SYLLABUS

(REGULATIONS 2019)

FOR

UNDER GRADUATE PROGRAMMES
CHOICE BASED CREDIT SYSTEM

(Applicable to the students admitted from the Academic Year 2019-20 onwards)

B.E. – ELECTRONICS AND COMMUNICATION ENGINEERING

EASWARI ENGINEERING COLLEGE
(AUTONOMOUS INSTITUTION)
Bharathi Salai, Ramapuram, Chennai – 600 089

191MAB404T **PROBABILITY AND RANDOM PROCESS** **L T P R C 0 3 2 0 4**

PREREQUISITES: NIL

COURSE OBJECTIVES:

To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.

- To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the basic concepts of random processes which are widely used in IT fields.
- To understand the concept of correlation and spectral densities.
- To understand the significance of linear systems with random inputs.

UNIT I : PROBABILITY AND RANDOM VARIABLES **12**

Probability review – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II : TWO - DIMENSIONAL RANDOM VARIABLES **12**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables.

UNIT III : RANDOM PROCESSES **12**

Classification – Stationary process – Markov process - Markov chain - Poisson process – Random telegraph process

UNIT IV : CORRELATION AND SPECTRAL DENSITIES **12**

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.

UNIT V : LINEAR SYSTEMS WITH RANDOM INPUTS 12

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

TOTAL PERIODS: 60 HOURS

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

- Use the probability distribution to study discrete and continuous random variables.
- Find the joint probability density function (PDF) of two new random variables by using the PDF of two given random variables and given transformation.
- Classify random processes and also find the nature of these processes with regard to different types of stationaries.
- Analyze the properties of auto correlation, cross correlation and power spectral density functions
- Produce the relations connecting auto correlation and cross correlation of input and output processes in a linear system.

TEXT BOOKS:

1. Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
2. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles ", Tata McGraw Hill, 4th Edition, New Delhi, 2002.

REFERENCE BOOKS:

1. Cooper. G.R., McGillem. C.D., "Probabilistic Methods of Signal and System Analysis", Oxford University Press, New Delhi, 3rd Indian Edition, 2012.
2. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes ", Tata McGraw Hill Edition, New Delhi, 2004.
3. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications ", Academic Press, 2004.

191ECC401T	**ANALOG AND INTEGRATED CIRCUITS**	**L**	**T**	**P**	**R**	**C**
		3	**0**	**0**	**0**	**3**

PREREQUISITES: NIL

COURSE OBJECTIVES:

- To give a comprehensive exposure to all types oscillators
- To study about wave shaping circuits and Multivibrators
- To study about tuned amplifiers and power amplifiers
- To introduce the basic building blocks of linear integrated circuits and to learn the applications of operational amplifiers
- To introduce the theory and applications of waveform generators and PLL
- To learn the theory of ADC and DAC

UNIT I : OSCILLATORS AND WAVE SHAPING CIRCUITS 9

Barkhausen Criterion for oscillation – RC oscillators using BJT - LC oscillators using BJT and crystal oscillators - UJT Oscillator - Integrator - differentiator– clampers and clippers –Multivibrators- Astable and Monostable.

UNIT II : TUNED AMPLIFIERS AND POWER AMPLIFIERS 9

Coil losses, unloaded and loaded Q of tank circuits-Analysis of single tuned amplifier double tuned amplifier – effect of cascading single tuned amplifiers on bandwidth – Stagger tuned amplifiers – Stability of tuned amplifiers – Neutralization – Hazeltine neutralization method – Power amplifiers: Class A- Class B-Class AB-Class C power amplifiers.

UNIT III : BASICS OF OPERATIONALAMPLIFIERS 9

General operational amplifier stages (IC 741)- Ideal characteristics–Inverting and Non inverting amplifier- DC and AC characteristics-Applications: Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Integrator–differentiator, Instrumentation amplifier, Logarithmic amplifier, Anti-logarithmic amplifier, Comparators, Schmitt trigger, Low-pass, high-pass and band-pass Butterworth filters

UNIT IV : MULTIVIBRATORS AND PLL 9

Multivibrators: Astable and Monostable using IC741and Timer IC 555

– Sine wave generators – Triangular wave generator -Operation of the basic PLL, Voltage Controlled Oscillator - application of PLL.

UNIT V : ANALOG TO DIGITAL AND DIGITAL TOANALOG CONVERTERS 9

D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current- Mode *R* - 2RLadder types - high speed sample-and-hold circuits, A/D Converters – specifications – Flash type - Successive Approximation type - Single Slope type – Dual Slope type.

TOTAL PERIODS: 45 HOURS

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

- Generate and reshape the waveforms using linear and nonlinear circuits.
- Analyse the performance parameters of tuned and power amplifiers
- Design linear and non-linear circuits using operational amplifiers
- Develop circuits for real time applications using PLL and multivibrators
- Design ADC and DAC circuits using operational amplifiers

TEXT BOOKS:

1. Jacob Millman, “Microelectronics‘, McGraw Hill, 2nd Edition, Reprinted, 2009. (UNIT I,II,IV,V)
2. Sedra and Smith, “Micro Electronic Circuits”; Sixth Edition, Oxford University Press, 2011. (UNIT I, III,IV,V)
3. Roy Choudhry D., Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., 2018, Fifth Edition. (Unit III – V)
4. Sergio Franco,“Design with Operational Amplifiers and Analog Integrated Circuits”, 4th Edition, Tata Mc Graw-Hill, 2016 (Unit III – V)

REFERENCE BOOKS:

1. David A. Bell,"—Electronic Devices and Circuits", Fifth Edition, Oxford University Press,2008.
2. Millman J.andTaubH., "Pulse Digital and Switching Waveforms", TMH, 2000.
3. Millman and Halkias. C., "Integrated Electronics", TMH, 2007.
4. Ramakant A. Gayakwad,"—OP-AMP and Linear ICs"', 4th Edition, Prentice Hall/ Pearson Education, 2015.
5. Robert F. Coughlin, Frederick F. Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth Edition, PHI,2001.
6. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson Education / PHI, 2008

191ECC402T	ANALOG AND DIGITAL COMMUNICATION	L T P R C 0 3 0 0 3

PREREQUISITES: NIL

COURSE OBJECTIVES:

- To understand the spectrum of AM and FM
- To analyze the various analog and pulse modulation techniques
- To compare the various keying techniques and understand the constellation diagram.
- To evaluate the source coding techniques and analyze the error coding techniques
- To apply the concepts of PN sequence in spread spectrum and multiple access techniques

UNIT I : ANALOG MODULATION **9**

Amplitude Modulation – Comparison of AM, DSBSC, SSBSC, VSB – Angle modulation – PM and FM, Superheterodyne receivers.

UNIT II : PULSE MODULATION **9**

Low pass sampling theorem – Quantization –Comparison of PCM, DPCM, DM and ADM, Time Division Multiplexing-Line coding

UNIT III : DIGITAL MODULATION AND TRANSMISSION 9

Phase shift keying – BPSK, BFSK,QPSK ,QAM – Comparison, ISI – Pulse shaping – Duo binary encoding – Eye pattern, Equalizers

UNIT IV : INFORMATION THEORY AND CODING 9

Measure of information – Entropy – Source coding theorem – Shannon–Fano coding, Huffman Coding– Channel capacity –– Error control codes – Linear and Cyclic codes, Convolutional Codes, Viterbi algorithm

UNIT V : SPREAD SPECTRUM AND MULTIPLE ACCESS 9

PN sequences – Properties – DSSS, FHSS– Processing gain, Jamming margin –Multiple Access – FDMA, TDMA, CDMA.

TOTAL PERIODS: 45 HOURS

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

- Analyze the spectra of Amplitude and Angle Modulation Techniques
- Compare the principles of Pulse Code Modulation Techniques
- Examine Digital Modulation and Demodulation Techniques
- Evaluate the source coding Demodulation Techniques and Error Control Coding Schemes.
- Analyze the types of Spread Spectrum and Multiple Access Techniques.

TEXT BOOKS:

1. Haykin S., “Digital Communications” John Wiley 2005.
2. Sanjay Sharma, “Communication Systems (Analog and Digital), S.K.Kataria & Sons
3. Taub H, D L Schilling, G Saha, “Principles of Communication Systems” 3/e, TMH 2007

REFERENCE BOOKS:

1. Hsu H P, Schaum Outline Series, “Analog and Digital Communications” TMH 2006.

2. Lathi B.P., “Modern Digital and Analog Communication Systems”, 3rd edition, Oxford University Press, 2007.
3. Martin S.Roden, “Analog and Digital Communication System”, Prentice Hall of India, 2002.

191ECC403T	ENGINEERING ELECTROMAGNETICS	L	T	P	R	C
		3	0	0	0	3

PREREQUISITES: NIL

COURSE OBJECTIVES:

- To gain conceptual and basic mathematical understanding of electric and magnetic fields in free space and in materials.
- To understand the coupling between electric and magnetic fields through Faraday's law, displacement current and Maxwell's equations.
- To understand wave propagation in lossless and in lossy media
- To be able to solve problems based on the above concepts

UNIT I : INTRODUCTION **9**

Electromagnetic model, Units and constants, Review of vector algebra, Rectangular, cylindrical and spherical coordinate systems, Line, surface and volume integrals, Gradient of a scalar field, Divergence of a vector field, Divergence theorem, Curl of a vector field, Stoke's theorem, Null identities

UNIT II : ELECTROSTATICS **9**

Electric field, Coulomb's law, Gauss's law and applications, Electric potential, Conductors in static electric field, Dielectrics in static electric field, Electric flux density and dielectric constant, Boundary conditions, Capacitance-Parallel, cylindrical and spherical capacitors, Electrostatic energy, Poisson's and Laplace's equations, Uniqueness of electrostatic solutions, Current density and Ohm's law, Electromotive force and Kirchhoff's voltage law, Equation of continuity and Kirchhoff's current law.

UNIT III : MAGNETOSTATICS 9

Lorentz force equation, Law of no magnetic monopoles, Ampere's law, Vector magnetic potential, Biot-Savart law and applications, Magnetic field intensity and idea of relative permeability, Magnetic circuits, Behaviour of magnetic materials, Boundary conditions, Inductance and inductors, Magnetic energy, Magnetic forces and torques.

UNIT IV : TIME-VARYING FIELDS AND MAXWELL's EQUATIONS 9

Faraday's law, Displacement current and Maxwell-Ampere's law, Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and solutions, Time-harmonic fields.

UNIT V : PLANE ELECTROMAGNETIC WAVES 9

Plane waves in lossless media, Plane waves in lossy media (low-loss dielectrics and good conductors), Group velocity, Electromagnetic power flow and Poynting vector, Normal incidence at a plane conducting boundary, Normal incidence at a plane dielectric boundary.

TOTAL PERIODS: 45

HOURS COURSE OUTCOMES:

Upon completion of this course, student will be able to:

- Apply the fundamentals of vector algebra, coordinate systems, electromagnetic laws and concepts
- Examine the electric field, electric potential, boundary conditions and energy density using the principles of Electrostatics
- Examine the magnetic field, magnetic potential, boundary conditions and magnetic energy density using the principles of Magnetostatics
- Analyze the physical significance of Maxwell's equations for static and time-varying fields.
- Evaluate the time varying fields and propagation of electromagnetic wave in lossy and in lossless media.

TEXT BOOKS:

1. Cheng D.K., Field and wave Electromagnetics, 2nd ed., Pearson (India), 1989 (UNIT I, II,III IV,V)
2. Hayt W.H. and Buck J.A., Engineering Electromagnetics, 7th ed., McGraw-Hill (India), 2006 (UNIT I-V)

REFERENCE BOOKS:

1. Griffiths D.J., Introduction to electrodynamics, 4th ed., Pearson (India), 2013
2. Notaros B.M., Electromagnetics, Pearson: New Jersey, 2011
3. Sadiku M.N.O. and Kulkarni S.V., Principles of Electromagnetics, 6th ed., Oxford (Asian Edition), 2015

191CSS421T	**OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES**	**L**	**TP**	**R**	**C**	**0 3**
		3	**0**			

PREREQUISITES: NIL

COURSE OBJECTIVES:

- To comprehend the fundamentals of object oriented programming, particularly in C++.
- To use object oriented programming to implement Inheritance and Polymorphism
- To introduce linear data structures and their applications.
- To introduce Non- linear data structures and their applications
- To enable the students to learn Sorting and Searching concepts

UNIT I : DATA ABSTRACTION & OVERLOADING **9**

Overview of C++ – Structures – Class Scope and Accessing Class Members – Reference variables – Initialization – Constructors – Destructors – Member Functions and Classes – Friend Function – Dynamic Memory Allocation – Static Class Members – Overloading: Function overloading and Operator Overloading.

UNIT II : INHERITANCE & POLYMORPHISM **9**

Base Classes and Derived Classes – Protected Members – Overriding – Public, Protected and Private Inheritance – Constructors and Destructors in derived Classes – Class Object To Base – Class Object Conversion – Composition Vs. Inheritance – Virtual functions – This Pointer –Virtual Destructors – Dynamic Binding.

UNIT III : LINEAR DATA STRUCTURES 9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation —– singly linked lists –Polynomial Manipulation - Stack ADT – Queue ADT - Evaluating arithmetic expressions.

UNIT IV : NON-LINEAR DATA STRUCTURES 9

Trees – Binary Trees – Binary tree representation and traversals – Binary Search trees - Application of trees– Graph and its representations – Graph Traversals – Representation of Graphs – Breadth-first search – Depth-first search - Connected components.

UNIT V : SORTING and SEARCHING 9

Sorting algorithms: Insertion sort - Quick sort - Merge sort - Searching: Linear search –Binary Search

TOTAL PERIODS: 45 HOURS

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

- Apply the concepts of object oriented programming using C++.
- Construct programs with inheritance and polymorphism.
- Implement the abstract data types of Linear and Non Linear data structures
- Solve the real world problems using tree and graph data structures.
- Analyze sorting, searching and hashing algorithms for data access

TEXT BOOKS:

1. Deitel and Deitel, “C++, How To Program”, Fifth Edition, Pearson Education, 2005.
2. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Third Edition, Addison- Wesley, 2007

REFERENCE BOOKS:

1. Bhushan Trivedi, “Programming with ANSI C++, A Step-ByStep approach”, Oxford University Press, 2010.
2. Bjarne Stroustrup, “The C++ Programming Language”, 3rd Edition, Pearson Education, 2007.
3. Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, “Fundamentals of Data Structures in C++”, Galgotia Publications, 2007.
4. Goodrich, Michael T., Roberto Tamassia, David Mount, “Data Structures and Algorithms in C++”, 7th Edition, Wiley, 2004.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Second Edition, Mc Graw Hill, 2002.

191ECC411L	CIRCUITS DESIGN AND SIMULATION LABORATORY	L T P R C 4 0 0 0 2

PREREQUISITES: NIL

COURSE OBJECTIVES:

- Analyze feedback amplifier and its gain - bandwidth characteristics.
- Design Oscillators, tuned amplifiers.
- Understand the operation of wave shaping circuits.
- Design filters using OP-AMP and to analyze the frequency response.
- Analyze the performance of various sinusoidal and non sinusoidal circuits using PSPICE tool.

LIST OF EXPERIMENTS

DESIGN AND TESTING OF THE FOLLOWING CIRCUITS:

1. Series feedback amplifier
2. Hartley Oscillator and Colpitts Oscillator
3. Single Tuned Amplifier
4. RC Integrator and Differentiator circuits
5. Inverting, non-inverting and differential amplifiers (using OP-AMP)
6. Instrumentation amplifier (using OP-AMP)
7. Astable, Monostable multivibrator and Schmitt trigger (using OP-AMP) 8. RC phase shift and Wein bridge oscillator (using OP-AMP)

SIMULATION USING PSPICE :

9. Wein Bridge Oscillator(Using transistor)
10. Double tuned Amplifier (Using transistor)
11. Schmitt Trigger circuit with Predictable hysteresis (Using transistor)
12. Analysis of power Amplifier (Using transistor)
13. Active Lowpass, high pass and band pass filter (using OPAMP)
14. A/ D and D/A converter(using OP-AMP)

TOTAL PERIODS: 60 HOURS

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

- Analyze the performance of various amplifiers designed using transistor and OP-AMP.
- Design oscillators, wave-shaping circuits and multivibrators.
- Design and simulate oscillators, tuned amplifier, wave-shaping circuits and power amplifier using SPICE Tool.
- Apply the knowledge to design filters, converters and instrumentation amplifiers
- Analyze the performance of filters, multivibrators, A/D and D/A converter using SPICE.

COMMUNICATION SYSTEMS LABORATORY **L T P R C 3**
191ECC412L **0 0 1 2**

PREREQUISITES: NIL

COURSE OBJECTIVES:

- To visualize the effects of sampling and TDM
- To Implement AM & FM modulation and demodulation
- To implement PCM
- To implement FSK, PSK and ASK schemes
- To implement Error control coding schemes **LIST OF EXPERIMENTS**

1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM Modulation and Demodulation
4. FM Modulation and Demodulation
5. Pulse Code Modulation and Demodulation
6. Line coding schemes
7. ASK,FSK and PSK
8. Convolutional encoder and decoder
9. Signal constellations of BPSK, QPSK and QAM (Simulink)
10. Error control coding schemes - Linear Block Codes (MATLAB Simulation)
11. Cyclic codes (MATLAB Simulation)
12. Communication link simulation

TOTAL PERIODS: 60 HOURS

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

- Analyze the effects of sampling and Time Division Multiplexing
- Evaluate the different modulation index in Amplitude Modulation
- Analyze the various stages in a Pulse Code Modulation system

- Demonstrate the various error coding schemes in digital communication system.
- Simulate end-to-end Communication Link

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191CSS431L	OBJECT ORIENTED PROGRAMMING AND DATA STURUCTURES LABORATORY	0	0	4	0	2

PREREQUISITES: NIL

COURSE OBJECTIVES:

- Learn C++ programming language.
- Be exposed to the different data structures
- Be familiar with applications using different data structures

LIST OF EXPERIMENTS

DESIGN AND TESTING OF THE FOLLOWING CIRCUITS:

1. Implement Structures in C++
2. Friend function
3. Overloading: Function overloading and Operator Overloading.
4. Inheritance
5. Constructors and Destructors in derived Classes
6. Virtual functions
7. List ADT - Array and Single linked list implementations
8. Stack ADT - Array and linked list implementations
9. Queue ADT - Array and linked list implementations
10. Evaluating arithmetic expressions using stack
11. Binary Search Tree ADT
12. Tree traversals
13. Insertion Sort
14. Quick Sort
15. Linear Search and Binary Search

TOTAL PERIODS: 60 HOURS

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

1. Design and implement C++ programs for manipulating stacks, queues, linked lists, trees, and graphs.
2. Apply good programming design methods for program development.
3. Apply the different data structures for implementing solutions to practical problems.