ECE - (4 Year B.TechProgramme) - COURSE CURRICULUM R-19													
II Year Course structure													
Semester - I													
Course Code	**Title of the course**	**CAT**	**Periods**						**Sessionals Marks**	**Semester end Exam marks**	**Total Marks**	**Credits**
			L	**T**	**P**	**E**	**O**	**Total**				
ECE211	EngineeringMathematics – III	BS	3	0	0	1	6	10	40	60	100	3
ECE212	Computer Architecture and Organization	ES	3	0	0	1	4	8	40	60	100	3
ECE213	Digital Electronics and Logic Design	PC	3	0	0	1	3	7	40	60	100	3
ECE214	Signals and systems	PC	3	0	0	1	5	9	40	60	100	3
ECE215	Probability Theory and Random Process	PC	3	0	0	1	5	9	40	60	100	3
ECE216	Electronic circuits and analysis-I	PC	3	0	0	1	5	9	40	60	100	3
ECE217	Electronic circuits and analysis-I Lab	PC	0	0	3	0	1	4	50	50	100	1.5
ECE218	Simulation Lab(MATLAB and HDL Programming)	PC	0	0	3	0	1	4	50	50	100	1.5
ECE 219	Human Values and Professional Ethics(Mandatory non-credit course)	HS	3	0	0	0	1	4	50	0	50	-
Total			21	0	6	6	31	64	390	460	850	21
Semester - II													
Course Code	**Title of the course**	**Category**	**Periods**						**Sessionals Marks**	**Semester end Exam marks**	**Total Marks**	**Credits**
			L	**T**	**P**	**E**	**O**	**Total**				
ECE221	EngineeringMathematics – IV	BS	3	0	0	1	6	10	40	60	100	3
ECE222	Control systems	ES	3	0	0	1	4	8	40	60	100	3
ECE223	Electronic circuits and analysis-II	PC	3	0	0	1	5	9	40	60	100	3
ECE224	Analog communication	PC	3	0	0	1	4	8	40	60	100	3
ECE225	Transmission Lines and EM Waves	PC	3	0	0	1	6	10	40	60	100	3
ECE226	Microprocessors and Microcontrollers	PC	3	0	0	1	5	9	40	60	100	3
ECE227	Electronic circuits and analysis-II Lab	PC	0	0	3	0	1	4	50	50	100	1.5
ECE228	Microprocessors and Microcontrollers lab	PC	0	0	3	0	1	4	50	50	100	1.5
Total			18	0	6	6	32	62	340	460	800	21

Engineering Mathematics – III (FOURIER ANALYSIS, COMPLEX VARIABLES and Z-TRANSFORMS)	
ECE 211	**Credits:3**
Instruction: 3 Periods & 1 E/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Pre -requisites: Basic concepts of Differentiation, Partial differentiation, Integration and Binomial expansion for rational index.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Understand the need for a function or its approximation as an infinite Fourier Series to represent discontinuous function which occurs in signal processing and electrical circuits.
2.	Find different Fourier Transforms of non-periodic functions and also use them to evaluate Boundary value problems.
3.	Analyze limit, continuity and differentiation of functions of complex variables and Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions.
4.	Understand Cauchy theorem and Cauchy integral formulas and apply these to evaluate complex contour integrals and represent functions as Taylor and Laurent series and determine their intervals of convergence and use residue theorem to evaluate certain real definite integrals.
5.	Understand the characteristics and properties of Z- transforms and its applications.

SYLLABUS

UNIT – I **[12 Periods]**

FOURIER SERIES

Introduction – Euler's formulae – Conditions for a Fourier expansion – Functions having points of discontinuity – Change of interval – Even and odd functions – Half range series - Parseval's formula.

Sections:10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7 and 10.9 .

UNIT – II **[12 Periods]**

FOURIER TRANSFORMS

Introduction – Definition – Fourier integral theorem(without proof) - Fourier sine and cosine integrals – Fourier transforms – Properties of Fourier transforms – Convolution theorem - Parseval's identity for Fourier transforms - Relation between Fourier and Laplace transforms - Fourier transforms of the derivatives of a function - Applications of transforms to boundary value problems.

Sections: 22.1, 22.2, 22.3, 22.4, 22.5, 22.6, 22.7, 22.8, 22.9 and 22.11.

UNIT – III **[12 Periods]**

FUNCTIONS OF A COMPLEX VARIABLE

Complex function, Real and Imaginary parts of Complex function, Limit, Continuity and Derivative of a Complex function, Cauchy-Riemann equations, Analytic function, entire function, singular point, conjugate function, Cauchy-Riemann equations in polar form, Harmonic functions, Milne-Thomson method, Simple applications to flow problems- Applications to flow problems – some standard transformations(Translation, Inversion and reflection , Bilinear transformations and its fixed points).

Sections:20.1, 20.2, 20.3, 20.4, 20.5, 20.6 and 20.8.

UNIT – IV **[12 Periods]**

COMPLEX INTEGRATION & SERIES OF COMPLEX TERMS

Complex integration - Cauchy's theorem - Cauchy's integral formula – Series of complex terms: Taylor's series, Maclaurin's series expansion, Laurent's series(without proofs). Zeros of analytic function, Singularities ofa complex function, Isolated singularity, Removable singularity, Poles, pole of order m, simple pole, Essential singularity, Residues, Residue Theorem, Calculation of residues, Residue at a pole of order m, Evaluation of real definite integrals: Integration around the unit circle, Integration around a semicircle

Sections: 20.12, 20.13, 20.14, 20.16 , 20.17, 20.18, 20.19 and 20.20.

UNIT – V **[12 Periods]**

Z-TRANSFORMS

Introduction – Definition - Some standard Z-transforms – Linearity property – Damping rule – Some standard results - Shifting to the right/left, Multiplication by - Two basic theorems (Initial value theorem and Final value theorem) – Convolution theorem. Evaluation of inverse Z- transforms - Applications to difference equations.

Sections:23.1, 23.2, 23.3, 23.4, 23.5, 23.6, 23.7, 23.8, 23.9, 23.12, 23.15 and 23.16.

TEXT BOOKS:

1. B. S. Grewal, "*Higher Engineering Mathematics*", 43rd edition, Khanna publishers, 2017.

REFERENCE BOOKS:

1. N P. Bali and Manish Goyal, "A text book of Engineering mathematics", Laxmi publications, latest edition.
2. Erwin Kreyszig, "*Advanced Engineering Mathematics*", 10th edition, John Wiley & Sons, 2011.
3. R. K. Jain and S. R. K. Iyengar, "Advanced Engineering Mathematics", 3rdedition, Alpha Science International Ltd., 2002.
4. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13thedition, Pearson Publishers.

Computer Architecture And Organization	
ECE 212	**Credits:3**
Instruction: 3 Periods & 1 E/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Pre -requisites: Digital Electronics.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Work with the typical assembly language instructions of a computer
2.	Organize the hardware involved in the CPU of a computer
3.	Design CPU & control unit of a basic computer
4.	Illustrate the concept of pipelining and multiprocessors.
5.	Use computing resources such as memory and I/O in an effective manner to improve the performance of a computer

SYLLABUS

UNIT – I **[09 Periods]**

REGISTER TRANSFER AND MICROOPERATIONS

Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Microoperations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit

UNIT – II **[12 Periods]**

BASIC COMPUTER ORGANIZATION

Instruction Codes, Computer Registers, Computer Instructions, hardwired control unit, Instruction Cycle, Memory Reference Instructions

MICROPROGRAMMED CONTROL

Control Memory, Address Sequencing, Microinstruction Formats, Micro program Example, Design of Control Unit

UNIT – III **[10 Periods]**

CPU ORGANIZATION

Introduction, General Register Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Stack Organization. Reduced Instruction Set Computer (RISC) and CISC architectures

UNIT – IV **[11 Periods]**

INPUT - OUTPUT ORGANIZATION

Peripheral Devices, Input - Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA),Introduction to pipelining, multiprocessors.

UNIT – V **[09 Periods]**

MEMORY ORGANIZATION

Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory

TEXT BOOKS:

1. M. Morris Mano, "*Computer System Architecture*", 3rd Ed., PHI, 1996

REFERENCE BOOKS:

1. V. Carl Hamacher, Zvonko G. Vranesic and Safwat G. Zaky, "*Computer Organization*", 5th Ed., McGraw Hill International,2011
2. Sivarama P. Dandamudi, "*Fundamentals of computer Organization and design*", Springer, 2002
3. William Stallings, "*Computer Organization & Architecture - Designing for performance*", 8th Ed., Pearson Education India,2013
4. John D. Carpinelli, "*Computer Systems Organization & Architecture*", 1st Ed., Pearson Education

India,2000
5. Sajjan G. Shiva, "*Computer design and architecture*", 3rd Ed., Marcel Dekker,2000
6. Hennessy- Patterson, "*Computer Architecture: A quantitative approach*", 5 th edition, Morgan Kaufmann,2011

Digital Electronics and Logic Design	
ECE 213	**Credits:3**
Instruction: 3 periods & 1 e/week	Sessional marks:40
End exam: 3 hours	End exam marks:60

Pre -requisites: Nil

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Perform conversions between different number systems and codes and apply the Boolean algebra to minimize the given logic expressions.
2.	Minimize the given Boolean expressions using K-Map (up to four variables) and QM method (up to 5 variables).
3.	Design and Analyze combinational logic circuits.
4.	Design and Analyze sequential logic circuits.
5.	Analyze the characteristics of logic families and compare their performance in terms of performance metrics.

SYLLABUS

UNIT – I **[09 Periods]**

NUMBER SYSTEMS

Number representation, Conversion of bases, Binary Arithmetic, Representation of Negative numbers, Binary codes: weighted and non-weightedBOOLEAN ALGEBRA: Basic definitions, Axiomatic Definitions, Theorems and properties, Boolean Functions, Canonical and standard forms.

(TB1- chapters 1 & 2)

UNIT – II **[09 Periods]**

LOGIC MINIMIZATION

The K-Map Method: Two variable map, Three variable map, four variable map Prime Implicants, Don't care conditions, NAND and NOR implementation, Quine-Mccluskey (QM) (upto five variables) Technique. (**TB1- chapters 3)**

UNIT – III **[09 Periods]**

COMBINATIONAL LOGIC DESIGN

Combinational circuits, Analysis Procedure, Design Procedure, Code Converters (BCD to XS3(XS3 to BCD)), Gray to Binary (Binary to Gray), Binary Adder-Subtractor, Decimal adder, Binary Multiplier, Magnitude comparator, Decoders, Encoders, Multiplexers. De-Multiplexer, Hazards.

(TB1- chapters4 & 9.7)

UNIT – IV **[09 Periods]**

SEQUENTIAL LOGIC DESIGN

Introduction to Latch and Flip flop, clocked S-R, JK, D, T flip flops. Excitation table of Flipflop, Flip flop conversion, Clocked flip flop design, Edge triggered flip flop, applications of flipflops.

Registers, Applications of Shift registers, universal shift register, Ripple counters, Synchronous counters, counter with unused states, Ring counters, Johnson counter.**(TB2- chapters 7 & 8 (till 8.5))**

UNIT – V **[09 Periods]**

LOGIC FAMILIES

Introduction, Characteristics of Digital ICs, Resistor Transistor Logic (RTL), Diode Transistor Logic (DTL), Transistor Transistor Logic (TTL), Emitter Coupled Logic (ECL), CMOS Logic, Interfacing CMOS and TTL. (**TB2- chapter 4)**

TEXT BOOKS:

1. M. Morris Mano and Michael D. Ciletti, “Digital Design”, 4th Edition, Pearson Publishers, 2001.
2. R.P Jain, “Modern Digital Electronics”, 3rd Edition, TMH, 2003.

REFERENCE BOOKS:

1. William I. Fletcher, “An Engineering Approach to Digital Design”, PHI, 1980.
2. John F. Wakerly, “Digital Design Principles and Practices”, 3rd Edition, Prentice Hall, 1999.

Signals and Systems	
ECE 214	**Credits:3**
Instruction: 3 Periods & 1 E/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Pre -requisites: Nil

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Identify the type of signals and systems and apply transformations on the independent variable.
2.	Characterize the LTI system and find its response for a given input signal.
3.	Analyze the continuous time signals and systems in the frequency domain using CTFS, CTFT and Laplace transforms.
4.	Analyze the discrete time signals and systems in the frequency domain using DTFT and Z transforms.
5.	Sample and reconstruct the low pass and band pass signal using sampling techniques. .

SYLLABUS

UNIT – I **[10 Periods]**

INTRODUCTION TO SIGNALS AND SYSTEMS

Continuous-Time (CT) signals and Discrete-Time (DT) signals and their representation; commonly used CT and DT signals- impulse, step, pulse, ramp, signum and exponentials; classification of CT and DT signals- periodic and aperiodic, even and odd, energy and power signals; operations on CT and DT signals- addition, subtraction, multiplication, differentiation and integration of CT signals, Time-shifting, Time-reversal and time-scaling of CT and DT signals, classification of CT and DT systems: static and dynamic, linear and non-linear, time- invariant and time-varying, causality, stability and invertability of systems.

UNIT – II **[08 Periods]**

CT and DT types of Linear time invariant (LTI) system, Impulse response, Step response, Response of a LTI system to arbitrary inputs, Transfer function of LTI system,DT type LTI system- convolution sum,CT type LTI system- convolutionintegral, Graphical representation of convolution, Properties of LTI systems,causality of LTI systems, interconnected LTI systems (CT and DT), CT type of LTI systems described by Linear constant coefficient differential equations, DT type LTI systems described by constant coefficient linear difference equations, BIBO stability of LTI systems (CT and DT types).

UNIT – III **[10 Periods]**

ANALYSIS OF CT SIGNALS AND SYSTEMS

Fourier series analysis of CT Signals, CT Fourier transform (FT)- magnitude and phase spectrum, Fourier transform for standard signals, Fourier transform of arbitrary signals, Properties of Fourier transform, Inverse Fourier transform. Laplace Transform (LT)- Relation between FT & LT, pole-zero locations, Laplace transform for standard signals& it's ROC, Properties of ROC, Properties of Laplace transform, Inverse Laplace transform, causality and stability &Analysis of CT systems using Fourier transforms and Laplace Transform.

UNIT – IV **[10 Periods]**

ANALYSIS OF DT SIGNALS AND SYSTEMS

Discrete-time Fourier transform(DTFT) & inverse DTFT, convergence of DTFT ,DTFT properties , Z-Transform (ZT) & its ROC, ROCs of right-sided, left sided and finite duration sequences, properties of ROC & ZT, inverse ZT, inversion methods-power series, PFE and Residue methods, solution of difference equations using ZT, relationship between ZT and DTFT. Application of ZT and DTFT in DT signal and system analysis, DT system function, transfer function, poles and zeros, stability

UNIT – V **[07 Periods]**

SAMPLING

Sampling theorem & it's Graphical and analytical proof for band limited signals, Nyquist rate, anti-aliasing filter, Types of sampling-Impulse sampling, Natural and flat top sampling; aperture effect due to flat- top sampling, Reconstruction of signal from its samples, Effect of under sampling - Aliasing; Introduction to band pass signals sampling theorem

TEXT BOOKS:

1. A.V. Oppenheim, AS Willsky and S.H. Nawab, " Signals and Systems", Pearson.
2. S.Haykin and B.V Veen, "Signals and Systems", John Wiley

REFERENCE BOOKS:

1. P. Ramakrishna Rao and Shankar Prakriya, "Signals and Systems", second addition, McGraw Hill (India) pvt Ltd. 2013
2. NagoorKani. "Signals and Systems", McGraw Hill
3. E.W Kamen and B.S.Heck, "Fundamentals of Signals and Systems", using the Web and Matlab, Pearson.
4. P. Ramesh Babu and R. Anandanatarajan, "Signals and Systems" 4/e, Scitech.
5. K. Raja Rajeswari and B. Visveswara Rao, "Signals and Systems", PHI.

Probability Theory and Random Processes	
ECE 215	**Credits:3**
Instruction: 3 Periods & 1 E/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Pre -requisites: Nil

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Calculate probabilities and conditional probabilities of events defined on a sample space.
2.	Compute statistical averages of one random variables using probability density and distribution functions and also transform random variables from one density to another
3.	Compute statistical averages of two or more random variables using probability density and distribution functions and also perform multiple transformations of multiple random variables.
4.	Determine stationarity and ergodicity and compute correlation and covariance of a random process.
5.	Compute and sketch the power spectrum of the response of a linear time-invariant system excited by a band pass/band-limited random process.

SYLLABUS

UNIT – I **[09 Periods]**

PROBABILITY AND RANDOM VARIABLES

Probability: Probability introduced through Sets and Relative Frequency, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events.

Random Variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables.

UNIT – II **[09 Periods]**

DISTRIBUTION & DENSITY FUNCTIONS AND OPERATION ON ONE RANDOM VARIABLE

Distribution & Density Functions: Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and Conditional Distribution, Methods of defining Conditional Event, Conditional Density, and Properties.

Operation on One Random Variable: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable

UNIT – III **[09 Periods]**

MULTIPLE RANDOM VARIABLES AND OPERATIONS

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (Proof not expected), Unequal Distribution, Equal Distributions.

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case

UNIT – IV **[09 Periods]**

RANDOM PROCESS – TEMPORAL CHARACTERISTICS

Introduction, The Random Process Concept: Classification of Process, Deterministic and Nondeterministic Process. Stationary and Independence: Distributions and Density Functions, Statistical Independence, First-order Stationary Process, Second-Order and Wide-sense Stationary, N-Order and Strict-Sense Stationary, Time Averages and Ergodicity, Mean-Ergodic Process, Correlation-Ergodic Process. Correlation Functions: Autocorrelation Functions and Its Properties, Cross-correlation Functions and its properties, Covariance Functions, Discrete-Time Process and Sequences. Measurement of Correlation Functions, Guassian Random Process, Poisson Random Process, Complex Random Process.

UNIT – V **[09 Periods]**

SPECTRAL ANALYSIS

The Power Spectrum: Relationship between Power spectrum and Autocorrelation, Relationship between Cross Power spectrum and Cross-correlation.

Linear System: Random signal Response of Linear system, Spectral characteristics of system response, Noise Bandwidth, Band pass, Band Limited and Narrowband Process. Rice's Representation.

TEXT BOOKS:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4Ed.,McGraw Hill, 2001
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, McGraw Hill, 2002.

REFERENCE BOOKS:

1. S. P. Eugene Xavier, "Probability Theory and Random Processes", (2nd Edition).S. Chand and Co. New Delhi, 1998
2. Henry Stark & John W. Woods, "Probability, Statistics, and Random Processes for Engineers", 4Ed, Pearson, 2012
3. Davenport W. B. Jrs. and W. I. Root, "Introduction to Random Signals and Noise", McGraw Hill N.Y., 1954
4. Dr.P.Srihari, "Probability Theory & Stochastic Process", 3rd edition, Hi-Tech Publishers, 2010

Electronic Circuits and Analysis-I	
ECE 216	**Credits:3**
Instruction: 3 Periods & 1 E/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Pre -requisites: Nil

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Analyze the response of linear wave shaping circuits for the given non sinusoidal input signals such as step, pulse, square wave and ramp.
2.	Design and Analyze diode clippers and clampers.
3.	Design and analyze various biasing circuits used to select an operating point of a CE transistor amplifier in its active region. Also analyze transistor amplifier circuits by using the h-parameter model.
4.	Analyze the frequency response of multistage amplifiers using h-parameter model and single stage amplifier using hybrid-πmodel.
5.	Design and Analyze BJT based Bistable, Astable and Monostable multi-vibrators.

SYLLABUS

UNIT – I **[09 Periods]**

LINEAR WAVE SHAPING CIRCUITS

Low Pass and High Pass Circuits, Response for sinusoidal, Step, Pulse, Square wave and Ramp inputs, Differentiator and Integrator, Compensated attenuators and uncompensated attenuators.

UNIT – II **[09 Periods]**

NON LINEAR WAVE SHAPING CIRCUITS

Diode series and shunt one level Clippers, Two level clippers for sinusoidal input, Multi level clippers for ramp input, Positive clamping circuit, Negative clamping circuit, Transient analysis of practical clamping circuit, Clamping circuit theorem.

UNIT – III **[09 Periods]**

TRANSISTOR BIASING AND AMPLIFIERS AT LOW FREQUENCIES

The operating point, criteria for fixing the operating point, Bias Stability, The stability factor S, Stabilization techniques: Fixed bias circuit, Collector-to-Base bias, Voltage divider bias. Thermal runaway, Thermal stability.

Transistor hybrid model, h-parameters, Analysis of transistor amplifier circuits (CE, CB, CC) using h-parameters, Simplified CE hybrid model.

UNIT – IV **[09 Periods]**

MULTISTAGE AND HIGH FREQUENCY AMPLIFIERS

Classification of amplifiers, Distortion in amplifiers, Millers theorem and its dual, Frequency response of an RC coupled amplifier, Cascode amplifiers, Darlington pair.

Transistor hybrid-π CE transistor model, determination of hybrid π conductance's, The CE short circuit current gain, current gain with resistive load.

UNIT – V **[09 Periods]**

MULTIVIBRATORS

Stable stages of a binary, fixed bias transistor binary, self biased transistor binary, Schmitt trigger circuit, collector coupled monostable multivibrator, collector coupled astablemultivibrator.

TEXT BOOKS:

1. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, McGraw

Hill Publication, 2009.[Unit-III, Unit-IV]
2. Jacob Millman& Herbert Taub, “Pulse Digital & Switching Waveforms” McGraw-Hill Book Company Inc.[Unit-I, Unit-II,Unit-V]

REFERENCE BOOKS:

1. K.Venkata Rao, Rama sudha. K, G.Manmadha Rao, “Pulse and Digital Circuits”, Pearson.
2. Donald A. Neamon, “Electronic Circuit Analysis and Design”, 2nd Edition. TMH publications.

Electronic Circuits and Analysis-I Lab	
ECE 217	**Credits:1.5**
Instruction: 3 Practical's & 1 O/week	Sessional Marks:50
End Exam: 3 Hours	End Exam Marks:50

Pre -requisites: Nil

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Obtain forward and reverse biased characteristics of a Silicon diode and use it to implement various applications such as different rectifier circuits and voltage regulation circuits used in regulated power supplies.
2.	Design and verify the output of linear and nonlinear wave shaping circuits for different inputs using Multisim
3.	Design a voltage divider bias circuit used to select an operating point of a CE transistor amplifier in its active region and derive the characteristics of a transistor in terms of h-parameters.
4.	Analyze the frequency response characteristics of single stage and multistage amplifiers using Multisim.
5.	Design and analyze different multi-vibrator circuits using Multisim.

LIST OF EXPERIMENTS

CYCLE-I:DESIGN AND SIMULATION USING MULTISIM SOFTWARE

1. Plot the V-I characteristics of a PN diode in forward and reverse bias and find the static, dynamic resistances.
2. Plot the V-I characteristics and regulation characteristics of a Zener diode in reverse bias.
3. Plot the output waveforms of a rectifiers in different configurations and find the ripple factor.
4. Plot the response of Low pass and High pass circuits for a given input
5. Plot the response of Clipper and Clamper circuits for the given input
6. Plot the input and output characteristics of CE configured transistor and find the h-parameter values from the characteristics.
7. Plot the input and output characteristics of CB configured transistor and find the h-parameter values from the characteristics.
8. Plot the frequency response of a single stage CE amplifier.
9. Plot the frequency response of a RC coupled multistage amplifier
10. Verify the functionality of a Bistablemultivibrator.
11. Verify the functionality of aAstablemultivibrator.
12. Verify the functionality of a Monostable multivibrator.
13. Verify the functionality of a Schmitt trigger circuit

CYCLE-II: HARDWARE EXPERIMENTS

1. Plot the V-I characteristics of a PN diode in forward and reverse bias and find the static, dynamic resistances.
2. Plot the V-I characteristics and regulation characteristics of a Zener diode in reverse bias.
3. Plot the output waveforms of a rectifier circuits in different configurations and find the ripple factor.
4. Plot the input and output characteristics of CE configured transistor and find the h-parameter values from the characteristics.
5. Plot the input and output characteristics of CB configured transistor and find the h-parameter values from the characteristics.
6. Verify the working of a BJT as a switch.
7. Plot the frequency response of a single stage CE amplifier.
8. Verify the functionality of a Bistablemultivibrator.

9. Verify the functionality of a Schmitt trigger circuit

Simulation Lab (MATLAB and HDL Programming)	
ECE 218	**Credits:1.5**
Instruction: 3 Practical's & 1 O/week	Sessional Marks:50
End Exam: 3 Hours	End Exam Marks:50

Pre -requisites: Nil

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Determine the convolution and correlation of signals using MATLAB
2.	Test the time invariant and Linearity property of a given system in MATLAB
3.	Plot the magnitude and phase spectrum of a given signal using various transformation tools.
4.	Implement the Adder, Substractor, Decoder, Encoder, MUX and DeMUX in VHDL
5.	Simulate and Analyze Flip-Flops, Shift Register and Counters using VHDL

LIST OF EXPERIMENTS

CYCLE-I: MATLAB

1. Basic Operations on Matrices.
2. Write a program for Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit impulse, unit step, square, saw tooth, triangular, sinusoidal, ramp, sinc.
3. Write a program to perform operations like addition, multiplication, scaling, shifting, and folding on signals and sequences and computation of energy and average power.
4. Write a program for finding the even and odd parts of signal/ sequence and real and imaginary parts of signal.
5. Write a program to perform convolution between signals and sequences.
6. Write a program to perform autocorrelation and cross correlation between signals and sequences.
7. Write a program for verification of linearity and time invariance properties of a given continuous/discrete system
8. Write a program for computation of unit samples, unit step and sinusoidal response of the given LTI system and verifying its physical realiazability and stability properties.
9. Write a program to find the Fourier transform of a given signal and plotting its magnitude and Phase spectrum.
10. Write a program for locating the zeros and poles and plotting the pole-zero maps in S plane and Z-plane for the given transfer function.
11. Write a program for Sampling theorem verification.
12. Write a program for Removal of noise by autocorrelation / cross correlation.
13. Generation of random sequence
14. Write a program to generate random sequence with Gaussian distribution and plot its pdfandCDF .
15. Write a program for verification of winer- khinchine relations.
16. Let Z be the number of times a 6 appeared in five independent throws of a die. Write a program to describe the probability distribution of Z by:
    Plotting the probability density function
    Plotting the cumulative distribution function
17. Plot the probability mass function and the cumulative distribution function of a geometric distribution for a few different values of the parameter p. How does the shape change as a function of p?
18. Write a program to generate 10,000 samples of an exponentially distributed random variable using the simulation method. The exponential random variable is a standard one, with mean 10. Plot also

the distribution function of the exponentially distributed random variable using its mathematical equation.

19. Write a program to determine the average value and variance of Y=exp(X), where X is a uniform random variable defined in the range [0, 1]. Plot the PDF of Y

20. Consider the random process defined as X[n] = 2U [n] − 4U [n − 1], where U [n] is a white noise with zero mean and variance σ2 = 1. Generate a realization of 1000 samples of X[n] by using MATLAB. Based on this realization, estimate the power spectral density and plot the estimate.

CYCLE-II: HDL MODELING AND SIMULATION OF THE FOLLOWING EXPERIMENTS USING MODELSIM

1. Realization of logic gates
2. Verifying the functionality of half adder and full adder using basic gates and universal gates.
3. Verifying the functionality of half subtractor and full subtractor using basic gates and universal gates.
4. Design of 4-bit magnitude comparator
5. Design of Multiplexers/De-multiplexers
6. Decoders , Encoders
7. Code converters
8. Verifying the functionality of JK,D and T- Flipflops
9. Design of synchronous counter using the given type of flip flop
10. Design of asynchronous counter using the given type of flip flop

Note: A minimum of any ten experiments have to be done from cycle-I and any six experiments from cycle-II

REFERENCES :

1. https://en.wikipedia.org/wiki/VHDL
2. https://en.wikipedia.org/wiki/MATLAB

Human Values and Professional Ethics(Mandatory non-credit course)	
ECE 219	**Credits: -**
Instruction: 3 Periods & 1 O/week	Sessional Marks:50

Pre -requisites: Nil

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
2.	Identify the multiple ethical interests at stake in a real-world situation or practice
3.	Articulate what makes a particular course of action ethically defensible
4.	Assess their own ethical values and the social context of problems
5.	Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human
6.	Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

SYLLABUS

UNIT – I **[10 Periods]**

HUMAN VALUES

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others – Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation– Commitment – Empathy –Self Confidence Character –Spirituality-Case Study.

LEARNING OUTCOMES

1. learn about morals, values & work ethics.
2. learn to respect others and develop civic virtue.
3. develop commitment
4. learn how to live peacefully

UNIT – II **[08 Periods]**

ENGINEERING ETHICS

Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas – Moral autonomy –Kohlberg's theory-Gilligan's theory-Consensus and controversy –Models of professional roles-Theories about right action-Self interest -Customs and religion –Uses of Ethical theories –Valuing time –Co operation –Commitment-Case Study

LEARNING OUTCOMES:

1. learn about the ethical responsibilities of the engineers.
2. create awareness about the customs and religions.
3. learn time management
4. learn about the different professional roles.

UNIT – III **[10 Periods]**

ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering As Social Experimentation –Framing the problem –Determining the facts – Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles –Utilitarian thinking respect for persons-Case study .

LEARNING OUTCOMES:

1. demonstrate knowledge to become a social experimenter.
2. provide depth knowledge on framing of the problem and determining the facts.
3. provide depth knowledge on codes of ethics.
4. develop utilitarian thinking

UNIT – IV **[10 Periods]**

ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK

Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing riskSafety and the Engineer-Designing for the safety-Intellectual Property rights(IPR)-.

LEARNING OUTCOMES:

1. create awareness about safety, risk & risk benefit analysis.
2. engineer's design practices for providing safety.
3. provide knowledge on Intellectual Property Rights.

UNIT – V **[07 Periods]**

GLOBAL ISSUES

Globalization –Cross culture issues-Environmental Ethics –Computer Ethics –Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts – Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research- Case Study

LEARNING OUTCOMES:

1. Develop knowledge about global issues.
2. Create awareness on computer and environmental ethics
3. Analyze ethical problems in research.
4. Give a picture on weapons development.

TEXT BOOKS:

1. M.Govindarajan, S.Natarajananad, V.S.SenthilKumar "Engineering Ethics includes Human Values" -PHI Learning Pvt. Ltd-2009
2. Harris, Pritchard and Rabins "Engineering Ethics", CENGAGE Learning, India Edition, 2009.
3. Mike W. Martin and Roland Schinzinger "Ethics in Engineering" Tata McGrawHill–2003.
4. Prof.A.R.Aryasri, DharanikotaSuyodhana "Professional Ethics and Morals" Maruthi Publications. 5. A.Alavudeen, R.KalilRahman and M.Jayakumaran "Professional Ethics and Human Values" -LaxmiPublications.
6. Prof.D.R.Kiran "Professional Ethics and Human Values"
7. PSR Murthy "Indian Culture, Values and Professional Ethics" BS Publication

Engineering Mathematics – IV (VECTOR CALCULUS, PARTIAL DIFFERENTIAL EQUATIONS and TESTING OF HYPOTHESIS)	
ECE 221	**Credits:3**
Instruction: 3 Periods & 1 E/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Pre -requisites: Basic concepts of Vector Algebra, differentiation, Partial differentiation, Integration and Probability.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Explain the characteristics of scalar and vector valued functions and provide a physical interpretation of the gradient, divergence, curl and related concepts.
2.	Transform line integral to surface integral, surface to volume integral and vice versa using Green's theorem, Stoke's theorem and Gauss's divergence theorem.
3.	Explain analytical methods for solving PDEs like applying Separation of Variables to solve elementary problems in linear second order Partial Differential Equations(Heat and Wave equations).
4.	Find numerical solution of ordinary differential equations.
5.	Analyze the statistical data by using statistical tests and to draw valid inferences about the population parameters.

SYLLABUS

UNIT – I **[12 Periods]**

VECTOR DIFFERENTIATION

Scalar and vector point functions – Del applied to scalar point functions: Gradient, directional derivative - Del applied to vector point functions - Physical interpretation of divergence and curl - Del applied twice to point functions - Del applied to products of point functions.

Sections: 8.4, 8.5, 8.6, 8.7, 8.8 and 8.9.

UNIT – II **[12 Periods]**

VECTOR INTEGRATION

Integration of vectors – Line integral ,Circulation, work done– Surfaces integral ,flux – Green's theorem in the plane – Stoke's theorem – Volume integral – Gauss divergence theorems (all theorems without proofs) – Irrotational and Solenoidal fields.

Sections: 8.10, 8.11, 8.12, 8.13, 8.14, 8.15, 8.16 and 8.18.

UNIT – III **[12 Periods]**

PARTIAL DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS

Introduction – Formation of partial differential equations by eliminating arbitrary constants and functions – Solutions of a partial differential equations by direct Integration – Linear equations of the first order (Lagrange's linear equations) ;

Applications: Method of separation of variables – Vibrations of a stretched string: Wave equation - One dimensional heat flow equation (), and two dimensional heat flow equation (i.e. Laplace equation:).

Sections: 17.1, 17.2, 17.4, 17.5, 17.8, 17.9, 17.10, 17.11, 18.2, 18.4 and 18.5.

UNIT – IV **[12 Periods]**

NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS

Numerical solution of Ordinary Differential equations: Picard's Method, Taylor's series method, Euler's Method, Runge-Kutta Method, Predictor-Corrector Methods, Milne's Method.

Sections: 32.1,32.2,32.3,32.4,32.7,32.8 and 32.9

UNIT – V **[12 Periods]**

TESTING OF HYPOTHESIS

Introduction – Sampling distribution – Testing a hypothesis – Level of significance – Confidence limits – Test of Significance of Large samples (Test of significance of single mean, difference of means.) – Confidence limits for unknown mean – Small samples – Students t-distribution – Significance test of a sample mean – Significance test of difference between sample means – chi square test – Goodness of fit.

Sections:27.1, 27.2, 27.3, 27.4, 27.5, 27.7, 27.11, 27.12,27.13, 27.14, 27.15, 26.16, 27.17 and 27.18.

TEXT BOOKS:

1. B. S. Grewal, "*Higher Engineering Mathematics*", 43rd edition, Khanna publishers, 2017.

REFERENCE BOOKS:

1. N P. Bali and Manish Goyal, "A text book of Engineering mathematics", Laxmi publications, latest edition.
2. Erwin Kreyszig, "*Advanced Engineering Mathematics*", 10th edition, John Wiley & Sons, 2011.
3. R. K. Jain and S. R. K. Iyengar, "Advanced Engineering Mathematics", 3rd edition, Alpha Science International Ltd., 2002.
4. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13th edition, Pearson Publishers.

Control Systems	
ECE 222	**Credits:3**
Instruction: 3 Periods & 1 E/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Pre -requisites: Nil

Course Outcomes:

By the end of the course, the student will be able to:	
1.	**Apply** signal flow graph and block diagram reduction techniques to Linear time invariant systems.
2.	**Develop** mathematical modeling of mechanical and electrical systems.
3.	**Analyze** the performance of 1^{st} and 2^{nd} order Linear time invariant systems with and without feedback control.
4.	**Calculate**the time domain specifications, stability using Routh-Hurwitz criterion and Root locus technique for Linear time invariant systems.
5.	**Calculate**the frequency domain specifications, system stability using bode plots, polar plots and Nyquist plotstechnique for Linear time invariant systems.

SYLLABUS

UNIT – I **[14 Periods]**

TRANSFER FUNCTIONS OF LINEAR SYSTEMS

Impulse response of linear systems-block diagrams of control systems-signal flow graphs-reduction techniques for complex block diagrams and signal flow graphs.

UNIT – II **[8 Periods]**

INTRODUCTION TO MATHEMATICAL MODELLING OF PHYSICAL SYSTEMS

Equations of electrical networksmodelling of mechanical systems- equations of mechanical systems.

UNIT – III **[12 Periods]**

TIME DOMAIN ANALYSIS OF CONTROL SYSTEMS

Time response of first and second order systems with standard input signals-steady state performance of feedback control systems-steady state error constants-effect of derivative and integral control on transient and steady state performance of feedback control systems.

UNIT – IV **[12 Periods]**

STABILITY ANALYSIS IN TIME DOMAIN

Concept of stability and necessary conditions for stability-Routh-Hurwitz criterion, relative stability analysis, the concept and construction of root loci, analysis of control systems with root locus.

UNIT – V **[14 Periods]**

STABILITY ANALYSIS IN FREQUENCY DOMAIN

Correlation between time and frequency responses - polar plots, bode plots-log magnitude versus phase plots-all pass and minimum phase systems-Nyquist stability criterion-assessment of relative stability-constant M&N circles.

TEXT BOOKS:

1. I.J. Nagrath&M.Gopal, “Control Systems Engineering”,Wiley Eastern Limited.
2. Benjamin C. Kuo, “Automatic Control Systems”,Prentice Hall of India.

REFERENCE BOOKS:

1. Ogata, “Modern Control Engineering”, Prentice Hall Of India

Electronic Circuits and Analysis-II	
ECE 223	**Credits:3**
Instruction: 3 Periods & 1 E/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Pre -requisites: Nil

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Analyze negative feedback amplifiers to determine input impedance, output impedance, voltage gain and sinusoidal oscillators to determine condition for frequency of oscillations.
2.	Analyze class-A, class-B, class-AB, class-C power amplifiers.
3.	Analyze BJT current mirror circuits, BJT differential amplifier circuits and determine the resonant frequency for the tuned voltage amplifiers.
4.	Design and analyze FET biasing circuits.
5.	Analyze common source, common drain and common gate amplifiers.

SYLLABUS

UNIT – I **[10 Periods]**

FEEDBACK AMPLIFIERS AND OSCILLATORS

Basic block diagram of feedback amplifier, general characteristics of negative feedback amplifier, analysis of input impedance, output impedance and gain for different topologies and practical negative feedback amplifiers.

General form of LC oscillator circuit, Analysis of Hartley oscillator, Colpitts oscillator, Clapp oscillator, RC phase shift oscillator, Wien bridge oscillator and crystal oscillator.

UNIT – II **[08 Periods]**

POWER AMPLIFIERS

Classification of power amplifiers, Class A power amplifiers, Class A single ended Transformer Coupled power amplifier, and Class B transformer coupled push pull, complementary and symmetry power amplifiers, Class C and Class AB power amplifiers, Harmonic Distortion, Thermal stability

UNIT – III **[10 Periods]**

TUNED VOLTAGE AND DIFFERENTIAL AMPLIFIERS

Need for tuned voltage amplifiers, analysis of single tuned, double tuned and stagger tuned amplifiers.

Basic BJT differential amplifier, DC transfers characteristics, small signal equivalent circuit analysis of Differential amplifier in differential and common modes, CMRR. Bipolar transistor constant current bias circuit, basic current mirror circuit, Widlar current mirror circuit.

UNIT – IV **[08 Periods]**

FET BIASING AND DC CIRCUIT ANALYSIS

JFET biasing: Fixed bias, self bias, voltage divider bias, drain feedback bias, Ideal and non -ideal current-voltage relationships of Enhancement and depletion mode MOSFETs, MOSFET DC circuit analysis

UNIT – V **[09 Periods]**

MOSFET AMPLIFIERS

MOSFET small signal equivalent circuit, Common source amplifier, Common source amplifier with source resistor, Source follower, Common Gate amplifier. NMOS amplifiers with enhancement load and depletion load.

TEXT BOOKS:

1. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, McGraw Hill Publication, 2009.[**UNIT-I,UNIT-II,UNIT-III**]
2. Donald A. Neamon, “Electronic Circuit Analysis and Design”, 2nd Edition. TMG publications. **[UNIT-III,UNIT-V]**

REFERENCE BOOKS:

1. Ramakanth A Gayakwad, “Op-Amps and Linear Integrated Circuits”- 4th Edition.
2. K Venkata Rao, K Rama Sudha, “ Electronic Devices and Circuits”,Mc Graw hill

Analog Communication	
ECE 224	**Credits:3**
Instruction: 3 Periods & 1 E/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Pre -requisites: Engineering Mathematics, Signals and Systems, Electronic Circuit Analysis.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Explain basic concepts of Analog Communication Systems and Compare Generation, Detection Techniques of Amplitude Modulation.
2.	Illustrate DSBSC, SSB Modulation and Demodulation schemes.
3.	Analyze Generation, Detection of FM and compare with Amplitude Modulation.
4.	Analyze the functioning of AM, FM Transmitters and Receivers.
5.	Evaluate the impact of noise in AM and FM modulation schemes. Differentiate analog pulse modulation techniques like PAM, PWM & PPM.

SYLLABUS

UNIT – I **[09 Periods]**

AMPLITUDE MODULATION

Introduction to communication system, Block diagram of Analog Communication,Need for modulation, Frequency Translation , Amplitude Modulation, Time domain and frequency domain description, Modulation index, Single tone modulation, power relations in AM waves, Generation of AM waves: square law Modulator, Switching modulator, Detection of AM Waves: Square law detector, Envelope detector.

UNIT – II **[09 Periods]**

DSB-SC& SSB MODULATION

Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves: Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop,power calculation in DSBSC system.

SSB signal, and its spectrum, Hilbert transform and its properties, Generation of SSB:Frequency discrimination and Phase discrimination methods, Demodulation of SSB wave, Power Calculations in SSB System, Vestigial side band modulation, Comparison of AM Techniques, Applications of AM Systems.

UNIT – III **[09 Periods]**

ANGLE MODULATION

Classification of Angle Modulation, Introduction to Phase modulation, Frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Bandwidth of Sinusoidal Modulated

FM Signal, Carson's rule, Effect of the Modulation Index on Bandwidth,Generation of FM:Direct method and Indirect method,Detection of FM wave:Frequency Discrimination and Phase Discrimination, Phase locked loop, Comparison of FM and AM

UNIT – IV **[09 Periods]**

RADIO TRANSMITTERS & RECEIVERS

Radio Transmitters:AMandFMTransmitters,SSBTransmitters;Radioreceiver:Tunedradiofrequencyreceiver,Superhetrodynereceiver,AMReceivers–RFSection,FrequencyChangingandTracking,IntermediateFrequencyandIFAmplifiers,AutomaticGainControl(AGC);FMReceivers–AmplitudeLimiting.

UNIT – V **[09 Periods]**

NOISE PERFORMANCE OF ANALOG MODULATION SYSTEMS AND ANALOG PULSE MODULATION

Noise performance of Analog modulation systems : Thermal noise, shot noise, Flicker Noise and Transition Noise, Signal to Noise ratio, Noise equivalent bandwidth, Noise equivalent temperature ,Noise figure, Figure of merit, Noise in AM Systems: DSB-SC, SSB-SC, AM with carrier (Envelope Detector); Noise in FM, pre- emphasis & De-emphasis, threshold effect, problems.

Analog Pulse Modulation: Pulse modulation and its types, PAM, PWM, PPM, concepts of Time Division Multiplexing, Frequency Division Multiplexing.

TEXT BOOKS:

1. Simon Haykins, "*Communication Systems*," Wiley, Fifth edition, 2009.-46
2. P.Ramakrishna Rao, "*Analog communications*" Tata McGraw Hill Education Private Limited. 2011.-29
3. H.Taub and D.Schilling, "*Principles of Communication Systems*"- TMH, 2003.-35

REFERENCE BOOKS:

1. B. P. Lathi, "*Modern Digital and Analog Communication Systems*," 2nd Edition, Oxford University Press, 2010. -23
2. Wayne Tomasi, "*Electronic Communications Systems: Fundamentals Through Advanced*,"- Pearson Education, Fifth Edition, 2011.-96
3. G. Kennedy, "*Electronic Communication Systems*," McGraw Hill, 2nd Edition, 1977.-28

Transmission Lines and EM Waves	
ECE 225	**Credits:3**
Instruction: 3 Periods & 1 E/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Pre -requisites:

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Design stubs using smith charts based on the concepts of transmission lines
2.	Apply vector calculus and laws of physics to solve the problems of electrostatic fields.
3.	Apply magnetostatic laws to solve the problems related to magnetostatic fields.
4.	Analyze time varying fields using Maxwell's equations in differential and integral forms.
5.	Analyze the phenomenon of Electromagnetic waves in conducting and dielectric medium.

SYLLABUS

UNIT – I **[10 Periods]**

TRANSMISSION LINES

Types of transmission lines, Applications of transmission lines, Equivalent circuit of pair of transmission lines, Primary constants, Transmission line equations, Secondary constants, lossless transmission lines, Distortion-less line, Phase and group velocities, Loading of lines, Input impedance of transmission lines, RF lines, Relation between reflection coefficient, Load and characteristic impedance, Relation between reflection coefficient and voltage standing wave ratio (VSWR), Lines of different lengths - $\lambda/8, \lambda/4, \lambda/2$ lines, Losses in transmission lines, Smith chart and applications, Stubs, Double stubs.

UNIT – II **[14 Periods]**

ELECTROSTATICS

Introduction to vector analysis, Fundamental of electrostatic fields, Different types of charge distributions, Coulomb's law and Electric field intensity**,** Potential function, Equi-potential surface, Electric field due to dipole; Electric flux density, Gauss's law and applications, Poisson's and Laplace's equations and its applications; Uniqueness theorem; Boundary conditions; Conductors & Dielectric materials in electric field; Current and current density, Relaxation time, Relation between current density and volume charge density; Dipole moment, Polarization, Capacitance, Energy density in an electric field.

UNIT – III **[12 Periods]**

STEADY MAGNETIC FIELDS

Introduction, Faradays law of induction, Magnetic flux density, Biot-Savart law, Ampere's circuit law, Magnetic Force, Magnetic Boundary conditions, Scalar and Vector magnetic potentials, Magnetization

& Permeability in materials, Inductance, Energy density, Energy stored in inductor.

UNIT – IV **[10 Periods]**

MAXWELL'S EQUATIONS

Introduction, Faradays law, displacement current, Equation of continuity for the varying fields, inconsistency of Amperes circuit law, Maxwell's equations in integral form, Maxwell's equations in point form, retarded potentials Meaning of Maxwell's equations, conditions at a Boundary surfaces, Retarded potentials.

UNIT – V **[10 Periods]**

ELECTROMAGNETIC WAVES

Introduction, Applications of EM waves, solutions for free space condition ,; Uniform plane wave propagations uniform plane waves, wave equations conducting medium, sinusoidal time variations, conductors & dielectrics, Depth of penetration, Direct cosines, Polarization of a wave, reflection by a perfect conductor – Normal incidence, Oblique incidence, reflection by a perfect dielectric-Normal incidence, reflection by a perfect insulator – oblique, Surface impedance, Poynting vector and flow of power, Complex Poynting vector.

TEXT BOOKS:

1. M.N.O. Sadiku, " Principles of Electromagnetic", Oxford International Student edn., 4^{th}Edn., 2007.
2. G.S.N.Raju, Electromagnetic Field Theory And Transmission Lines, Pearson Education (Singapore) Pvt., Ltd., New Delhi, 2005.
3. G. SasiBhushana Rao, "Electromagnetic Field Theory and Transmission Lines", Wiley, India Pvt. Ltd, 2012.

REFERENCE BOOKS:

1. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 2^{nd} Ed., 2000.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", TMH, 7th Ed., 2006.
3. Simon Ramo, et.al-, "Fields and waves in communication electronics", Wiley India Edn., 3^{rd}Edn., 1994

Microprocessors and Microcontrollers	
ECE 226	**Credits:3**
Instruction: 3 Periods & 1 E/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

Pre -requisites: Digital Electronics.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	**Gain comprehensive**knowledge of the architecture of 8-bit 8085 Microprocessorand its interrupt structure
2.	**Familiarize** the instruction set of 8085&Apply them to write assembly language programs for Arithmetic &logical operations
3.	**Acquire** knowledge of the architecture and operation of Intel 8051 microcontroller and Analyze the hardware features like timers, memory, interrupts and serial communication available in 8051 Microcontroller Family of devices
4.	**Develop** assembly language programs for data transfer, arithmetic, logical, and branching operations using instruction set of 8051 and apply them in control applications
5.	**Develop** applications that will provide solution to real world problems by Interfacing 8051 Microcontroller with various peripherals such as ADC, DAC, keyboard, display, Interrupt and Serial communication modules, memory

SYLLABUS

UNIT – I **[09 Periods]**

OVERVIEW OF 8085 ARCHITECTURE

Introduction to Microprocessors and Microcomputers, Internal Architecture and Functional Description of INTEL 8085 Microprocessor, Interrupt Structure of 8085

UNIT – II **[09 Periods]**

INSTRUCTIONSET AND ASSEMBLY LANGUAGE PROGRAMMING FOR 8085

Addressing modes, instruction set, assembler directives (Significant), macros and operators. Simple programs involving arithmetic, logical, branch and string manipulation instructions.

UNIT – III **[10 Periods]**

8051 MICROCONTROLLER

Introduction to Microcontrollers, comparing Microprocessors and Microcontrollers, Architecture of 8051 Micro controller, Register organization of 8051, SFRs, Addressing modes of 8051.

Pin configuration of 8051, Input/Output Ports and Circuits, External Memory, Counters/Timers and modes of Timers, Serial data Input/Output, Interrupts

UNIT – IV **[09 Periods]**

ASSEMBLY LANGUAGE PROGRAMMING OF 8051

Programming the 8051. Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions.

UNIT – V **[09 Periods]**

INTERFACING 8051

Interfacing with Keyboards, Displays, D/A and A/D converters, Multiple Interrupts, Serial Data Communication, Memory.

TEXT BOOKS:

1. Ramesh S. Gaonkar, Architecture Programming and Applications, 3rd Edition, PenramInternational Pvt. Ltd.
2. Muhammed Ali Mazidi, Janice GillispieMazidi, Rolin D Mc Kinlay ,The 8051 Microcontroller and Embedded Systems Using Assembly and C, 2nd Edition, Pearson Education, 2008.
3. Kenneth. J. Ayala, DhananjayV. Gadre, The 8051 Microcontroller & Embedded Systems Using Assembly and C, 1st edition, Cengage learning, 2010

REFERENCE BOOKS:

1. N. Senthil Kumar, M. Saravanan, and S. Jeevananthan, Microprocessors and Microcontrollers, OUP India.
2. David E. Simon, An Embedded Software Primer, Pearson Education
3. Satish Shah, 8051 Microcontrollers: MCS 51 Family and Its Variants, 1/e, Oxford University Press, 2010

Electronic Circuits and Analysis-II Lab	
ECE 227	**Credits:1.5**
Instruction: 3 Practical's & 1 O/week	Sessional Marks:50
End Exam: 3 Hours	End Exam Marks:50

Pre -requisites: Nil

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Design and determine input impedance, output impedance, band width and voltage gain of feedback amplifiers.
2.	Design sinusoidal oscillators for given frequency.
3.	Determine efficiency of given power amplifiers and obtain frequency response of tuned voltage amplifiers.
4.	Calculate the parameters of BJT differential amplifier.
5.	Obtain the frequency response of a MOSFET amplifiers.

LIST OF EXPERIMENTS

1.Obtain the input and output impedance of a trans-conductance amplifier.
2.Obtain the frequency response of a voltage shunt feedback amplifier.
3. Generate a sinusoidal signal using Colpitts oscillator at a desired frequency.
4. Generate a sinusoidal signal using Wein bridge circuit.
5. Generate a sinusoidal signal using RC phase shift oscillator and observe the lissajous patterns at different phase shifts.
6. Plot the frequency response of a tuned voltage amplifier and find the resonant frequency.
7. Obtain the output waveforms of a class-B pushpull power amplifier and calculate the efficiency.
8. Determine the gain and CMRR for the BJT differential amplifier.
9. Obtain the frequency response of a MOSFET Common source amplifier
10. Obtain the frequency response of a MOSFET Common drain amplifier
11.Plot the V-I characteristics of an n-channel enhancement MOSFET and verify its operation as an inverter.

Microprocessors and Microcontrollers lab	
ECE 228	**Credits:1.5**
Instruction: 3 Practical's & 1 O/week	Sessional Marks:50
End Exam: 3 Hours	End Exam Marks:50

Pre -requisites: Microprocessors and Interfacing, Microcontroller & Embedded Systems

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Program the 8085 using assembly level language to perform arithmetic operations.
2.	Program the 8085 using assembly level language to perform logical operations
3.	Program the 8051 using assembly level language to perform arithmetic and logical operations.
4.	Interface modules like ADC, DAC, Stepper motor, traffic lights to 8051 and control them using assembly level programs.
5.	Program timers of 8051 to generate waveforms with different frequencies.

LIST OF EXPERIMENTS

CYCLE-I:PROGRAMMING 8085 MICROPROCESSOR

1. Study and familiarization of 8085Microcontroller trainer kit
2. Assembly Language Program for addition of 8-bit numbers stored in an array
3. Assembly Language Program for Multiplication by successive addition of two 8-bit numbers
4. Assembly Language Program for finding largest no. from a given array of 8-bit numbers
5. Assembly Language program to arrange 8-bit numbers stored in an array in ascending order
6. Perform different Logical operations.

CYCLE-II: PROGRAMMING 8051 MICROCONTROLLER

1. Study and familiarization of 8051 Microcontroller trainer kit
2. Assembly Language Program for addition of 8-bit numbers stored in an array
3. Assembly Language Program for Multiplication by successive addition of two 8-bit numbers
4. Assembly Language Program for finding largest no. from a given array of 8-bit numbers
5. Assembly Language program to arrange 8-bit numbers stored in an array in ascending order
6. Stepper motor control by 8051 Microcontroller
7. Interfacing of 8-bit ADC 0809 with 8051 Microcontroller
8. Interfacing of 8-bit DAC 0800 with 8051 Microcontroller and Waveform generation using DAC
9. Implementation of Serial Communication by using 8051 serial ports
10. Assembly Language Program for use of Timer/Counter for various applications
11. Traffic light controller/Real-time clock display
12. Simple test program using ARM 9 mini 2440 kit (Interfacing LED with ARM 9 mini 2440 kit)

Note: A minimum of any five experiments have to be done from each cycle.