancing processor performance

UNIT-1:
Register Level Design – General characteristics, Description, Languages, Combinational and sequential components, Design methods, Processor Level design- components, design techniques.

(7 Hours)

UNIT-2:
Processor Design- Processor organization, information representation, number Formats. Instruction sets – Instruction formats, instruction types, multiplication & division ALU design, Floating Point arithmetic, IEEE 754 floating point formats.

(8 Hours)

UNIT-3
Control design – Instruction sequencing, interpretation, Hard-wired control-Design methods, multiplier and CPU control unit, Micro programmed control – Basic concepts, minimizes microinstruction size, multiplier control unit, Micro programmed Computers – CPU control unit,.

(8 Hours)

UNIT-4:
Memory organization – Device characteristics, RAM, Serial access memories, virtual memory, concept of cache & associative memories.

(7 Hours)

UNIT-5
System Organization – Local and long distance communication input-output systems, Interrupt, DMA, introduction to parallel processing.

(8 Hours)

UNIT-6:
Concept of parallel processing, Pipelining, vector processors, introduction of RISC architecture, Date Flow architecture.

(7 Hours)

Text books:

1	Computer Architecture and organization	Third Edition, 1997	Jhon.P. Hayes	McGraw-Hill Companies

Reference books:

1	Computer organization	Fifth edition, 2001	Carl Hammacher	McGraw-Hill Science
2	Structured computer and Organization	Fifth edition, 2005	Andrew S. Tanenbaum	PHI
3	computer organization and microprogramming	First edition, 1972.	CHU, YAOHAN	Prentice Hall
4	Computer System Architecture	Third Edition ,1992	M.Morris Mano	Prentice Hall

5th Semester

EE1311	Electronics Workshop	L = 0	T = 0	P = 2	Credits = 2

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcome
➢ To Acquaint Students with basic Electronics workshop practices like, identification of components, operate and control various machines, repair, troubleshooting , and Circuit Design Methods. ➢ To create interest in Hardware Technology. ➢ Student will understand Project Implementation and testing with proper report writing.	Students 1. Will able to identify different Electronics Components. 2. Will be able to do mini project to enhance their practical Knowledge. 3. Will be able to do Artwork, printing, Etching & drilling of PCB 4. Will be able `to work in a teamwork

Expt. No.	Name of Experiment
1	Study of Passive Elements : Resistors, Capacitors, Inductors etc.
2	Study of Active Elements : Diodes, Transistors, Thyristors, Power Supplies etc.
3	Study of Electronic Transformers.
4	Study of Wires, Cables etc.
5	Study of Interconnect Components: Electromechanical Switches, Solid state relays, Optocouplers etc.
6	Study of Speakers and Microphones.
7	Study of Electronic Circuit Protection Components: Fuses, Circuit Breakers, Zener Diodes etc.
8	Electronics Mini Project : Selection, Estimation, PCB layout design, Fabrication, Soldering, Testing, Troubleshooting , Results , Report etc.
9	Interconnect components: Solid state Relays ,Coaxial RF connectors, Mechanical switches for electronic Circuits.
10	Electronic Circuit Protection: Snubber Capacitor (IGBT Protection), Thermisters, Discrete Semiconductor, Over voltage Protection, Over Current Protection.
11	Study of LTCC (Low Temperature co -fired Ceramic Tapes, Niobium Oxide Capacitors, EDLC (Electronic Double Layer Carbon) Super Capacitors.
12	Study of Chip Resistors, Line feed Resistors (Surge Resistors Networks).

5th Semester

EE1311	Seminar	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	Continuous Evaluation	ESE		Total	ESE Duration
	100	00		100	

OBJECTIVES: To develop technical presentation skill through Seminar based on Mini-Project work carried out in subject **EE310 / EE719Electronics Workshop Laboratory.**

5th Semester

EE1320	**OE I : Data Acquisition & Signal Conditioning**	L= 3	T = 0	P = 0	Credits = 3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
The course gives an overview about the data acquisition methods, to acquaint students with ADCs and DACs and various data acquisition techniques.	Students 1. Will be able to identify the basic model of data acquisition system. 2. Will understand the various methods and attributes of signal conditioning. 3. Will understand the various types of data acquisition hardware. 4. Will understand the serial data communication standards. 5. Will understand different standards for connection of different programmable instruments 6. Will be introduced to various IEEE standards.

UNIT-1:
Definition of data acquisition and control, Fundamentals of data acquisition**,** Signal conditioning, Data acquisition and control system configuration, Computer plug-in I/O, Distributed I/O, Stand-alone or distributed loggers/controllers, Analog and digital signals: Classification of signals, Sensors and transducers, Transducer characteristics, Resistance temperature detectors (RTDs), Thermistors, Thermocouples, Strain gauges, Wheatstone bridges.

(8 Hours)

UNIT-2:
Signal conditioning: Types and classes, Field wiring and signal measurement, Noise and interference, Minimizing noise, Shielded and twisted-pair cable.

(7 Hours)

UNIT-3
Plug-in data acquisition boards, A/D Boards, Single ended Vs differential signals, Resolution, dynamic range and accuracy of A/D boards, Sampling rate and the Nyquist theorem, Sampling techniques, D/A boards, Digital I/O boards.

(7 Hours)

UNIT-4:
Serial data communications, Transmission modes – simplex and duplex, RS-232-C interface standard, RS-485 interface standard, Comparison of the RS-232 and RS-485 standards, Serial interface converters, Protocols, Error detection.

(8 Hours)

UNIT-5
IEEE 488 Standard, Introduction, Electrical and mechanical characteristics, Physical connection configurations, Device types, Bus structure, GPIB handshaking, Device communication, Requirements of IEEE 488.2 controllers, Standard commands for programmable instruments (SCPI).

(7 Hours)

UNIT-6:
Ethernet and field buses for data acquisition, Physical layer, Medium access control, Difference between 802.3 and Ethernet, The universal serial bus (USB), USB overall structure, Topology.

(8 Hours)

Text books:		
1	Data Acquisition for Instrumentation and Control Systems	John Park and Steve Mackay

Reference books:				
1	Electronic Analog Digital Conversion	1st Edition	H. Schmid	Tata McGraw Hill
2	Data Converters	1st Edition , 1993	B. S. Sonde	Tata McGraw Hill

5th Semester

EE1322	OE I : Microprocessor & Microcontroller	L= 3	T = 0	P = 0	Credits = 3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
To understand the architecture, programming and addressing modes of Intel 8085 and 8051 To study the instruction set and programming of 8085 and 8051 To understand various interfacing of devices for various applications.	Students 1. Will be able to understand the architecture of 8085 and 8051. 2. Will demonstrate the ability to identify, Formulate and design program for an assigned task. 3. Will be able to interface Peripheral devices. 4. Will apply the knowledge of microprocessor and microcontroller in their respective field.

UNIT-1:
Concept of bit, byte & word, Micro Computer organization with I/O devices and memory. Microprocessor, address, data & control bus, RAM / ROM memory.

UNIT-2:
Architecture of 8085 Intel microprocessor, pins diagram of 8085, Demultiplexing of Address & Data Bus, Generation of various control signals for I/O & Memory Organization.

UNIT-3
Addressing mode, Basic Instruction set, Subroutine instructions like CALL, PUSH, POP, XTHL instructions and their uses. Interrupts-Interrupt structure of 8085, Programs based on instructions.

UNIT-4:
Salient features of microcontroller 8051, Architecture of 8051, Pins diagram of 8051, SFRs of 8051, Addressing modes, Instruction set, Simple programs based on arithmetic, logical operations, BCD arithmetic, bit manipulations. Reset Circuit of 8051.

UNIT-5
Advanced instructions, delay programs. Interfacing of LED, 7 segment display, switches, LCD display interfacing Matrix Keyboard interfacing.

UNIT-6:
Different modes of timer/Counters, applications of timer, Interfacing of ADC & DAC.Serial Communication.

Text books:

1	Programming & Interfacing 8085	Ramesh Gaonkar	Penram Publication
2	8051 Microcontroller	Kenneth Ayala	Penram Publication

Reference books:

1	8085 Microprocessor	Ajit Pal	Tata Mc-Graw Hill
2	0000 to 8085	ShridharGhosh	PHI
3	The 8051 Microcontroller & Embedded System	M. A. Mazidi, J. G. Mazidi	Pearson

5th Semester

EE1323	**OE I : Consumer Electronics**	L= 3	T = 0	P = 0	Credits = 3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ To give knowledge and competencies regarding consumer electronic equipments.	Students will be able to 1. Understand the knowledge of the safety aspects in the field of Electrical and Electronics products. 2. Analyze the basics of Audio Systems. 3. Analyze the basics of Video Systems 4. Know about current trends in mobile and wireless technologies. 5. Understand the basics of refrigeration cycle and cooling system. 6. Know the recent trends in Processors and computer peripherals.

Unit -I
Standards and Safety norms:Electronics and Electrical safety norms and standards, Electronic products covered under compulsory registration

Unit -II
Audio Systems:Sound Recording and reproduction, Hi-Fi Sound System, Audio Mixers, Graphics Equalizers, Public Address System.

Unit -III
Video Systems:Color fundamentals, Luminance and Chrominance signal , Color camera, digital television systems.

Unit IV
Wireless Technology & Mobile phones:Mobile Phones, various wireless technologies, Introduction to 3G, WiFiTechnology, GSM

Unit -V
Air conditioner and Refrigerators:Fundamentals, Refrigeration cycles, compressors, home automation

Unit -VI
Computers:Recent microprocessor, Pentium family architecture and salient features , Recent Memories technologies (RAM, HDD), Computer peripherals

Text Books:

1. S.P. Bali, "Consumer Electronics", Pearson Education, First Edition
2. B. R. Gupta, VandanaSinghal, "Consumer Electronics", S. K. Kataria& Sons, 2006
3. J.S. Chitode, "Consumer Electronics", Technical Publication,
4. for unit-I Electronics Standards of India *www.**electronics**tds.gov.in*
5. Related internet sites

6th Semester

GE1312	Fundamentals of Economics	L= 3	T=0	P=0	Credits=3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

UNIT-1:Introduction to Economics and Consumers' Behaviors:
Definitions, meaning and importance of economics Utility analysis: concept and measurement (cardinal and ordinal), Law of diminishing marginal utility, law of equi-marginal utility, Indifference curve analysis: Meaning and properties of indifference curve, marginal rate of substitution, budget constraint, Complement and substitute goods, Consumer's equilibrium. Demand Analysis: Meaning and determinants of demand, law of demand, Elasticity of Demand-price, cross and income elasticity, measurement of elasticity of demand. Concept of supply, Supply curve, elasticity of supply-determinants and measurement, time element in determination of supply.

UNIT-2: Production and Costs
Factors of Production: Land, Labour, Capital, Enterprise and their peculiarities, Importance of Capital in production process. Entrepreneur and Innovations, Product and Process innovations, Concepts and types of costs: Fixed vs variable, total, average and marginal costs, Short run and long run cost curves. Law of Variable proportions (Law of diminishing marginal returns) and Return to Scale (Increasing, constant and decreasing), Economies and diseconomies of scale. Depreciation: Meaning and various method of calculating depreciation.

UNIT-3: Market structures - equilibrium output and price
Forms of market structures: Perfect competition, monopolistic competition, oligopoly, duolpoly and monopoly, Demand and revenue curves for firm and industry in various forms of market structure, Total, average and marginal revenue curves, equilibrium of firms and industries under various forms of market structures, Price discrimination - Degrees and conditions of discrimination.

UNIT-4: National income accounting:
Concepts of GDP and GNP,Estimation of GDP and GDP at factor and market prices, at constant and current prices, difference between GDP and NDP, GNP and NNP, per capita income as a measure of economic well-being, concepts of economic growth and development, Factors affecting economic growth and development. Capital formation and accumulation.

UNIT-5: Money, Banking and Public Finance
Money: definition, functions and role, Evolution of money, Banking- reserve ratios and credit creation by commercial banks, Functions of a central bank and instruments of credit control, Functions of money market. Inflation: Meaning, types, causes and consequences, measures to control inflation, Concepts of deflation and Stagflation. Sources of public revenue and forms of government expenditure, Taxation: Cannons of taxation. Classification of taxes-Direct (Income tax, Wealth tax, Corporation tax, tax on capital, capital gains, etc) and Indirect Taxes (Expenditure tax, Import duties, Excise duties), Revenue and capital expenditure.

UNIT-6: International Trade and Institutions

Definitions of closed vs open economy, small open economy, Concept of exchange rate- Fixed, flexible and managed, Role of Multilateral institutions, viz., IMF, World Bank, WTO (GATT) in promoting, Trade, growth and international financial transactions.

6th Semester

GE1312	Fundamentals of Economics	L= 3	T=0	P=0	Credits=3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Text Books:

1. Modern Economics: H. L. Ahuja, 13th Edition, S. Chand Publisher, 2009.
2. Modern Economic Theory: K. K. Devett, 3rd edition, S. Chand Publisher,2007

Reference Books:

1. Advance Economic Theory: H. L. Ahuja, 17th Edition, S. Chand Publisher, 2009.
2. International Trade: M. L. Zingan, 12th edition, Vindra Publication, 2007.
3. Macro Economics: M. L. Zingan, 11th edition, Vindra Publication, 2007.
4. Economics: Samuelson,
5. Monitory Economics: M. L. Sheth, 1st Edition, Himayalaya Publisher, 1995.
6. Economics of Development and Planning: S. K. Misra and V. K. Puri, 12th edition, Himalaya Publishing House, 2006.

6th Semester

EE1303	Transmission Lines and Wave Guides	L= 4	T =0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ To enable the students, to have a fair knowledge about the theory and problems of EM wave transmission through waveguides and transmission line. ➢ To lay a strong foundation on the theory of transmission line. ➢ To avail deep knowledge and mathematical analysis of Radiation of EM wave, Classification of different types of waveguides and their characterization.	Students will be 1. Able to study the fundamentals of transmission line theory. 2. Aware of the propagation characteristics of electrical waves in telephone cable as an application of transmission lines. 3. Aware of the different parameters and constraints in high frequency transmission of information. 4. Derive and understand Electromagnetic equations for TE, TM and TEM wave for parallel plane waveguide and will do characterization for it. 5. Derive and understand Electromagnetic equations for TE, TM and TEM wave for rectangular waveguide and will do characterization for it. 6. Derive and understand Electromagnetic equations for TE, TM and TEM wave for circular waveguide and will do characterization for it.

UNIT-1:
TRANSMISSION LINE THEORY :Different types of transmission lines , Definition of Characteristic impedance ,The transmission line as a cascade of T-Sections Definition of Propagation Constant, General Solution of the transmission line , The two standard forms for voltage and current of a line terminated by an impedance , physical significance of the equation and the infinite line , The two standard forms for the input impedance of a transmission line terminated by an impedance , meaning of reflection coefficient , wavelength and velocity of propagation.

(8 Hours)

UNIT-2:
Waveform Distortion: Distortion less transmission line, The telephone cable, Inductance loading of telephone cables, Input impedance of lossless lines – reflection on a line not terminated by Zo, Transfer impedance reflection factor and reflection loss, T and ∏ Section equivalent to lines.

(7 Hours)

UNIT-3
LINE AT RADIO FREQUENCIES: Standing waves and standing wave ratio on a line , One eighth wave line , The quarter wave line and impedance matching , the half wave line, The circle diagram for the dissipation less line , The Smith Chart , Application of the Smith Chart , Conversion from impedance to reflection coefficient and vice-versa. Impedance to Admittance conversion and vice versa, Input impedance of a lossless line terminated by impedance, single stub matching and double stub matching.

(8 Hours)

UNIT-4:
GUIDED WAVES: Waves between parallel planes of perfect conductors, Transverse electric and transverse magnetic waves, characteristics of TE and TM Waves, Transverse Electromagnetic waves, Velocities of propagation, component uniform plane waves between parallel planes, Attenuation of TE and TM waves in parallel plane guides, Wave impedances.

(7 Hours)

UNIT-5
RECTANGULAR WAVEGUIDES: Transverse Magnetic Waves in Rectangular Wave guides ,Transverse Electric Waves in Rectangular Waveguides ,characteristic of TE and TM Waves , Cutoff wavelength and phase velocity , Impossibility of TEM waves in waveguides , Dominant mode in rectangular waveguide ,Attenuation of TE and TM modes in rectangular waveguides , Wave impedances , characteristic impedance ,Excitation of modes.

(8 Hours)

6th Semester

EE1303	Transmission Lines and Wave Guides	L= 4	T =0	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

UNIT-6:

CIRCULAR WAVE GUIDES AND RESONATORS: Bessel functions, Solution of field equations in cylindrical co-ordinates , TM and TE waves in circular guides wave impedances and characteristic impedance ,Dominant mode in circular waveguide ,excitation of modes.

(7 Hours)

Text books:				
1	Networks, Lines and Fields	2003	J.D.Ryder	PHI
2	Electro Magnetic Waves and Radiating System	2003	E.C. Jordan and K.G.Balmain	PHI
3	Transmission lines and wave guides		L.Ganesan,S.S.Sreeja Mole	
Reference books:				
1	Fields and Waves in Communication Electronics	2003	Ramo, Whineery and Van Duzer	John Wiley
2	Field and Waves in Electromagnetism	1989	David K.Cheng	Pearson Education

6th Semester

EE1314	Digital Signal Processing	L= 3	T = 1	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objectives	Outcomes
➢ This course will provide solid foundations of discrete time signal processing fundamental concepts, Transform domain analysis, Mathematical analysis of FIR and IIR filter design.	1. Students will be able to design and compute Discrete Fourier transform and convolution of discrete time signals. 2. Students will be able analyze Z transform and determine region of convergence of discrete time signals. 3. Students will be able to construct structures for the realization of discrete Time system. 4. Students will be able to design and evaluate IIR filter design. 5. Students will be able to develop and evaluate FIR filter design. 6. Students will be able to discuss and interpret fundamental of DSP processors.

UNIT-1:
The Discrete Fourier Transform Computation of DFT, Properties of DFT, Finding convolution of long data sequences, FFT algorithms, Decimation in time, Decimation in Frequency, radix-n algorithms.

(7 Hours)

UNIT-2:
Z Domain Analysis: The z-Transform, The Region of Convergence for the z-Transform, The Inverse z-Transform, Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot, Properties of the z-Transform, Analysis and Characterization of LTI Systems Using z-Transforms, System Function Algebra and Block Diagram Representations, The Unilateral z-Transform.

(7 Hours)

UNIT-3
Filter Realization: Structures for the realization of discrete Time system: structure for FIR system, Structure for IIR system, state space system analysis and structures

(7 Hours)

UNIT-4:
IIR filter Design: Bilinear transformation, Impulse invariant transformation, Low pass IIR digital filters, Butterworth and Chebyshev filter, Spectral transformations.

(7 Hours)

UNIT-5
FIR Filter Design: FIR filter design using windowing techniques, Frequency sampling technique.

(7 Hours)

UNIT-6:
Fundamentals of DSP Processor: Multiplier and Multiplier accumulator, Modified Bus Structures and Memory access in P-DSPs, Multiple access memory , Multi-ported memory , VLIW architecture, Pipelining , Special Addressing modes in P-DSPs, On chip Peripherals, Computational accuracy in DSP processor, Architecture of TMS320C6X.

(6 Hours)

Text books:

1	Discrete time signal processing	2nd edition, 1999	V. Oppenheim, R, W, Schafer	PHI
2	Digital signal processing – Principles, algorithms and applications	3rd Edition ,1996	J. G. Proakis, D. G. Manolakis	PHI
3	Digital Signal Processors, Architecture, Programming and Applications	2002	Venkataramani, Bhaskar	Tata McGraw Hill

6th Semester

EE1314	Digital Signal Processing	L= 3	T = 1	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Reference books:

1	Digital signal processing- A computer based approach	2nd Edition, 2002	S. K. Mitra	Tata McGraw Hill
2	Digital signal processing- A practical approach	2nd Edition,2001	E. C. Ifeachor, B. W. Jarvis	Pearson Education
3	Introduction to DSP	1989	Johny R Johnson	PHI
4	Theory and applications of digital signal processing		Lawrence R. Rabiner and Bernard Gold	PHI

6th Semester

EE1315	Lab. : Digital Signal Processing	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objectives	Outcomes
➢ This lab aims at understanding of MATLAB in signal processing. ➢ Mathematical analysis of DSP using MATLAB ➢ Designing of DSP algorithms and filters using MATLAB. ➢ Programming a DSP chip for applications like filtering signal etc.	Students 1. Can solve signal processing based numerical using MATLAB. 2. Will develop DSP algorithm using MATLAB and test it for mathematical database. 3. Will design FIR and IIR filter and evaluate its characteristics. 4. Will program a DSP chip(TMSC6711) to filter signals and other signal processing application using MATLAB and code composer studio.

Expt. No.	Name of Experiment
1	To generate and plot discrete time signals.
2	Compute linear convolution and correlation of discrete time signals.
3	To plot pole zero plot of a discrete time signal and comment on stability of a system.
4	To find inverse Z transform and find its ROC of a signal, determine system is causal or not.
5	To compute DFT and IDFT of discrete time signals.
6	Compute linear and circular convolution using DFT / IDFT method.
7	To realize digital filter and convert from one form to another.
8	Write a program for FIR filter design.
9	Write a program for IIR filter design.
10	Study of DSP starter Kit (TMS 320c611dsk),
11	To implement High pass filter on DSP processor.

6th Semester

EE1316	Digital System Design	L= 3	T = 1	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ To develop ability to use a hardware description language, simulation, and a logic synthesis tool in the design of digital circuits ➢ To design and model digital circuits with VHDL at behavioral, structural, and RTL levels . ➢ To develop test benches to simulate combinational and sequential circuits.	1. Students will able to understand the design methodologies 2. Students will understand different modeling styles of VHDL 3. Students will design the basics of synchronous sequential logic and finite state machines. 4. Students will develop a formal testbench for various combinational and sequential logic circuits. 5. Students will able to incorporate different building blocks in the design of a digital system 6. Students will able to realize functions using programmable logic devices

UNIT-1: **Hardware Descriptive Language:**
Introduction to HDL, Design Flow, Design Methodologies, HDL History, Capabilities, Hardware Abstraction, Basic Terminology, Model Analysis, Comparison between VHDL and Verilog. Basic VHDL Elements: Identifiers, Data Objects, Data Types, Operators.

UNIT-2: **Dataflow Modeling:**
Concurrent Signal Assignment Statements, delta delay model, multiple drivers, block statement, concurrent assertion statement. Structural Modeling: Component Declaration, component Instantiation, resolving signal values

UNIT-3:**Behavioral Modeling**:
Behavioral Modeling, Entity declaration, architecture body, Various Sequential Statements and Constructs, multiple processes, postponed processes. Finite-State Machines: Modeling and Simulation of Moore and Mealy FSMs. Supporting Constructs: Generics and Configuration, Subprograms and Overloading, Operator overloading, Package declaration, package body, design Libraries, visibility.

UNIT-4: **Advanced Features**
Structural Modelling, Generate statements, type conversions, guarded signals, attributes aggregate targets. Model Simulation: Writing a Test Bench, Simulation, Use of text file for input and output, Hardware Modeling Examples.

UNIT-5 **Combinational Logic Design:**
Combinational Logic Design with PLDs/FPGAs: Adders/Subtractions, ALU, Multipliers, Shifters. Sequential Logic Design with PLDs/FPGAs: Synchronous Sequential Circuits, Asynchronous Sequential Circuits. Introduction to Verilog: Basic elements, an overview.

UNIT-6: **Programmable Devices**:
XILINX, ALTERA logic families-CPLD / FPGA architecture, logic module, switching technology, I/O cells, Programmable interconnect. Design flow for different design styles.

Text books:

1	A VHDL Primmer	3rdEdition ,1998.	Bhasker	Prentice Hall
2	Digital System Design using VHDL	2nd Edition,2007	Charles. H.Roth	CL-Engineering
3	VHDL-Analysis &Modelling of Digital Systems	2nd Edition, 1997	Navabi Z	McGraw Hill
4	VHDL-IV Edition	4th Edition,2002.	Perry	TMH
5	Fundamentals of Digital Logic with VHDL Design	2nd Edition, 2005.	Brown and Vranesic	TMH

Reference books:

1	Applications Specific Integrated Circuits	1997	Michael John & Sebastian Smith	Addison-Wesley Professional

6th Semester

EE1317	Lab. : Digital System Design	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objectives	Outcomes
➢ The student will acquire knowledge of computer-aided design tools for design of complex digital logic circuits. ➢ The student will learn to analyze the results of logic and timing simulations and to use these simulation results to debug digital systems.	Student 1. Will be able to model, simulate, verify with hardware description language. 2. Will be able to design and prototype with programmable logic. 3. Will learn the modular design style to create large digital logic circuits. 4. Will able to create and simulate basic circuit modules (or macros) using VHDL.

Expt. No.	Name of Experiment
1	Write a VHDL code for Basic gates.
2	Write a VHDL Dataflow code for Half Adder, Half Subtractor.
3	Write a VHDL Dataflow code for 4:1 MUX, 2:4 Decoder, 1:4 DEMUX.
4	Write a VHDL Dataflow code for 1-bit, 2-bit Comparator.
5	Using Selected Signal Assignment, write VHDL code for 4:1 MUX, 2:4 Decoder, Full Adder.
6	Using Conditional Signal Assignment, write VHDL code for 4:1 MUX, 2:4 Decoder, Full Adder.
7	Write Behavioural VHDL code for sr latch.
8	Write Behavioural VHDL code for d latch.
9	Write Behavioural VHDL code for 4-bit Shift register, 4-bit counter.
10	Experiment based on Structural Modeling
11	Using Generate Statement Write VHDL code for 8 Bit Carry Look Ahead Adder using FA.
12	Write VHDL Code for Sequence Detector using MOORE M/C
13	Write VHDL Code for Sequence Detector using MEALY M/C

6th Semester

EE1326	Microcontroller & Interfacing	L=3	T = 1	P = 0	Credits = 4

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
1. To understand the architecture, programming concept and addressing modes of Intel 8051. 2. To understand various interfacing concepts like LCD, RTC, ADC etc. for designing microcontroller based applications.	1. Will understand architectural details of microcontrollers 8051 2. Will be able to understand the assembly language programming concept 3. Apply the knowledge of timer in real time. 4. Apply the knowledge of serial communication and interrupts in real time design. 5. Design the system with LCD Interfacing, RTC Interfacing. 6. Develop the system with data acquisition.

Unit I:
Overview of 8051 Microcontroller family, Introduction to MCS 51 family, Architecture, Memory organization, Internal RAM, Flag Register, Register Banks, SFRs , Functional pin description and various resources of MCS 51, Hardware Overview, Addressing modes, Instruction set and Assembly language programming Programs using look up table.
(8 Hours)

Unit II:
Loop, Jump and Call instructions, Bit manipulation, 8051 I/O programming, Delay Programs. I/O Interfacing such as LED, switches, 7segment display, keyboard matrix programming.
(7 Hours)

Unit III:
8051 programming in C: Data types and time delay, I/O programming, Logic operations, Data conversion programs, Lookup table access, Timer programming in assembly and C: Various modes of operation, SFR related to timer operation.
(8 Hours)

Unit IV:
Serial Port programming in assembly and C: Basics of serial communication, 8051 connection to RS 232. Serial data transfer programs. 8051 interrupts, Interrupts programming in assembly and C, programming timer interrupt, external interrupt, serial interrupt.
(7 Hours)

Unit V: I
Interfacing and programming for LCD, Interfacing RTC, EEPROM using I2C Bus and programming.
(7 Hours)

Unit VI:
Interfacing of ADC, DAC, stepper motor and PS2 keyboard and programming
(8 Hours)

Text Books:
1) The 8051 Microcontroller and Embedded systems , Muhammad Ali Mazidi , J.G. Mazidi, 2nd edition Pearson Education, Prentice Hall of India.
2) 8051 Microcontrollers programming and practice By Mike Predcko.
3) The 8051 Microcontroller Architecture, programming and Applications By Kenneth Ayala, Penram India publication.
4) Advanced Microprocessors and Peripherals , A. K. Ray, K. M. Bhurchandi, Second edition, Tata McGraw Hill, 2000.

Reference Book:
1) Intel or Atmel MCS 51 Family Microcontrollers Data Sheets.

6th Semester

EE1327	**Lab. Microcontroller and Interfacing**	L = 0	T = 0	P = 2	Credits = 1

Evaluation Scheme	Continuous Evaluation	ESE	Total	ESE Duration
	40	60	100	

Objective	Outcomes
1. To understand the architecture, programming and addressing modes of Intel 8051. 2. To study the instruction set and programming of 8051. 3. To understand various interfacing concepts and circuits necessary for various applications.	Students 1. Will be able to understand the concept of Controller, architecture of 8051. 2. Will demonstrate the ability to identify, formulate and design program for an assigned task. **3.** Will be able to interface & program peripheral devices.

Expt. No.	Name of Experiment
1	Add data bytes in a internal RAM.
2	Convert single digit Hex number to its ASCII equivalent
3	Find the maximum data byte in a block
4	Data block transfer.
5	Find three number of negative data bytes in a block.
6	Convert BCD to its binary equivalent.
7	Generate a saw tooth waveform using DAC.
8	Read Analog signal from channel 2 of ADC and store it to internal RAM.
9	Rotate stepper motor into clockwise and counter clockwise direction
10	Generate square waveform from pin no P 1.2 of 8051
11	Display character on LCD.

6th Semester

EE1328	OE II : Fuzzy Logic & Neural Network	L= 3	T = 0	P = 0	Credits = 3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ To make the students well acquainted with Soft computing techniques, especially Fuzzy logic, Neural networks and Genetic algorithm. ➢ To make the students able to identify the complex problems in conventional structures, obtain intelligent acceptable solutions for these problems using soft computing techniques and take the necessary corrective action in the light of ongoing events.	Students 1. Aare able to define the concept of fuzziness and compare with crisp logic 2. Can define, describe and analyze uncertainty, unpredictability and vagueness using fuzzy logic concepts. 3. Are able to control process in automated way using fuzzy controllers 4. Are able to compare the concept of Artificial neurons with the biological neurons and define different learning processes. 5. Are able to design and solve pattern recognition and classification problems using different learning methods 6. Are able to evaluate and solve optimization problem using Genetic algorithm.

UNIT-1:
Crisp sets: An overview, Fuzzy sets: Basic types, basic concepts, basic properties of α-cuts, representation of fuzzy sets, and extension principle of fuzzy sets

(8 Hours)

UNIT-2:
Operations on fuzzy sets, Fuzzy numbers, Arithmetic operations on intervals, arithmetic operations on fuzzy numbers, fuzzy equations

(7 Hours)

UNIT-3 :
Fuzzy controllers: an overview with applications, applications of fuzzy logic

(8 Hours)

UNIT-4:
Fundamental concepts of ANN: Basic building blocks of artificial neural networks, network architectures, activation functions, McCulloch-Pitt's neuron model, Learning rules: Hebbian learning rule, Perceptron learning rule, Delta learning (Widrow- Hoff and LMS)rule, Competitive learning rule, Boltzmann learning

(7 Hours)

UNIT-5:
Brief introduction to single layer and multilayer perceptions, ADALINE and MADALINE, feed-forward networks, back propagation networks and applications.

(8 Hours)

UNIT-6:
Radial basis function network, Self organizing feature map and applications

(7 Hours)

Text books:				
1	Fuzzy sets and Fuzzy logic	2008	George J. Klir and Bo Yuan	Prentice Hall
2	Neural Networks: A comprehensive Foundation'	2nd Edition, 2005	Simon Haykin	Pearson publications
Reference books:				
1	Fuzzy sets: Uncertainty & information	1988	Klir and Folger	PHI
2	Introduction of Artificial Neural Networks	1999	Jacek Zurada	Pws Pub Co
3	Fuzzy Logic with engineering applications,	3rd Edition,	Timothy Ross,	Wiley Publication
4	Principles of Soft Computing	, 2nd Edition,	S. N. Sivanandanam and S. N. Deepa,	Wiley Publication

6th Semester

EE1329	OE II : Basics of Analog and Digital Communication Systems	L= 3	T = 0	P = 0	Credits =3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ To Study of amplitude, frequency & phase modulation. ➢ To learn the concept of PPM, PAM, PWM & PCM & delta modulation. ➢ To understand the operation of digital modulation techniques.	Students 1. Will Recognize and utilize latest analogue and digital communication technologies. 2. Will understand fundamental concepts & limits in information theory in the context of digital communication theory. 3. Will demonstrate different modulation techniques. 4. Will be able to explain digital modulation techniques for transmitting digital data. 5. Will be able to describe various types of transmitters & receivers in communication system. 6. Will be able to describe various Source coding and channel coding

UNIT-1: Basic block diagram of Analog communication system, Modulation techniques: Need for modulation, Basic concepts of AM, FM, PM, Transmitters.

(7 Hours)

UNIT-2:Receivers: Basic receiver (TRF), Super heterodyne receiver, AM detectors, FM Detectors, Noise Types of Noise, Definition of Noise figure, signal to noise ratio, calculation of noise figure.

(8 Hours)

UNIT-3Pulse Modulation: Generation and demodulation of PAM, PWM, PPM, Time division Multiplexing, Frequency division multiplexing.

(8 Hours)

UNIT-4Basic digital Modulation System, Channel capacity, PCM, ADPCM, Delta Modulation, ADM.

(7 Hours)

UNIT-5Digital Modulation techniques: ASK, FSK, PSK, BPSK,QPSK, MSK, DPSK, BFSK,

(8 Hours)

UNIT-6 Source coding and channel coding, Information theory, Huffman coding, LZ coding, Basic concept of convolution code.

(7 Hours)

Text books:				
1	Electronic Communication System	Fourth Edition, 1999	Gorge Kennedy	Tata McGraw-Hill
2	Digital Communications		SymonHykin	Wiley, 1988
Reference books:				
1	Electronic Communication Systems	Second Edition, 1993	Frank R. Dungan	Delmar Publishers
2	Communication Electronics	Third Edition, 2007	Louis Frenzel	McGraw-Hill
3	Digital and analog communication systems	Fifth Edition,2003	K. Sam Shanmugam	John Wiley & Sons

6th Semester

EE1330	OE II : Biomedical Instrumentation	L= 3	T = 0	P = 0	Credits = 3

Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	10	60	100	3 Hrs

Objective	Outcome
➢ This course is intended for exposing the students to basics of biomedical instrumentation.	Students 1. Will learn the basic concepts of biomedical instrumentation. 2. Will be introduced to transducers and will learn about biomedical transducers 3. Will learn measurement techniques which involved in processes such as cardiovascular measurements. 4. Will also learn techniques in x-rays, EMG, etc 5. Will learn techniques and practices for patient care 6. Will learn about the history and use of computers in biomedical instrumentations.

UNIT-1:
Introduction to Biomedical instrumentation, development of biomedical instrumentation, biometrics, Physiological system of body, problems encountered in measuring a living system.

UNIT-2:
Basic transducer principle, active transducer, passive transducer, electrode theory, biopotential electrodes, biochemical transducers

UNIT-3 :
The heart and cardiovascular system, characteristics of blood flow, blood pressure measurement, heart sound measurement. Principles of ultrasonic diagnosis, temperature measurement, electrocardiograph, plethysmography, pulmonary function measurement spirometry, pulmonary function analyzers, respiratory gas analyzers

UNIT-4:
Generation of ionizing radiation, instrumentation for diagnostic X-ray, special technique, instrumentation for medical use of radioisotopes, radiation therapy, EMG

UNIT-5 :
Patient care and monitoring, the elements of intensive care monitoring , diagnosis, calibration, reparability of patient monitoring equipment, instrumentation for monitoring patient, pacemakers, defibrillators,

UNIT-6:
Computers in biomedical instrumentation, digital computer, microprocessor, interfacing the computer with medical instrumentation and other equipments,Electrical safety of medical equipment. Physiological effects of electrical current, shock hazards from electrical equipments, Methods of accident prevention.

Text books:				
1	Biomedical Instrumentation & Measurement		By Leaslie Cromwell, Fred Weibell, Erich A Pfeiffer	PHI

Reference books:				
1	Handbook of Biomedical Instrumentation		R.S.Khandpur	TMH
2	Bioelectronic Measurement		Dean A Dmane, David Michaels	Prentice Hall
3	Medicine and Clinical Engineering		Jacobson and Webster	PHI
4	Introduction to Biomedical Equipment Design		Carr and Brown	John Wiley
5	Biomedical Digital Signal Processing		Tompkins	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Engineering (UG)
SoE & Syllabus 2014
7 & 8 Semester
Electronics Engineering

Updated on June. 2020

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.E. SCHEME OF EXAMINATION 2014

(Revised Scheme of Examination w.e.f. 2020-21 onward)

SoE No. EE-101

Electronics Engineering

S no.	Sub Code	Subject	Contact Hours				Credits	% Weightage			ESE Duration
			L	T	P	Total		MSEs*	TA**	ESE	
SEVENTH SEMESTER											
1	**Professional Elective-II**		3	1	0	4	4	30	30	40	3 Hrs
	EE1401	PE II: Embedded Systems									
	EE1403	PE II: Digital CMOS Circuits									
	EE1405	**PE II:** Algorithm & Data Structures									
2	**Lab Professional Elective-II**		0	0	2	2	1		60	40	
	EE1402	**Lab. :** PE II: Embedded Systems									
	EE1404	**Lab. :** PE II: Digital CMOS Circuits									
	EE1406	**Lab. :** PE II**:** Algorithm & Data Structures									
3	EE1407	Electronics Circuit Design	3	1	0	4	4	30	30	40	3 Hrs
4	EE1408	**Lab. :**Electronics Circuit Design	0	0	2	2	1			60	
5	EE1409	Digital Communication	3	0	0	3	3	30	30	40	
6	EE1410	**Lab.:** Digital Communication	0	0	2	2	1			60	
7	EE1434	RF & Microwave	4	0	0	4	4	30	30	40	
8	EE1435	**Lab.:** RF & Microwave	0	0	2	2	1		60	40	
9	EE1412	Project Phase-I	0	0	4	4	4		60	40	
10	EE1413	Industrial Training / CRT	0	0	0	0	2		100		
Total			**13**	**2**	**12**	**27**	**25**				
EIGHTH SEMESTER											
1	**Professional Elective-III**		3	0	0	3	3	30	30	40	3 Hrs
	EE1414	PE III: Computer Communication Network									
	EE1415	PE III: Operating System Concepts									
	EE1436	PE III: RADAR Enginneering									
	EE1437	PE III: Micro Electro Mechanical Systems									
	EE1439	PE III: Display Technology									
	EE1440	PE III: Programming, Data Structures and Algorithms using Python									
2	**Professional Elective-IV**		4	0	0	4	4	30	30	40	3 Hrs
	EE1417	PE IV: Soft Computing									
	EE1419	PE IV: Analog VLSI Design									
	EE1427	PE IV: Digital Image Processing									
	EE1423	PE IV: Object Oriented Programming									
3	**Lab:Professional Elective-IV**		0	0	2	2	1		60	40	
	EE1418	**Lab. :** PE IV: Soft Computing									
	EE1420	**Lab. :** PE IV: Analog VLSI Design									
	EE1428	**Lab. :** PE IV: Digital Image Processing									
	EE1424	**Lab. :** PE IV: Object Oriented Programming									
4	**Professional Elective-V**		3	0	0	3	3	30	30	40	3 Hrs
	EE1416	PE V: Biomedical Instrumentation & its Applications									
	EE1421	PE V: Optical Communication									
	EE1425	PE V: Wireless Communication									
	EE1438	PE V: Mechatronics									
5	EE1433	**Lab.:** Electronics Design Automation	0	0	2	2	1		60	40	
6	EE1430	Comprehensive Viva-voce	0	0	0	0	3			100	
7	EE1431	Extra/Co-Curricular / Competitive Examinations	0	0	0	0	2		100		
8	EE1432	Project Phase-II	0	0	8	8	8		60	40	
Total			**10**	**0**	**12**	**22**	**25**				

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment**

TA ** = for Theory : 20 marks on lecture quizzes, 8 marks on assignments, 2 marks on class performance

TA = for Practical : MSPA will be 15 marks each**

Chairperson	**Version**	**1.03**	**Applicable for AY 2020-21 Onwards**
Dean (Acad. Matters)	**Date of Release**	**June 2019**	

7th Semester

EE1401	PE II : Embedded System	L= 3	T = 1	P = 0	Credits = 4

Objective	Outcome
➢ To understand the concept of Embedded System, ARM Architecture & RTOS. ➢ To understand different functional blocks like ADC, DAC, RTC,I2C etc. ➢ To understand device programming concepts.	Students will 1. Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.. 2. Become aware of the architecture of the ARM processor 3. Developed programmed based on ARM architecture. 4. Analyze various examples of embedded systems based on ARM processor. 5. Design real time embedded systems using the concepts of RTOS. 6. Understand different communication protocol.

UNIT-1:
Introduction to ARM, Advantages of architectural features of ARM Processor, Processor modes, Register organization, Exceptions and its handling, 3/5- stage pipeline ARM organization.

(7 Hours)

UNIT-2:
Memory and memory-mapped I/Os, ARM and THUMB instruction sets, ARM programmer's model, addressing modes, Instruction set in detail and programming, data processing instruction, data transfer instruction, Control flow instructions, simple assembly language programs.

(8 Hours)

UNIT-3
ARM floating point architecture, Memory buses: AMBA, ASB, & APB. Architectural support for system development.

(7 Hours)

UNIT-4:
DMA Architecture*, Memory Hierarchy, memory size and speed, on-chip memory, caches, cache design, memory management.*

(8Hours)

UNIT-5
Architectural support for operating system, RTOS issues, µCOS-II and embedded Linux features, the shared Data Problem, Software Architectures (Round Robin, Round Robin with Interrupts, Function Queue Scheduling,),Selecting a software Architecture, Introduction to RTOS :tasks and task states, tasks and data, semaphores and shared data, message queues, mailboxes and pipes, events, RT Linux.

(7 Hours)

UNIT-6:
Case for Real Time Operating System, Embedded ARM applications such as USB interface, Bluetooth, Ethernet.

(8 Hours)

Text books:

1	ARM System–on-chip Architecture	2nd edition, 2000	Steve Furber	Pearson Education Asia
2	Embedded Linux, Hardware, Software and interfacing	2002.	Craig Hallabaugh	Addison-Wesley Professional
3	ARM System Developer's Guide: Designing and Optimizing	2005	Sloss Andrew N, Symes Dominic & Wright Chris	Morgan Kaufman Publication

Reference books:

1	Technical references on www.arm.com.
2	Web base resources for RTOS and µCOS.

7th Semester

EE1402	PE II : Lab.. : Embedded system	L = 0	T = 0	P = 2	Credits = 1

Objective	Outcome
➢ To familiar with RARM7 software & KITS. ➢ To enhance the ability of logical thinking so that student will be design an algorithm and program for a specific task .	Student 1. Will be able to understand different instruction used in programming. 2. Will be able to design Effective algorithm design for specific experiment. 3. Will be perfume experiments on different peripheral devices like LCD, Seven segment, GSM, etc.

Expt. No.	Name of Experiment (Any Ten)
1	To swap data byte
2	To perform addition, subtraction of 16 bit number
3	To find larger of a two numbers.
4	To perform factorial of a given number
5	To perform ON/OFF LED and show status of LED on LCD
6	To display number from 0 to 9 on seven segment display.
7	To ON/OFF LED using Switch.
8	To rotate a stepper motor in clockwise & anti-clock wise direction with equal delay.
9	To Perform experiment on DAC of LPC2103
10	To read ADC and display value on LCD.
11	To find 1's complements of a given number.
12	Study of RTOS
13	Write device driver for UART.
14	Modify scheduler in such a way that it will assign highest priority to keypad.
15	To read values from RTC and display on LCD.
16	To send SMS to any mobile number.
17	Interface pen drive for writing predefined file.

7th Semester

EE1403	PE II :Digital CMOS circuits	L= 3	T = 1	P = 0	Credits = 4

Objective	Outcome
1. To introduce the students to the fundamentals of CMOS circuits. 2. To learn the modeling of circuits, circuit characterization and performance extraction. 3. To understand basic electrical properties of MOS circuits and the design process at gate level and subsystem level. 4. To give basic understanding of Layout rules.	1. Students will learn the basics of MOS Circuits and the various MOS Process Technologies. 2. Students will design the physical layout of standard and compound Gates. 3. Students will demonstrate the ability to design a system, component or process as per needs and specifications. 4. Students will analyze inverter design, characteristics and applications. 5. Students will identify and analyze performance parameters of CMOS Circuits. 6. Students are expected to design circuits using different CMOS styles and also to do analysis on complex logic structures.

UNIT-1:
Introduction of MOSFETs:MOS Physics, NMOS Enhancement Transistor, MOS Transistor Operations, PMOS Enhancement Transistor, Regions of Operations, Threshold Voltage, MOS Device Equations, Small Signal Modeling of MOSFETs.

(7 Hours)

UNIT-2:
Physical Structure and Fabrication of CMOS IC : Integrated Circuit Layers, MOSFETs, CMOS Layers, Overview of Silicon Processing, N-Well Process, P-Well Process, Basic Physical Design of Simple Logic Gates, Stick Diagram, Euler's Path, Twin Tub Process, Silicon on Insulator (SOI) Process, Latch-up Effect.

(8 Hours)

UNIT-3:
Logic Design With MOSFETs: Ideal Switches and Boolean Operations, MOSFETs as Switches, Basic Logic Gates in CMOS, Compound Gates in CMOS, Transmission Gate Circuits (TG), Pass Transistor, Multiplexers.

(7 Hours)

UNIT-4:
MOS inverter Characteristics: Resistive load inverter, Inverters with n type MOSFET load, CMOS inverter, Principle of operation, DC characteristics, Tristate Inverter, Noise Margin, Introduction to Bi-CMOS Inverter.

(8 Hours)

UNIT-5 :
Analysis of CMOS Logic Gates: MOS Device Capacitance, Switching Characteristics, Rise Time, Fall Time, Propagation Delay, Power Dissipation in CMOS, Charge Sharing, Fan-in, Fan-out, Combinational circuit design, static CMOS, Ratioed Logic circuits, sequential circuit, Latches and Flip Flops.

(7 Hours)

UNIT-6:
Advanced Techniques in CMOS Logic Circuits: Complex Logic Structures, Complementary Static CMOS, Pseudo NMOS Logic, Dynamic CMOS Logic, CMOS Domino Logic, CMOS Pass Transistor Logic and Flip-Flops.

(8 Hours)

Text books:				
1	Introduction to VLSI Circuits and Systems	First Edition	John P. Uyemura	Wiley Publication
2	Principle of CMOS VLSI Design	2nd Edition, 1994	Neil H. E. Weste, K. Eshraghian	Addison Wesley VLSI Series

Reference books:				
1	CMOS VLSI Design	3rd Edition, 2005	Pucknell , K. Eshraghian	Prentice Hall
2	CMOS Digital Integrated circuits Analysis and Design	Third edition, 2008	Sung-Mo Kang, Yusuf leblebici	TataMcGraw Hill

7th Semester

EE1404	PE II : Lab. : Digital CMOS Circuits	L = 0	T = 0	P = 2	Credits = 1

OBJECTIVES	OUTCOMES
➢ To introduce the students to the fundamentals of CMOS circuits. ➢ To understand basic electrical properties of MOS circuits and the design process at gate level and subsystem level. ➢ To give basic understanding of Layout rules.	STUDENTS 1. Will learn the basics of MOS Circuits and learn the various MOS Process Technologies. 2. Will learn the physical layout of standard and compound Gates 3. Will demonstrate the ability to design a system, component or process as per needs and specifications. 4. Are expected to design circuits using different CMOS styles and also to do analysis on CMOS structures

Expt. No.	Name of Experiment
1	Design of CMOS Inverter using DSCH2 Tool.
2	Gate Level Analysis of 2-Input NAND & NOR Gate.
3	Implement the Following Function using Compound Gates. $F2=\overline{(A+B+C)*D*(E+F)}$
4	Design Half Adder using NAND Gates.
5	Design 2:1 Multiplexer using NAND Gates.
6	Design 2:4 Decoder using NAND Gates.
7	Draw Layout of CMOS Inverter Microwind.
8	Draw Layout of 2-Input NAND Gate using Microwind.
9	Draw Layout of 2-Input NOR Gate Microwind.
10	Draw Layout of Half Adder Microwind.
11	Draw Layout of 2:1 Multiplexer Microwind.

7th Semester

EE1405	PE II : Algorithm & Data Structure	L= 3	T = 1	P = 0	Credits = 4

Objective	Outcome
1. To Study different Programming Aspect 2. To understand performance of System as per Time and Space Tradeoff. 3. To learn the Various Data Structure 4. To learn basics of Algorithm	Students will be able to 1. Demonstrate and analyze various Clauses techniques. 2. Demonstrate various operation on data Structure 3. Understand various types Data Structure 4. Study various types Algorithm 5. Analyze Performance of System. 6. Study the trade off method

UNIT-1:
Introduction to Algorithms, Basics of Algorithm, Sub Algorithms, Procedures and Functions, Analysis ofAlgorithms, Time and Space Complexity, Programming aspects with respect to structured programming, Top down and bottom Up Approach.

UNIT-2:
Arrays, Operations, Types, Representation of 1D, 2D arrays in memory, Sparse Matrices, Sorting, Quick Sort, Merge Sort, Insertion, Radix, Selection and Bubble Sort, Searching , Linear, Binary Search, Hashing and collision Handling mechanism.

UNIT-3:
Stack , Fundamentals, Operations, Push , Pop , Applications of Stacks, Evaluation of Expressions,Recursion, Stack Machines and Multiple Stacks, Queues, Operations, Add , Delete, Types of Queues ,Priority Queues, Circular Queue, Dequeue.

UNIT-4:
Fundamentals of singly, Doubly, Circular, Linked Stacks and Queues, Examples of Linked List, CircularLinked List, Doubly Linked List and Dynamic Storage Management, Garbage Collection, Compaction andApplications of Linked List, Operations of Polynomials, Generalized Linked List.

UNIT-5:
Basic Terminology , Binary Tree Traversals, Threaded Storage Representation, Binary Search Tree,Applications of Tree, Preliminary Treatment of AVL Trees, B-Trees, B+ Trees, Heap Sort.

UNIT-6:
Basic Terminology, Graph Representation, Matrix, List, Multi-List, Graph Traversals, Breath First Search,Depth First Search, Minimum Cost Spanning Trees, Shortest Path Algorithm, Topological Sort, Critical Path.

Text books:
1 Data Structures and Program, Design in C Second Edition Kruse, Leung and Tondo, PHI
2 Fundamentals of Data Structures,Fifth Edition ,Ellis Horowtiz and SartajSahaniGalgotia,Publications,

Reference books:
1 An Introduction to Data Structures with Applications, Second Edition Tremblay & Sorenson, TMH
2 Data Structures, SchuamSeries,Fifth Edition Seymour Lipschutz, G.A. V. Pai,TMH

7th Semester

EE1406	PE II : Lab. : Algorithm & Data Structure	L = 0	T = 0	P = 2	Credits = 1

Objective	Outcomes
➢ To verify the fundamental data structures and algorithms, to have good command of algorithmic techniques, their applications and complexity.	Students 1. Will understand Algorithm and their Applications. 2. Will understand the use of Data Structures in Computer Programming. 3. Will get exposure to Practical Computer Programming Concept.

Expt. No.	Name of Experiment
1	Write a program on control Structure & Statements
2	Write a program on If –else structure
3	Write a program on Case Statement
4	Write a program on Functions
5	Write a program on Macros
6	Write a program on Pointers
7	Write a program on Structures
8	Write a program on Linked List
9	Write a program on Doubly linked list
10	Write a program on graphs
11	Write a program on Trees
12	Write a program on Search Algorithms
13	Write a program on Stacks

7th Semester

EE1407	Electronics Circuit Design	L= 3	T = 1	P = 0	Credits = 4

Objective	Outcome
➢ This course deals with the various types of Power Supplies, Active filters, Amplifiers and their analysis. ➢ It also gives better understanding of the functions of operations and limitations of different Circuits.	Student 1. Will understand power supply issues and design 2. Will understand state of art and practical power supply design 3. Will able to design and filters 4. Will able to design amplifiers 5. Will able to design power amplifier 6. Will able to design practical wave shaping circuits

UNIT-1:
Design of Regulated Power Supplies : Series Voltage Regulator, Monolithic Voltage Regulators, Protection Circuits

UNIT-2:
Design of Switch Mode Power Amplifiers: Introduction to switch mode power supplies ,comparison linear and switch mode power supplies, Analytical techniques, Buck converter, Boost Converter, Buck-Boost Converter.

UNIT-3 :
Design of Filters :Butterworth and Chebyshev Filters, First Order and Second Order Filter, second Order LCR Resonator, Second order Active Filters Based on Inductor Replacement.

UNIT-4:
Design of Tuned &Untuned Amplifiers: Tuned Amplifier Circuits, Inductor Losses, Use of Transformers, Amplifiers with Multiple Tuned Circuits , Synchronous Tuning, Frequency Response of Amplifier, RC Coupled Amplifiers, Low-Frequency Response of an RC-Coupled Stage, Cascaded Transistor CE Stage, (8 Hours)

UNIT-5 :
Design of Power Amplifiers: Classification of Output Stage, Class A Output Stage, Class-B Output Stage, Class AB Output Stage, Class C Output Stage, Power BJTs, Variations on the Class AB Configuration, IC Power Amplifiers, Design of Heat Sinks for Power Amplifiers(7 Hours)

UNIT-6:
Design of Signal Generators and Wave Shaping Circuits :Op-Amp RC Oscillator Circuits, LC and Crystal Oscillators, BistableMultivibrators, Design of Square and Triangular Waveform using AstableMultivibrators, Design of Standardized Pulse, The MonostableMultivibrator, Precision Rectifier Circuits

Text books:				
1	Microelectronics Circuits : Theory and Applications	Fifth Edition, 2010.	Adel S. Sedra and Kenneth C. Smith	Oxford University Press
2	Millman's Electronics Devices and Circuits	Second Edition,2008	Jacob Millman, Christos C. Halkias, SatyabrataJit	Tata McGraw Hill
3	Schaum's Outline of Electronics Devices and Circuits	Third Edition 2002	Jimmie Kathey	McGraw Hill
Reference books:				
1	Design with Operational Amplifiers and Analog Integrated Circuits	Third Edition, 2002	Sergio Franco	McGraw Hill
2	Electronics Devices and Circuits Theory	1999	NasheskyBoylestead	PHI
3	Microelectronics Circuit Analysis and Design	Fourth Edition 2010	Donald A. Naemen	McGraw Hill

7th Semester

EE1408	Lab. : Electronics Circuit Design	L = 0	T = 0	P = 2	Credits = 1

Objective	Outcomes
➢ This course deals with the various types of active filters, such as LP, HP, BP, BR, and notch filters, which is very useful in communications. It also gives better understanding of the functions of operations and limitations of different ICs and their remedies.	Students 1. Will acquire knowledge of Practical Circuit Design. 2. Will have a fair knowledge of Analysis of circuit Design. 3. Will understand the Power supplies and their design.

Expt. No.	Name of Experiment
1	Design of LPF (Butterworth Filter) First Order
2	Design of HPF (Butterworth Filter) Second Order
3	Design of Non-Ideal Differential Amplifier / Multistage
4	Design of Multistage RC Coupled Amplifiers
5	Design of Class B Amplifier(Symmetry)
6	Design of Triangular Wave Generator
7	Design of Precision Rectifier
8	Design of Step Down SMPS
9	Design of Step Up SMPS
10	Mini-project

7th Semester

EE1409	Digital Communication	L= 3	T = 0	P = 0	Credits = 3

Objectives	Outcomes
This course provides compressive coverage of digital communication systems and understanding of the operation of digital modulation schemes	1. Graduates will learn waveform coding techniques. 2. Graduates will gain knowledge of fundamental concepts & limits in information theory in the context of digital communication theory. 3. Graduates will able to analyze mathematical model of digital communication systems. 4. Graduates will learn different types of digital modulation techniques. 5. Graduates will able to learn the role of coding in the reliable transmission of digital information over a noisy channel. 6. Graduates will able to learn principles of spread spectrum modulation with emphasis on direct sequence and frequency hopping techniques.

UNIT-1:
PCM, DM, ADM, DPCM, sub-band and transform coding, model based speech coding like LP coding, CELP coding.
(7 Hours)

UNIT-2:
Introduction to information theory, entropy, Huffman, Prefix code, and L-Z encoding algorithm, Rate distortion theory for optimum quantization.
(8 Hours)

UNIT-3 :
Gram-Schmitt procedure, Signal space representation of baseband and modulated signals, line coding and baseband digital transmission, Error probability and optimum receivers for AWGN channels, Matched filters.
(7 Hours)

UNIT-4:
Digital Modulation techniques, Transmitter, Receiver and signal space representation of BPSK, BFSK,QPSK, Introduction toTDM,FDM,OFDM.
(8 Hours)

UNIT-5 :
Channel capacity Review of channel coding, Linear block codes, cyclic codes convolution, encoding and decoding, distance properties, Viterbi algorithm and Fano algorithm. Trellis coded modulation methods.
(7 Hours)

UNIT-6:
Study of PN sequences, direct sequence methods, Frequency hop methods, digital spread spectrum, slow and fast frequency hop, performance analysis, synchronization methods for spread spectrum. Application of spread spectrum, CDMA.
(8 Hours)

Text books:

1	Digital communication	3rd Edition, 2004	John G Prokis	Springer publication
2	Digital communication	2nd Ed, 2002.	Simon Haykin	John Wiley & sons

Reference books:

1	Modern Communication systems (Principles and application)	6th Edition, 2002	Leon W. Couch	Pearson
2	Digital Communication	5th Edition, 2003.	ShanmughamK.Sam	John Wiely
3	Modern Digital & Analog Communication Systems	3rd Edition, 1999.	B.P.Lathi	Oxford university Press
4	Principles of Communication Systems	3rd Edition, 2007.	Taub Schilling	Tata McGraw Hill publication

7th Semester

EE1410	Lab. : Digital Communication	L = 0	T = 0	P = 2	Credits = 1

Objective	Outcome
This course gives implementation of various modulation techniques, coding, decoding & mathematical modeling using related software.	1. Students will be able to apply suitable modulation schemes and coding for various applications. 2. Students will be able to identify and describe different techniques in modern digital communications, in particular in source coding, modulation and detection, carrier modulation, and channel coding 3. Students will be able analyze Performance of spread spectrum communication system. 4. Student will be able to design communication based project.

Expt. No.Name of Experiment

Sr. No	Name of Experiment
1.	Study of sampling process (MATLAB & Simulink)
2.	Study of Pulse Coded Modulation Technique (MATLAB & Simulink)
3.	Study of Delta Modulation Technique (MATLAB & Simulink)
4.	Calculation of Entropy ,Efficiency,Average code word length,Variance for Huffman Code
5.	Gram Schimdt orthogonalization procedure for given set of signals
6.	Plot Amplitude Shift Keying, Frequency Shift Keying , Phase shift keying
7.	Design of coherent Binary Phase shift keying system
8.	Design of coherent Quaternary Phase shift keying system
9.	Design of Encoder for Cyclic Hamming Code
10.	Convolutional code generation (Time domain & Transform domain approach)
11.	Pseudo random Noise sequence generation
12.	Mini project based on simulink

EE1434	RF & Microwave	L=4	T = 0	P = 0	Credits = 4

Objectives	Outcomes
basic concept of microwave power generators. Study of scattering matrices of transmission lines and the design of microwave filters, microwave network analysis and measurement	1. Analyze the causes of failure of conventional tubes at high frequency and the detail concept of cavity klystron amplifier, Reflex klystron 2. Study modes of operation and different types of magnetron. 3. Study transmission characteristics of Microwave passive Devices (Reciprocal and non reciprocal): 4. Analysis of microwave network. 5. Study of different types microwave measurement techniques. 6. Study of Design of microwave filters by various methods, Microwave solid state devices.

UNIT-1:
Microwave linear beam tubes (O type): High frequency limitations of conventional microwave devices, Two cavity Klystron Amplifier – Mechanism and mode of Operation, Power output and Efficiency, Applegate diagram, applications, Reflex Klystron Oscillator – Mechanism and mode of Operation Power output, efficiency, mode curve, Electronic Admittance, Modulation of Reflex Klystron; Applications, Helix TWT, BWO. Slow wave structures.

(8 Hours)

UNIT-2:
Microwave cross-field tubes (M Type): Magnetron Oscillator – Hull cut-off voltage, Mechanism of Operation, Mode separation, Phase focusing effect, Power output and Efficiency, Cylindrical magnetron, parallel plate magnetron, split anode magnetron, Types of strapping, Tuning of magnetron. Applications, Numerical Problems.

(7 Hours)

UNIT-3
Microwave passive Devices (Reciprocal and non reciprocal):Wave guide Tees - E plane Tee, H plane Tee, Magic Tee and their applications, Directional couplers, Wave guide Corners, Bends and Twists ,Attenuators, Isolators, Gyrators, Circulators, Phase shifter, Rectangular cavity resonator, Transmission line resonators.

(8 Hours)

UNIT-4:
Microwave Network Analysis: Introduction, Symmetrical Z and Y matrices for reciprocal network, Scattering matrix representation of multi port networks, comparison between [S], [Z] and [Y] matrices, Inter relationship between impedance matrix, admittance matrix and Scattering matrix, properties of scattering matrix, Scattering matrix of transmission lines, ABCD parameters with S parameters, Scattering matrix derivation for all components, Numerical Problems.

(8 Hours)

UNIT-5
Microwave measurement: Introduction, Tunable detector, Slotted line Carriage, VSWR meter, Power measurements sensor, Bolo meter sensor, power sensor, Low and High power measurement, Insertion loss and Attenuation measurement, VSWR measurement – Low and High VSWR, Impedance measurement. Frequency measurement, Measurement of cavity Q, Dielectric measurement, Antenna Measurement – radiation pattern, Phase and gain. Types of Microwave filters: Image parameter method, Insertion loss method.

(7 Hours)

UNIT-6
Microwave solid state devices and circuits: Microwave diodes – Gun diode – Mode of operation, Crystal diode, PIN diode –, IMPATT diodes, Application as Oscillator and Amplifiers, Varactor diode, parametric amplifier, Microwave transistors, MASER. Strip lines: Micro strip lines, parallel strip lines. Coplanar, shielded

(8 Hours)

EE1434	RF & Microwave	L=4	T = 0	P = 0	Credits = 4

Text books:

1	Microwave device and circuits	Third Edition, 1999	Samuel Y.Liao	Prentice Hall
2	Foundations of microwave engineering	2nd Edition, 2009	R.E. Collins	Tata Mc-Graw Hill
3	Microwave engineering	2nd Edition, 2003	R Chatterjee	Ewp publication

Reference books:

1	Microwave communication	1987	Edgar Hund, E. Hund, Bruce L. R. Smith, ,	Tata Mc-Graw Hill
2	Introduction to microwave Theory &Measurements	1st Edition, 1964.	Algie L. Lance	Tata Mc-Graw Hill
3	Microwave Engineering	First edition, 2007	Annapurna Das, Sisir. K.Das	Tata McGraw-Hill Co., Ltd.
4	Microwave	1978	Reich J.H. et al	East West Press
5	Microwaves	1995	K.C.Gupta	Wiley, Eastern Ltd

7th Semester

EE1435	Lab. : RF & Microwave	L = 0	T = 0	P = 2	Credits = 1

Objectives	Outcomes
➢ To introduce the students, to the basics of microwave devices, microwave measurements and antennas used in communication systems.	Students 1. Will understand and gain complete knowledge about characteristics of Reflex Klystron. 2. Will study power distribution in Directional coupler, E & H plane and Magic tee. 3. Will perform frequency measurement. 4. Will differentiate parameters of antenna.

Expt. No.	Name of Experiment
1	Introduction to Microwave Components.
2	To find the frequency of reflex klystron & Determine electronic and mechanical tuning range.
3	To verify power verses repeller voltage characteristics of reflex klystron.
4	To verify frequency verses repeller voltage characteristics of reflex klystron.
5	To find attenuation of fixed attenuator and To verify the calibration of variable attenuators.
6	To verify the performance of wave-guide tees i) E-plane tee ii) H-plane tee.
7	To verify the performance of E-H plane tee (magic tee).
8	To verify the relationship among free space wavelength, cut off wavelength, guide wavelength.
9	To find the Q-factor of absorption type frequency meter and it's insertion loss.
10	To verify the performance of directional coupler i) multi hole ii) cross directional coupler.
11	To determine coupling and isolation of a three port circulator.
12	To determine the gain of pyramidal horn antenna, plot the beam pattern and find the lobe width.
13	To verify characteristics of Gunn diode.
14	To measure the small V.S.W.R. and large V.S.W.R.
15	To measure the V.S.W.R. of an unknown load, and determine impedance using smith chart.
16	To verify various MIC Components.

7th Semester

EE1412	**Project phase-I**	**L = 0**	**T = 0**	**P = 4**	**Credits = 4**

7th Semester

EE1413	**Industrial Training / CRT**	**L = 0**	**T = 0**	**P = 0**	**Credits = 2**

8th Semester

EE1414	PE III : Computer Communication Network	L= 3	T = 0	P = 0	Credits = 3

Objective	Outcome
➢ To learn basics of data communication, wireless transmission, spread spectrum, medium access control- FDMA, TDMA & CDMA. ➢ To study TCP/IP, ARP, RARP, UDP protocols & addressing. ➢ To study network security & its applications.	Students will be able to 1. Will have understanding of reference mode for data communication & functions of all layers of OSI reference model. 2. Will have understanding of IEEE standard 802 for LAN and MAN & functions of speed LAN repeaters, hubs, bridges, fast Ethernet, Wireless LAN. 3. Will able to differentiate between various protocols of different layers & standards on data communication. 4. Will acquire knowledge of the network layer routing protocols. 5. Understand the computer networks protection mechanisms & theory of fundamental cryptography 6. Will acquire knowledge Multimedia, real time transport protocol & Web security

UNIT-1:
Introduction, network and services: communication network, approaches to network design, types of network, two stage and three stage network. Uses of computer networks, LAN, MAN, WAN, design issues for layers, connection oriented and connectionless services, service primitives, Application and layered architecture, OSI reference model.
(8 Hours)

UNIT-2 :
LAN network and medium access layer: LAN structure, random access, multiple access protocols, IEEE standard 802 for LAN and MAN, high speed LANS, repeaters, hubs, bridges, fast Ethernet, Wireless LAN
(7 Hours)

UNIT-3 :
Physical layer and data link layer: transmission media, PSTN.
Data link layer design issues, error detection and correction methods, elementary data link protocols, sliding window protocols.
(8 Hours)

UNIT-4:
Network layer and transport layer: network layer design issues, routing, congestion, internetworking, transport layer design issues, transport service primitives, internet transport protocol, TCP/IP architecture, TCP/IP protocol, IP packets, IP addressing, TCP/IP utilities ,wireless TCP and UDP, routers and gateways
(7 Hours)

UNIT-5:
Application layer: network security cryptography, secrete key, public key, digital signature, domain name system, electronic mail system
(8 Hours)

UNIT-6: Multimedia, real time transport protocol, e-mail security, web security, communication security, electronic mail, world wide web.
(7 Hours)

Text books:				
1	Computer Networks	3rd Edition,1996	Tanenbaum	Prentice Hall
2	Data Communications and Networking	4th edition, 2007	Behrouz a Forouzan	Tata Mc. Graw Hill
Reference books:				
1	Data and Computer Communication	8th Edition,2006	W. Stallings	Prentice Hall
2	Telecommunication switching systems and networks	2004.	T. Vishwanathan	Prentice Hall

8th Semester

EE1415	PE III : Operating Systems Concepts	L= 3	T = 0	P = 0	Credits = 3

Objective	Outcome
➢ To Study different modulation techniques. ➢ To understand transmitter &receivers communication systems. ➢ To learn the concept of PPM, PAM, PWM & PCM. ➢ To learn basics of noise, types of noise & various propagation layers, spectrum of electromagnetic waves.	Students will be able to 1. Demonstrate and analyze various amplitude modulation techniques. 2. Demonstrate and analyze various angle modulation techniques. 3. Understand various types of receivers in communication system. 4. Analyze various types of noise in communication system and investigate noise parameters. 5. Understand pulse modulation techniques. 6. Study antenna theory with its various types.

UNIT-1:
Computer System organization ,Architecture, Structure, Operations, Process Management, Memory Management, OS Services, User Operating System Interface, System Calls, System Programs

(8 Hours)

UNIT-2:
Process Concept, Scheduling, Operations, Scheduling Criteria, Scheduling Algorithms, Tread Scheduling, Multiple Processor Scheduling

(7 Hours)

UNIT-3 :
Synchronization, Critical Section Problem, Semaphores, Deadlocks, System Models, Characterization, Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance

(8 Hours)

UNIT-4:
Memory Management Strategies, Swapping, Continuous Memory Allocation, Paging, Segmentation , Virtual Memory Management, Demand Paging, Page Replacement, Trashing,

(7 Hours)

UNIT-5 :
File System Concept, Access Methods, Directory and Disk Structure, Mounting, Sharing, Mass Storage Structure, Disk Attachment, Scheduling, RAID Structure

(8Hours)

UNIT-6:
Protection and Security , Domain of Protection, Access Matrix, Access Control, Language based Protection, Security Problem, System and Network Threats, Cryptography as Security Tool

(7 Hours)

Text books:				
1	Operating System Concepts	Eigth Edition, 2012	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne	John Wiley & Sons (ASIA) Pvt. Ltd
2	Modern Operating Systems	2003.	Andrew S. Tanenbaum	Prentice Hall of India Pvt. Ltd
Reference books:				
1	Operating Systems	2002	Harvey M. Deitel	Pearson Education Pvt. Ltd
2	Operating System	4th Edition, 2003	William Stallings	Prentice Hall of India
3	An Introduction to Operating Systems, Concepts and Practice	2003	Pramod Chandra P. Bhatt	PHI,

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Dean (Acad. Matters)		Date of Release	May 2017	

8th Semester

EE1436	PE III : RADAR ENGINEERING	L= 3	T = 0	P = 0	Credits = 3

Objective	Outcome
To familiarize with basic principles of Radar Engineering that is essential for defense and core industry.	Students can understand 1. Basic principles of radars. 2. Moving target detection 3. Different kinds of target tracking techniques 4. Radar receiver system 5.Basic radar measurements 6.Radar Transmitter System

UNIT-I
INTRODUCTION:
Simple form of Radar Equation, Radar Block Diagram and Operation,
Radar Frequencies and Applications, RADAR EQUATION: Detection of Signals in noise, Receiver Noise and SNR, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF, System Losses.

(8 Lectures)

UNIT-II
MTI AND PULSE DOPPLER RADAR: Introduction, Principle, Delay Line Cancellers, DOPPLER Filter banks, digital MTI processing, moving target detector, Pulse Doppler Radar.

(7 Lectures)

UNIT-III
TRACKING RADAR:
Tracking with Radar, Monopulse Tracking, conical scan and sequential lobing, tracing accuracy, low angle tracking,tracking in range, Comparison of Trackers.

(8 Lectures)

UNIT-IV
DETECTION OF RADAR SIGNALS IN NOISE: Introduction, Matched Filter Receiver, detectors, automatic detectors, integretors, constant false alarm rate receivers, the radar operator, signal management.

(7 Lectures)

UNIT-V
Information from radar signals: Introduction, basic radar measurements, theoretical accuracy radar measurements, ambiguity diagram, pulse compression, target recognition.

(7 Lectures)

UNIT-VI
RADAR Transmitter: Introduction, linear beam power tubes, magnetron, RADAR RECEIVERS: RECEIVERS noise figure, superheterodyne receiver.

(6 Lectures)

TEXT BOOKS:
1. Merrill I. Skolnik, "Introduction to Radar Systems", 3rd Ed., McGraw-Hill, 2003.
2. Simion. Kingsley, "Understanding Radar Systems", Standard Publishing, 1999.
REFERENCES:
1. Byron. Edde, "Radar Principles, Technology, Applications", Pearson education, 2007.
2. G.SasiBhushanaRao, "Microwave and Radar Engineering", Pearson education, 2013.

8th Semester

EE1437	PE III : MICRO ELECTRO MECHANICAL SYSTEMS	L= 3	T = 0	P = 0	Credits = 3

Objective	Outcome
• Standard microfabrication techniques and the issues surrounding them • 2. Major classes, components, and applications of MEMS devices/systems and to demonstrate an understanding of the fundamental principles behind the operation of these devices/systems • 3. Microfabrication techniques and applications to the design and Manufacturing of an MEMS device or a microsystem • 4. Foster interest for further study	Students: 1. Will demonstrate the ability to understand working principles of currently available micro sensors, actuators used in Microsystems. 2. Will apply scaling laws that are used extensively in the conceptual design of micro devices and systems. 3. Will understand the basic principles and applications of micro-fabrication processes, such as photolithography, ion implantation, diffusion, oxidation, CVD, PVD, and etching. 4. Will understand RF MEMS components 5. Will understand Physical Micro sensors 6. Will understand the recent advancements in the field of MEMS and devices.

UNIT I
Introduction to MEMS: Benefits of Miniaturization, Types of MEMS: Optical MEMS, Bio- MEMS, RF- MEMS, Microfludics, Success Stories, Pressure sensor, Accelerometer, Micro-mirror TV Projector

UNIT II
Microfabrication and Micromachining: Integrated Circuit Processes, Bulk Micromachining, Isotropic Etching and Anisotropic Etching, Wafer Bonding, High Aspect-Ratio Processes (LIGA), MEMS Device fabrication using Bulk Micromachining

UNIT III
Surface Micromachining: One or two sacrificial layer processes, Surface micromachining requirements, Device fabrication using Surface Micromachining example, Microcantilever fabrication

UNIT IV
RF MEMS Devices: Capacitor, Inductor, Switches, and antennas, RF MEMS components in communications, space and defense applications

UNIT V
Physical Micro sensors: Classification of physical sensors, Integrated, Intelligent, or Smart sensors, Sensor Principles and Examples: Thermal sensors, Electrical Sensors, Mechanical Sensors, Chemical and Biosensors

UNIT VI
Microactuators: Classification of microactuators, Electrostatic, Electromagnetic and Thermal microactuation, Mechanical design of microactuators, Microactuator examples, microvalves, micropumps, micromotors.

TEXT BOOKS:
1. Micro and Smart Systems: Ananthasuresh, G. K., Vinoy, K. J., Gopalakrishnan, S., Bhat, K. N., and Aatre, V. K., Wiley-India,NewDelhi, 2010.

REFERENCE BOOKS:
1. VLSI Technology, Sze S.M. (ed),McGraw Hill
2. RF MEMS and Their Applications: Vijay Varadan, K. J. Vinoy, K. A. Jose, Wiley, 2002.

8th Semester

EE1439	PE III : Display Technology	L= 3	T = 0	P = 0	Credits = 3

Objectives	Outcomes
To provide the fundamental knowledge for understanding concepts of different display technologies related to manufacturing techniques and materials selection	Gradates will. 1. Identify different display technologies and manufacturing processes. 2. Learn practical knowledge of display technologies 3. Analyze properties of Luminescence materials. 4. Explore design parameters for displays and analyze matrix addressing. 5. Comprehend the fundamentals of backlight unit technologies. 6.Be able to design and elaborate applications of displays

UNIT-I

Overview of display industry, information capacity of displays, introduction to different flat panel display technologies.Fundamentals of Photometry, including luminance and brightness, Colorimetry: visual basis of colorimetry, psychophysical experiments to quantify color, CIE colorimetry.

UNIT-II

Characterization and performance of displays: Concepts of aspect ratio, color gamut, contrast and gradation, directional visibility, driving power, efficiency, speed, memory and storage, degradation, resolution, addressability, physiological factors, and measurement instrumentation.

UNIT-III

Luminescence and luminescent materials: Physical processes and interactions leading to emission of light, processes responsible for the transfer of energy in luminescent materials, chemistry and preparation of luminescent materials, and emission properties of the prepared materials.

UNIT-IV

Basics of matrix addressing of displays: active and passive matrix.Technical discussion of display technologies: LEDs, OLEDs, LCDs, Active matrix TFT back planes for OLED and LCD displays. Other displays and associated technologies.

UNIT-V

Advanced TFT Backplane Technologies (IGZO, LTPS, etc.) and Driver Integration. Back Light Unit Technologies (CCFL, LED, QD, etc.).

UNIT-VI

Future and New Applications of Displays. Materials for Display – TFT, EL and LC Materials and Modes.

Text books

1. W. Mara, Liquid crystal flat panel displays: manufacturing science & technology. Springer Science & Business Media, 2012.
2. Introduction to Flat Panel Displays, Jiun-Haw Lee, David N. Liu, Shin-Tson Wu, Wiley Publications.

Reference Books

1. R. H. Chen, Liquid crystal displays: fundamental physics and technology. John Wiley and Sons, 2011.
2. Fundamentals of Solid- State Lighting: LEDs, OLEDs and their Applications in Illumination and Displays, Vinod Kumar, Khanna, CRC Press.

8th Semester

EE1417	PE IV : Soft Computing	L= 4	T = 0	P = 0	Credits =4

Objective	Outcome
➢ To make the students well acquainted with Soft computing techniques, especially Fuzzy logic, Neural networks and Genetic algorithm. ➢ To make the students able to identify the complex problems in conventional structures, obtain intelligent acceptable solutions for these problems using soft computing techniques and take the necessary corrective action in the light of ongoing events.	Students 1. Are able to define the concept of fuzziness and compare with crisp logic 2. Can define, describe and analyze uncertainty, unpredictability and vagueness using fuzzy logic concepts. 3. Are able to control process in automated way using fuzzy controllers 4. Are able to compare the concept of Artificial neurons with the biological neurons and define different learning processes. 5. Are able to design and solve pattern recognition and classification problems using different learning methods 6. Are able to evaluate and solve optimization problem using Genetic algorithm.

UNIT-1:
Overview of Crisp Sets, Concepts of Fuzzy sets, representation of fuzzy sets, extension principle, fuzzy compliments, t-norms and t- conorms.

(8 Hours)

UNIT-2:
Fuzzy numbers, arithmetic operation on intervals and on fuzzy sets, lattice of fuzzy numbers, fuzzy equations

(7 Hours)

UNIT-3 :
Fuzzy controllers, Defuzzification Methods, applications of fuzzy logic in pattern recognition and image processing,

(8 Hours)

UNIT-4:
Introduction of neural networks, learning methods, perceptrons, perceptron training algorithm, single layer perceptron, multiplayer perceptron, neural network architectures, ADALINE, MADALINE

(7 Hours)

UNIT-5 :
LMS algorithm, Back propagation algorithm, RBF networks, self-organizing feature maps, Applications of ANN

(8 Hours)

UNIT-6:
Introduction of Soft Computing Methods, Fundamentals of Genetic Algorithms, Encoding, Fitness function, Genetic modeling, Applications of GA.

(7 Hours)

Text books:				
1	Fuzzy sets and Fuzzy logic	2008	George J. Klir and Bo Yuan	Prentice Hall
2	Neural Networks, Fuzzy logic and Genetic Algorithms, Synthesis and applications		S. Rajsekharan, VijayalaxmiPai,	Prentice Hall
3	Neural Networks: A comprehensive Foundation'	2nd Edition, 2005	Simon Haykin	Pearson publications

Reference books:				
1	Fuzzy sets: Uncertainty & information	1988	Klir and Folger	Prentice Hall
2	Introduction of Artificial Neural Networks	1999.	Jacek Zurada	Pws Pub Co
3	Principles of soft computing		S.N.Sivanandam, S.N.Deepa	Wiley India Ed.
4	Fuzzy Logic with engineering applications,	3rd Edition,	Timothy Ross,	Wiley Publication

8th Semester

EE1418	PE IV : Lab.:Soft Computing	L = 0	T = 0	P = 2	Credits = 1

Objectives	Outcomes
• To make the students well acquainted with Soft computing techniques, especially Fuzzy logic, Neural networks and Genetic algorithm. • To make the students able to identify the complex problems in conventional structures, obtain intelligent acceptable solutions for these problems using soft computing techniques and take the necessary corrective action in the light of ongoing events.	Students 1. Can define, describe and analyze uncertainty, unpredictability and vagueness using fuzzy logic concepts. 2. Are able to find solution to automation problems through fuzzy logic controllers. 3. Are able to introduce intelligence in conventional structure using neural networks and solve pattern recognition and classification problems. 4. Are able to determine optimized solutions for some problems using concepts of Genetic algorithm.

Expt. No	Name Of Experiment
1	Write a program to Implement of fuzzy set operation.
2	To Study various defuzzification techniques.
3	To Study fuzzy inference system.
4	To study fuzzy logic controller using fuzzy logic toolbox.
5	Write a program to study different Activation Functions
6	To perform classification using McCulloch and Pitts's Neuron Model
7	To design neural network using unsupervised Learning Rules
8	To design neural network using supervised Learning Rules .
9	Write a program to implement back propagation learning algorithm..

8th Semester

EE1419	PE IV : Analog VLSI Design	L= 4	T = 0	P = 0	Credits =4

Objectives	Outcomes
To understand small signal modeling of MOS transistor, Perform analysis of single stage amplifiers, analyze amplifiers based on frequency response calculation and working principle of one stage , two stage operational amplifiers	Student will able to 2. Design small signal model of MOS transistor & understand SPICE Model 3. Perform analysis of single stage amplifiers with or without load. 3. Calculate small signal parameters of differential amplifier. 4. Design current mirrors as bias element. 5. Design single stage amplifiers in frequency domain 6. Analyze Performance parameters of CMOS op amp

Unit I:Basic MOS Device Physics:
Threshold voltage, Derivation of I/V characteristics, second order effects, MOS device capacitance, MOS small signal models, MOS SPICE models.

(6 hours)

Unit II:Single stage amplifiers:
Basic concept, common source, common source stage with resistive load, CS stage with source degeneration, source follower, common gate.

(7 hours)

Unit III: Differential amplifiers:
Single ended & differential operation, Basic differential pair, qualitative and quantitative analysis, Common mode response

(6 hours)

Unit IV:
Passive and active current mirrors:
Basic current mirror,Cascode current mirror, Active current mirror,common mode properties

(6 hours)

Unit V: frequency response of amplifiers:
Miller effect, association of poles with node, common source stage , source follower, common gate stage

(7 hours)

Unit VI: Operational amplifiers:
Performance parameters, one stage op amp, Two stage op amp, Gain boosting, Noise in op amp

(6 hours)

Text books:				
1	Design of Analog CMOS Integrated circuits	Ninteenth reprint 2010	BehzadRazavi	Mc-graw-Hill

Reference books:				
1	CMOS circuit design, layout, and Simulation'	Second edition, reprint 2009.	Jacob Baker	WSE
2	CMOS Analog Circuit Design	second edition, 2010	P.E.Allen, D.R.Holdberg	Oxford univ. press
3	Analysis and Design of Analog Integrated Circuits	fifth edition, reprint 2010	Paul B Gray , Hurst , Lewis, Meyer	John Wiley & sons

8th Semester

EE1420	PE IV : Lab. : Analog VLSI Design	L = 0	T = 0	P = 2	Credits = 1

OBJECTIVES	OUTCOMES
➢ To introduce the students to the fundamentals of CMOS circuits. ➢ To learn the modeling of circuits, circuit characterization and performance extraction. ➢ To understand basic electrical properties of MOS circuits and the design process at gate level and subsystem level. ➢ To give basic understanding of various analyses of differential amplifiers. ➢ 5. To give basic understanding of non linear circuits such as comparator design.	STUDENTS 1. Will learn the basics of MOS Circuits. 2. Will be able to simulate MOS devices and CMOS circuits with SPICE: AC, DC,Transients. 3. Will learn the various MOS Process Technologies. 4. Will be able to design an electrical component or system to meet desired needs. 5. Will be able to design and analysis of analog circuits. 6. Will be able to design and analysis of basic analog functional module designs such as current mirrors, active load, biasing circuits

Expt. No.	Name of Experiment
1	NMOS characteristic :- Vds Vs ID for various values of Vgs.
2	PMOS characteristic :- Vds Vs ID for various values of Vgs.
3	Current source using current mirror :- DC analysis
4	Common Source amplifier:- AC analysis Transient analysis
5	Common Drain amplifier:- AC analysis Transient analysis
6	Differential Amplifier :- AC analysis Transfer curve (Vin Vs Vout, DC condition)
7	Op-Amp Design: AC analysis Transient analysis DC analysis
8	SPICE simulation of basic analog circuits, Analog Circuit simulation Verification of layouts.
9	Basic CMOS Comparator Design
10	Source Coupled Pair Differential Amplifier

8th Semester

EE1427	PE IV : Digital Image Processing	L= 4	T = 0	P = 0	Credits = 4

Objective	Outcome
The principal objective is to provide an introduction to basic concepts and methodologies for digital image processing, and to develop a foundation that can be used as the basis for further study and research in this field.	1. Graduates will learn the basic concepts of image processing and concepts of digital geometry that help in understanding the image processing operations. 2. Graduates will learn image enhancement techniques in spatial domain. 3. Graduates will learn image enhancement techniques in frequency domain. 4. Graduates will understand fundamental concepts of image segmentation. 5. Graduates will understand fundamental concepts of image restoration. 6. Graduates will understand fundamental concepts of image compression and storage techniques.

UNIT-1:
Digital image fundamentals : Digital Image through scanner, digital camera, Concept of gray levels, Gray level to binary image conversion, Sampling and quantization, Relationship between pixel, Imaging Geometry.

(8 Hours)

UNIT-2:
Image Transforms: 2-D FFT, Properties, Walsh transform, Hadamard Transform, Discrete cosine Transform, Haar transform, Slant transform.

(7 Hours)

UNIT-3 :
Image enhancement : Point processing, Histogram processing, Spatial filtering and its frequency domain interpretation. Enhancement in frequency domain, Image smoothing, Image sharpening.

(8 Hours)

UNIT-4:
Image segmentation: Detection of discontinuities. Edge linking and boundary detection, Thresholding, Region oriented segmentation.

(7 Hours)

UNIT-5 :
Image Restoration: Degradation model, Algebraic approach to restoration, Inverse filtering, Least mean square filters, Constrained Least Squares Restoration, Interactive Restoration.

(8 Hours)

UNIT-6:
Image compression: Redundancies and their removal methods, Fidelity criteria, Image compression models, Source encoder and decoder, Error free compression, Lossy compression.

(7 Hours)

Text books:				
1	Digital Image processing	2nd Edition, 2002	R.C. Gonzalez & R.E. Woods	Wesley/ Pearson education
2	Fundamentals of Digital Image processing	1989.	A.K.Jain	PHI
Reference books:				
1	Digital Image processing using MAT LAB	2004	Rafael C. Gonzalez, Richard E Woods and Steven L.	PEA,
2	Digital Image Processing	3rd Edition,2004.	William K. Pratt	John Wilely
3	Fundamentals of Electronic Image Processing	SPIC/IEEE Series,1996	Arthur R. Weeks	PHI

8th Semester

EE1428	PE IV : Lab. : Digital Image Processing	L = 0	T = 0	P = 2	Credits = 1

Objective	Outcome
➢ The principal objective is to provide an introduction to basic concepts and methodologies for digital image processing, and to develop a foundation that can be used as the basis for further study and research in this field.	STUDENTS 1. Will learn the basic concepts of image processing, concepts of digital image geometry. 2. Will learn image enhancement techniques in spatial and frequency domain. 3. Will also learn image segmentation. 4. Will also learn image compression and restoration techniques.

Expt. No	Name Of Experiment
1	To Explore statistical properties of Image & displaying histogram & profile.
2	Histogram modification
3	Image smoothing operations
4	Pseudo coloring of gay level images
5	Edge detection
6	Segmentation using threshold
7	Region based segmentation
8	Image Transforms
9	Image Compression
10	Image Segmentation

8th Semester

EE1423	PE IV : Object Oriented Programming	L= 4	T = 0	P = 0	Credits = 4

Objective	Outcome
• The course aims is to introduce the students to Object Oriented Programming Concepts. • Demonstrate mastery of object oriented programming concepts: inheritance, polymorphism, and operator overloading. • To teach efficient storage mechanisms of data for an easy access • Demonstrate mastery of pointers, iterators, memory management including object creation and destruction.	Students will be able to 1. Will learn the basic concepts of Object Oriented Programming. 2. Will perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs. 3. Will design program using the concept of Inheritance, Polymorphism, Overloading 4. Can choose the appropriate data structure and algorithm design method for a specified application. 5. students will be able to use linear and non linear data structures like stacks, queues , linked list etc. 6. Understand advanced features of C++ specifically stream I/O, templates and Exception Handling.

UNIT-1:
Principles of Object Oriented Programming (OOP), Software Evaluation, OOP Paradigm, Basic Concepts of OOP, Benefits of OOP, Application of OOP.

(8 Hours)

UNIT-2:
Introduction to C++, Tokens, Keywords, Identifiers, Variables, Operators, Manipulators, Expressions and Control Structures, Pointers, Functions, Function Prototyping Parameters Passing in Functions, Values Return by Functions, Inline Functions, Friend and Virtual Functions.

(7 Hours)

UNIT-3 :
Classes and Objects, Constructors and Destructors, Operator overloading, Type of Constructors, Function Overloading, Inheritance, Types of Inheritance Virtual Functions and Polymorphism.

(8 Hours)

UNIT-4:
Definition of a data structure, Primitive and Composite data types, Asympotic notations, Arrays, Operations of Arrays, Order lists, Stacks, Applications of Stack, Infix to Postfix Conversion, Recursion, Queues, Operations of Queues.

(7 Hours)

UNIT-5 :
Singly linked list, Operations, Doubly linked list, Operations, Trees and Graphs: Binary tree, Tree traversal; Graph, Definition, Types of Graphs, Traversal (BFS & DFS), Dijkstra`s algorithm

(8 Hours)

UNIT-6:
Files, classes for file stream operations, Opening, Closing and Processing files, End of file detection , File pointes, Updating a file , Error Handling during file operations, Command line arguments, Templates, Exception Handling.

(7 Hours)

Text books:				
1	Object Oriented programming with C++	4th Edition,2008	E. Balagurusamy	TMH
Reference books:				
1	Object Oriented Programming in Microsoft C++	Third Edition, 2003	Robert Lafore	Galgotia publication
2	Fundamental of data structure in C++	2002.	E. Horowitz and S.Shani	Galgotia Pub
3	Computer algorithms	1998.	Horowitz, S.Shani and S.Rajasekaran	Galgotia Pub Pvt Ltd

Chairperson		Version	1.01	Applicable for AY 2017-18 Onwards
Dean (Acad. Matters)		Date of Release	May 2017	

8th Semester

EE1424	PE IV : Lab. : Object oriented programming	L = 0	T = 0	P = 2	Credits = 1

Objective	Outcomes
➢ The course aims is to introduce the students to Object Oriented Programming Concepts memory management including object creation and destruction, and parameter passing in C++ .	Students 1. Will understand Algorithm and their Applications. 2. Will understand the use of Data Structures in Computer Programming. 3. Will get exposure to Practical Computer Programming Concept.

Expt. No.	Name of Experiment
1	Write a function using variables as arguments to swap the values of a pair of integers.
2	Write a program to read the ballot & count the votes cast for each candidate using an array, variable count. In case, a number read is outside the range 1 to 5, the ballot should be considered as a ' spoilt ballot' and the program should also count the number of spoilt ballot.
3	Write a program to read a matrix of size m*n from the keyboard and display the same on the screen.
4	Write a macro that obtains the largest of three numbers.
5	As the practical 4, using inline function. Test the function using the main program.
6	Define a class to represent a bank account including the following members:- Data Members, Member function to display the name and balance.
7	Modify the class and the program of practical 6 for handling 10 customers.
8	Create 2 classes OM and DB which store the value of distance. DM store distances in meters and cm and DB in feet and inches. Write a program that can read values for the class objects and add 1 object OM with another object of DB. Use a friend function to carry out the addition operation the object that stores the results may be a DM object or a DB object, depending upon the units in which the results are require. The display should be in the format of feet and inches or meters and cms depending on the object on display.
9	Write a program for maintaining the inventory of books that are being sold at the shop the Design a system using a class called books with suitable member functions and constructors. Use new operator in constructor to allocate memory space require.
10	Define a class string that could work as a user defined string type include constructors that will enable us to create an .un-initialized string String s1; :/ string with length 0 And also to initialize an object with string constant at the time of creation like String s2("well done"); . Include a function that adds two strings to make a third string.
11	Create a class float that contains 2 float data member. Over load all the 4 arithmetic operators so that do operate on the objects of float.
12	Define 2 classes POLAR and RECTANGLE to represent points in the POLAR and RECTANGLE systems. Use conversion routines to convert from one system to the other.
13	Exercise on file handling

8th Semester

EE1416	PE V: Biomedical Instrumentation& its Applications	L= 3	T = 0	P = 0	Credits = 3

Objective	Outcome
This course is intended for exposing the students to basics of biomedical instrumentation.	Students 1. Will learn the basic concepts of biomedical instrumentation. 2. Will be introduced to transducers and will learn about biomedical transducers 3. Will learn measurement techniques which involved in processes such as cardiovascular measurements. 4. Will also learn techniques in x-rays, EMG, etc 5. Will learn techniques and practices for patient care 6. Will learn about the history and use of computers in biomedical instrumentations.

UNIT-1:
Introduction to Biomedical instrumentation, development of biomedical instrumentation, biometrics, Physiological system of body, problems encountered in measuring a living system.

UNIT-2:
Basic transducer principle, active transducer, passive transducer, electrode theory, biopotential electrodes, biochemical transducers

UNIT-3 :
The heart and cardiovascular system, characteristics of blood flow, blood pressure measurement, heart sound measurement. Principles of ultrasonic diagnosis, temperature measurement.

UNIT-4:
Electrocardiograph, plethysmography, pulmonary function measurement spirometry, pulmonary function analyzers, respiratory gas analyzers.

UNIT-5:
Generation of ionizing radiation, instrumentation for diagnostic X-ray, special technique, instrumentation for medical use of radioisotopes, radiation therapy, EMGpacemakers, defibrillators, Electrical safety of medical equipment. Physiological effects of electrical current, shock hazards from electrical equipments, Methods of accident prevention.

UNIT-6:
Telemedicine, Telemedicine applications, video conferencing, digital communication in telemedicine Teleradiology, Tele Cardiology, Telepsychiatry, Hospital Information System, Computer Networks in Health care.

Text books:

1	Biomedical Instrumentation & Measurement	By Leaslie Cromwell, Fred Weibell, Erich A Pfeiffer	PHI

Reference books:

1	Handbook of Biomedical Instrumentation	R.S.Khandpur	TMH
2	Bioelectronic Measurement	Dean A Dmane, David Michaels	Prentice Hall
3	Medicine and Clinical Engineering	Jacobson and Webster	PHI
4	Introduction to Biomedical Equipment Design	Carr and Brown	John Wiley
5	Biomedical Digital Signal Processing	Tompkins	

8th Semester

EE1421	PE V: Optical communication	L= 3	T = 0	P = 0	Credits = 3

Objective	Outcome
➢ This course will provide understanding for applying optical fiber technology to sophisticated modern telecommunication systems. ➢ To understand the fundamental behavior of the individual optical components, describes their interactions with other devices in an optical fiber. ➢ To measure & analyze different measurements, parameters & properties of optical fiber.	Student 1. Will learn the basic elements of optical fiber. 2. Will understand the different kinds of losses, signal distortion in optical wave g gra 3. Will able to al structures, LA 4. Will learn the suc receiver operation & performance. 5. Will understand the operational principal of WDM, SONET, measurement of attenuation, dispersion, refractive index profile in optical fibers. 6. Will be able to classify various operational principal and used to measurements optical source characteristic.

1.02 Nov. 2018 Applicable for AY 2018-19 Onwards

UNIT-1: INTRODUCTION TO OPTICAL FIBERS
Evolution of fiber Optic system. Principle of optical communication-Attributes and structures of various fibers such as step index, graded index mode and multi modefibers. Propagation in fibers-Ray mode, Numerical aperture and multipath dispersion in step index and graded index fibers structure.

(8 Hours)

UNIT-2:SIGNAL DEGRADATION IN OPTICAL FIBERS
Attenuation, Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Group Delay, Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers, Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers, Mode Coupling, Design Optimization of SM fibers, RI profile and cut-off wavelength.

(7 Hours)

UNIT-3 : FIBER OPTICAL SOURCES
Direct and indirect Band gap materials, LED structures, Light source materials, Quantum efficiency and LED power, Modulation of a LED, Laser Diodes , Modes and Threshold condition, Rate equations, External Quantum efficiency, Resonant frequencies, Laser Diodes structures and radiation patterns, Single Mode lasers, Modulation of Laser Diodes, Temperature effects, Fabry Perot cavity Quantum laser

(8 Hours)

UNIT-4: FIBER OPTICAL RECEIVERS
PIN and APD diodes , Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise ,Comparison of Photo detectors, Fundamental Receiver Operation, Error Sources, Receiver Configuration, Probability of Error, The Quantum Limit, Noise Effects on System Performance, Eye diagram.

(7 Hours)

UNIT-5 : DIGITAL TRANMISSION SYSTEM
Introduction of fibers cables, Fiber Splicing and connectors, Operational Principals of WDM, SONET, LAN 1000 baseSX, LX and Passive Components, Optical TDM.

(8 Hours)

UNIT-6:MEASUREMENT IN OPTICAL FIBERS
Attenuation, Time domain dispersion and Frequency domain dispersion, OTDR, NA measurement Refractive index profile and optical source characteristic measurements.

(7 Hours)

Text books:				
1	Optical Fiber Communication	3rd edition, 1999.	Gerd Keiser	McGraw-Hill Science/Engineering /Math
2	Optical Communication, Principles and Practice	2nd Edition,1994	J.Senior	Prentice Hall of India

Reference books:				
1	Optical Communication System	2001	J.Gower	Prentice Hall of India
2	Fiber-Optic Communication System	Third Edition, 2009.	GovindAgrawal	John Willy & Sons

Chairperson		Version	1.01	Applicable for AY 2017-18 Onwards
Dean (Acad. Matters)		Date of Release	May 2017	

8th Semester

EE1425	PE V : Wireless Communication	L= 3	T = 0	P = 0	Credits = 3

Objective	Outcome
➢ To develop a strong theoretical background involving the evolution and future of wireless communication systems. ➢ To develop a detailed technical knowledge of current practice in wireless systems and networks.	Students Will be able to 1. Acquire knowledge of evolution of mobile communication. 2. Understand cellular concept in mobile communication system. 3. Differentiate fading technique. 4. Explain need and different methods for enhancing the quality of communication. 5. Classify different system & standard in mobile communication system. 6. Compare wireless network current practice in wireless systems.

UNIT-1:
Introduction to Wireless Communication Systems: Evolution of Mobile Radio Communications Mobile Radio Systems around the world. Examples of Wireless Communication Systems, Comparison of common wireless communication systems, trends of cellular radio and personal communications, Second generation (2G) cellular Networks, Third generation (3G) cellular Networks, wireless local loops and LMDS.

(8 Hours)

UNIT-2:
The Cellular Concept: Cellular telephone system, frequency reuse, channel assignment and handoff strategies, interference and system capacity, trunking and grade of service, improving capacity in cellular system.

(7 Hours)

UNIT-3 :
Mobile Radio Propagation- Large & Small Scale Path Loss & Fading: Introduction to Radio Wave Propagation, Reflection, Diffraction, Scattering Practical Link Budget Design Using Path Loss Models, Signal Penetration into Buildings, Ray Tracing & Site Specific Modeling. Small Scale Multipath Propagation, Small Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types Of Small Scale Fading, Rayleigh &Rician Distribution.

(8 Hours)

UNIT-4:
Equalization & Diversity: Fundamentals of equalization, space polarization, frequency and time diversity techniques, space diversity, polarization diversity, frequency and time diversity. RAKE Receiver.

(7 Hours)

UNIT-5 :
Wireless Systems and Standards: GSM- global system for mobile: services and features, GSM system architecture, GSM radio subsystem, GSM channel types, GSM frame structure, signal processing in GSM, introduction to CDMA digital cellular standard (IS-95).

(8 Hours)

UNIT-6:
Wireless Networking: Introduction to wireless networks, Differences Between Wireless & Fixed Telephone Networks, Development of wireless networks, Traffic routing in wireless networks, Wireless data services, Common channel signalling, Signalling System No. 7.An Example of SS7,SIP-Global Cellular Network Interoperability.

(7 Hours)

Text books:				
1	Wireless Communication – Principles and practice	2nd edition, 2002	T S. Rappaport	Prentice Hall PTR, upper saddle river, New Jersey
2	Mobile Communications – Design fundamentals	2nd edition, 1997	William C. Y. Lee	John Willey

Reference books:				
1	Wireless digital communication : modulation & spread spectrum applications	1995.	KamiloFeher	Prentice Hall PTR; Har/Dis edition
2	Wireless and Cellular Communication	3rd Edition,2005	W .C .Y. Lee	McGraw Hill
3	The Mobile Radio Propagation channel	2nd Edition, 2000	J.D. Parson	John Willey

Chairperson		Version	1.01	Applicable for AY 2017-18 Onwards
Dean (Acad. Matters)		Date of Release	May 2017	

8th Semester

EE1438	PE V : Mechatronics	L= 3	T = 0	P = 0	Credits = 3

Objective	Outcome
• Understand the basic concepts of Mechatronics • To understand the control and instrumentation in Industry • Understand the design and development process in Production Industry	Students will be introduced to : 1. Mechatronics key elements 2. sensor and transducer 3. Actuating device 4. Signal, system and controls 5. Closed loop controllers: Continuous and discrete process 6. Advanced application in Mechatronics

UNIT-I
Introduction: Mechatronics key elements, design processes and issues, Modeling and simulation of physical system, electrical system, Mechanical translation- rotation system, electromechanical coupling

UNIT-II
Sensor and transducer: Introduction to sensor and transducer, sensor for motion, position measurement, force, torque, tactile sensor and flow sensor, temperature sensing device, ultrasonic sensor, range sensor, active vibration control

UNIT-III
Actuating device: Direct current motor, permanent magnet stepper motor, fluid power actuation, fluid power design element, piezoelectric actuators. Transducer signal conditioning and device for data conversion

UNIT-IV
Closed loop controllers: Continuous and discrete process, control modes, two step mode, proportion mode, derivative control, integral control, PID controller, digital controller, control system performance, Programmable controllers.

UNIT-V
Input/output systems: Interfacing, input/output addressing, interface requirements, peripheral interface adapters, serial communications interface and examples of interfacing problems.

UNIT-VI
Advanced application in Mechatronics: Case studies in mechatronics system design.

TEXT BOOKS:
1. DevdasShetty and Richard A. kolk, Mechatronics system design, Thomson Asia Pvt. Ltd, second reprint, 2001
REFERENCE BOOKS:
1. W.Bolton, Mechatronics, Pearson education Asia, third Indian reprint 2001 , Additional Reading:
2. David G. Alciatore and Michael B.hisland, Introduction to Mechatronics and measurement system, Tata McGraw hill, second edition,2003.

8th Semester

EE1433	Lab. Electronic Design Automation	L = 0	T = 0	P = 2	Credits = 1

Expt. No.	Name of Experiment
1	Study of Device model using SPICE.
2	DC circuit analysis.
3	Transient analysis.
4	AC circuit analysis.
5	Analysis of Diode circuits.
6	Bipolar junction transistors.
7	Field effect transistors.
8	Op-Amp Circuits.
9	SMPS/SWITCHING CIRCUIT.

Text books:				
1	Introduction to PSpice using OrCAD for circuits and Electronics	Third edition, 2003.	Muhammad H.Rashid	Prentice Hall

Reference Website:	
1	http://bwrc.eecs.berkeley.edu/classes/icbook/spice/

8th Semester

EE1430	**Comprehensive Viva-voce**	**L = 0**	**T = 0**	**P = 0**	**Credits =2**

8th Semester

EE1431	**Extra -Curricular / Competitive Exam**	**L = 0**	**T = 0**	**P = 0**	**Credits = 2**

8th Semester

EE1432	**Project Phase -II**	**L = 0**	**T = 0**	**P = 8**	**Credits = 8**