Bachelor of Technology
Scheme of Studies/Examination
B. TECH 1ST YEAR (SEMESTER-I) COMMON FOR ALL BRANCHES (2014-2015)

S. No.	Course No.	Subject	L:T:P	Hours/Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical(Major Test)	Total	
1	AS-101	Applied Physics-I	4:0:0	4	4	75	25	0	100	3
2-A	AS-103	Applied Chemistry	4:0:0	4	4	75	25	0	100	3
2-B	ME-101	Manufacturing Technology and Processes	3:0:0	3	3	75	25	0	100	3
3	AS-105	Applied Mathematics-I	4:1:0	5	4.5	75	25	0	100	3
4-A	HS-101	Technical Communication	3:0:0	3	3	75	25	0	100	3
4-B	BT-101	Fundamental of Biotechnology	3:0:0	3	3	75	25	0	100	3
5-A	ME-105	Engg. Drawing and Graphics	0:0:3	3	1.5	75	25	0	100	3
5-B	ECE -101/ME-103/CE-101	Basics of Electronics Engg./Basics of Mechanical Engg./Basics of Civil Engg.	3:0:0	3	3	75	25	0	100	3
6-A	EE-101	Electrical Technology Fundamentals	4:2:0	6	5	75	25	0	100	3
6-B	CSE-101	Introduction to Computer Programming	3:0:0	3	3	75	25	0	100	3
7	AS-107	Applied Physics Lab -I	0:0:2	2	1		20	30	50	3
8-A	AS-109	Applied Chemistry Lab	0:0:2	2	1		20	30	50	3
8-B	ME-107	Engg. Workshop	0:0:3	3	1.5		20	30	50	3
9-A	EE-103	Electrical Technology Lab	0:0:2	2	1		20	30	50	3
9-B	CSE-103	Computer Programming Lab	0:0:2	2	1		20	30	50	3
10-B	ECE-103/	Basic Electronics Lab/ Basic Mechanical Lab/ Basic Civil Lab	0:0:2	2	1		20	30	50	3
	ME-109/									
	CE-103									
		Total	**19:02:9\ 20:01:9**	**31,30**	**25/25.5**	**450**	**210/230**	**90/120**	**750A/800B**	

Bachelor of Technology
Scheme of Studies/Examination
B. TECH 1ST YEAR (SEMESTER-II) COMMON FOR ALL BRANCHES (2014-2015)

S. No.	Course No.	Subject	L:T:P	Hours/Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical (Major Test)	Total	
1	AS-102	Applied Physics-I	4:0:0	4	4	75	25	0	100	3
2-A	AS-103	Applied Chemistry	4:0:0	4	4	75	25	0	100	3
2-B	ME-101	Manufacturing Technology and Processes	3:0:0	3	3	75	25	0	100	3
3	AS-104	Applied Mathematics-II	4:1:0	5	4.5	75	25	0	100	3
4-A	HS-101	Technical Communication	3:0:0	3	3	75	25	0	100	3
4-B	BT-101	Fundamental of Biotechnology	3:0:0	3	3	75	25	0	100	3
5-A	ME-105	Engg. Drawing and Graphics	0:0:3	3	1.5	75	25	0	100	3
5-B	ECE -101/ME-103/CE-101	Basics of Electronics Engg./Basics of Mechanical Engg./Basics of Civil Engg.	3:0:0	3	3	75	25	0	100	3
6-A	EE-101	Electrical Technology Fundamentals	4:2:0	6	5	75	25	0	100	3
6-B	CSE-101	Introduction to Computer Programming	3:0:0	3	3	75	25	0	100	3
7	AS-106	Applied Physics Lab -I	0:0:2	2	1		20	30	50	3
8-A	AS-109	Applied Chemistry Lab	0:0:2	2	1		20	30	50	3
8-B	ME-107	Engg. Workshop	0:0:3	3	1.5		20	30	50	3
9-A	EE-103	Electrical Technology Lab	0:0:2	2	1		20	30	50	3
9-B	CSE-103	Computer Programming Lab	0:0:2	2	1		20	30	50	3
10-B	ECE-103/	Basic Electronics Lab/	0:0:2	2	1		20	30	50	3
	ME-109/	Basic Mechanical Lab/								
	CE-103	Basic Civil Lab								
		Total	**19:02:9\20:01:9**	**31,30**	**25/25.5**	**450**	**210/230**	**90/120**	**750A/800B**	

Bachelor of Technology (Electronics & Communication Engineering)

Scheme of Studies/Examination

Semester III

S. No.	Course No.	Subject	L:T:P	Hours/Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical (Major Test)	Total	
1	AS-201	Applied Mathematics-III	3:1:0	4	3.5	75	25	0	100	3
2	ECE-201	Signals & Systems	3:1:0	4	3.5	75	25	0	100	3
3	ECE-203	Electronic Devices	4:0:0	4	4	75	25	0	100	3
4	ECE-205	Network Analysis & Synthesis	4:0:0	4	4	75	25	0	100	3
5	ECE-207	Digital Electronics	3:1:0	4	3.5	75	25	0	100	3
6	ECE-209	Analog Communication	4:0:0	4	4	75	25	0	100	3
7	ECE-211	Signals & Systems Lab	0:0:3	3	1.5	0	40	60	100	3
8	ECE-213	Digital Electronics Lab	0:0:3	3	1.5	0	40	60	100	3
9	ECE-215	Analog Communication lab	0:0:3	3	1.5	0	40	60	100	3
		Total		**33**	**27.0**	**450**	**270**	**180**	**800**	
10	*MPC-201	Environmental Studies	3:0:0	3	0	75	25	0	100	3

* MPC-201 is a mandatory course which will be a non credit subject and student has to get pass marks in order to qualify for the Degree award.

Bachelor of Technology (Electronics & Communication Engineering)
Scheme of Studies/Examination
Semester IV

S. No.	Course No.	Subject	L:T:P	Hours/Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical (Major Test)	Total	
1	AS-206	Numerical Analysis	4:0:0	4	4	75	25	0	100	3
2	ECE-202	Data Structures & Algorithms	3:1:0	4	3.5	75	25	0	100	3
3	ECE-204	Electronic Measurement & Instruments	4:0:0	4	4	75	25	0	100	3
4	ECE-206	Electromagnetic Theory	3:1:0	4	3.5	75	25	0	100	3
5	ECE-208	Analog Electronics	3:1:0	4	3.5	75	25	0	100	3
6	ECE-210	Computer Architecture & Organization	3:0:0	3	3	75	25	0	100	3
7	ECE-212	Data Structures Lab	0:0:3	3	1.5	0	40	60	100	3
8	ECE-214	Electronic Measurement & Instruments Lab	0:0:3	3	1.5	0	40	60	100	3
9	ECE-216	Analog Electronics lab	0:0:3	3	1.5	0	40	60	100	3
		Total		**32**	**26**	**450**	**270**	**180**	**900**	
10	*MPC 202	Energy Studies	3:0:0	3	0	75	25		100	3

* MPC-202 is a mandatory course which will be a non credit subject and student has to get pass marks in order to qualify for the Degree award.

Bachelor of Technology (Electronics & Communication Engineering)
Scheme of Studies/Examination
Semester V

S. No.	Course No.	Subject	L:T:P	Hours/Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical (Major Test)	Total	
1	ECE - 301	Microprocessors & Interfacing	3:1:0	4	3.5	75	25	0	100	3
2	HS-303	Business Intelligence & Enterpreneurship	4:0:0	4	4	75	25	0	100	3
3	ECE-303	Antenna & Wave Propgation	3:1:0	5	3.5	75	25	0	100	3
4	ECE-305	VLSI Technology	4:0:0	4	4	75	25	0	100	3
5	CSE-309	Essentials of Information Theory	4:0:0	4	4	75	25	0	100	3
6	ECE-307	Control Systems Engg	4:1:0	5	4.5	75	25	0	100	3
7	ECE-309	Microprocessors & Interfacing Lab	0:0:3	3	1.5	0	40	60	100	3
8	ECE-311	Design Automation Lab	0:0:3	3	1.5	0	40	60	100	3
9	ECE-313	Antenna & Wave Propagation Lab	0:0:3	3	1.5	0	40	60	100	3
10	ECE-315*	Personality & Soft Skills Development	2:0:0	2	2	0	100	0	100	3
		Total		**35**	**30**	**450**	**370**	**180**	**1000**	

* The student will be evaluated on the basis of technical seminar and technical writing/reading skills for 1 credit each

Bachelor of Technology (Electronics & Communication Engineering)
Scheme of Studies/Examination
Semester VI

S. No.	Course No.	Subject	L:T:P	Hours/Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical (Major Test)	Total	
1	ECE-302	Digital Signal Processing	4:1:0	5	4.5	75	25	0	100	3
2	ECE- 304	Digital Design Using Verilog	3:1:0	4	3.5	75	25	0	100	3
3	ECE-306	Digital Communication	4:1:0	5	4.5	75	25	0	100	3
3	HS-302	Fundamentals of Management	4:0:0	4	4	75	25	0	100	3
5	ECE-308	Computer Communication Network	4:0:0	4	4	75	25	0	100	3
6	ECE-310	Digital Signal Processing lab	0:0:3	3	1.5	0	40	60	100	3
7	ECE- 312	Digital Design Using Verilog Lab	0:0:3	3	1.5	0	40	60	100	3
8	ECE-314	Digital Communication lab	0:0:3	3	1.5	0	40	60	100	3
9	ECE- 316*	Personality & Soft Skills Development 2	2:0:0	2	2	0	100	0	100	3
		Total		**33**	**27**	**375**	**345**	**180**	**900**	

* The student will be evaluated on the basis of technical seminar and technical group discussions for 1 credit each

Bachelor of Technology (Electronics & Communication Engineering)
Scheme of Studies/Examination
Semester VII

S. No.	Course No.	Subject	L:T:P	Hours/Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical (Major Test)	Total	
1	ECE-401	Microcontroller & Embedded Systems Design	3:0:0	3	3	75	25	0	100	3
2	ECE-403	Digital Image Processing	4:0:0	4	4	75	25	0	100	3
4	ECE-405	Power Electronics	3:0:0	3	3	75	25	0	100	3
4		Core Elective - I**	3:0:0	3	3	75	25	0	100	3
5		Core Elective - II**	3:0:0	3	3	75	25	0	100	3
6	ECE-407	Microcontroller & Embedded Systems Design Lab	0:0:3	3	1.5	0	40	60	100	3
7	ECE-409	Digital Image Processing Lab	0:0:3	3	1.5	0	40	60	100	3
8	ECE-411***	Project-1	0:0:10	10	5	0	100	100	200	3
9	ECE-413*	Industrial Case Studies 1	2:0:0	2	2	0	100	0	100	
		Total		**34**	**26**	**375**	**405**	**220**	**1000**	

* The performance of the student will be evaluated by the presentation delivered and the report submitted by the student related to Industrial/Research problems & its suggested solutions.

** The students should select two departmental electives subjects from the list of core elective subjects.

***The project should be initiated by the student in the 7th semester beginning and will be evaluated In the end of the semester on the basis of a presentation and Report.

Bachelor of Technology (Electronics & Communication Engineering)
Scheme of Studies/Examination
Semester VIII

S. No.	Course No.	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical (Major Test)	Total	
1	ECE-402	Wireless & Mobile Communication	4:0:0	4	4	75	25	0	100	3
2	ECE-404	Microwave Engineering	3:0:0	3	3	75	25	0	100	3
3		Core Elective - III**	3:0:0	3	3	75	25	0	100	3
4		Core Elective - IV**	3:0:0	3	3	75	25	0	100	3
5	ECE-406 ***	Project-II	0:0:14	14	7	0	100	100	200	3
6	ECE-408	Wireless & Mobile communication lab	0:0:3	3	1.5	0	40	60	100	3
7	ECE-410	Microwave Engineering Lab	0:0:3	3	1.5	0	40	60	100	3
8	ECE-412 *	Seminar & Report Writing	2:0:0	2	2	0	100	0	100	3
		Total		**35**	**25**				**900**	
9	ECE-440****	General Fitness & Professional Aptitude							100	3

* The performance of the student will be evaluated by the presentation delivered and the report submitted by the student related to Industrial/Research problems & its suggested solutions.

** The students should opt two departmental electives subjects from the list of core elective subjects.

***The project should be initiated by the student in continuation of the 7th semester and will be evaluated In the end of the semester on the basis of a presentation and Report.

**** A viva of the students will be taken by external examiner (Principal/Director/Professor/or any senior Person with Experience more than 10 years) at the end of the semester and grades will be given according to the grade chart.

S. No.	Core Electives-7th Sem.		S. No.	Core Electives-8th Sem.	
1	ECE-415	Advance Digital Communication	1	ECE-414	DSP Processor
2	ECE-417	Nano Electronics	2	ECE-416	Mobile Communication Networks
3	ECE-419	Optical Communications	3	ECE-418	MEMS
4	ECE-421	Adaptive Signal Processing	4	ECE-420	Transducers & Its Applications
5	ECE-423	Satellite Communication	5	ECE-422	Radar Engineering
6	ECE-425	Digital VLSI Design	6	ECE-424	High Frequency Circuit and Systems
7	ECE-427	Analog CMOS IC Design	7	ECE-426	Biomedical Signal Processing
8	ECE-429	Consumer Electronics	8	ECE-428	Multimedia Communications
9	ECE-431	Robotics	9	ECE-430	Mixed VLSI Design
10	ECE-433	Non-Conventional Energy Resources	10	ECE-432	Microstrip Antenna
11	ECE-435	Microstrip line Analysis	11	ECE-434	Strategic Electronics
12	ECE-437	Software Defined Radios	12	ECE-436	Cognitive Radios

AS-201	APPLIED MATHEMATICS-III						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**1**	**-**	**3.5**	**75**	**25**	**100**	**3 hrs**
Purpose	To acquaint the students with the basic use of PDE, Linear Programming problems, Fourier series and transforms, Complex variables and Probability.						
Course Outcomes							
CO1	This section is concerned mainly with Fourier series. However, the underlying ideas can also be extended to nonperiodic phenomena. This leads to Fourier integrals and transforms which are very much useful in solving the initial and boundary value problems.						
CO 2	Students will learn about the formation and solution the partial differential equations. First order PDE of any degree by using Charpit's method will be discussed in details. In addition, how to solve homogeneous linear PDE with constant coefficients and variable separable method and LPP will be covered under this section.						
CO 3	Complex analysis is concerned with generalization of the familiar real functions of calculus and their detailed knowledge is an absolute necessity in practical work to solve engineering problems.						
CO 4	Probability theory provides models of probability distributions(theoretical models of the observable reality involving chance effects) to be tested by statistical methods which has various engineering applications, for instance, in testing materials, control of production processes, robotics, and automatization in general, production planning and so on.						

UNIT-I

Fourier Analysis **(11 hrs)**

Fourier series: Euler's formulae, Orthogonality conditions for the Sine and Cosine funtions, Dirichlet's conditions, Fourier expansion of functions having points of discontinuity, Change of interval, Odd and even functions, Half-range series.

Fourier Transforms: Fourier integrals, Fourier transforms, Fourier Cosine and Sine transforms, Properties of Fourier transforms, Convolution theorem, Parseval's identity, Fourier transforms of the derivative of a function, Application of transforms to boundary value problems (Heat conduction and vibrating string).

UNIT-II

Partial Differential Equations and LPP **(11 hrs)**

Formation and Solutions of PDE, Lagrange's Linear PDE, First order non-linear PDE, Charpit's method, Homogeneous linear equations with constant coefficients, Method of separation of variables.

Solution of linear programming problems: using Graphical and Simplex methods.

UNIT-III

Theory of Complex Variables **(12 hrs)**

A review of concept of functions of a complex variable, Limit, continuity, differentiability and analyticity of a function. Basic elementary complex functions (exponential functions, trigonometric & Hyperbolic functions, logarithmic functions) Cauchy-Riemann Equations.

Line integral in complex plane, definition of the complex line integral, basic properties, Cauchy's integral theorem, and Cauchy's integral formula, brief of Taylor's, Laurent's and Residue theorems (without proofs).

UNIT-IV

Probability theory: (11 hrs)

A review of concepts of probability and random variables: definitions of probability, addition rule, conditional probability, multiplication rule, Conditional Probability, Mean, median, mode and standard deviation, Bayes' Theorem, Discrete and continuous random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, moment generating function.

Standard Distributions: Binomial, Poisson and Normal distribution.

References Books:

1. E. Kreyszig : Advanced Engineering Mathematics, Wiley India.
2. B. V. Ramana: Engineering Mathematics, Tata McGraw Hill.
3. R.K. Jain, S.R.K. Iyengar: Advanced Engineering Mathematics, Taylor & Francis.
4. Murray R Spiegel: Schaum's Outline of Complex Variables, McGraw Hill Professional.
5. Michael D. Greenberg: Advanced Engineering Mathematics, Pearson Education, Prentice Hall.

Note: The Examiners will set nine questions: first question will be short answer type (covering the entire syllabus) and another eight questions will be set taking two questions from each unit. Students will have to attempt five questions in all; first question will be compulsory and other four questions, selecting one from each unit. All questions will carry equal marks.

ECE-201	Signals and Systems						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**1**	**0**	**3.5**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the basic concepts of signals and systems, Random variables, discretisation of analog signals, fourier series, fourier transform and laplace transform.**						
Course Outcomes							
CO1	**Introduce and classify signals and systems based on their properties.**						
CO2	**To understand the basic concepts of random variables and Linear time invariant systems.**						
CO3	**Familiarization with the sampling process and spectral analysis of signals using fourier series.**						
CO4	**Apply transform techniques to analyze continuous-time and discrete-time signals and systems**						

Unit-I

Introduction to Signals: Continuous and discrete time signals, deterministic and stochastic signals, periodic and a periodic signals, even and odd signals, energy and power signals, exponential and sinusoidal signals and singular functions. Signal representation in terms of singular functions, orthogonal functions and their use in signal representation

Introduction to Systems: Linear and non-linear systems, time invariant and time varying systems, lumped and distributed systems,deterministic and stochastic systems, casual and non-causal systems, analog and discrete/digital memory and memory less systems.

Unit-II

Random Variables: Introduction to Random Variables, pdf, cdf, moments, distributions, correlation functions.

Linear Time Invariant Systems: Introduction to linear time invariant (LTI) systems, properties of LTI systems, convolution integral, convolution sum, causal LTI systems described by differential and difference equations. Concept of impulse response

Unit-III

Discretisation of Analog Signals: Introduction to sampling, sampling theorem and its proof.Effect of undersampling, reconstruction of a signalfrom sampled signal.

Fourier Series : Continuous time fourier series (CTFS), Properties of CTFS, Convergence of fourier series, Discrete time Fourier Series (DTFS), Properties of DTFS **,** Fourier series and LTI system, Filtering.

Unit-IV

Fourier Transform: Continuous Time Fourier Transform (CTFT), Properties of CTFT, Systems characterized by linear constant- coefficient differential equations.

Discrete time fourier transform (DTFT), Properties of DTFT, Duality, Systems characterized by Linear constant coefficient difference equations.

Laplace Transform: Introduction to Laplace transform, Region of convergence for laplace transform, Inverse laplace transform, Properties oflaplace transform, Analysis and characterization of LTI systems using laplace transform, System function algebra and block diagram representations, Unilateral laplace transform.

Text Books:

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, Signals and Systems, Prentice Hall India, 2nd Edition, 2009

Reference Books:

1. Simon Haykins – "Signal & Systems", Wiley Eastern
2. Tarun Kumar Rawat , Signals and Systems , Oxford University Press.

Note: Question paper template will be provided to the paper setter.

ECE -203	Electronic Devices						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**0**	**0**	**4**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the various electronic devices such as various types of diodes, BJT's, FET's and regulated power supplies.**						
Course Outcomes							
CO1	**To understand the concept of carrier transport phenomena in semiconductors and various diodes such as p-n junction diode, tunnel diode and schottky diodes.**						
CO2	**To understand the detailed concept of BJT's and calculation of parameters of transistors using different models.**						
CO3	**Describe the characteristics & parameters of FET's and MOSFET's.**						
CO4	**To understand the concept of different types of regulated power supplies.**						

Unit- I

Carrier Transport Phenomena: Carrier Drift, Carrier Diffusion, Hall Effect, Mobility and Resistivity. Generation and Recombination of carriers, Fermi energy level, its position and its variation with doping concentration.**PN Junction**: Basic Structure, Built in potential Barrier, Electric Field, Space charge width, Junction capacitances: Depletion & Diffusion Capacitance, Small signal model of PN Junction Diode. Tunnel Diode, Schottky Diode**.**

Unit- II

Bipolar Junction Transistor: Basic principle of operation, Forward Active mode & other modes. Non Ideal Effects: Base Width Modulation, Current Crowding, High Injection. Ebers-Moll Model, Frequency Limitations of BJT'S, Hybrid Pi Model, Introduction to H-Parameters, Hetrojunction Bipolar Transistors.

Unit -III

Field Effect Devices: JFET concepts, Basic Operation, Internal pinch off voltage, Pinch off voltage, Ideal DC current voltage relationship, Transconductance, Channel length modulation, velocity saturation effects, Small Signal Model & Frequency Limitations.Two Terminal MOS structure, Energy band diagrams, Depletion layer thickness, Capacitance Voltage Relationship, Basic MOSFET operation, Small Signal Model.

Unit-IV

Regulated Power Supplies: Voltage Regulation, Zener diode shunt voltage regulator, Transistor series and Transistor shunt voltage regulator, Controlled Transistor Voltage Regulator, Op-Amp Series voltage regulator, Complete power supply and SMPS.

Text Books:

1. D. A. Neamen,DhrubesBiswas Semiconductor Physics and Devices (IRWIN), McGraw Hill Higher Education, 4th Edition
2. B.G. Streetman, Solid State Electronic Devices, Prentice Hall of India, New Delhi, 1995.

Reference Books:

1. E S. Yang, Microelectronic Devices, McGraw Hill, Singapore, 1988.
2. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991.
3. Millman&Halkias: Integrated Electronics, TMH.
4. Boylestad&Nashelsky: Electronic Devices & Circuit Theory, PHI.

Note: Question paper template will be provided to the paper setter.

ECE-205	Network Analysis and Synthesis						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**0**	**0**	**4**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of topology, transient analysis, network modeling, filters and methods of network analysis and synthesis for solving simple and complex circuits.**						
Course Outcomes							
CO1	**To understand the concept of network topologies and the network analysis in the time domain for solving simple and complex circuits.**						
CO2	**Describe the circuit element models, network analysis using Laplace transform and time domain behavior from the pole-zero plots.**						
CO3	**Describe the characteristics & parameters of two port networks.**						
CO4	**To understand the concept of filters and synthesis of one port network.**						

Unit -I

Introduction: Principles of network topology, graph matrices, Network Analysis (Time-Domain): Singularity Functions, Source-Free RC, RL, Series RLC, Parallel RLC circuits, Initial & Final Conditions, Impulse & Step Response of RC, RL, Series RLC, Parallel RLC circuits.

Unit-II

Network Analysis (using Laplace Transform): Circuit Element Models, Transient Response of RC, RL, RLC Circuits to various excitation signals such as step, ramp, impulse and sinusoidal excitations using Laplace transform.

Network Functions: Terminal pairs or Ports, Network functions for one-port and two-port networks, poles and zeros of Network functions, Restrictions on pole and zero Locations for driving point functions and transfer functions.

Unit-III

Characteristics and Parameters of Two Port Networks: Relationship of two-port variables, short-circuit admittance parameters, open circuit impedance parameters, transmission parameters, hybrid parameters, relationships between parameter sets, Inter-connection of two port networks.

Unit-IV

Types of Filters and their Characteristics: Filter fundamentals, constant-k and m-derived low-pass and high-pass filters.

Network Synthesis: Causality & Stability, Hurwitz Polynomials, Positive real functions, Synthesis of one port networks with two kind of elements.

Text Books:

1. Fundamentals of Electric Circuits: Charles K. Alexander, Matthew N. O. Sadiku, McGraw Hill Education
2. Network Analysis: M.E. Van Valkenburg, PHI

Reference Books:

1. Circuits & Networks: Sukhija & Nagsarkar, Oxford Higher Education.
2. Network Analysis & Synthesis: F. F. Kuo, John Wiley.
3. Basic Circuit Theory: Dasoer Kuh, McGraw Hill Education.
4. Circuit Analysis: G.K. Mithal; Khanna Publication

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Note: Question paper template will be provided to the paper setter.

ECE-207	Digital Electronics						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**1**	**0**	**3.5**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of Digital Electronics covering the contents of digital techniques, logic gates & logic families etc.**						
Course Outcomes							
CO1	**Students will be able to design a minimum circuit for any function**						
CO2	**Students will be able to analyze various logic families available to design digital components**						
CO3	**Students will be able to design state machine circuits using sequential and combinational circuits**						
CO4	**Students will be able to understand the basics of various PLD's.**						

Unit-I

Introduction to Digital Techniques: Digital Systems; Logic circuits, Analysis, design and implementation of digital systems, Number Systems and Codes- Positional number system; Binary, octal and hexadecimal number systems; Methods of base conversions; Binary, octal and hexadecimal arithmetic; Representation of signed numbers; Fixed and floating point numbers; Binary codes: BCD codes, Excess-3, Gray codes; Error detection and correction codes - parity check codes and Hamming code.

Combinatonial Design using Gates: Combinatonial Logic Systems: Definition and specification; Truth table; Basic logic operation and logic gates. Basic postulates and fundamental theorems of Boolean algebra;Standard representation of logic functions : SOP and POS forms; Simplification of switching functions using K-map and Quine-McCluskey tabular methods; Synthesis of combinational logic circuits using AOI, NAND,NOR and other combination of other logic functions.

Unit-II

Logic families: Introduction to different logic families; Operational characteristics of BJT in saturation and cut-off regions; Operational characteristics of MOSFET as switch; TTL inverter - circuit description and operation; CMOS inverter - circuit description and operation; Structure and operations of TTL ,CMOS and ECL gates; Electrical characteristics of logic gates – logic levels and noise margins, fan-out, propagation delay, transition time, power consumption and power-delay product; interfacing of TTL and CMOS families.

Combinational design using MST devices: Encoders, Decoders, multiplexers, demultiplexers and their use as logic elements; Parity circuits and comparators; Arithmetic modules- adders, subtractors , BCD arithmetic circuits.

Unit-III

Sequential circuits: Definition of state machines, state machine as a sequential controller; Basic sequential circuits- latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, T flip-flop; Timing hazards and races; Analysis of state machines using D flip-flops and JK flip-flops; Design of state machines - state table, state assignment, transition/excitation table, excitation maps and equations, logic realization;

State machine design: Designing state machine using ASM charts, Designing state machine using state diagram, Design of registers, counters-asynchronous and synchronous, up/down counter, Ring and Johnson counters.

Unit-IV

Memory – Organization, Functional Diagram, Memory operations, Classification of semiconductor memories, Read and Write Memories, ROM, Programmable Logic Devices-PLAs, PALs and their applications, Generic Array logic devices, Sequential PLDs and their applications; Introduction to field programmable gate arrays (FPGAs) and ASICS.

Text Books:

1. G.K.Kharate: Digital Electronics,1st edition, Oxford university press, 2010

Reference Books:

1. M.M.Mano and M.D.Ciletti: Digital design4th edition, Printece Hall.2006
2. R.P.Jain: Modern Digital Electronics, 3rd edition, TMH.2003
3. A.A.Kumar: Fundamentals of digital circuits,2nd edition, Printece Hall of India
4. A.P.Malvino and D.P.Leach: Digital principles and applications,6th edition,TMH,2008
5. Z. Kohavi, Switching and Finite Automata Theory, McGraw Hill, 1970.

Note: Question paper template will be provided to the paper setter.

ECE-209	Analog Communication						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**0**	**0**	**4**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of basic communication systems and various noises in that system, different analog modulation techniques and also AM&FM transmission & reception with various pulse techniques.**						
Course Outcomes							
CO1	**To understand the concept of basic comm. System and various types of noise and analog modulation techniques.**						
CO2	**To understand the concept of AM transmission & reception.**						
CO3	**To understand the concept of FM transmission & reception.**						
CO4	**To understand the concept of SSB transmission & reception and analog pulse techniques.**						

Unit-I

Communication Systems and Noise: Constituents of communication system, Modulation, Bandwidth requirement, Noise, Classification of noise, Resistor noise, Multiple resistor noise sources, Network with reactive elements, Noise Temperature, Noise bandwidth, Noise figure, its calculation and measurement, Bandpass noise representation, Noise calculation in Communication Systems, Noise in Amplitude Modulated System, Noise in angle modulated systems, SNR calculation for AM and FM.

Analog Modulation Techniques: Theory of amplitude modulation, AM power calculations, AM modulation with a complex wave, Concepts of angle modulation, Theory of frequency modulation, Mathematical analysis of FM, Spectra of FM signals, Narrow band FM, Wide band FM, Phase modulation, Phase modulation obtained from frequency modulation, Comparison of AM, FM & PM.

Unit-II

AM Transmission: Generation of Amplitude Modulation, Low level and high level modulation, Basic principle of AM generation, Square law modulation, Amplitude modulation in amplifier circuits, Vander bijl modulation, Suppressed carrier AM generation (Balanced Modulator) ring Modulator, Product Modulator/balanced Modulator.

AM Reception: Tuned Ratio Frequency (TRF) Receiver, Super heterodyne Receiver, RF Amplifier, Image Frequency Rejection, Cascade RF Amplifier, Frequency Conversion and Mixers, Tracking & and Alignment, IF Amplifier, AM detector, AM detector with AGC, Distortion in diode detectors, Double hetro-dyne receiver, AM receiver using a phase locked loop (PLL), AM receiver characteristics.

Unit-III

FM Transmission: FM allocation standards, Generation of FM by direct method, Varactor diode Modulator, Indirect generation of FM, The Armstrong method RC phase shift method, Frequency stabilized reactance FM transmitter, FM stereo transmitter, Noise triangle.

FM Reception: Direct methods of Frequency demodulation, Travis detector/frequency discrimination (Balanced stop detector), Foster seelay of phase discriminator, Ratio detector, Indirect method of FM

demodulation, FM detector using PLL, Pre-emphasis / de-emphasis, Limiters, The FM receiver, RF Amplifier, FM stereo receiver, Square, Triangular, Sinusoidal FM generation Voltage controlled oscillator.

Unit-IV

SSB Transmission: Introduction, Advantages of SSB Transmission, Generation of SSB, The Filter method The Phase Shift Method, The Third Method, AM Compatible SSB Modulation, Pilot Carrier SSB, Independent Side-band Systems (ISB), Vestigial Side-band Modulation (VSB), VSB-SC, Application of AM and FM in TV transmission.

SSB Reception: SSB Product Demodulator, Balanced Modulator as SSB Demodulator, Pilot Carrier SSB Receiver, SSB Double Super-hetrodyne Receiver, Compatible SSB (CSSB) Receiver, ISB/Suppressed Carrier Receiver, Modern Communication Receiver.

Analog Pulse Modulation: Introduction, Pulse amplitude modulation (PAM), Natural PAM Frequency Spectra for PAM, PAM Time Multiplexing Flat-top PAM, PAM Modulator Circuit, Demodulation of PAM Signals, Pulse Time Modulation (PTM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), PPM Demodulator,

Text Books:

1. Proakis, J. G. and Salehi, M., Fundamentals of Communication Systems, Dorling Kindersley (2008) 2nd ed.
2. Mithal G K, Radio Engineering, Khanna Pub.

Reference Books:

1. Taub, H., Principles of Communication Systems, McGraw-Hill (2008) 3rd ed.
2. Haykin, S., Communication Systems, John Willey (2009) 4th ed
3. Kennedy, G., Electronic Communication Systems, McGraw-Hill (2008) 4th ed.

Note: Question paper template will be provided to the paper setter.

ECE-211	Signals and Systems Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical (Major Test)**	**Practical (Minor Test)**	**Total**	**Time**
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3 Hr.**
Course Outcomes							
CO1	**To understand the basic concepts of MATLAB**						
CO2	**To explore properties of various types of signals and systems.**						
CO3	**To visualize the relationship between continuous and discrete fourier transforms.**						
CO4	**To understand the concept of sampling in time and frequency domain.**						

List of Experiments:

1) To demonstrate some simple signal.

2) To explore the effect of transformation of signal parameters (amplitude-scaling, time-scaling and time-shifting).

3) To explore the various properties of the impulse signals.

4) To visualize the complex exponential signal and real sinusoids.

5) To identify a given system as linear or non-linear.

6) To explore the time variance and time invariance property of a given system.

7) To explore causality and non-causality property of a system.

8) To visualize the relationship between the continuous-time Fourier series and Fourier transform of a signal.

9) To visualize the relationship between the discrete-time Fourier series and Fourier transform of a signal.

10) To visualize the relationship between continuous-time and discrete-time Fourier transform of a signals.

11) To demonstrate the time domain sampling of bandlimited signals (Nyquist theorem).

12) To demonstrate the time domain sampling of non-bandlimited signals and antialiasing filter.

13) To demonstrate the signal reconstruction using zero-order hold and first-order hold filters.

14) To demonstrate the sampling in frequency domain (Discrete Fourier Transform).

15) To demonstrate the spectral analysis using Discrete Fourier Transform.

17) To demonstrate the convolution and correlation of two continuous-time signals.

18) To demonstrate the convolution and correlation of two discrete-time signals.

ECE-213	Digital Electronics Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical (Major Test)**	**Practical (Minor Test)**	**Total**	**Time**
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3 Hr.**

Course Outcomes	
CO1	**To understand the concept of TTL gates such as AND, OR, NAND etc.**
CO2	**To study and verify various combinational circuits such as multiplexers, Comparators etc.**
CO3	**To understand the concept of sequential circuits such as flip flops, counters etc.**
CO4	**To design the state machine of four states and to study a sequence detector.**

List of Experiments:

1. Study of TTL gates AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. Design and realize a given function using K-Maps and verify its performance.
3. To verify the operation of Multiplexer and Demultiplexer.
4. To verify the operation of 2 bit Comparator using gates.
5. To verify the truth table of S-R, J-K, T, D Flip-flops.
6. To verify the operation of Bi-directional shift register.
7. To design and verify the operation of 3-bit asynchronous counter.
8. To design and verify the operation of asynchronous Up/down counter using J-K FFs.
9. Design a state machine of 4 states.
10. To design a sequence detector.

ECE-215	Analog Communication Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical (Major Test)**	**Practical (Minor Test)**	**Total**	**Time**
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3 Hr.**
Course Outcomes							
CO1	**To study various modulation techniques of Amplitude modulation and also demodulation.**						
CO2	**To study the generation techniques of SSB and DSBSC modulation**						
CO3	**To understand the concept of PLL , its capture range and frequency multiplier using PLL.**						

List of Experiments:

1. i) To study Double Sideband Amplitude Modulation and determine its modulation factor and power in sidebands.
   ii) To study amplitude demodulation by linear diode detector.
2. i) To study Frequency Modulation and determine its modulation factor.
   ii) To study PLL 565 as frequency demodulator
3. To study Sampling and reconstruction of pulse amplitude modulation system.
4. To study the Sensitivity characteristics of superhetrodyne receiver.
5. To study the Selectivity characteristics of superhetrodyne receiver.
6. To study the Fidelity characteristics of superhetrodyne receiver.
7. i) To study Pulse Amplitude Modulation
   a) Using switching method
   b) By sample and hold circuit.

   ii) To demodulate the obtained PAM signal by IInd order Low pass filter.
8. To study Pulse Width Modulation / Demodulation.
9. To study Pulse Position Modulation / Demodulation.
10. To study active filters (Low-pass, High-pass, Band-pass, Notch filter).

MPC-201	Environmental Studies (B.Tech. All Branches Semester –III/IV)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**0**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**To learn the multidisciplinary nature, scope and importance of Environmental Studies**						
Course Outcomes							
CO1	**Basic concepts of Various kinds of Microscopy and Centrifugation Techniques**						
CO2	**To learn the theoretical and practical aspects of Electrophoresis and Chromatography Techniques**						
CO3	**To learn the concepts of different kinds of Spectroscopy and Colourimetry**						
CO4	**To understand the concept of radioisotope techniques and their applications in research**						

UNIT 1

The multidisciplinary nature of environmental studies.Definition, Scope and Importance. Need for public awareness. Natural Resources: Renewable and Non-Renewable Resources: Natural resources and associated problems.

(a) Forest Resources: Use and over-exploitation, deforestation, case studies. Timber eztraction, mining, dams and their effects on forests and tribal people.
(b) Water Resources- Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
(c) Mineral Resources- Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
(d) Food Resources- World Food Problems, changes caused by agriculture and overgazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
(e) Energy Resources- Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.
(f) Land Resources- Land as a resource, land, degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyle.

UNIT II

Ecosystem-Concept of an ecosystem.Sturcture and function of an ecosystem.Producers, consumers and decomposers.Energy flow in the ecosystem.Ecological Succession.Food Chains, food webs and ecological pyramids. Introduction, types,characteristic features, structure and function of the following ecosystem-

a. Forest Ecosystem
b. Grassland Ecosystem
c. Desert Ecosystem
d. Aquatic Ecosystems(ponds, streams, lakes, rivers, oceans, esturaries

Field Work. Visit to a local area to document Environment assets-river/forest/grassland/hill/mountain.Visit to a local polluted site- Urban /Rural

Industrial/Agricultural.Study of common plants, insects and birds. Study of simple ecosystems-pond, river, hill, slopes etc. (Field work equal to 5 lecture hours).

UNIT III

Biodiversity and its conservation. Introduction, Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversityof global, National and local levels. India as a mega-diversity nation Hot spots of Biodiversity. Threats to biodiversity: Habitat loss, poaching of wild life, man-wildlife conflicts. Endangered and endemic species of India.Conservation of Biodiversity- In situ and Ex-Situ conservation of biodiversity.

Environmental Pollution Defiinitiom. Cause, effects and control measures of- (a) Air Pollution (b) Water Pollution (c) Soil Pollution (d) Marine Pollution (e) Noise Pollution (f) Thermal Pollution (g) Nuclear Hazards
Solid waste management- cause, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides

UNIT IV

Social Issues and the Environment.From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people: Its problems and concerns. Case Studies.Environmental ethics-issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.Wasteland Reclamation.Consumerism and waste products.Environment Protection Act.Air (Prevention and Control of Pollution) Act.Water (Prevention and Control of Pollution) Act.Wildlife Protection Act.Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public Awareness. Human population and the Environment.Population growth, variation amomg nations. Population explosion-Family Welfare Programme. Envirommentsnd human health.Human rights.Value Education.HIV/AIDS, Women and Child Welfare.Role of Information Technology in Environment and Human Health.Case Studies.

Text Books

1. Environmental Studies- Deswal and Deswal. Dhanpat Rai & Co.
2. Environmental Science & Engineering Anandan, P. and Kumaravelan, R. 2009. Scitech Publications (India) Pvt. Ltd., India
3. Environmental Studies. Daniels Ranjit R. J. and Krishnaswamy. 2013. Wiley India.
4. Environmental Science- Botkin and Keller. 2012. Wiley , India

AS-206	NUMERICAL ANALYSIS						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**0**	**0**	**4**	**75**	**25**	**100**	**3 hrs**
Purpose	To acquaint the students with the complete procedure to numerically approximate the solution for different kinds of problems occur in science, engineering and technology whose exact solution is difficult to find.						
Course Outcomes							
CO1	In this section student will learn the methods to find the roots of nonlinear (algebraic or transcendental) equations, and eigen value problem of a matrix that can be obtained numerically where analytical methods fail to give solution.						
CO2	Students will learn to solve a large system of linear equations and matrix inversion by various numerical methods and techniques.						
CO3	Discussion on interpolation will be useful in constructing approximate polynomial to represent the huge amounts of experimental data, and to find the intermediate values. Numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.						
CO4	Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations will be useful in attempting many engineering problem.						

UNIT - I

Solution of Algebraic and Transcendental Equation and Eigen Value Problem: Solution of algebraic and transcendental equation by the method of bisection, the method of false position, Newton-Raphson method and Graeffe's Root squaring method. Eigen value problem by power method and Jacobi method.

UNIT-II

Solution of System of Equations and Matrix Inversion: Solution of linear algebraic equation: Gauss elimination and Gauss-Jordan methods- Method of Triangularization and Crout's reduction. Iterative methods: Gauss-Jacobi, Gauss-Seidel and Relaxation methods. Matrix inversion by Gauss - Jordan elimination, Crout's , Doolittle and Choleski Methods.

UNIT-III

Interpolation: Finite Differences, Relation between operators - Interpolation by Newton's forward and backward difference formulae for equal intervals. Newton's divided difference method and Lagrange's method for unequal intervals. Gauss Central difference formulae, Bessel and Stirling formulae.

Numerical differentiation: Newton's forward difference formula to compute derivatives, Newton's backward difference formula to compute derivatives, Derivatives using Central difference formulae, to find the maxima and minima of a tabulated function.

Numerical Integration: by Newton's Cotes formulae, Trapezoidal and Simpson's $1/3^{rd}$ and $3/8^{th}$ rules, Romberg method.

UNIT-IV

Solution of Ordinary Differential Equation: Single step methods: Taylor series method, Picard's method of successive approximation, Euler, Modified Euler's and Improved Euler methods, Runge Kutta method of fourth order only. Multistep methods: Milne and Adams– Bashforth methods.

Curve fitting: Introduction, Principle of Least squares, Method of Least squares, Fitting of a straight line, parabola and exponential functions.

References Books:

- M. K. Jain, SRK Iyengar and R.K. Jain, Numerical Methods For Scientific & Engg 6e, New Age International (P) Ltd (2008), ISBN-13:978-8122420012.

- Kendall E. Atkinson, An Introduction to Numerical Analysis, Wiley; 2 edition, (January 17, 1989), ISBN-10: 0471624896 , ISBN-13: 978-0471624899.
- S. C. Chapra and Raymond P Canale, Numerical Methods for Engineers, Tata McGraw Hill, Indian Edition.
- James Scarborough, Numerical Mathematical Analysis, Oxford & IBH Publishing Co. Pvt. Ltd (1950), ISBN 10: 0009780021, ISBN-13:978-0009780021.
- C.F. Gerald and O.P. Wheatley, Applied Numerical Analysis, Addison Wesley; 7 edition (2003), ISBN-13:978-0321133045.

Additional Readings:

- S.S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt. Ltd. (2007), ISBN-13: 978-8120327610.
- Babu Ram, Numerical Methods, Pearson, ISBN 978-8-317-3221-2.
- P.Thangaraj, Computer Oriented Numerical Methods, PHI, ISBN 978-81-203-3539-4.

Note: The Examiners will set nine questions: first question will be short answer type (covering the entire syllabus) and another eight questions will be set taking two questions from each unit. Students will have to attempt five questions in all; first question will be compulsory and other four questions, selecting one from each unit. All questions will carry equal marks.

ECE-202	Data Structures & Algorithms						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**1**	**0**	**3.5**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of C basics, and basic algorithms using data structures such as searching and sorting, operations of linked lists and basics of trees and graphs.**						
Course Outcomes							
CO1	**Students will be able to recall 'C' basics and design basic algorithms using various data structures**						
CO2	**Students will be able to design implement various searching and sorting algorithms on arrays.**						
CO3	**Students will be able to use pointers to perform various operations of linked lists**						
CO4	**Students will be able to understand the basics of trees and Graphs.**						

Unit-I

Overview of 'C': History, Characters used in 'C", Data Types, 'C' Tokens, Structures of 'C' program, Operators and Expressions, Flow of Control, I/O functions, Arrays, Structures, user defined data types

Introduction: Overview, Concept of Data Structures, Design of suitable Algorithm, Algorithm analysis

Unit-II

Arrays - Searching and Sorting: Introduction, 1-D arrays - addressing an element in an array, array traversal, insertion and deletion, Multi-D arrays, representation of arrays in physical memory, application of arrays, Searching algorithms: linear search, binary search. Sorting algorithms: selection sort, insertions sort, bubble sort, shell sort, merge sort, radix sort (Algorithm and Analysis).

Stacks and Queues: Stacks operations, Applications of Stacks – Arithmetic operations using Infix to prefix and postfix notations, their conversion and evaluation, Queues operations, Circular, Priority queue and Deque.

Unit-III

Pointers: Introduction, Pointer variables, pointers and arrays, array of pointer, pointers and structures, Dynamic allocation

Linked Lists: Introduction, linked lists, operations on linked lists (Creation, Traversing, Searching, Insertion and Deletion), Circular and doubly linked list, Linked Stacks and Linked Queues, Comparison of sequential and linked storage.

Unit- IV

Trees: Binary Trees, representation of trees (Linear and linked), Traversal of binary trees. Types of binary trees: Expression tree, Binary search tree, Heap tree, threaded binary trees.

Graphs: Introduction, Graph terminology, various representations of Graphs, operations: Insertion, Deletion and traversal.

Text Books:

1. Data Structures using C by A. K. Sharma , Pearson Publication
2. Theory & Problems of Data Structures by Jr. Symour Lipschetz, Schaum's outline by TMH.

Reference Books:

1. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub
2. Data Structures and program design in C by Robert Kruse, PHI Expert Data Structures with C by R.B. Patel

Note: Question paper template will be provided to the paper setter.

ECE-204	Electronic Measurement and Instruments						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**0**	**0**	**4**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of Electronics Measurements like measurement of voltage, current & resistance etc.**						
Course Outcomes							
CO1	**Students will learn the techniques of measurement of resistance using different bridges**						
CO2	**AC Bridges & Voltage Indicating & Recording Devices will be introduced to the students**						
CO3	**Students will be able to recognize the functioning of different Analog & Digital Instruments**						
CO4	**Transducers & Data Acquisition Systems will be introduced to the students**						

Unit-I

Measurement and Error: Functional elements and generalized configuration of a measuring Instrument, Characteristics of instruments, errors in measurements and their statistical analysis.

Measurement of Resistance: Wheat stone bridge, Carey-Foster Bridge, Kelvin double bridge, Measurement of Insulation resistance.

Unit-II

A-C Bridges: Maxwell Inductance bridge. Maxwell Inductance Capacitance Bridge, Anderson's Bridge, Hay's Bridge, De-Sauty's Bridge, Schering's bridge and Wein's bridge.

Voltage Indicating and Recording Devices: Analog voltmeters and Potentiometers, Self balancing potentiometer and X-Y recorders, Galvanometers - Oscillographs, Cathode - Ray Oscilloscopes, Magnetic Tape Recorders.

Unit-III

Electronic Instruments: Wave analyzer, Distortion meter: Q-meter. Measurement of Op-Amp parameters.

Digital Instruments: Digital Indicating Instruments, Comparison with analog type, digital display methods, digital methods of time and frequency measurements, digital voltmeters.

Unit-IV

Transducers: Classification of Transducers, Strain Gauge, Displacement Transducers - Capacitive Transducers, LVDT, Piezo-electric Transducers, Temperature Transducers – resistance thermometer, Thermocouples and Thermistors, Liquid level measurement Low pressure (vacuum) measurement.

Data Acquisition Systems: A to D and D to A converters, Analog and Digital Data Acquisition Systems, Multiplexing, Spatial Encoders, Telemetry.

Text Book:

1. A Course in Electrical and Electronics Measurements and Instrumentation: A.K. Sawhney; Dhanpat Rai & Sons.

Reference Books:

1. Electronics Instrumentation and Measurement Techniques: Cooper W.D & Helfrick A.D.; PHI

Doeblin E.O., Measurement Systems: Application & Design, Mc Graw Hill.

Note: Question paper template will be provided to the paper setter.

ECE-206	Electromagnetic Theory						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**1**	**0**	**3.5**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of Electric & Magnetic Fields and make them understand the phenomenon of propagation of electromagnetic waves.**						
Course Outcomes							
CO1	**Basics of electrostatics including dielectric properties will be covered.**						
CO2	**Basics of magneto-statics and Maxwell's equations will be covered.**						
CO3	**Fundamentals of Uniform plane waves and their propagation in different mediums will be covered.**						
CO4	**Fundamentals of Transmission Lines and different modes of wave propagation in waveguides will be covered.**						

Unit-I

Electric Field and Current: Introduction to Vectors:Addition, Subtraction, Multiplication & Differentiation. Coordinate Systems: Rectangular, Cylinderical & Spherical. Coulomb's law. Electric Field Intensity, Electric Potential,Field of a Line Charge, Field of a Sheet of Charge, Electric Flux Density,Electric Dipole, Current Density, Continuity of Current, Gauss's Law and Applications, Electric Field Behaviour in Dielectrics, Boundary Conditions at Interface between Two Dielectrics, Method of Images,Capacitance of Two Wire Line, Poisson's and Laplace's Equations, Uniqueness Theorem.

Unit-II

Magnetic Field and Maxwell Equations: Biot - Savart Law. Ampere's law, Magnetic Vector potentials, Force on a moving charge, Differential Current Element, Force and Torque on a Closed Circuit, Magnetic Boundary Conditions, the Magnetic Circuit,Faraday's Law, Maxwell's Equations in Point and Integral form for Free space, Good Conductors & Lossy Dielectric for Sinusoidal Time Variations& Static Fields, Retarded potentials.

Unit-III

The Uniform Plane Wave: Plane Waves & its Properties, Wave Equation for Free Space and Conducting Medium, Propagation of Plane Waves in Lossy Dielectrics,Good Dieletrics& Good Conductors. The Poynting Vector and Power considerations, Skin Effect, Reflection of Uniform Plane Waves (Normal & Oblique Incidence).

Unit-IV

Transmission Lines and Waveguides: The Transmission Line Equations, Graphical Methods, Smith chart, Time-domain and Frequency- domain Analysis, Reflection in Transmission Lines, SWR. TE, TM, TEM waves, TE and TM modes in Rectangular and Circular Waveguides, Cut-off & Guided Wavelength, Wave Impedance and Characteristic Impedance, Dominant Modes, Power Flow in waveguides, Excitation of Waveguides, Dielectric Waveguides.

Text Books:

1. Hayt W H., Engineering Electromagnetics, Tata McGraw Hill, 6th Edition.

References Books:

1 Jordan E C & Balmain K G, Electromagnetic Waves and Radiating Systems, PHI.2 David K. Chang, Field and Waves Electromagnetics, Addison Wesley.

Note: Question paper template will be provided to the paper setter.

ECE-208	Analog Electronics						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**1**	**-**	**3.5**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of various models of BJT's and FET's, multistage amplifiers, concept of feedback and its topologies, oscillators and detail of operational amplifiers with its applications.**						
Course Outcomes							
CO1	**To understand the concept of various amplifiers using BJT and FET and various transistor models**						
CO2	**Describe the frequency response of multistage amplifiers and the detailed concept of feedback topologies.**						
CO3	**To understand the concept of Barkhausen criteria of oscillation and various RC and LC oscillators and their frequency of oscillation.**						
CO4	**To understand the concept of Operational amplifier and its various applications such as current mirror, Schmitt trigger and various op-amp parameters.**						

Unit -I

Amplifier Models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.

Unit -II

Transistor Frequency Response: High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues.

Feedback Topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.

Unit -III

Oscillators: Review of the basic concept, Barkhausen criterion for oscillators,type of RC oscillators : RC phase shift oscillator , Wien bridge oscillator , LC oscillators : Hartley oscillator, Collpit oscillator , Clapp oscillator ,555 Timer as a monostable and astable multivibrator.

Unit -IV

Op-Amp Applications: Schmitt trigger and its applications. Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load. Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OP-AMP design: design of differential amplifier for a given specification, design of gain stages and output stages.

Text Books:

1. Electronic Devices and Circuits by Millman and Halkias, McGraw Hills, New Delhi

Reference Books:

1. Operational Amplifiers and Linear Integrated Circuits by Ramakant A Gayakwad,PHI.
2. A.S. Sedra & K.C.Smith, Microelectronics Circuits, Oxford University Press
3. Robert L. Boylestad & Louis Nashelsky, Electronic Devices & Circuit Theory,Pearson

Note: Question paper template will be provided to the paper setter.

ECE-210	Computer Architecture &Organization						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of basic structure of computer hardware & software, Control & processor design and memory & system organisation.**						
Course Outcomes							
CO1	**To understand the concept of basics of computer hardware & software**						
CO2	**To understand the concept of control design & processor design**						
CO3	**To familiarize with the concept of various memory systems.**						
CO4	**To familiarize with the concept of system organisation.**						

Unit-I

Basic Structure of Computer Hardware and Software: Introduction to basic computer architecture, register transfer, bus and memory transfers, arithmetic, logic and shift micro operations.

Central Processing Unit: Introduction, general register organization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, RISC, Macros and Subroutines.

Unit-II

Control Design: Micro programmed control, control memory, address sequencing, micro program example, design of control unit, Hardwired Control: design methods, Multiplier Control Unit, CPU Control unit.

Processor Design: Decimal arithmetic unit – BCD adder, BCD subtraction, decimal arithmetic operations, ALU design, Forms of Parallel processing classification of Parallel structures, Array Processors, Structure of general purpose Multiprocessors.

Unit-III

Memory Organization:

Memory hierarchy, main memory, auxillary memory, associative memory,cache memory, virtual memory, memory management, hardware multiprocessor architectures and their characteristics, interconnection structures, Random access memories: semiconductor RAMS, Serial – access Memories – Memory organization, Main Memory Allocation.

Unit-IV

System Organization:

Pipeline and Vector Processing: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, RISC pipeline, vector processing, array processors, Input-output Organisation: Peripheral devices, input-output interface, asynchronous data transfer, modes of transfer, priority interrupt,DMA, IOP serial communication.

Text Books:

1. Morris Mano, “Computer System Architecture”, PHI.
2. J.F. Heys, “Computer Organization and Architecture”, TMH.

Reference Books:

1. J. Hennessy and D. Patterson, Computer Architecture A Quantitative Approach, 3rd Ed, Morgan Kaufmann, 2002.

Note: Question paper template will be provided to the paper setter.

E- 212	Data Structures Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical (Major Test)**	**Practical (Minor Test)**	**Total**	**Time**
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3 Hr.**

Course Outcomes	
CO1	**Students will be able to recall 'C' basics and design basic algorithms using various data structures**
CO2	**Students will be able to design implement various searching and sorting algorithms on arrays.**
CO3	**Students will be able to use pointers to perform various operations of linked lists**
CO4	**Students will be able to understand the basics of trees and Graphs.**

List of Experiments:

1. Write a program to print a 2D array.
2. Write a program to find the factorial of an n^{th} number using recursion.
3. Write a program to print Fibonacci sequence.
4. Using clock() function of time.h header file, compare the timings of linear search and binary search for an 1D array of 1000 elements
5. Compare the timings of the following sorting algorithm
    a. Bubble sort
    b. Selection sort
    c. Insertion sort
6. Implement stacks using arrays for the following user defined functions
    a. Size of stack
    b. Number of elements in the stack
    c. Pop with underflow check
    d. Push with overflow check
7. Implement queues using arrays for the following user defined functions
    a. Size of queue
    b. Number of elements in the queue
    c. Insert an element with overflow check
    d. Delete an element with underflow check
8. Implement linked list for the following user defined functions
    a. Create a node and Insert an element
    b. Delete an element and its node
    c. Find the location of a given value
    d. Print the list in forward or reverse order
9. Traverse a tree and print the elements in
    a. Preorder
    b. Post order
    c. In order
10. Traverse a graph and print the elements using
    a. Depth first search
    b. Breadth first search

ECE-214	Electronic Measurement and Instruments Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical (Major Test)**	**Practical (Minor Test)**	**Total**	**Time**
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3 Hr.**
Course Outcomes							
CO1	**To measure the unknown inductance and capacitance using various AC bridges.**						
CO2	**To measure the unknown frequency using different frequency bridges.**						
CO3	**To understand the concept of caliberation of energy meter and B-H curve of different magnetic materials.**						
CO4	**To understand the concept conversion of voltmeter into ammeter using potentiometer.**						

List of Experiments:

1. To measure the unknown Inductance in terms of capacitance and resistance by using Maxwell's Inductance bridge.
2. To measure unknown Inductance using Hay's bridge.
3. To measure unknown capacitance of small capacitors by using Schering's bridge.
4. To measure 3-phase power with 2-Wattmeter method for balanced and unbalanced bridge.
5. To measure unknown capacitance using De-Sauty's bridge.
6. To measure unknown frequency using Wein's frequency bridge.
7. To measure unknown low resistance by Kelvin's Double bridge.
8. To test the soil resistance using Meggar (Ohm meter).
9. To calibrate Energy meter using standard Energy meter.
10. To plot the B-H curve of different magnetic materials.
11. To calibrate the Voltmeter using Crompton Potentiometer.
12. To convert the Voltmeter into Ammeter using Potentiometer.
13. Insulation testing of cables using Digital Insulation Tester.

ECE-216	Analog Electronics Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical (Major Test)**	**Practical (Minor Test)**	**Total**	**Time**
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3 Hr.**
Course Outcomes							
CO1	**To design and calculate the gain , frequency response etc of the various configuration of transistor amplifier.**						
CO2	**Describe the frequency response of and test the performance of various LC and RC oscillators.**						
CO3	**To understand and design the various applications of 555 timer such as astable and monostable multivibrator.**						

List of Experiments:

1. To Design a simple common emitter (CE) amplifier Circuit using BJT and find its gain and frequency response.

2. To Design a differential amplifier using BJT and calculate its gain and frequency response

3. To design RC coupled Single stage BJT amplifier and determination of the gain ,frequency response, input and output impedances.

4. To design a BJT Emitter follower and determination of the gain, input and output impedances .

5. To design and test the performance of BJT-RC Phase shift Oscillator for $f0 \leq 10$ KHz.

6. To design and test the performance of BJT – Hartley Oscillators for RF range $f0 \geq 100$KHz.

7. To design and test the performance of BJT – Colpitt Oscillators for RF range $f0 \geq 100$KHz.

8. To design an astable multivibrator using 555 timer.

9. To design a monostable multivibrator using 555 timer.

10. To design Schmitt trigger using op-amp and verify its operational characteristics.

MPC-202	Energy Studies (B.Tech All Branches Semester III/IV)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**0**	**75**	**25**	**100**	**3**
Purpose	**To make the students conversant with the basics concepts and conversion of various form of Energy**						
Course Outcomes							
CO1	**An overview about Energy , Energy Management, Audit and tariffs**						
CO2	**Understand the Layout and working of Conventional Power Plants**						
CO3	**Understand the Layout and working of Non Conventional Power Plants**						
CO4	**To understand the role of Energy in Economic development and Energy Scenario in India**						

UNIT-I

Introduction: Types of energy, Conversion of various forms of energy, Conventional and Non-conventional sources, Need for Non-Conventional Energy based power generation.
Energy Management: General Principles of Energy Management, Energy Management Strategy.
Energy Audit & Tariffs: Need, Types, Methodology and Approach.

UNIT-II

Conventional Energy sources: Selection of site**,** working of Thermal, Hydro, Nuclear and Diesel power plants and their schematic diagrams & their comparative advantages- disadvantages.

UNIT-III

Non Conventional Energy sources: Basicprinciple, site selection and power plant layout of Solar energy, photovoltaic technologies, PV Systems and their components, power plant layout of Wind energy, layout of Bio energy plants ,Geothermal energy plants and tidal energy plants.

UNIT-IV

Energy Scenario: Lay out of power system, Role of Energy in Economic development, energy demand, availability and consumption, Commercial and Non-commercial energy, Indian energy scenario, long term energy scenario, energy pricing, energy sector reforms in India, energy strategy for the future.

Text Books:

1. Energy Studies-Wiley and Dream tech India
2. Soni, Gupta, Bhatnagar: Electrical Power Systems – DhanpatRai& Sons
3. NEDCAP: Non Conventional Energy Guide Lines
4. G.D. Roy :Non conventional energy sources
5. B H Khan :Non Conventional energy resources - McGraw Hill
6. Meinel A B and Meinal M P,Addison :Applie
7.
8. d Solar Energy- Wesley Publications
7. George Sutton :Direct Energy Conversion - McGraw

Bachelor of Technology (Electronics & Communication Engineering)
Scheme of Studies/Examination
Semester V

S. No.	Course No.	Subject	L:T:P	Hours/Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical (Major Test)	Total	
1	ECE - 301	Microprocessors & Interfacing	3:1:0	4	3.5	75	25	0	100	3
2	HS-303	Business Intelligence & Enterpreneurship	4:0:0	4	4	75	25	0	100	3
3	ECE-303	Antenna & Wave Propgation	3:1:0	4	3.5	75	25	0	100	3
4	ECE-305	VLSI Technology	4:0:0	4	4	75	25	0	100	3
5	CSE-309	Essentials of Information Theory	4:0:0	4	4	75	25	0	100	3
6	ECE-307	Control Systems Engg	4:1:0	5	4.5	75	25	0	100	3
7	ECE-309	Microprocessors & Interfacing Lab	0:0:3	3	1.5	0	40	60	100	3
8	ECE-311	Design Automation Lab	0:0:3	3	1.5	0	40	60	100	3
9	ECE-313	Antenna & Wave Propagation Lab	0:0:3	3	1.5	0	40	60	100	3
10	ECE-315*	Personality & Soft Skills Development	2:0:0	2	2	0	100	0	100	3
		Total		**36**	**30**	**450**	**370**	**180**	**1000**	

* The student will be evaluated on the basis of technical seminar and technical writing/reading skills for 1 credit each

Semester VI

S. No.	Course No.	Subject	L:T:P	Hours/Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical (Major Test)	Total	
1	ECE-302	Digital Signal Processing	4:1:0	5	4.5	75	25	0	100	3
2	ECE- 304	Digital Design Using Verilog	3:1:0	4	3.5	75	25	0	100	3
3	ECE-306	Digital Communication	4:1:0	5	4.5	75	25	0	100	3
3	HS-302	Fundamentals of Management	4:0:0	4	4	75	25	0	100	3
5	ECE-308	Computer Communication Network	4:0:0	4	4	75	25	0	100	3
6	ECE-310	Digital Signal Processing lab	0:0:3	3	1.5	0	40	60	100	3
7	ECE- 312	Digital Design Using Verilog Lab	0:0:3	3	1.5	0	40	60	100	3
8	ECE-314	Digital Communication lab	0:0:3	3	1.5	0	40	60	100	3
9	ECE- 316*	Personality & Soft Skills Development 2	2:0:0	2	2	0	100	0	100	3
		Total		**33**	**27**	**375**	**345**	**180**	**900**	

* The student will be evaluated on the basis of technical seminar and technical group discussions for 1 credit each.

ECE -301	Microprocessor & Interfacing						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**1**	**-**	**3.5**	**75**	**25**	**100**	**3**
Purpose	**To learn the architecture and programming of Intel family microprocessors and its interfacing.**						
Course Outcomes							
CO 1	**To study the Architecture of 8085 microprocessors**						
CO 2	**To learn the architecture 8086 Microprocessor and its interfacing to memories**						
CO 3	**To learn the instruction set of 8086 Microprocessor and assembly language programming of 8086 Microprocessor.**						
CO 4	**To learn interfacing of interrupts, basic I/O and DMA with 8086 Microprocessor**						

Unit I

8085 CPU Architecture: Evolution of Microprocessor, Introduction to 8085 - 8085 architecture Pin Details - Addressing Modes -Instruction Set and Assembler Directives, Instruction Timing Diagram.

Unit -II

8086 CPU Architecture: 8086 Block diagram; description of data registers, address registers; pointer and index registers, PSW, Queue, BIU and EU. 8086 Pin diagram description, Generating 8086 CLK and reset signals using 8284. WAIT state generation. Microprocessor BUS types and buffering techniques, 8086 minimum mode and maximum mode CPU module. MAIN MEMORY SYSTEM DESIGN: Memory devices, 8086 CPU Read/Write timing diagrams in minimum mode and maximum mode. Address decoding techniques. Interfacing SRAMS; ROMS/PROMS, Interfacing and refreshing DRAMS.

Unit -III

8086 Instruction Set: Instruction formats, addressing modes, Data transfer instructions, string instructions, logical instructions, arithmetic instructions, transfer of control instructions; process control instructions; Assembler directives.

8086 PROGRAMMING TECHNIQUES: Writing assembly Language programs for logical processing, arithmetic processing, timing delays; loops, data conversions.

Unit -IV

Basic I/O Interface: Parallel and Serial I/O Port design and address decoding. Memory mapped I/O Vs Isolated I/O Intel's 8255 and 8251- description and interfacing with 8086. ADCs and DACs, - types, operation and interfacing with 8086. Interfacing Keyboards, alphanumeric displays, multiplexed displays, and stepper motor, optical encoder with 8086.

Interrrupts and DMA: 8086 Interrupt mechanism; interrupt types and interrupt vector table. Applications of interrupts, Intel's 8259. DMA operation. Intel's 8237.

Text Books:

- Barry B. Brey, "The Intel Microprocessor8086/8088, 80186", Pearson Education, Eighth Edition, 2009
- D.V. Hall, Microprocessors and Interfacing, McGraw Hill 2nd ed.

Reference Books:

- Liu, Gibson, "Microcomputer Systems: The 8086/88 Family", 2nd Edition, PHI,2005
- Kenneth Ayala, "The 8086 Microprocessor: Programming & Interfacing the PC", Cengage Learning, Indian Edition, 2008
- Kip Irvine, "Assembly language for IBM PC", PHI, 2nd Edition, 1993
- Peter Abel, "Assembly language programming", Pearson Edu,5th Edition,2002
- Uffenback, "The 8086 Family Design" PHI, 2nd Edition.
- Walter A Triebel and Avtar Singh; The 8088 and 8086 Microprocessors, Programming, Interfacing, Software, Hardware and Applications, Fourth Edition, Pearson Education.

HS-303	Business Intelligence & Entrepreneurship						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**-**	**-**	**4**	**75**	**25**	**100**	**3**
Course Outcomes							
CO 1	**Students will be able understand who the entrepreneurs are and what competences needed to become an Entrepreneur**						
CO 2	**Students will be able understand insights into the management, opportunity search, identification of a Product; market feasibility studies; project finalization etc. required for small business enterprises.**						
CO 3	**Students can be able to write a report and do oral presentation on the topics such as product identification, business idea, export marketing etc.**						
CO 4	**Students be able to know the different financial and other assistance available for the establishing small industrial units.**						

Unit -I

Entrepreneurship: Concept and Definitions; Entrepreneurship and Economic Development; Classification and Types of Entrepreneurs; Entrepreneurial Competencies; Factor Affecting Entrepreneurial Growth – Economic, Non-Economic Factors; EDP Programmes; Entrepreneurial Training; Traits/Qualities of an Entrepreneurs; Entrepreneur; Manager Vs. Entrepreneur.

Unit -II

Opportunity / Identification and Product Selection: Entrepreneurial Opportunity Search and Identification; Criteria to Select a Product; Conducting Feasibility Studies; Project Finalization; Sources of Information.

Unit -III

Small Enterprises and Enterprise Launching Formalities : Definition of Small Scale; Rationale; Objective; Scope; Role of SSI in Economic Development of India; SSI; Registration; NOC from Pollution Board; Machinery and Equipment Selection; Project Report Preparation; Specimen of Project Report; Project Planning and Scheduling using Networking Techniques of PERT / CPM; Methods of Project Appraisal.

Unit -IV

Role of Support Institutions and Management of Small Business : Director of Industries; DIC; SIDO; SIDBI; Small Industries Development Corporation (SIDC); SISI; NSIC; NISBUD; State Financial Corporation SIC; Marketing Management; Production Management; Finance Management; Human Resource Management; Export Marketing; Case Studies-At least one in whole course.

Text Books:

1. Small-Scale Industries and Entrepreneurship. Himalaya Publishing House, Delhi -Desai, Vasant, 2003.
2. Entrepreneurship Management -Cynthia, Kaulgud, Aruna, Vikas Publishing House, Delhi, 2003.
3. Entrepreneurship Ideas in Action- L. Greene, Thomson Asia Pvt. Ltd., Singapore, 2004.

ECE-303	Antenna & Wave Propgation						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**1**	**0**	**3.5**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the performance parameters of antenna, methods of analysis of antenna, antenna used for various applications and different ways of propagating the signal.**						
Course Outcomes							
CO1	**To understand the performance parameters of antenna.**						
CO2	**Understanding the mechanism of calculating the radiated fields of antenna and to calculate the radiated fields of some common Antennas.**						
CO3	**To understand the requirements, principals, and structures for an antenna to be broadband.**						
CO4	**To understand the different ways of signal propagation.**						

Unit – I

Basic Principles and Definitions: Retarded vector and scalar potentials. Radiation and induction fields. Radiation from elementary dipole (Hertzian dipole, short dipole, Linear current distribution), half wave dipole, Antenna parameters : Radiation resistance, Radiation pattern, Beam width, Gain, Directivity, Effective height, Effective aperture, Bandwidth and Antenna Temperature.

Unit – II

Radiating Wire Structures and Antenna Arrays: Folded dipole , Monopole, Biconical Antenna, Loop Antenna, Helical Antenna. Principle of pattern multiplication, Broadside arrays, Endfire arrays, Array pattern synthesis, Uniform Array, Binomial Array, Chebyshev Array, Antennas for receiving and transmitting TV Signals e.g. Yagi-Uda and Turnstile Antennas.

Unit – III

Broadband and Frequency Independent Antennas : Broadband Antennas. The frequency independent concept : Rumsey's principle, Frequency independent planar log spiral antenna, Frequency independent conical spiral antenna and Log periodic antenna.

Patch Antenna: Advantages and basic Configurations of Patch antenna. Different feeding techniques of Patch antenna. Method to analyze Patch antenna

Unit – IV

Propagation of Radio Waves : Different modes of propagation, Ground waves, Space waves, Surface waves and Tropospheric waves, Ionosphere, Wave propagation in the ionosphere, critical frequency, Maximum Usable Frequency (MUF), Skip distance, Virtual height, Radio noise of terrestrial and extra terrestrial origin. Multipath fading of radio waves.

Text Books:

1. A.R.Harish, M.Sachidananda, Antenna and Wave Propagation, Oxford University Press.
2. G.S.N.Raju, Antenna and Wave Propagation, Pearson.

Reference Books:

1. ConstantineA.Balanis, Antenna Theory Analysis and Design, John wiley & Sons.
2. John D. Kraus, Ronald JMarhefka, Ahmad S Khan, Antennas for all applications, McGraw Hill.
3.

Note: Question paper template will be provided to the paper setter.

ECE-305	VLSI Technology (5th Semester)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**-**	**0**	**4**	**75**	**25**	**100**	**3 Hrs**
Course Outcomes							
CO1	**Students will be able estimate oxide thickness, growth rate, etch rate, deposition rate, and perform pattern etching etc. using knowledge of mathematics, science, engineering and practices.**						
CO2	**Students can design and conduct experiments such as oxidation, metallization and analyze growth / deposition rate, thickness etc.**						
CO3	**Shall be able to understand system, design such as CVD reactor, PVD chamber etc.**						
CO4	**Understanding of professional and ethical responsibility while working in clean rooms.**						
CO5	**Communicate effectively: Students can write an engineering report on the topic assigned and give an effective oral presentation.**						

Unit -I

Clean Room Technology - Clean room concept – Growth of single crystal Si, surface contamination, cleaning & etching, cleaning of p-type & n-type Si-wafer by solvent method & RCA cleaning, Fabrication process of p-n diode- (10hrs)

Unit -II

Oxidation – Growth mechanism and kinetic oxidation, oxidation techniques and systems, oxide properties, oxide induced defects, charactrisation of oxide films, Use of thermal oxide and CVD oxide; growth and properties of dry and wet oxide, dopant distribution, oxide quality, Isolation Techniques with reference to VLSI circuits- (10hrs)

Unit -III

Solid State Diffusion – Fick's equation, atomic diffusion mechanisms, measurement techniques, diffusion in polysilicon and silicon di-oxide diffusion systems. Ion implantation – Range theory, Equipments, annealing, shallow junction, high energy implementation- (10hrs)

Unit -IV

Mask making, E-beam writing, Lithography – Optical lithography, Lift-off technique, Some Advanced lithographic techniques, Physical Vapour Deposition – APCVD, Plasma CVD, MOCVD. Metallisation - Different types of metallisation, uses & desired properties, Fabrication process of Schottky diodes, VLSI Process integration and NMOS fabrication process – (10hrs)

Text Book:

1. Semiconductor Devices Physics and Technology, Author: Sze, S.M.; Notes: Wiley, 1985
2. VLSI Technology, Author: Sze, S.M.; Notes: Wiley, 1985;
3. An Introduction to Semiconductor Microtechnology, Author: Morgan, D.V., and Board;
4. The National Technology Roadmap for Semiconductors industry.

ECE-307	Control System Engineering (5th Semester)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**1**	**0**	**4.5**	**75**	**25**	**100**	**3 Hrs**
Purpose	**The purpose of this course is to create awareness about the various types of control systems with the techniques to analyze them so that the learner is able to mathematically design and evaluate the conditions for which a control system can provide stable output with improved performance.**						
Course Outcomes							
CO1	**Learner will be able to design and simplify the mathematical and graphical models of a control system through block diagram and signal flow graph method.**						
CO2	**Learner can evaluate the conditions for which a system can work under stable conditions in time domain.**						
CO3	**Learner will know about easier graphically methods to evaluate the conditions of stability in frequency domain.**						
CO4	**Learner will able to apply the compensation technique using state variable approach to covert an unstable system into a stable system under certain conditions.**						

Unit-I

Introduction: The control system-open loop & closed loop, servomechanism, stepper motor. Mathematical Models of Physical Systems: Differential equation of physical systems, transfer function, block diagram algebra, signal flow-graphs, Mason's formula & its application. Feedback Characteristics of Control Systems: Feedback and non-feedback systems, Effects of feedback on sensitivity (to parameter variations), stability, overall gain etc.

Unit-II

Time Response Analysis: Standard test signals, time response of first order and second order systems, steady-state errors and error constants, design specification of second-order- systems. Stability:The concept of stability ,necessary conditions for stability, Hurwitz stability criterion, Routh stability criterion, Relative stability analysis. The Root Locus Technique: The Root locus concept, construction /development of root loci for various systems, stability considerations.

Unit-III

Frequency Response & Stability Analysis: Correlation between time and frequency response, Polar Plots, Nyquist plots, Bode Plots, Nyquist stability criterion, Gain margin & Phase margin, relative stability using Nyquist Criterion, frequency response specifications.

UNIT-IV

Compensation of Control Systems: Necessity of compensation, Phase lag compensation, phase lead compensation, phase lag lead compensation, feedback compensation. State Variable Analysis: Concept of state,state variable and state model, state models for linear continuous time systems, diagonalization solution of state equations, concept of controllability and observability.

Text Book: *Control System Engg.: I. J. Nagrath & M.Gopal; New Age India.*

Reference Books:

1.Automatic Control Systems: B.C. Kuo; PHI.
2.Modern Control Engg: K. Ogata; PHI.
3.Control Systems: Principles & Designing : Madan Gopal; TMH.

Note: Question paper template will be provided to the paper setter.

ECE-309	Microprocessor Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
0	**0**	**3**	**1.5**	**40**	**60**	**100**	**3 Hour**
Purpose	**Write the efficient Assembly Language Program for different problem statements and implement different system interfacing.**						
Course Outcomes							
CO 1	**Understanding different steps to develop program such as Problem definition, Analysis, Design of logic, Coding, Testing, Maintenance (Modifications, error corrections, making changes etc.)**						
CO 2	**To be able to apply different logics to solve given problem.**						
CO 3	**To be able to write program using different implementations for the same problem**						
CO 4	**Use of programming language constructs in program implementation**						

Before starting with the experiments, teacher should make the students conversant with the following essential theoretical concepts.

A. i) Programming Model of Intel's 8086.
   ii) Addressing Modes of Intel's 8086.
   iii) struction formats of Intel's 8086
B. Instruction set of Intel's 8086.
C. Assembler (TASM), and Debugger.

LIST OF EXPERIMENTS: (Verification of atleast 3 experiments may also be done using TASM)

I a) Familiarization with 8086 Trainer Kit.
   b) Familiarization with Digital I/O, ADC and DAC Cards.
   c) Familiarization with Turbo Assembler and Debugger S/Ws.

II Write a program to arrange block of data in
   i) ascending and (ii) descending order.

III Write a program to find out any power of a number such that $Z = X^N$.
   Where N is programmable and X is unsigned number.

IV Write a program to generate.
   i) Sine Waveform (ii) Ramp Waveform (iii) Triangular Waveform Using DAC Card.

V Write a program to measure frequency/Time period of the following functions.
   (i) Sine Waveform (ii) Square Waveform (iii) Triangular Waveform using ADC Card.

VI Write a program to increase, decrease the speed of a stepper motor and reverse its direction of rotation using stepper motor controller card.

VII Write a programmable delay routine to cause a minimum delay = 2MS and a maximum delay = 20 minutes in the increments of 2 MS

VIII Write a program that takes any two numbers as Input from the user through the input device (Keyboard) & Prints their sum on the standard output device (Screen).

IX Write a program that takes any two numbers as Input from the user through the input device (Keyboard) & Prints their sum on the standard output device (Screen) by giving appropriate messages to the user

X Write a program that initializes 100 positions in an array and loads them with 0. XI Write a program that prints a Blinking character in the middle of the screen.

XII Write a program that accepts a number from the user through the input device (Keyboard), calculates its factorial and prints the result on the screen.

ECE-311	Design Automation Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical (Major Test)**	**Practical (Minor Test)**	**Total**	**Time**
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3 Hr.**
Course Outcomes							
CO1	**To familiarize the students with circuit simulation tool (Multisim).**						
CO2	**Describe the Digital and analog aspects of the simulation tool.**						
CO3	**To familiarize with the programming aspects of the virtual microcontrollers using inbuilt compiler and debugger.**						
CO4	**To familiarize with the hardware associated with the simulating tool (NI-ELVIS).**						

List of Experiments:

1) Introduction to Multisim and associated GUI (Graphical User Interface) modules.
2) To design and study the volt-ampere characteristics of PN-Diode.
3) To design a virtual bridge rectifier.
4) To design a virtual Schmitt Trigger using Operational Amplifier.
5) To design a virtual low pass filter and study its phase and frequency response.
6) To design a virtual monostable multivibrator using 555 timer.
7) To design a virtual Weighted Average DAC.
8) To program and simulate the virtual MCU (Micro-Controller Unit) for LCD display.
9) Introduction to NI-ELVIS board.
10) To design on board circuit for Differentiator and Integrator and taking the output on screen.
11) To design on board circuit for Shift Register using associated peripherals and considering the output on screen.
12) To design the virtual single toned amplitude modulation circuit and analyze the spectrum of the output.

ECE-313	Antenna & Wave Propagation Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical (Major Test)**	**Practical (Minor Test)**	**Total**	**Time**
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3 Hr.**
Course Outcomes							
CO1	**To understand the basic concepts of HFSS used for 3D simulations**						
CO2	**To design various types of antenna**						
CO3	**To analyze various types of antennas**						
CO3	**To Find performance parameters of antenna**						

Antenna Designing Lab

(1) To study and analyze the characteristic of monopole antenna.

(2) To study and analyze the characteristic of Dipole antenna.

(3) To study and analyze the characteristic of quarter wave Dipole.

(4) To study and analyze the characteristic of Turnstile antenna.

(5) To study and analyze the characteristic of different Patch antenna.

(6) To study and analyze the characteristic of square loop antenna.

(7) To study and analyze the characteristic of array of square loop antenna.

(8) To study and analyze the characteristic of rectangular Waveguide.

(9) To study and analyze the characteristic of circular Waveguide.

(10) To study and analyze the characteristic of circulator.

HS-302	FUNDAMENTALS OF MANAGEMENT (B Tech All Branches Semester III/IV)						
Lecture	**Tutorial**	**Practical**	**Credits**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**To make the students conversant with the basics concepts in management thereby leading to nurturing their managerial skills**						
Course Outcomes							
CO1	**An overview about management as a discipline and its evolution**						
CO2	**Understand the concept and importance of planning and organizing in an organization**						
CO3	**Enabling the students to know about the importance of hiring and guiding the workforce by understanding the concept of leadership and communication in detail**						
CO4	**To understand the concept and techniques of controlling and new trends in management**						

UNIT-1

1. Introduction to Management: Meaning, Definition, nature, importance & Functions, Management as Art, Science & Profession- Management as social System, Concepts of management-Administration

2. Evolution of Management Thought: Development of Management Thought- Scientific management, Administrative Theory of Management, Bureaucratic Organization, Behavioral approach (Neo Classical Theory): Human Relations Movement; Behavioral Science approach; Modern approach to management – Systems approach and contingency approach.

UNIT-II

3. Planning: nature, purpose and functions, types of plans, planning process, Strategies and Policies: Concept of Corporate Strategy, formulation of strategy, Types of strategies, Management by objectives (MBO), SWOT analysis, Types of policies, principles of formulation of policies

4. Organizing: nature, importance, process, organization structure: Line and Staff organization, Delegation of Authority and responsibility, Centralization and Decentralization, Decision Making Process , Decision Making Models, Departmentalization: Concept and Types (Project and Matrix), formal & informal organizations

UNIT-III

5. Staffing: concept, process, features; manpower planning; Job Analysis: concept and process; Recruitment and selection: concept, process, sources of recruitment; performance appraisal, training and development

6. Directing: Communication- nature, process, formal and informal, barriers to Effective Communication, Theories of motivation-Maslow, Herzberg, McGregor ; Leadership – concept and theories, Managerial Grid, Situational Leadership. Transactional and Transformational Leadership.

UNIT-IV

7. Controlling: concept, process, types, barriers to controlling, controlling Techniques: budgetary control, Return on investment, Management information system-MIS , TQM-Total Quality Management, Network Analysis- PERT and CPM.

8. Recent Trends in Management: -

Social Responsibility of Management–Management of Crisis, Total Quality Management, Stress Management, ., Concept of Corporate Social Responsibility (CSR) and business ethics.
Functional aspects of business: Conceptual framework of functional areas of management- Finance; Marketing and Human Resources

Text books

1. Management Concepts - Robbins, S.P; Pearson Education India
2. Principles of Management - Koontz &O'Donnel; (McGraw Hill)

Recommended books

1. *Business Organization and Management* – Basu ; Tata McGraw Hill
2. Management and OB-- Mullins; Pearson Education
3. Essentials of Management – Koontz, Tata McGraw-Hill
4. Management Theory and Practice – Gupta, C.B; Sultan Chand and Sons, new Delhi
5. Prasad, Lallan and S.S. Gulshan. *Management Principles and Practices.* S. Chand & Co. Ltd., New Delhi.
6. Chhabra, T.N. *Principles and Practice of Management*. DhanpatRai& Co., Delhi.
7. Organizational behavior – Robins Stephen P; PHI.

ECE-302	Digital Signal Processing						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**-**	**-**	**3.5**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the basic concepts of Digital Signal Processing, Z-Transform, Fourier transform Designing of FIR and IIR Filters.**						
Course Outcomes							
CO1	**Introduce to Z-Transform, Fourier Transform and their properties.**						
CO2	**To understand the basic concepts of Frequency Domain sampling and implementation of Discrete Time Systems.**						
CO3	**Familiarization with the Design of FIR Filters.**						
CO4	**Familiarization with the Design of IIR Filters.**						

Unit-I

Discrete Transforms: Z- transform and its properties, Inversion of Z-transform, One sided Z-transform and solution of differential equations. Analysis of LTI systems in Z-domain, causality, stability, schur-cohn stability test, relationship between Z-transform and Fourier transform.
Frequency Selective Filters: All pass filters, minimum-phase, maximum-phase and mixed-phase systems, Goertzel algorithm, Chirp Z-transform, applications of Z-Transform.

Unit-II

Frequency Domain Sampling and DFT: Properties of DFT, Linear filtering using DFT, Frequency analysis of signals using DFT, radix 2, radix-4, computation of DFT of real sequences.
Implementation of Discrete Time Systems: Direct form, cascade form, frequency sampling and lattice structures for FIR systems. Direct forms, transposed form, cascade form parallel form. Lattice and lattice ladder structures for IIR systems.

Unit-III

Design of FIR Filters (Part A): Characteristics of practical frequency selective filters. Filters design specifications peak pass band ripple, minimum stop band attenuation. Four types of FIR filters, alternation theorem.
(Part B): Design of FIR filters using windows, Kaiser window method comparison of design methods for FIR filters, Gibbs phenomenon, design of FIR filters by frequency sampling method, design of optimum equiripple FIR filters.

Unit-IV

Design of IIR Filters (Part A): Design of IIR filters from analog filters, Design by approximation of derivatives, Impulse Invariance Method, Bilinear Transformation Method, Least Square Methods.
(Part B) : Characteristics of Butterworth, Chebyshev and Elliptical analog filters, Design of IIR filters, Frequency transformation, , design of IIR filters in frequency domain.

NOTE:

Text Books:

1. John G. Proakis, Digital Signal Processing, PHI

Reference Books:

1. S. K. Mitra, Digital Signal Processing , TMH
2. Rabiner and Gold, Digital Signal Processing, PHI
3. Salivahan, Digital Signal Processing , TMH
4. Digital Signal Processing: Alon V. Oppenhelm;PHI

Note: Question paper template will be provided to the paper setter.

ECE-306	Digital Communication						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**1**	**0**	**5**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes							
CO1	**Student will be able to perform coding of various sources.**						
CO2	**Student will be able to analyze various basic digital pulse modulation schemes.**						
CO3	**Student will be able to understand base band pulse transmission.**						
CO4	**Student will be able to analyze various basic digital modulation techniques.**						

Unit – I

Information Theory: Introduction, Entropy, Huffman Coding, Channel Capacity,Channel Coding, Linear Block Codes, Matrix Description, Syndrome Decoding, Hamming Code, Cyclic Code,Convolution Code generation and Viterbi decoding.

Unit – II

Pulse Modulation System: Model of digital communication systems, Sampling theorem for baseband and bandpass signals: natural sampling, Flat top sampling, Signal recovery & holding, Quantization of signal, Quantization error, Source coding & companding, Pulse code modulation (PCM), Noise in PCM systems, Differential pulse code modulation (DPCM), Adaptive pulse code modulation (ADPCM), Delta modulation (DM), Comparison of PCM, DPCM and DM, Adaptive delta modulation, Quantization noise, Time division multiplexed systems (T & E type systems), Calculation of O/P signal power, The effect of thermal noise, O/P signal to noise ratio in PCM, Quantization noise in delta modulation, The O/P signal to quantization noise ratio in delta modulation, O/P signal to noise ratio in delta modulation

Unit – III

Base Band Pulse Transmission: Matched filter and its properties average probability of symbol error in binary enclosed PCM receiver, Intersymbol interference, Nyquist criterion for distortionless base band binary transmission, ideal Nyquist channel raised cosine spectrum, correlative level coding Duo binary signalling, tapped delay line equalization, adaptive equalization, LMS algorithm, Eye pattern.

Unit – IV

Digital Pass Band Transmission: Pass band transmission model; gram Schmidt orthogonalization procedure, geometric Interpretation of signals, Response of bank of correlaters to noise input, detection of known signal in noise, Hierarchy of digital modulation techniques, BPSK, DPSK, DEPSK, QPSK, systems; ASK, FSK, QASK, Many FSK, MSK, Many QAM, Signal space diagram and spectra of the above systems, effect of intersymbol interference, bit
symbol error probabilities, synchronization.

Text Books:

1. Proakis John G., Digital Communication System, McGraw, (2000) 4th ed.
2. Simon Haykein, Digital Communication Systems, Wiley India edition, (2009) 2nd ed.
3. Information Theory,Coding and Cryptography, Ranjan Bose, TMH, II edition, 2007

Reference Books :

1. Taub & Schilling, Principles of Communication Systems, McGraw Hill Publications, (1998) 2nd ed.
2. Simon Haykin, Communication Systems, John Wiley Publication, 3rd ed.
3. Sklar, Digital Communications, Prentice Hall-PTR, (2001) 2nd ed.
4. Lathi B. P., Modern Analog and Digital Communication, , Oxford University Press, (1998) 3rd
5. R N Mutagi, Digital Communication: Theory, Techniques and Applications, Oxford University Press, 2nd ed.

ECE-310	Digital Signal Processing Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical (Major Test)**	**Practical (Minor Test)**	**Total**	**Time**
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3 Hr.**

Course Outcomes	
CO1	**Introduction to MATLAB.**
CO2	**Study of different function and signals of DSP.**
CO3	**Study of DFT and DTFT with their properties.**
CO4	**Study of z-transform and its properties.**

List of Experiments:

1. Introduction to MATLAB.
2. Write a program to plot the Sine wave, cosine wave and Tangent wave.
3. Write a program to plot the following functions: a)impulse function b)unit step c)unit ramp d) exponential e) sinusoidal
4. Write a program to plot the convolution and multiplication of two signals.
5. Define a function to compute DTFT of a finite length signal. Plot the magnitude and phase plots using subplots.
6. Verify the Symmetry, time shifting and modulating properties of DTFT with a rectangular pulse.
7. Study the aliasing effect by using a Sinusoidal Signal. Show the plots of' continuous time Signal. Sampled Signal and reconstructed signals by using subplot.
8. Write a program to plot real, imaginary phase and magnitude of exponential function
9. Study different window functions available in signal processing.
10. Verify the properties of Discrete Fourier Transform (DFT).
11. Write a program to find the convolution of two sequences using in built convolution function.
12. Write a program to study the frequency shift property of DTFT.
13. Write a program to study circular shift property of DTFT.
14. Write a program to study scaling property of DFT.
15. Write a program to study the sampling theorem of a continuous time signal.
16. Write a program to study the Z-Transform.
17. Write a program to study the various Properties of Z-Transform.

ECE-314	Digital Communication Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
-	**-**	**3**	**1.5**	**40**	**60**	**100**	**3 Hr.**
Course Outcomes							
CO1	**Student will be able to perform coding techniques.**						
CO2	**Student will be able to understand Optical fibre communication process schemes.**						
CO3	**Student will be able to understand base band pulse transmission.**						
CO4	**Student will be able to analyze various basic digital modulation techniques.**						

List of Experiments:

1. To Study ASK
2. To Study PSK
3. To Study FSK
4. To Study Balanced Modulator & Demodulator
5. To Study PCM
6. Setting up a Fiber Optic Analog Link
7. Setting up a Fiber Optic Digital Link
8. Losses in Optical Fiber
9. Measurement of Numerical Aperture
10. Time Division multiplexing of signals.

NOTE: At least 10 experiments are to be performed with atleast 7 from above list, remaining 3 may either be performed from the above list or designed & set by concerned institution as per the scope of the syllabus.

ECE 308	Computer Communication Networks						
Lecture	**Tutorial**	**Practical**	**Credit**	**Theory**	**Sessional**	**Total**	**Time**
4	**0**	**0**	**4**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of basic computer networks used in communication. Also familiarize the students with the various layers of OSI and TCP/IP model.**						
Course Outcomes							
CO1	**To understand the concept of basics of computer networks and physical layer& media.**						
CO2	**To understand the concept and processes of data link layer and medium access sublayer.**						
CO3	**To familiarize with the concept and design issues of network, transport & session layer.**						
CO4	**To familiarize with the concept and protocols of presentation and application layer.**						

Unit – I

Introduction:

Introduction to Computer Networks, Protocols and standards, Network Models: The OSI Model, Layers in the OSI Model, TCP/IP protocol suite, Introduction to addressing.

Physical Layer and Media:

Analog and Digital (signals & data), Transmission media : Guided &Unguided, The Telephone System, Narrowband ISDN, Broadband ISDN and ATM.

Unit -II

The Data Link Layer:

Data Link Layer Design issues, Error Detection & correction, Data link control: Framing, Flow & Error control, Noiseless channels, Noisy channels, HDLC, Point to Point protocols.

The Medium Access Sublayer:

Aloha Protocols, LAN Protocols: wired LAN,s ,Wireless LAN, Networks, Satellite Networks.

Unit -III

Network Layer:

Design issues, IPv4 addresses, IPv6 addresses, internetworking,IPv4, IPv6 ,congestion control algorithms.

Transport & Session Layer:

Protocol design issues, Process to process delivery, UDP, TCP connection Management, remote procedure calls.

Unit – IV

Presentation Layer:

Design issues, abstract Syntax notation, data compression technique, cryptography.

Application Layer:

Design issues, file transfer, access and management, electronic mail, virtual terminals, WWW & HTTP

.

Text Books:

1. Forouzan B.A, Data Communications and Networking, Tata-Mc-Graw Hill.
2. Tanenbaum A.S, Computer Networks, PHI.

Reference Books:

1. Stallings W, Data and Computer Communications, PHI.
2. Leon –Garcia, Computer Networks, Mc Graw Hill

ECE401	**MICROCONTROLLER AND EMBEDDED SYSTEM DESIGN**						
Lecture	**Tutorial**	**Practical**	**Credit**	**Theory**	**Sessional**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes							
CO1	**Acquired knowledge about the architecture of microcontrollers.**						
CO2	**Acquired knowledge about instruction set and programming concepts.**						
CO3	**To understand peripheral interfacing to microcontrollers.**						
CO4	**To design the systems /models based on microcontrollers**						

Unit I

Introdution: Compare Microprocessor and Microcontroller, Different types of microcontrollers, Embedded microcontrollers and External memory microcontrollers, Compare- 4 bit, 8 bit, 16 bit, and 32 bit microcontrollers, Processor Architectures: Harvard V/S Princeton, CISC V/S RISC; Microcontrollers memory types, Microcontrollers features: Clocking, I/O pins, Interrupts, Timers, Peripherals, Choosing a microcontroller, Applications of microcontrollers.

Embedded Systems, Embedded Processors, Hardware units, Devices and Software in a system, Examples of embedded systems, Systems design and processors, Design process and examples in embedded Systems.

Unit II

8051 Architecture: Block diagram of 8051, Programming modal of 8051, On-chip memory organization – general purpose registers, SFR registers, internal RAM and ROM, Oscillator and Clock circuits. Pin Diagram of 8051, I/O Pins, Ports and Circuits, Connecting external memory, Counters and Timers, Serial data transmission/reception and transmission modes, Interrupts, Interrupt handler subroutine, Timer flag interrupt, Serial port interrupt, External interrupt, Software generated interrupts.

8051 Instruction Set and Programming : Instruction syntax, Assembler directives, Addressing modes, Data transfer instructions, logical instructions, arithmetic instructions, Jump and Call instructions, I/O port, Timer and counter programming, Serial port and Interrupt programming.

Unit III

PIC Microcontroller Architecture: Introduction to PIC microcontrollers, Different features of PIC Microcontroller, Block diagram of PIC16/18, Pipelining, Pin Configuration of PIC16/18, Program memory considerations, Register file structure, Addressing modes, Instruction set, Interrupt and timers, Synchronous serial port module, USART.

Unit IV

Application Design & Hardware Interfacing with 8051: Interfacing Matrix Keyboards, LCD displays, ADCs, DACs, Relays, PWM, Stepper and DC motor, Measuring Frequency and Pulse Width Measurement, Hardware circuits for handling multiple interrupts.
Introduction to Advanced Microcontrollers: AVR and ARM microcontrollers

Text Books:

1. Kenneth Ayala," The 8051 Microcontroller" 3rd ed. CENGAGE Learning.
M.A. Mazidi, J.G. Mazidi, R. D. McKinlay," The 8051 Microcontroller and Embedded systems using assembly and C" -2nd Ed, Pearson Education.
2. Myke Predko, "Programming and Customizing the 8051 Microcontroller", TMH.
John. B. Peatman, "Design with PIC Microcontroller", Pearson Education, 2003.
3. Raj Kamal, "Embedded systems architecture, programming and design"-2nd nd. McGraw-Hill Companies.
4. Intel's manual on "Embedded Microcontrollers".Manish K Patel,"Microcontroller based embedded system", McGraw Hill Education.

References Books:

1. Myke Predko, "Programming and customizing PIC microcontroller" Mc- Graw Hill. M.A. Mazidi, R. D. McKinlay,Causey," The PIC microcontroller and Embedded Systems using assembly and C for PIC18" -2nd Ed, Pearson.
2. M.A. Mazidi,Naimi" The AVR microcontroller and Embedded Systems using assembly and C" -2nd Ed, Pearson.

Bachelor of Technology (Electronics & Communication Engineering)
Scheme of Studies/Examination
Semester VII

S. No.	Course No.	Subject	L:T:P	Hours/Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical (Major Test)	Total	
1	ECE-401	Microcontroller & Embedded Systems Design	3:0:0	3	3	75	25	0	100	3
2	ECE-403	Digital Image Processing	4:0:0	4	4	75	25	0	100	3
3	ECE-405	Power Electronics	3:0:0	3	3	75	25	0	100	3
4		Core Elective - I**	3:0:0	3	3	75	25	0	100	3
5		Core Elective - II**	3:0:0	3	3	75	25	0	100	3
6	ECE-407	Microcontroller & Embedded Systems Design Lab	0:0:3	3	1.5	0	40	60	100	3
7	ECE-409	Digital Image Processing Lab	0:0:3	3	1.5	0	40	60	100	3
8	ECE-411***	Project-1	0:0:10	10	5	0	100	100	200	3
9	ECE-413*	Industrial Case Studies 1	2:0:0	2	2	0	100	0	100	
		Total		**34**	**26**	**375**	**405**	**220**	**1000**	

* The performance of the student will be evaluated by the presentation delivered and the report submitted by the student related to Industrial/Research problems & its suggested solutions.
** The students should select two departmental electives subjects from the list of core elective subjects.
***The project should be initiated by the student in the 7th semester beginning and will be evaluated in the end of the semester on the basis of a presentation and report.

Bachelor of Technology (Electronics & Communication Engineering)
Scheme of Studies/Examination
Semester VIII

S. No.	Course No.	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical (Major Test)	Total	
1	ECE- 402	Wireless & Mobile Communication	4:0:0	4	4	75	25	0	100	3
2	ECE- 404	Microwave Engineering	3:0:0	3	3	75	25	0	100	3
3		Core Elective - III**	3:0:0	3	3	75	25	0	100	3
4		Core Elective - IV**	3:0:0	3	3	75	25	0	100	3
5	ECE- 406 ***	Project-II	0:0:14	14	7	0	100	100	200	3
6	ECE- 408	Wireless & Mobile communication lab	0:0:3	3	1.5	0	40	60	100	3
7	ECE- 410	Microwave Engineering Lab	0:0:3	3	1.5	0	40	60	100	3
8	ECE- 412 *	Seminar & Report Writing	2:0:0	2	2	0	100	0	100	3
		Total		**35**	**25**	**300**	**380**	**220**	**900**	
9	ECE- 440****	General Fitness & Professional Aptitude							100	3

* The performance of the student will be evaluated by the presentation delivered and the report submitted by the student related to Industrial/Research problems & its suggested solutions.
** The students should opt two departmental electives subjects from the list of core elective subjects.
***The project should be initiated by the student in continuation of the 7th semester and will be evaluated in the end of the semester on the basis of a presentation and Report.
**** A viva of the students will be taken by external examiner (Principal/Director/Professor/or any senior Person with Experience more than 10 years) at the end of the semester and grades will be given according to the grade chart.

S. No.	Core Electives-7th Sem.		S. No.	Core Electives-8th Sem.	
1	ECE-415	Advance Digital Communication	1	ECE-414	DSP Processor
2	ECE-417	Nano Electronics	2	ECE-416	Mobile Communication Networks
3	ECE-419	Optical Communications	3	ECE-418	MEMS
4	ECE-421	Adaptive Signal Processing	4	ECE-420	Transducers & Its Applications
5	ECE-423	Satellite Communication	5	ECE-422	Radar Engineering
6	ECE-425	Digital VLSI Design	6	ECE-424	High Frequency Circuit and Systems
7	ECE-427	Analog CMOS	7	ECE-426	Biomedical Signal Processing
8	ECE-429	Consumer Electronics	8	ECE-428	Multimedia Communications
9	ECE-431	Robotics	9	ECE-430	Mixed VLSI Design
10	ECE-433	Non-Conventional Energy Resources	10	ECE-432	Microstrip Antenna
11	ECE-435	Microstrip line Analysis	11	ECE-434	Strategic Electronics
12	ECE-437	Software Defined Radios	12	ECE-436	Cognitive Radios

ECE-401	MICROCONTROLLER AND EMBEDDED SYSTEM DESIGN						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major test**	**Minor test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Pre-requisites: Microprocessor							
Course Outcomes							
CO1	Acquired knowledge about the architecture of microcontrollers.						
CO2	Acquired knowledge about instruction set and programming concepts in C and assembly language.						
CO3	To understand peripheral interfacing to microcontrollers.						
CO4	To design the systems /models based on microcontrollers						

Unit- I

INTRODUTION: Microprocessor and Microcontroller, Different types of Microcontrollers, 4 bit, 8 bit, 16 bit, and 32 bit Microcontrollers, Processor Architectures: Harvard & Princeton, CISC & RISC, Microcontrollers memory types, Microcontrollers features, Criteria for choosing a microcontroller, Applications of microcontrollers.

Embedded System, Embedded Processors, Hardware units, Devices and Software in a system, Embedded system on chip, Complex Systems design and processors, Design examples.

Unit- II

8051 ARCHITECTURE: 8051 Architecture, On-chip memory organization – general purpose registers, SFR registers, Internal RAM and ROM, Oscillator and Clock circuits. Pin Diagram of 8051, I/O Pins, Port, Connecting external memory, Counters and Timers, Purpose of TCON & TMOD registers, Serial data transmission/reception and transmission modes, Purpose of SCON & PCON registers, Different Types of Interrupts, Purpose of Time Delays.

Unit- III

8051 INSTRUCTION SET AND PROGRAMMING : Instruction syntax, Assembler directives, Addressing modes, Data transfer instructions, arithmetic and logical instructions, Jump and Call instructions, I/O port, Timer and Counter programming, Serial port and Interrupt programming.

PIC MICROCONTROLLER ARCHITECTURE: Introduction to PIC Microcontroller families, Different features of PIC16 Microcontrollers, PIC16 Architecture and Pipelining, Pin Configuration of PIC16, Program memory considerations, Register file structure, Addressing modes, Instruction set.

Unit-IV

APPLICATION DESIGN & HARDWARE INTERFACING WITH 8051: Interfacing Matrix Keyboards, LCD, ADC, DAC, Temperature Sensor, Stepper and DC motor, Relay and PWM.

Introduction of Advanced Microcontrollers: AVR and ARM microcontrollers.

Text Books:

1. Kenneth Ayala," The 8051 Microcontroller" 3rd ed. CENGAGE Learning.
2. M.A. Mazidi, J.G. Mazidi, R. D. McKinlay," The 8051 Microcontroller and Embedded systems using assembly and C" -2nd Ed, Pearson Education.
3. John. B. Peatman, "Design with PIC Microcontroller", Pearson Education, 2003.

References Books:

1. Myke Predko, "Programming and Customizing the 8051 Microcontroller", TMH.
2. Manish K Patel,"Microcontroller based embedded system", McGraw Hill Education.
3. Raj Kamal, "Embedded systems architecture, programming and design"-2nd nd. McGraw-Hill Companies.
4. Intel's manual on "Embedded Microcontrollers".
5. Myke Predko, "Programming and customizing PIC microcontroller" Mc- Graw Hill.
6. M.A. Mazidi, R. D. McKinlay,Causey," The PIC microcontroller and Embedded Systems using assembly and C for PIC18" -2nd Ed, Pearson.

7. M.A. Mazidi,Naimi" The AVR microcontroller and Embedded Systems using assembly and C" -2nd Ed, Pearson.

ECE-403	Digital Image processing						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**0**	**0**	**4**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes							
CO1	**Students should be able to explain the basics of Digital Image processing**						
CO2	**Student will be able to explain sampling and quantization of digital image**						
CO3	**Student will be able to analyze the image enhancement operations on digital image**						
CO4	**Students will be able to analyze the various image analysis and computer vision algorithm**						

Unit-I

Introduction: Processing and applications, Image representation and modeling, Image Enhancement, Restoration, analysis, reconstruction from Projections, Image Data Compression. Image Perception: Light, Luminance, Brightness, Contrast, MFT of visual System, Visibility Function, Image fidelity, Color representation, color matching and reproduction, color vision Model

Unit-II

Image sampling and Quantization: Introduction, Two dimensional sampling theory, practical limitations in sampling and reconstruction, Image quantization, Optimum mean square or Lloyd-Max quantizer.

Unit-III

Image Enhancement: Introduction, Point Operation, Histogram Modeling, Spatial Operations, Transform Operations, Multispectral Image enhancement, Color Image enhancement.

Unit-IV

Image Analysis and Computer Vision: Introduction, Spatial Feature Extraction, Transform features, Edge Detection, Boundary Extraction, Shape features, Image segmentation.

Reference Books:

1. Fundamentals of Digital Image Processing by Anil K Jain, Publisher: Prentice Hall

Text Books:

1. Digital Image Processing, third edition by Rafael C. Gonzalez and Richard E Woods. Publisher: Pearson Education.
2. Digital Image Processing by S. Sridhar , Publisher: Oxford

ECE-405	Power Electronics						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To understand and acquire knowledge about various power semiconductor devices. To prepare the students to analyze and design different power converter circuits.**						
Course Outcomes							
CO1	**Acquire knowledge about fundamental concepts and techniques used in power electronics.**						
CO2	**Ability to analyze various single phase and three phase power converter circuits and understand their applications.**						
CO3	**Foster ability to identify basic requirements for power electronics based design application.**						
CO4	**To develop skills to build, and troubleshoot power electronics circuits.**						

Unit-1

Introduction: Concept of Power Electronics, Applications of power electronics, Advantages and disadvantages of power-electronic converters, Power electronic systems, Power semiconductor devices, Types of power electronic converters. Power semiconductors: The p-n junction, Basic structure of power diodes, Characteristics of power diodes, Power transistors, Power MOSFETS, Insulated gate bipolar transistor, Static induction transistor.

Unit-II

Thyristors :Terminal characteristics of thyristors, thyristor turn on methods, Switching characteristics of thyristors, Thyristor gate characteristics, Two-transistor model of a thyristor, Thyristor ratings, Thyristor protection, Improvement of thyristor characteristics, Series and parallel operation of thyristors, Gate turn off thyristor, Firing circuits for thyristors.

Thyristor Commutation: Class A commutation: Load commutation, Class B commutation: Resonant commutation, Class C commutation: Complementary commutation, Class D commutation: Impulse commutation, Class E&F commutation.

Unit–III

Phase Controlled Rectifiers: Principle of phase control, Full wave controlled converters, Single phase full wave converters, Single phase symmetrical and asymmetrical semi converters, three phase rectifiers and thyristor converters, Performance parameters of three phase full converters, Effect of source impedance on the performance of converters. Principle of chopper operation, Control strategies, Step up choppers, Types of chopper circuits, Single phase voltage source inverters: Operating principle, Force commutated thyristor inverters, Voltage control in single phase inverters.

Unit-IV

AC Voltage Controllers: Principle of phase control, Principle of integral cycle control, single phase ac voltage controller with R load and RL load.

Cycloconverters: Principle of cycloconverter operation, step up and step down cycloconverters, Three phase half wave converters, Output voltage equation for a cycloconverter, Load commutated cycloconverter.

Text Books

1. P S Bimbhra: Power Electronics, Khanna Publishers.

Reference Books

1. M. H. Rashid. : Power Electronics – circuits, devices & applications, Pearson Education.

ECE-407	Microcontroller and Embedded System Design Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test(Practical)**	**Minor Test**	**Total**	**Time(Hrs)**
0	**0**	**3**	**1.5**	**60**	**40**	**100**	**3**
Course Objectives	1. To design of microcontroller based systems. 2. To impart practical knowledge of 8051 and PIC Microcontrollers						
Course Outcomes							
CO1	To familiarization with 8051 and PIC Microcontrollers.						
CO2	Ability to write a C language and assembly language program for 8051 and PIC Microcontroller.						
CO3	Ability to interfacing the various Peripheral to 8051 and PIC Microcontrollers.						
CO4	Ability to design the embedded systems based on 8051 and PIC Microcontrollers.						

List of Experiment performed using 8051/AT 89C51 microcontroller:

1. To study implementation & interfacing of Display devices Like LCD, LED Bar graph & seven segment display with Microcontroller 8051/AT89C51.
2. Write an ALP to toggle all the bits of Port P1 continuously with 250 ms delay.
3. Write an ALP to generate 10 kHz square wave.
4. Write an ALP to toggle only the bit P1.5 continuously with some delay. Use Timer 0, mode 1 to create delay.
5. Write an ALP to generate 10 kHz frequency using interrupts.
6. Write an ALP to interface LCD data pins to port P1 of 89C51 and display a message on LCD.
7. Write an ALP to interface keypad. Whenever a key is pressed, it should be displayed on LCD.
8. Write an ALP to interface seven segment display unit.
9. Write an ALP to interface a switch and a buzzer to two different pins of a Port such that the buzzer should sound as long as the switch is pressed.
10. Write an ALP to transmit a message from Microcontroller to PC serially using RS232.
11. To study implementation & interfacing of Different motors like stepper motor, DC motor & servo Motors.
12. Write an ALP to interface Stepper Motor to rotate the motor in clockwise and anticlockwise directions.
13. Write an ALP for PWM based speed control of motor.
14. Write an ALP to interface Elevator.
15. Write an ALP for temperature & pressure measurement & to display on intelligent LCD display 8051 Microcontroller and design an embedded system to get analog input from Temperature sensor and display the temperature value on PC Monitor.
16. Design an embedded system for traffic light controller using 8051 Micro controller
17. Design an embedded system for the automatic motion of a car (Model of car) & Subsequent display on LCD
18. Temperature Measurement Design a Thermometer, using LM35 and 2 digits, 7 segment displays.
19. Obstacle Detector through Ultra Sonic Design an obstacle detection system using ultrasonic transmitter receiver.
20. Hot Chamber Controller Design a hot chamber to maintain the temperature say at 40 degrees centigrade.
21. Lamp Controller Design a light sensor and a timer to control a lamp for 3, 4 or 8 hours.
22. Water Pump Controller Design a water pump controller by sensing the low and high level in

water tank using microcontroller.

ECE-409	Digital Image Processing Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical Test**	**Minor Test**	**Total**	**Time**
-	-	3	1.5	60	40	100	3 Hr.
Course Outcomes							
CO1	**Students should be able to explain the basics of Digital Image processing**						
CO2	**Student will be able to explain sampling and quantization of digital image**						
CO3	**Student will be able to analyze the image enhancement operations on digital image**						
CO4	**Students will be able to analyze the various image analysis and computer vision algorithm**						

List of Experiments:

1. Study of Image processing toolbox of Matlab.
2. WAP to read and show various images of at least five different formats.
3. WAP to extract R, G, B component of Color Image.
4. WAP to convert a color image into gray scale and save it in new format.
5. WAP to invert a gray scale image.
6. WAP to implement Morphological operations on an image.
7. WAP to implement Histogram equalization.
8. WAP to implement various edge detection algorithms.
9. WAP to implement image segmentation
10. WAP to implement boundary extraction of basic structure.

ECE-402	Wireless & Mobile Communication						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	0	**0**	**4**	**75**	**25**	**100**	**3**
Purpose	To introduce the concepts of wireless / mobile communication using cellular environment. To make the students to know about the various modulation techniques, ppropagation methods, and multi access techniques used in the mobile communication.						
Course Outcomes							
CO 1	It deals with the fundamental cellular radio concepts such as frequency reuse and handoff.						
CO 2	This also demonstrates the principle of trunking efficiency and how trunking and interference issues between mobile and base stations combine to affect the overall capacity of cellular systems.						
CO 3	It provides idea about analog and digital modulation techniques used in wireless communication.						
CO 4	It presents different ways to radio propagation models and predict the large – scale effects of radio propagation in many operating environment.						

Unit–I

Introduction to Wireless Communication Systems: Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless telephone systems, comparison of various wireless systems.

Modern Wireless Communication Systems: Second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks.

Unit–II

Introduction to Cellular Mobile Systems: Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analog cellular systems, digital Cellular Systems.

Cellular System Design Fundamentals: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity.

Unit– III

Multiple Access Techniques for Wireless Communication: Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access, packet ratio, capacity of a cellular systems.

Unit–IV

Wireless Standards-GSM, IS-95, UMTS-IMT-2000, Signaling, Call Control, Mobility Management and location Tracing.

Suggested Books:

1. Theodore S.Reppeport, Wireless Communications Principles and Practice, IEEE Press, Prentice Hall.
2. William C.Y.Lec, Mobile Cellular Telecommunications, Analog and Digital Systems, Mc-Graw Hill Inc.
3. Kamilo Feher, Wireless Digital Communications, Modernization & Spread Spectrum Applications, Prentice Hall of India, New Delhi.
4. Kaveh Pahlavan and Allen H. Levesque " Wireless Information Networks", Wiley Series, John Wiley and Sons Inc.

ECE-404	Microwave Engineering						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hrs**
Purpose	**As a part of RF communication technology the purpose of this course is to create awareness about conventional microwave resonators, generators, components and devices along with the importance of scattering parameters so that the learner is able to design and apply these basic approaches in commercial as well as defence applications.**						
Course Outcomes							
CO1	**Learner will be able to mathematically design basic resonator cavities and will be able to measure microwave parameters such as impedance, frequency and VSWR etc.**						
CO2	**Learner will learn the conventional methods to generate the microwaves.**						
CO3	**Learner will know about the importance of scattering parameters along with its applications in the analysis of basic microwave components.**						
CO4	**Learner will learn about transferred electron and avalanche transit time devices in detail.**						

Unit-I

Microwave Resonators: Brief description of waveguides, coplanar waveguides, cavity resonators: rectangular, cylindrical, spherical and coaxial, excitation and coupling of cavities, Q factor. Microwave Measurements: Measurement of frequency, impedance (using slotted section) attenuation, power, dielectric constant, measurement of V.S. W. R., insertion loss and permeability

Unit-II

Microwave Generators: Construction, characteristics, operating principle and typical applications of Klystron(two cavity, multicavity), Reflex Klystron, magnetron(Cylindrical magnetron and description of Π mode applications) and Traveling Wave Tube(TWT).

Unit-III

Matrix Description of Microwave Circuits: Scattering Matrix: properties, measurement of scattering coefficients, scattering matrices for common microwave systems. Microwave Components: Waveguide tees- E-plane, H-plane, magic tee, rat race, directional coupler, tuning screws and stubs, isolators and circulators-their constructional features and applications. Microwave filters, Phase shifters, attenuators, and frequency meter.

Unit-IV

Solid State Microwave Devices: Transferred Electron Devices- Gunn Effect; negative differential resistance phenomenon, field domain formation, Gunn diode structure. Avalanche transit time devices: IMPATT, TRAPATT, BARITT diodes, Parametric amplifiers

TEXT BOOK: Samuel Y. Liao, Microwave Devices and Circuits, Prentice-Hall of India.

Reference Books:

1. David M. Pozar, Microwave Engineering, John Wiley and sons Inc. Das,
2. Annapurna & Sisir K. Das, Microwave Engineering, Tata McGraw-Hill.

ECE-408	Wireless & Mobile Communication Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
-		**3**	**1.5**	**40**	**60**	**100**	**3 Hour**
Purpose	**To give the students an idea about the Wireless communication theory and technology using the NI-Labview software and RF communication module.**						
Course Outcomes							
CO 1	**To study the wireless communication using NI-Labview**						
CO 2	**To learn about the functioning of Universal Software Radio Peripheral (USRP)**						
CO 3	**To learn the implementation of different analog modulation schemes using the USRP.**						
CO 4	**To learn the implementation of different digital modulation schemes using the USRP.**						

1. Introduction to NI-LabVIEW and familiarization with its basic functions.
2. Study of modulation toolkit and its usage in Wireless Communication.
3. Study the interfacing of hardware (USRP module) with the PC and configuring the same.
4. Implementation of AM using Software Defined Radio (SDR).
5. Implementation of FM using SDR with application such as transfer of files
6. Implementation of M-PSK transmitter using SDR concept.
7. Implementation of M-PSK receiver using SDR
8. Implementation of M-QAM transmitter using SDR.
9. Demonstrates the use of the Bluetooth functions to set up data transfer via Bluetooth between a server VI and a client VI.
10. Design two-dimensional convolution to perform image edge detection.
11. Implementation of M-QAM receiver using SDR.
12. Implementation of PSK Modulation system with Convolutional Coding.
13. Implementation of FSK Modulation system with BCH Coding.
14. Implementation of QAM Modulation system with Golay Coding

ECE-410	Microwave engineering lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
-		**3**	**1.5**	**40**	**60**	**100**	**3 Hour**
Purpose	**To give the students an idea about the study and analysis of components used in Microwave Engg.**						
Course Outcomes							
CO 1	**Students will learn the steps to analyze microwave components.**						
CO 2	**Students will be able to find the characteristics of microwave components.**						
CO 3	**Students will learn the steps to analyze various antennas.**						
CO 4	**Students will be able to find the characteristics of various antennas.**						

List of Experiments:

1. To study microwave components.
2. To study the characteristics of the reflex Klystron tube and to determine its electronic tuning range.
3. To determine the frequency and wavelength in a rectangular waveguide working in TE_{10} mode.
4. To determine the standing wave ratio and reflection coefficient.
5. To study the I-V characteristics of gunn diode.
6. To study the magic Tee.
7. To study the isolator and attenuator.
8. To measure the coupling coefficient and directivity of a waveguide directional coupler.
9. To measure the polar pattern and the gain of a waveguide horn antenna.
10. To measure the insertion loss and attenuation.

ECE-415	Advance Digital Communication						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**0**	**0**	**4**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To understand and acquire knowledge about various power semiconductor devices. To prepare the students to analyze and design different power converter circuits.**						
Course Outcomes							
CO1	**Acquire knowledge about fundamental concepts and techniques used in digital communications**						
CO2	**Ability to analyze various techniques of communication and understand their applications.**						
CO3	**Foster ability to identify basic requirements for power digital communication based design application.**						
CO4	**To develop skills to build, and troubleshoot on digital communication circuits**						

Unit-I

Probability and Stochastic Processes: Probability: Random Variables, Probability Distribution, and Probability Densities, Functions of Random Variables, Statistical Average of Random Variables, Some Useful Probability Distributions, Upper Bounds on the Tail Probability, Sums of Random Variables and Central Limit Theorem.Stochastic Processes: Statistical Averages, Power Density Spectrum, Response of a Linear Time - Invariant System to a Random Input Signal, Sampling Theorem for Band- Limited Stochastic Processes, Discrete-time Stochastic Signals and Systems, Cyclostationary processes.

Unit -II

Source coding: Mathematical Models for Information Sources, A Logarithmic Measure of information: Average Mutual Information and Entropy, Information Measure for Continuous Random Variables. Coding for Discrete Sources: Coding for Discrete Memory less sources, Discrete Stationary Sources, The Lempel-Ziv Algorithm.Coding for Analog Sources-Optimum Quantization: Rate- Distortion Function, Scalar Quantization, Vector Quantization. Coding Techniques for Analog Sources: Temporal Waveform Coding, Spectral Waveform Coding, Model- Based Source Coding.

Unit -III

Characterization of Communication Signal and Systems: Signal Space Representation: Vector Space Concept, Signal Space Concept, Orthogonal Expansion of Signals, Gram Schmitt Procedure.
Optimum Receivers for the Additive White Gaussian Noise Channel: Performance of the Optimum Receiver for Memory Less Modulation: Probability of Error for Binary Modulation, Probability of Error for M- ary Orthogonal Signals, Probability of Error for M- ary Binary- Coded Signals, Probability of Error for M- ary PAM, Optimum Receiver for Binary Signals.

Unit -1V

Carrier and Symbol Synchronization: Signal Parameter Estimation: The Likelihood Function, Carrier Recovery and Symbol Synchronization in Signal Demodulation.Carrier Phase Estimation: Maximum Likelihood Carrier Phase Estimation, The Phased – Locked Loop, Effect of Additive Noise on the Phase Estimate, Decision Directed Loops, Non- Decision Directed Loops.

Text Book: *Digital Communication*, J.G. Proakis, Prentice Hall India.
Reference Book: *Principles of Communication Systems,* Taub & Schilling, McGraw Hill Education; 3rd.

ECE-417	Nano Electronics						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**0**	**0**	**4**	**75**	**25**	**100**	**3 Hour**
Course Outcomes							
CO 1	**Students will be using physics, mathematics, and material science engineering to understand the latest development in the area of Microelectronics leading to Nanoelectronics.**						
CO 2	**Students be able to understand the fundamentals of classical CMOS technology and issues in scaling MOSFET in the sub-100nm regime**						
CO 3	**Understanding basic principles of non classical transistors with new device structure and nano materials.**						
CO 4	**Understand the issues in realizing Germanium and compound semiconductor MOSFET.**						
CO5	**Students will learn materials characterization techniques extensively.**						

Unit-I

Overview: Nano devices, Nano materials, Definition of Technology node, Basic CMOS Process flow, MOS Scaling theory, Issues in scaling, Short channel effects, Description of a typical 65 nm CMOS technology, Requirements for Non classical MOS transistor, MOS capacitor, Role of interface quality and related process techniques, Gate oxide thickness scaling trend, SiO2 vs High-k gate dielectrics. Integration issues of high-k , Interface states, bulk charge, band offset, stability, etc.

Unit-II

Metal Gate Transistor : Motivation, requirements, Integration Issues, Transport in Nano MOSFET, velocity saturation, ballistic transport, injection velocity, velocity overshoot, SOI - PDSOI and FDSOI., Ultrathin body SOI - double gate transistors, Vertical transistors - FinFET and Surround gate FET, Metal source/drain junctions - Properties of schotky junctions on Silicon, Germanium and compound semiconductors –Work function pinning, Germanium Nano MOSFETs : strain , quantization , Advantages of Germanium over Silicon.

Unit-III

PMOS versus NMOS, Compound semiconductors - material properties, MESFETs Compound semicocnductors MOSFETs in the context of channel quantization and strain , Hetero structure MOSFETs exploiting novel materials, strain, quantization.
Synthesis of Nanomaterials : CVD, Nucleation and Growth, ALD, Epitaxy, MBE. Compound semiconductor hetero-structure growth, emerging nano materials: Nanotubes, nanorods and other nano structures, LB technique, Soft lithography etc. Microwave assisted synthesis, Self assembly etc.

Unit-IV

Characterization : Quantum wells and Thickness measurement techniques: Contact - step height, Optical - reflectance and ellipsometry, AFM, Nanomaterials Characterization techniques: FTIR, XRD, AFM, SEM, TEM, EDAX and interpretation of results.

References

1. Fundamentals of Modern VLSI Devices, Y. Taur and T. Ning, Cambridge University Press. Silicon VLSI Technology, Plummer, Deal , Griffin , Pearson Education India.
2. Encyclopedia of Materials Characterization, Edited by: Brundle, C.Richard; Evans, Charles A. Jr.; Wilson, Shaun ; Elsevier.

ECE - 419	Optical Communication						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	0	0	4	75	25	100	3 Hr.
Purpose	Purpose :To familiarize the students with the concepts of Optical communication covering the contents of optical fibers, losses in fibers, optical sources, detectors etc.						
Course Outcomes							
CO1	Students will be able to understand the structure of fiber and the mechanism of light travelling in the fiber.						
CO2	Students will be able to analyze various losses associated with fibers.						
CO3	Students will learn about the optical sources and optical detecters.						
CO4	Students will be able to understand the various components needed in optical networks						

Unit – I

INTRODUCTION : Optical Fibers: Structure, Propagation within the fiber, Numerical aperture of fiber, step index and graded index fiber, Modes of propagation in the fiber, Single mode and multi mode fibers. Splices and connectors. Optical Power Launching and Coupling. Fiber-to-fiber joints.

Unit–II

LOSSES IN OPTICAL FIBER : Rayleigh Scattering Losses, Absorption Losses, Leaky modes, Mode coupling losses, Bending Losses, Combined Losses in the fiber.

DISPERSION EFFECT: Effect of dispersion on the pulse transmission Intermodal dispersion, Material dispersion, Wave guide dispersion, Polarization Mode Dispersion Total dispersion, Transmission rate. Dispersion Shifted Fibers, Dispersion Compensating Fibers.

Unit – III

LIGHT SOURCES : LEDS, Laser Action in semiconductor Lasers, Semiconductor Lasers for optical communication – Laser modes, Spectral Characteristics, Power Voltage Characteristics, Frequency response.

DETECTORS : P-I-N Photodiode, APD, Noise Analysis in detectors, Coherent and non-coherent detection, Infrared sensors. Bit error rate.

Unit– IV

THE FIBER-OPTIC COMMUNICATION SYSTEM: Design considerations of fiber optic systems: Analog and digital modulation. Optical Devices: Optical coupler, space switches, linear divider-combiners, wavelength
division multiplexer and demultiplexer, optical amplifier

OPTICAL NETWORKS: Elements and Architecture of Fiber-Optic Network, Optical link network-single hop , multihop, hybrid and photonic networks.

Suggested Books:

1. John Power, An Introduction to Fiber optic systems, McGraw Hill International.
2. John Gowar , Optical communication Systems.
3. R. Ramaswamy, Optical Networks, Narosa Publication
4. John M. Senior,Optical Fiber Communication
5. Gerd Keiser, Optical Fiber Communication

ECE - 421	Adaptive Signal Processing						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**4**	**75**	**25**	**100**	**3 Hr.**
Purpose	To familiarize the students with various stochastic processes and models, analysis of wiener filters, steepest descent algorithms. Also, students will be able to understand LMS & RLS algorithms and check the robustness and study the Finite-Precision effects on LMS and RLS algorithms.						
Course Outcomes							
CO1	To understand various stochastic processes and models in adaptive signal processing.						
CO2	To understand the analysis of wiener filters, the concept of the linear prediction and steepest descent algorithms.						
CO3	To understand the concept and use of Least-Mean-Square (LMS) & Recursive Least-Squares (RLS) algorithms with applications to specific engineering problems.						
CO4	To apply the concept robustness and analysis the Finite-Precision effects on LMS and RLS algorithms.						

Unit -I

Stochastic Processes and Models: Partial Characterization of a Discrete-Time Stochastic Process, Mean Ergodic Theorem, Correlation Matrix, Correlation Matrix of Sine Wave Plus Noise, Stochastic Models, Wold Decomposition, Asymptotic Stationarity of an Autoregressive Process, Yule—Walker Equations.

Wiener Filters: Linear Optimum Filtering: Statement of the Problem, Principle of Orthogonality, Minimum Mean-Square Error, Wiener-Hopf Equations, Error-Performance Surface, Multiple Linear Regression Model.

Unit -II

Linear Prediction: Forward Linear Prediction, Backward Linear Prediction, Levinson-Durbin Algorithm, Properties of Prediction-Error Filters, Schur-Cohn Test.

Method of Steepest Descent: Basic Idea of the Steepest-Descent Algorithm, The Steepest-Descent Algorithm Applied to the Wiener Filter, Stability of the Steepest-Descent Algorithm, Example, The Steepest-Descent Algorithm as a Deterministic Search Method, Virtue and Limitation of the Steepest-Descent Algorithm.

Unit -III

The Least-Mean-Square (LMS) Algorithm: Signal-Flow Graph, Optimality Considerations, Applications, Statistical Learning Theory, Transient Behavior and Convergence Considerations, Efficiency.

The Recursive Least-Squares (RLS) Algorithm: Some Preliminaries, The Matrix Inversion Lemma, The Exponentially Weighted RLS Algorithm, Selection of the Regularization Parameter, Update Recursion for the Sum of Weighted Error Squares, Example: Single-Weight Adaptive Noise Canceller.

Unit -IV

Robustness: Robustness, Adaptation, and Disturbances, Robustness: Preliminary Considerations Rooted in H∞ Optimization, Robustness of the LMS Algorithm, Robustness of the RLS Algorithm, Comparative Evaluations of the LMS and RLS Algorithms from the Perspective of Robustness.

Finite-Precision Effects: Quantization Errors, Least-Mean-Square (LMS) Algorithm, Recursive Least-Squares (RLS) Algorithm, Summary and Discussion.

TEXT BOOKS:

1. S. Haykin, Adaptive filter theory, Pearson

REFERENCE BOOKS:

1. T. Adali and S. Haykin, Adaptive Signal Processing, Wiley India
2. B. Widrow and S.D. Stearns, Adaptive signal processing, Prentice Hall.

ECE 423	Satellite Communication						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of Satellite communication and various terms, laws and multiple access schemes used in its working.**						
Course Outcomes							
CO1	**To understand the concept of basics of satellite communication and various basic laws and terms of satellite communication.**						
CO2	**To understand the concept and processes of various communication satellites used in satellite communication.**						
CO3	**To familiarize with the concept and design issues of satellite link design and satellite access.**						
CO4	**To familiarize with the concepts of Multiple access schemes used in satellite communication.**						

Unit -I

SATELLITE ORBITS: Orbital Mechanics- Kepler's laws ,locating the satellite in the Orbit, locating the satellite with respect to the earth, Orbital elements, look angle determination, Sub satellite point, Azimuth and elevation angle calculation, Orbital perturbations, Longitudinal and Inclination changes; Launches and launch vehicles-ELV's, Placing the satellite into geostationary orbit, Doppler shift, range variations, solar eclipse, sun transit outage.

Unit -II

COMMUNICATION SATELLITES: Satellite Subsystems, Attitude and Orbit Control system(AOCS), Telemetry, Tracking, Command and Monitoring (TTC&M), Power System, Communication Subsystems-description, Transponders, satellite antennas-basic antenna types, basic antennas in practice.

Unit -III

Satellite link design and Satellite access: Basic transmission theory**,** system noise temperature and G/T ratio; Downlink design-link budget; Uplink design; design for specified C/N, uplink and downlink attenuation in rain, communication link design procedure; system design examples.

Unit –IV

Multiple access schemes: FDMA, TDMA, CDMA, DAMA; VSAT systems-basic techniques, VSAT earth station engineering, system design; DBS systems-C-band and Ku band home TV, digital DBS; satellite mobile systems; GPS

Text Books:

1. Timothy Pratt, Satellite Communications, Wiley India edition

Reference Books:

1. Anil K Maini, Satellite Communication, Wiley India edition

ECE-425	Digital VLSI Design						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**4**	**75**	**25**	**100**	**3 Hr.**
Purpose	Analog CMOS circuits are used in amplifiers and various filters circuits. This course teaches design methods of CMOS IC circuits.						
Course Outcomes							
CO1	To understand MOS digital circuits concepts						
CO2	To understand the MOS inverter and its design						
CO3	To learn MOS combinational and sequential circuit design						

Unit -I

Introduction: Introduction to MOSFETs : MOS Transistor Theory – Introduction MOS Device, Fabrication and Modeling , Body Effect, Noise Margin; Latch-up

Unit -II

MOS Inverter: MOS Inverter, MOS Transistors, MOS Transistor Switches, CMOS Logic, Circuit and System Representations, Design Equations, Static Load MOS Inverters, Transistor Sizing, Static and Switching Characteristics; MOS Capacitor.

Unit -III

MOS Combinational circuits: Combinational MOS Logic Circuits: Pass Transistors/Transmission Gates; Designing with transmission gates, Primitive Logic Gates; Complex Logic Circuits.

Unit -IV

MOS Sequential Circuits: Sequential MOS Logic Circuits: SR Latch, clocked Latch and flip flop circuits, CMOS D latch and edge triggered flip flop.

Books:

1. S. M. Kang and Y. Leblebici, CMOS Digital Integrated Circuits : Analysis and Design, Third Edition,
MH, 2002.
2. N. Weste, K. Eshraghian and M. J. S. Smith, Principles of CMOS VLSI Design : A Systems Perspective, Second Edition (Expanded), AW/Pearson, 2001.
3.J. P. Uyemura, CMOS Logic Circuit Design, Kluwer, 1999.

ECE-427	Analog CMOS						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**4**	**75**	**25**	**100**	**3 Hr.**
Purpose	Analog CMOS circuits are used in amplifiers and various filters circuits. This course teaches design methods of CMOS IC circuits.						
Course Objectives							
CO1	To understand CMOS digital circuits concepts						
CO2	To design Analog circuits using CMOS.						
CO3	To learn modeling of CMOS based amplifiers circuits						

Unit -I

Basic Analog CMOS Circuits: Introduction to analog design, Passive and active current mirrors, Switched Capacitor circuits - basic principles, sampling switches, switched capacitor integrator, switched capacitor amplifier.

Unit -II

CMOS single stage Amplifiers: Common-Source stage with resistive load and diode connected load, source follower, common-gate stage, cascode stage, folded cascode stage. Frequency responses of CS stage, CD stage, CG stage, cascode stage.

Unit -III

Differential Amplifier & Op-Amp: Single-ended and differential operation, basic differential pair – qualitative and quantitative analyses, common-mode response, differential pair with MOS loads, Performance parameters of op-amp, one stage op-amp, two-stage CMOS op-amp, slew rate, power supply rejection.

Unit -IV

Oscillators: General considerations, Ring oscillators, LC oscillators – cross-coupled oscillators, Colpitts oscillator, One-port oscillator, and voltage controlled oscillators.

Books:

1.Razavi, “Design of analog CMOS integrated circuits”, McGraw Hill, Edition 2002.

2. Allen, Holberg, “CMOS analog circuit design”,Oxford University Press, 2nd Edition, 2012.

ECE-429	Consumer Electronics						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of audio and video systems and also With various advanced electronic gadgets and home appliances**						
Course Outcomes							
CO1	**To understand the concept of basic audio system and AM/FM tuners.**						
CO2	**To understand the concept of Video Systems.**						
CO3	**To understand the various advanced electronic gadgets.**						
CO4	**To understand the various electronic home appliances.**						

Unit-I

Audio System: Wave motion, Microphones, Headphones and Headsets, Loudspeakers, Acoustics, Disc recording and Distortion in disc and tape, Optical recording and reproduction, Control circuits, Amplifying systems, Portable stereo, Theatre sound system and AM/FM tuners.

Unit-II

Video Systems: Monochrome TV standards and systems, Colour TV standards and systems, Monochrome and colour TV controls, Video Tape recording and reproduction, video disc recording and playback, Remote controls and Video systems.

Unit-III

Electronic Gadgets: Telecommunication Systems, Switching Systems, Modulation techniques, Fiber optics, Mobile Systems, Xerography and Fascimile fax, Automated Teller Machines and Top Boxes.

Unit-IV

Home Appliances: Digital clocks, In-Car Computers, Microwave ovens, Washing Machines, Air Conditioners and Refrigerators.

Reference Books:

1. Consumer Electronics By S.P. Bali, Pearson Education, 1st edition.
2. Colour Television-principles & practice R.R Gulati by Wiley Eastern Limited, New Delhi.
3. Colour Television & Video Technology by A.K. Maini CSB Publisher
4. VCR-principles, maintenance & repair by S.P. Sharma, Tata Mc Graw Hill, New Delhi
5. Colour TV by A. Dhak.

ECE-431	ROBOTICS						
Lecture	**Tutorial**	**Practical**	**Credit**	**Theory**	**Sessional**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes							
CO1	**The basic concepts related to robot, Parts of robots, End effectors and to make the student familiar with the various drive systems for robot.**						
CO2	**Various sensors and machine vision and their applications in robots.**						
CO3	**About various control system, robot programming, Artificial intelligence and safety standards of robots**						
CO4	**Industrial and Non-industrial Applications of robots.**						

Unit–I

Fundamentals of Robot: Definition, History and Development in robot technology. Robot Technology: Characteristics, Basic Components, Robot Anatomy, Robot Generations, Robot selection, Present and Future Applications.

Robot Drive Systems and End Effectors: Robot Classification: Arm geometry, Degrees of freedom, Power sources, Types of motion, Path Control. Robot End Effectors: Mechanical grippers, Vacuum, Magnetic, Adhesive. Special purpose grippers, Process tooling, Compliance, Robot Drive systems: Hydraulic, Pneumatic and Electric system.

Unit-II

Sensor : Requirements of a sensor, Sensor classification, Principles and Applications of the following types of sensors : Position of sensors (Potentiometer, Encoder, LVDT, Resolvers, LMDT, Hall – effect sensors),Velocity sensors(Encoder, Tachometer, Differentiation of position signal),Acceleration sensors, Force and Pressure Sensors(Piezoelectric, Force sensing resistor, Strain Gauge, Antistatic foam), Torque Sensors, Micro switches, Visible light and Infrared Sensors, Touch and Tactile sensors, Proximity Sensors(Magnetic, optical, Ultrasonic, Inductive, Capacitive, Eddy Current), Range Finder (Ultrasonic, Light-based, GPS), Sniff Sensors, Taste Sensors, Vision Sensors, Voice recognition devices, Voice synthesizers, RCC.

Machine Vision : Visual sensing, Architecture of robotics vision system, Machine vision: Image acquisition (Vidicon tube, CCD), Digitization, Image processing, Image Analysis, Image interpretation. Machine vision application, other optical methods.

Unit-III

Control System, Programming and Artificial Intelligence: Control Systems: PLC, PID, CNC, MPU, URC. Robot programming: Programming methods, Languages, levels of robot programming, Program statements. Elements of Artificial Intelligence, System architecture, Application of fuzzy logic in robotics, Robot Safety, safety standards.

Unit–IV

Robot Applications: Industrial applications, Automation in manufacturing, Robot applications, Material handling, Processing application, Assembly application, Inspection application, evaluating the potential of a robot application, future applications, challenge for the future, Innovations, Non-industrial application.

Text Books:

1. James G. Keramas, " Robot technology fundamentals", Delmar Publishers.
2. Saeed B. Niku, "Introduction to robotics analysis,control and applications", 2nd ed., Wiley India.
3. R. K. Mittal,I.J.Nagrath, "Robotics and Control", TMH Education Pvt. Lmt.

ECE-433	Non-conventional Energy Resources						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**-**	**-**	**4**	**75**	**25**	**100**	**3 Hour**
Course Outcomes							
CO 1	**To understand the energy demand of world, nation and available resources to fulfill the demand**						
CO 2	**To know about the conventional energy resources and their effective utilization**						
CO 3	**To acquire the knowledge of modern energy conversion technologies**						
CO 4	**To be able to understand and perform the various characterization techniques of fuels**						
CO5	**To be able to identify available nonconventional (renewable) energy resources and techniques to utilize them effectively.**						

Unit-I

Introduction: Energy demand of world and country and gap analysis, Fossil fuel based systems, Impact of fossil fuel based systems, Non conventional energy – seasonal variations and availability, Renewable energy – sources and features, Hybrid energy systems. Distributed energy systems and dispersed generation (DG).

Unit-II

Solar thermal systems: Solar radiation spectrum, Radiation measurement , Technologies, Applications, Heating, Cooling, Drying, Distillation, Power generation; Costing : Life cycle costing (LCC),Solar thermal system

Solar Photovoltaic systems ,Operating principle, Photovoltaic cell concepts ,Cell, module, array, Series and parallel connections, Maximum power point tracking, Applications ,Battery charging, Pumping , Lighting,Peltier cooling , Costing: Life cycle costing ,Solar PV system

Unit-III

Microhydel: Operating principle, Components of a microhydel power plant, Types and characteristics of turbines, Selection and modification, Load balancing, Costing: Life cycle costing -Microhydel

Wind ; Wind patterns and wind data, Site selection, Types of wind mills , Characteristics of wind generators, Load matching, Life cycle costing - Wind system LCC

Unit-IV

Biomass: Learning objectives, Operating principle, Combustion and fermentation, Anaerobic digester, Wood gassifier, Pyrolysis, Applications, Bio gas, Wood stoves, Bio diesel, Combustion engine, Life cycle costing - Biomass system LCC

Hybrid Systems, Need for Hybrid Systems, Range and type of Hybrid systems, Case studies of Diesel-PV, Wind-PV, Microhydel-PV, Biomass-Diesel systems, electric and hybrid electric vehicles

Suggested Books:

1. Ashok V Desai, Non-Conventional Energy, Wiley Eastern Ltd, New Delhi, 2003
2. Mittal K M, Non-Conventional Energy Systems, Wheeler Publishing Co. Ltd, New Delhi,2003
3.Ramesh R & Kumar K U, Renewable Energy Technologies, Narosa Publishing House, New Delhi, 2004
4.Wakil MM, Power Plant Technology, Mc Graw Hill Book Co, New Delhi, 2004.

ECE-435	MICROSTRIP LINE ANALYSIS						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**-**	**-**	**4**	**75**	**25**	**100**	**3 Hour**
Course Objectives							
CO 1	**To understand the need of microstrip analysis .**						
CO 2	**To know about the dispertion models and measurements.**						

Unit -I

Microstrip Lines I: Quasi- Static Analyses, Dispersion Models, and Measurements

Introduction, Quasi-Static Analyses of a Microstrip, Microstrip Dispersion Models, Microstrip Transitions, Microstrp Measurements.

Unit -II

Microstrip Lines II: Fullwave Analyses, Design Considerations, and Applications

Methods of Full Wave Analysis, Analysis of Open Microstrip, Analysis of Enclosed Microstrip, Design Considerations, Other Types of Microstrip Lines, Microstrip Applications.

Unit -III

Microstrip Discontinuities I: Quasi- Static Analysis and Characterization

Introduction, Discontinuity Capacitance Evaluation, Discontinuity Inductance Evaluation, Characterization of Various Discontinuities, Compensated Microstrip Discontinuities.

Unit -IV

Slotlines

Introduction, Slotline Analysis, Design Considerations, Slotline Discontinuities, Other Slotline Configurations, Slotline Transitions, Slotline Applications.

Text Book: K.C. Gupta, Ramesh Garg, Inder Bhal and Parkash Bhartia, ***Microstrip lines & Slotlines,*** Second ed., Artech House, London

ECE-437	Software Defined Radios						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3		**-**	**3**	**75**	**25**	**100**	**3**
Purpose	**To understand Modern Radio Communication System that can be reconfigured.**						
Course Outcomes							
CO 1	**Conceptualize the SDR and implementation details**						
CO 2	**Design SDR for a specific application**						
CO 3	**Identify the challenges in the maintenance of SDR**						
CO 4	**Analyse the transmitter and receiver architectures**						

Unit-I

Introduction – Software Defined Radio – A Traditional Hardware Radio Architecture – Signal Processing Hardware History – Software Defined Radio Project Complexity.
A Basic Software Defined Radio Architecture – Introduction – 2G Radio Architectures Hybrid Radio Architecture- Basic Software Defined Radio Block Diagram- System Level Functioning Partitioning-Digital Frequency Conversion Partitioning.

Unit-II

Analog-to-Digital and Digital-to-Analog Conversion- Introduction – Digital Conversion Fundamentals- Sample Rate- Bandpass Sampling- Oversampling- Antialias Filtering – Quantization – ADC Techniques-Successive Approximation- Figure of Merit-DACs- DAC Noise Budget- ADC Noise Budget.

Unit-III

Digital Frequency Up- and Down Converters- Introduction- Frequency Converter Fundamentals- Digital NCO- Digital Mixers- Digital Filters- Halfband Filters- CIC Filters Decimation, Interpolation, and Multirate Processing-DUCs - Cascading Digital Converters and Digital Frequency Converters.
Signal Processing Hardware Components- Introduction- SDR Requirements for Processing Power- DSPs- DSP Devices- DSP Compilers- Reconfigurable Processors Adaptive Computing Machine- FPGAs

Unit-IV

Software Architecture and Components – Introduction- Major Software Architecture Choices – Hardware – Specific Software Architecture- Software Standards for Software Radio-Software Design Patterns- Component Choices- Real Time Operating Systems- High Level Software Languages- Hardware Languages.

Text Books

1. Paul Burns, Software Defined Radio for 3G, Artech House, 2002.
2. Tony J Rouphael, RF and DSP for SDR, Elsevier Newnes Press, 2008
3. Jouko Vanakka, Digital Synthesizers and Transmitter for Software Radio, Springer, 2005.
4. P Kenington, RF and Baseband Techniques for Software Defined Radio, Artech House, 2005.

ECE-414	DSP Processor						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 Hour**
Course Objectives	**1. To study Programmable DSP Processors.** **2. To provide an understanding of the fundamentals of DSP techniques.** **3. To study implementation & applications of DSP techniques.** **4. To understand architecture of DSP processor** **5. To understand DSP system design using FPGA.**						
Course Outcomes							
CO 1	To describe the detailed architecture, addressing mode, instruction sets of TMS320C5X.						
CO 2	To write program of DSP processor.						
CO 3	To describe the detailed architecture, addressing mode, instruction sets of TMS320C54X.						
CO 4	To know DSP system design using FPGA.						

Unit -I

INTRODUCTION: Digital Signal Processing, Advantages of DSP, Applications of DSP.
FUNDAMENTALS OF PROGRAMMABLE DSPs: 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.

Unit -II

ARCHITECTURE OF TMS320C5X: Architecture, Bus Structure & memory, CPU, addressing modes.
Programming TMS320C5X: Assembly language syntax, Assembly language Instructions, Simple ALP – Pipeline structure, Operation Block Diagram of DSP starter kit, Application Programs for processing real time signals.

Unit -III

PROGRAMMABLE DIGITAL SIGNAL PROCESSORS: Block diagrams of 54X internal Hardware, buses , internal memory organization, Data Addressing modes of S320C54XX Processors, Program Control, On-chip peripheral, Interrupts ofTMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Unit -IV

ADVANCED PROCESSORS and FPGA: Code composer studio - Architecture of TMS320C6X, Introduction to FPGA, Design flow for an FPGA based system design, FPGA based DSP system design. Comparison of the performance of the system designed using FPGA and Digital signal processors, Application note on DSP systems.

Text- Books:

1. B. Venkataramani and M. Bhaskar, Digital Signal Processors -Architecture, Programming and Applications 2nd edition, Mc Graw Hills 2011.
2. Avtar Singh, S. Srinivasan DSP Implementation using DSP microprocessor with Examples from TMS32C54XX –Thamson.

Reference Books:

1. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. , S. Chand & Co, 2000.
2. Digital signal processing-Jonathen Stein John Wiley 2005.
3. S.K. Mitra, Digital Signal Processing, Tata McGraw-Hill Publication, 2001.
4. B. Venkataramani, M. Bhaskar, Digital Signal Processors, McGraw Hil

ECE-416	Mobile Communication Network						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3		**-**	**3**	**75**	**25**	**100**	**3**
Purpose	**To expose the students to the most recent technological developments in Mobile communication systems.**						
Course Outcomes							
CO 1	**Fundamental concepts in wireless, cellular technology**						
CO 2	**Standards evolved**						
CO 3	**Models of mobile radio channels**						
CO 4	**Communication technologies adapted, Wireless networks**						

Unit-I

Introduction To Mobile Radio Systems Evolution of Mobile radio communications – Mobile radio systems in the U.S. and around the world – Examples of Mobile radio systems. **Standards and Cellular Concept Cellular concept** – Frequency reuse – Channel Assignment strategies – Handoff strategies – Interference and System capacity – Trunking and Grade of service – Improving capacity in cellular systems.

Unit-II

Mobile Radio Propagation Small-scale multipath propagation – Impulse response of a multipath channel – Parameters of mobile multipath channel – Types of small-scale fading – Rayleigh and Rician distributions – Statistical models for multipath fading channels.

Unit-III

Mobile System and Network Architectures GSM Services and Features – GSM system architecture – GSM radio subsystem – Frame structure for GSM – Signal processing in GSM – GPRS network architecture – GPRS services and features – 3G UMTS network architecture – UMTS services and features.

Unit-IV

Wireless Standards Multiple access techniques – FDMA, TDMA and CDMA – Wireless networking – Design issues in personal wireless systems – Cordless systems and Wireless Local Loop (WLL) – IEEE 802.16 Fixed Broadband Wireless Access standard – Mobile IP and Wireless Application Protocol.

Text Books

1. Rappaport, T.S., "Wireless Communications", Principles and Practice, Prentice Hall, NJ, 1996.
2. William Stallings, "Wireless Communication and Networking", Pearson Education, 2002.
3. Siegmund M. Redl, Mathias K. Weber, Malcolm W. Oliphant, "An Introduction to GSM", Artech House Publishers, 1995.
4. Kraus, J.D., "Antennas", II Edition, John Wiley and Sons, NY, 1977. 5. Collin, R.E. and Zucker, F., - "Antenna theory: Part I", Tata McGraw Hill, NY, 1969.

ECE-418	MEMS						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**-**	**-**	**4**	**75**	**25**	**100**	**3**
Course Outcomes							
CO 1	**Students will be using knowledge of mathematics, science, and engineering to understand various MEMS devices.**						
CO 2	**Students be able to understand various processes used such as oxidation, metallization, fabrication and packaging of MEMS devices.**						
CO 3	**Understanding basic principles of bulk micromachining and clean rooms practices**						
CO 4	**Understand materials and MEMS packaging techniques.**						
CO 5	**Students can write an engineering report on the one of potential MEMS devices and give an effective oral presentation.**						

Unit-I

Introduction to Microsystems: Overview of microelectronics manufacture and Microsystems technology. Definition - MEMS materials. Laws of scaling. The multi disciplinary nature of MEMS. Survey of materials central to micro engineering. Applications of MEMS in various industries.

Unit-II

Micro Sensors and Actuators: Working principle of Microsystems - micro actuation techniques, micro sensors – types, Microactuators and types,micropump, micromotors, micro – valves, microgrippers – micro- accelerometers.

Unit-III

Fabrication Process Substrates - single crystal silicon wafer formation, Clean room practices, Photolithography, Ion implantation, Diffusion, Oxidation, CVD - Physical vapor deposition, epitaxy - etching process.

Unit-IV

Micro System Manufacturing Bulk Micro manufacturing - surface micro machining – LIGA Micro system packaging materials - die level - device level - system level - packaging techniques – die preparation – surface bonding wire bonding - sealing. Introduction to assembly, Introduction to Micro-system design.

Text Books

1. MEMS and Microsystems Design and Manufacture" by Tai-Ran Hsu. Tata McGraw-Hill Publishing Company Ltd.
2. Foundation of MEMS" by Chang Liu. Pearson Education.
3. MEMS Handbook", Mohamed Gad – el – Hak, CRC Press, 2002.
4. Rai - Choudhury P. MEMS and MOEMS Technology and Applications", PHI Learning Private Limited, 2009.
5. Sabrie Solomon, "Sensors Handbook," Mc Graw Hill, 1998.

References

1. Francis E.H. Tay and Choong .W.O, "Micro fluidics and Bio mems application", IEEE Press New York, 1997.
2. Trimmer William S., Ed., "Micromechanics and MEMS", IEEE Press New York, 1997.
3. Maluf, Nadim, "An introduction to Micro electro mechanical Systems Engineering", AR Tech house, Boston 2000.
4. Julian W.Gardner, Vijay K.Varadan, Osama O. Awadel Karim, "Micro sensors MEMS and Smart Devices", John Wiby & sons Ltd., 2001.

ECE-420	Transducers & Its Applications						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3		**-**	**3**	**75**	**25**	**100**	**3**
Purpose	**Understanding the structural and functional principles of sensors and transducers used for various physical and nonelectric quantities and how to use them to measure these quantities.**						
Course Outcomes							
CO 1	**Explain the principles of operation of the sensor parameters and generators**						
CO 2	**Interpretation of the measurement results by using transducers.**						
CO 3	**Development of measurement schemes for different non electrical quantities**						
CO 4	**Assimilating knowledge about the implementation of sensors and transducers.**						

Unit-I

Definition of transducer. Advantages of an electrical signal as out-put. Basic requirements of transducers, Primary and Secondary Transducer, Analog or digital types of transducers. Resistive, inductive, capacitive, piezoelectric, photoelectric and Hall Effect tranducers.

Unit-II

Measurement of Pressure – Manometers, Force summing devices and electrical transducers
Measurement of Temperature – Metallic resistance thermometers, semi conductor resistance sensors (Thermistors), thermo-electric sensors, pyrometers.

Unit-III

Measurement of Displacement – Potentiometric resistance type transducers, inductive type transducers, differential transformer (L.V.D.T), capacitive transducers, Hall effect devices, strain gage transducers.
Measurement of Velocity – variable reluctance pick up, electromagnetic tachometers, photoelectric tachometer, toothed rotor tachometer generator..

Unit-IV

Measurement of Force – Strain-gage load cells, pneumatic load cell, LVDT type force transducer.
Measurement of Torque – Torque meter, torsion meter, absorption dynamometers, inductive torque transducer, digital methods.

Suggested Books:

1. B.C. Nakra, K.K. Chaudhry, "Instrumentation Measurement and Analysis," Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Thomas G. Beckwith etc. all, "Mechanical Measurements (International Student Edition), Addison-Wesley Longman, Inc. England.
3. A.K. Sawhney, " A Course in Electrical and Electronic Measurements and Instrumentation," Dhanpat Rai & Sons, Delhi-6.

ECE 422	Radar Engineering						
Lecture	**Tutorial**	**Practical**	**Credit**	**Theory**	**Sessional**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of radar, various types of radar, radar mixers and various other technologies.**						
Course Outcomes							
CO1	**To understand the concept of basics of radar, its equation and signals associated with radar.**						
CO2	**To understand the concept of CW and MTI radar.**						
CO3	**To familiarize with the concept of tracking radar.**						
CO4	**To familiarize with the concept of radar receiver, mixers and duplexers.**						

Unit- I

Radar BASICS:
Radar Block Diagram & operation, Applications of Radar.

Radar Equation:
Simple form of Radar Equation, Detection of signals in noise,Signal to Noise ratio, Transmitter Power. Pulse repetition frequenc)' & range ambiguities, System losses, Propagation effects.

Unit- II

CW & Frequency Modulated Radar:
The Doppler effect, CW Radar, FM- CW Radar, Multiple Frequency CW Radar.

MTI & Pulse Doppler Radar:
Introduction, Delay Line Cancellors. Multiple or staggered Pulse repetition frequencies.range-Gated Doppler Filters, Limitation of MTI performance, Noncoherent MTI, Pulse Doppler radar, MTI from a moving platform.

Unit-III

Tracking Radar: Tracking with Radar, Sequential Lobbing, Conical Scan, Monopulse Tracking Radar, Tracking in range, Acquisition, Low angle tracking.

Unit-IV

Receivers, Displays & Duplexers:
Radar Receivers, Noise Figure, MixerLow-noise Front ends. Displays, Duplexer, Receiver protectors.

Text Book:
I. Introduction to Radar Systems: Merrill!. Skolnik,; MGH
Reference Book:
Electronic Communication Systems: Kennedy; TMH.

ECE-424	High Frequency Circuits and Systems						
Lecture	**Tutorial**	**Practical**	**Credit**	**Theory**	**Sessional**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	**This course aims to introduce the design of high frequency CMOS circuits suitable for transmitter and receiver of modern communication devices**						
Course Outcomes							
CO1	**To explore the various performance measures of high frequency circuits.**						
CO2	**To learn the design of high frequency filters, amplifiers and oscillators.**						

Unit-I

PARAMETERS OF HIGH FREQUENCY CIRCUITS

Gain Parameters, Non-linearity parameters, Noise figure, Phase Noise, Dynamic range, RF front end performance parameters, performance trade offs in an RF circuit.

Unit-II

HIGH FREQUENCY FILTER DESIGN

Modern filter design, Frequency and impedance scaling, High Pass filter design, Band pass filter design, Band reject filter design, the effects of finite Q.

Unit- III

HIGH FREQUENCY AMPLIFIER DESIGN

Zero as bandwidth enhances,Shunt-series amplifier, Bandwidth enhancement with frequency Doublers, Tuned amplifiers, Neutralization and unilateralization , cascaded Amplifiers.

Unit -IV

MIXERS AND OSCILLATORS

Mixer fundamentals, Non linear systems as Linear mixers, multiplier based mixers, Subsampling mixers. Problems with purely linear oscillators, Tuned oscillator, Negative Resistance oscillators, frequency synthesis.

BOOKS

1. Aleksandar Tasic, Wouter.A.Serdijn, John.R.Long, "Adaptive Low Power Circuits for Wireless Communication (Analog Circuits and Signal Processing)", Springer, 1st Edition, 2006.

2. Chris Bowick, "RF Circuit design", Newnes (An imprint of Elesvier Science), 1st Edition, 1997.
   Thomas.H. Lee, "The design of CMOS Radio-Frequency Integrated Circuits",Cambridge University Press, 2nd Edition, 2004.

ECE-426	Bio-Medical Signal Processing						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3		**-**	**3**	**75**	**25**	**100**	**3**
Purpose	**To understand the concept of Bio-Medical Signal Processing.**						
Course Outcomes							
CO 1	Introduction to signal and information.						
CO 2	Introduction to Biomedical Signals and ECG.						
	Introduction to Adaptive filtering and EEG.						
CO 4	Introduction to Event detection and waveform analysis.						

Unit – I

Signals and Information: Definitions and properties of Laplace transform, Basic of DFT and FFT, z-transform, Sampling theorem.
Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability, impulse response, convolution, poles and zeros, frequency response, group delay, phase delay, Applications of Digital Signal Processing.

Unit – II

Introduction to Biomedical Signal: General measurement and diagnostic system, classification of signals, introduction to biomedical signals, Biomedical signal acquisition and processing.
ECG: ECG signal origin, ECG parameters-QRS detection different techniques, ST segment analysis, Arrhythmia, Arrhythmia analysis, Arrhythmia monitoring system.

Unit – III

Adaptive Filtering: Introduction, General structure of adaptive filters, LMS adaptive filter, adaptive noise cancellation, cancellation of ECG from EMG signal, Cancellation of maternal ECG in fetal ECG.
EEG: EEG signal characteristics, Sleep EEG classification and epilepsy.

Unit – IV

Event Detection and waveform analysis: Need for event detection, Detection of events & waves, Correlation analysis of EEG signals, Identification of heart sounds, Morphological analysis of ECG waves.
Frequency Domain Analysis: Introduction, Spectral analysis, linear filtering, Removal of high frequency noise (power line interference), motion artifacts (low frequency) and power line interference in ECG.

Text Book:

1. Biomedical Signal Analysis" A case study approach, Rangaraj M Rangayyan, John Wiley publications.

Reference Books:

1. "Biomedical Signal Processing Time and Frequency Domains Analysis (Volume I)", Arnon Cohen, CRC press.
2. "Biomedical Signal Processing Principles and Techniques" D.C.Reddy, Tata Mc Graw-Hill
3. "Biomedical Digital Signal Processing", Willis J. Tompkins, PHI

ECE-428	Multimedia Communications						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of basic multimedia communication systems and various compression algorithms of text, audio, image and video.**						

Course Outcomes	
CO1	**To understand the concept of basic multimedia comm. System and various types of networks and applications.**
CO2	**To understand the concept text and image compression.**
CO3	**To understand the concept of audio and video compression.**
CO4	**To understand the concept of multimedia synchronization and video indexing.**

Unit - I

Multimedia Communication: Introduction, Multimedia networks: Telephone networks, Data networks, ISDN, B-ISDN. Multimedia Applications: Interactive applications over the internet and entertainment applications.

Digitization Principles, Representation of Text, Images, Audio and Video.

Unit - II

Text Compression: Compression principles, Text Compression techniques: Static Huffman Coding, Dynamic Huffman Coding, Arithmetic Coding, Lempel Ziv and Lempel Ziv welsh coding.

Image Compression: Graphics interchange format, Tagged image file format, JPEG in detail.

Unit - III

Audio Compression: Differential Pulse Code Modulation, Adaptive Differential PCM, Adaptive Predictive coding, Linear predictive coding and MPEG audio coders,

Video Compression: Video Compression principles, Frame types, Motion estimation and compensation, H.261, H.263

Unit - IV

Multimedia Synchronization: Basic definitions and requirements, Time stamping and Pack architecture.

Video Indexing: Basics of content based image retrieval and video content representation.

Reference Books:

1. Multimedia communications: Fred Halsall; Pearson Education Asia.
2. Multimedia Systems" by Ralf Steinmetz and Klara Nahrstedt
3. Multimedia Systems, Standards, and Networks" by A. Puri and T. Chen

ECE-430	Mixed VLSI Design						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**4**	**75**	**25**	**100**	**3 Hr.**
Purpose	**This course teaches how in real life applications both analog and digital circuits can implemented for various system design.**						
Course Outcomes							
CO1	**To know mixed signal circuits like DAC, ADC, PLL etc.**						
CO2	**To gain knowledge on filter design in mixed signal mode.**						
CO3	**To acquire knowledge on design of different architectures in mixed signal**						

Unit-I

PHASE LOCKED LOOP

Characterization of a comparator, basic CMOS comparator design, analog multiplier design, PLL - simple PLL, charge-pump PLL, applications of PLL.

Unit- II

SAMPLING CIRCUITS

Basic sampling circuits for analog signal sampling, performance metrics of sampling circuits, different types of sampling switches. Sample-and-Hold circuit with miller capacitance.

Unit- III

D/A CONVERTER

Input/output characteristics of an ideal D/A converter, performance metrics of D/A converter, D/A converter in terms of voltage, current, and charge division or multiplication, switching functions to generate an analog output corresponding to a digital input.

Unit- IV

A/D CONVERTER

Input/output characteristics and quantization error of an A/D converter, performance metrics of pipelined architectures, Successive approximation architecture.

BOOKS:

1. S. M. Kang and Y. Leblebici, CMOS Digital Integrated Circuits : Analysis and Design, Third Edition, TMH, 2002.
2. Razavi, "Design of analog CMOS integrated circuits", McGraw Hill, Edition 2002.
3. Jacob Baker, "CMOS Mixed-Signal circuit design", IEEE Press, 2009.
4. Gregorian, Temes, "Analog MOS Integrated Circuit for signal processing", John Wiley & Sons, 1986.

ECE-428	Microstrip Antenna						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of basic Antenna.**						
Course Outcomes							
CO1	**To understand the concept of basic Antenna. System and various types of applications.**						
CO2	**To understand the concept of microstrip antenna and its analytical modeling**						
CO3	**To understand the different designs of microstrip antenna**						
CO4	**To understand the applications of different designs of microstrip antenna**						

Unit-1

Micro Strip Radiator

Introduction, Microstrip Antenna Configurations, Feeding Techniques and Modeling of Microstrip Antenna, Radiation field, Surface wave and Photonic Bandgap Structures and Applications

Unit- 2

Analytical Modeling and Full Wave Analysis

Introduction, Transmission Line Model, Cavity model, Radiation Fields, Aperture and Mutual admittance, conductance. **Full wave analysis:** Input Impedance and Radiation efficiency, Radiation pattern, Mixed Potential Integral Equation Analysis, Greens function, Finite Difference Time-Domain Analysis.

Unit-3

Rectangular and Circular Microstrip Antenna

Introduction, Models for Rectangular Patch Antennas, Design Consideration for Rectangular Patch antennas, Tolerance Analysis, Mechanical Tuning, Quarter-wave Rectangular Patch Antenna, **Circular Microstrip Antenna:** Analysis of Circular disk, Cavity and Transmission line modeling of circular antennas.

Unit- 4

Circularly Polarized and Broadband Microstrip Antenna Design

Circular Polarization, Rectangular and Circular Circularly polarized Antennas, Power divider : T Junction and Wilkinson.
Effect of Substrate Parameter on Bandwidth, Selection of suitable Patch Shape, Feeding Techniques, Multimoding Techniques , Impedance Matching, Resistive Loading.

Text book: Ramesh Garg, Prakash Bhartiya, Inder Bahl, Apisak Ittipboon, "**Microstrip Antenna Design Handbook",** Artech House Boston, London.

ECE-434	Strategic Electronics						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**0**	**0**	**4**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes							
CO1	**Students will be aware of state-of the art in flexible electronics**						
CO2	**Students be able to understand the fundamentals of Smart Structure and Materials**						
CO3	**Understanding basic principles of fabrication techniques used for the fabrication of futuristic flexible electronic devices, structure, sensors and transducers.**						
CO4	**Understand the characterization techniques used in futuristic electronic devices, smart materials, structures, etc.**						

Unit-I

Emerging flexible electronics technology, involving new materials and processing techniques such as amorphous and nanocrystalline silicon, organic and polymeric semiconductors, solution cast films of carbon nanotubes, and graphene. Real device are discussed including high speed transistors, photovoltaics, flexible flat-panel displays, etc.

Unit – II

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes. Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

Unit - III

Clean room practices, Photolithography, Ion implantation, Diffusion, Oxidation, CVD - Physical vapor deposition, epitaxy - etching process.
Bulk Micro manufacturing - surface micro machining – LIGA ,Micro system packaging materials - die level- device level - system level - packaging techniques – die preparation – surface bonding - wire bonding - sealing. Introduction to assembly, Introduction to Micro-system design

Unit - IV

Characterization Techniques: Quantum wells and Thickness measurement techniques: Contact - step height, Optical - reflectance and ellipsometry, AFM, Nanomaterials Characterization techniques: IV-CV Electrochemical Impedance, FTIR, XRD, AFM, SEM, TEM, EDAX and interpretation of results.

Books:

1. Flexible Electronics: Materials and Applications, Editors: **Wong**, William S., **Salleo**, Alberto (Eds.) 2.Brain Culshaw – Smart Structure and Materials Artech House – Borton. London-1996.
3. MEMS and Microsystems Design and Manufacture" by Tai-Ran Hsu. Tata McGraw-Hill Publishing Company Ltd
4. Marc F Madou, "Fundamentals of Micro Fabrication", CRC Press, 2nd Edition, 2002.
5. Semiconductor Material and Device Characterization By Dieter K. Schroder, Willey Publications

ECE-436	Cognitive Radios						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3		**-**	**3**	**75**	**25**	**100**	**3**
Purpose	**To understand the concept of Cognitive Radio and Spectrum sharing**						
Course Outcomes							
CO 1	Conceptualize the CR and implementation details						
CO 2	Design CR for a specific application						
CO 3	Identify the challenges in the maintenance of CR						
CO 4	Analyse the transmitter and receiver architectures						

Unit-I

RF System Design – Introduction- Noise and Channel Capacity- Link Budget- Receiver Requirements- Multicarrier Power Amplifiers- Signal Processing Capacity Tradeoff.

Unit-II

CR Architecture- Cognitive Radio Architecture, Dynamic Access Spectrum, Spectrum Efficiency, Spectrum Efficiency gain in SDR and CR ,Spectrum Usage, SDR as a platform for CR, OFDM as PHY layer ,OFDM Modulator, OFDM Demodulator, OFDM Bandwidth, Benefits of OFDM in CR, Spectrum Sensing in CR, CR Network

Unit-III

Smart Antennas Using Software Radio- Introduction- 3G smart Antenna Requirements Phased Antenna Array Theory- Applying Software Radio Principles to Antenna Systems Smart Antenna Architectures- Optimum Combining/ Adaptive Arrays- DOA Arrays- Beam Forming for CDMA- Downlink Beam Forming.

Unit-IV

Application of SDR -Application of SDR in Advance Communication System-Case Study, Challenges and Issues, Implementation, Parameter Estimation –Environment, Location, other factors, Vertical Handoff, Network Interoperability.

Text Books:

1. Jeffrey.H.Reed ,Software Radio : A Modern Approach to Radio Engineering , Pearson , Reference Books: 1. Markus Dillinger , KambizMadani ,Nancy Alonistioti, Software Defined Radio : Architectures , Systems and Functions ,Wiley
2. Tony .J. Rouphael , RF and DSP for SDR, Elsevier Newness Press ,2008
3. Dr.TajStruman ,Evaluation of SDR –Main Document
4. SDR –Handbook , 8th Edition , PENTEK 5. Bruce a. Fette , Cognitive Radio Technology, Newness, Elsevier.