Autonomous Programme Structure of Second Year B. Tech. AY 2019-2020

S. Y. B. Tech. Electronics & Telecommunication Engineering Semester – I										
Course Code	Course Title	Teaching Scheme			Examination Scheme				Marks	Credit
		Hours/Week								
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
EC 2101	Electronic Devices and Circuits	3	1	0	50	50	0	0	100	4
EC 2102	Network Theory	3	1	0	50	50	0	0	100	4
EC 2103	Digital Electronics	3	1	0	50	50	0	0	100	4
EC 2104	Data Structures	3	0	0	50	50	0	0	100	3
BSEC2101	Engineering Mathematics-III	3	1	0	50	50	0	0	100	4
EC 2105	Electronic Devices and Circuits Lab	0	0	4	0	0	0	25	25	2
EC 2106	Digital Electronics Lab	0	0	2	25	0	0	0	25	1
EC 2107	Data Structures Lab	0	0	4	0	0	50	0	50	2
	Total	**15**	**4**	**10**	**275**	**250**	**50**	**25**	**600**	**24**
	Grand Total	**29**							**600**	**24**

MKSSS's Cummins College of Engineering for Women
Karvenagar, Pune-411052

DEAN ACADEMICS
MKSSS's Cummins College of Engineering for Women
Karvenagar, Pune-411052

Principal
MKSSS's Cummins College of Engg. For Women, Karvenagar, Pune-52.

APPROVED BY
Governing Body Members
MKSSS's Cummins College of Engineering for Women
Karvenagar, Pune-411052

EC2101 Electronic Devices and Circuits

Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorial: 1 Hr/Week

Examination scheme:
In Semester: 50 Marks
Semester: 50 Marks
Credits: 4

Course Objectives:

1. Introduce the characteristics, working principles as well as concept of load line and operating point of FETs for analysing DC circuits
2. Explain the concepts of employing simple models to represent non linear elements such as JFETs and MOSFETs
3. Analyse JFET and MOSFET amplifiers and discuss general frequency response of amplifiers
4. Impart the knowledge of feedback and its effects on characteristics of amplifier
5. Familiarise the students with audio power amplifiers using BJTs

Course Outcomes:
Having successfully completed this course, the student will be able to:

1. Explain characteristics of FETs and determine transistor parameters
2. Analyse RC coupled amplifier for DC and AC conditions
3. Determine the frequency response of transistorised RC coupled circuits
4. Analyse effect of negative feedback on amplifier parameters. Explain principle of working of oscillators and calculate frequency of oscillation for given circuit
5. Calculate efficiency and harmonic distortion for Class A, Class B and Class AB Power Amplifiers and compare them

Unit 1: JFET **(09)**
Introduction, Construction and working, JFET characteristics (Transfer and Drain), Schockley's equation, JFET biasing and DC analysis, JFET as amplifier and its configurations (CS/CD/CG) and comparison, CS amplifier analysis.

Unit 2: MOSFET **(10)**
Two terminal MOS structure, EMOSFET-construction, symbols, Ideal EMOSFET V-I characteristics, additional MOSFET structures (DMOSFET and CMOS), non-ideal V-I characteristics of EMOSFET (finite output resistance, body effect, break down effect, temperature effect, short channel effects), MOSFET biasing and DC circuit analysis, MOSFET small signal amplifier (CS configuration).

Unit 3: Frequency response of amplifiers **(07)**
General frequency response for RC coupled amplifier, Low frequency response, Miller effect, High frequency response, Multistage frequency effects, square wave testing for RC coupled amplifiers.

Unit 4: Feedback Amplifiers and Oscillators **(08)**

Classification of amplifiers, feedback concept, General characteristics of negative feedback amplifiers, Feedback Topologies, Barkhausen criterion, sinusoidal oscillators: RC Phase shift and LC oscillators, Crystal oscillators.

Unit 5: Power Amplifiers **(08)**

Types (Class A, B, AB and C) and their comparison, Second Harmonic distortion, Analysis of Class A, Class B and Class AB amplifiers, Introduction to Class C amplifiers.

Text books:

1. R.L.Boylstad, L.Nashlesky, **'Electronic Devices and Circuits Theory'**, *PrenticeHall of India,* (9th Edition), (2006).
2. Donald Neaman,**'Electronic Circuit Analysis and Design'**, *Tata McGraw Hill,* (3rd Edition), (2007).

Reference Books:

1. David A. Bell, **'Electronic Devices and Circuits'**, *Oxford,* (5th Edition), (2008).
2. Millman , Halkias, **'Integrated Electronics- Analog and Digital Circuits and Systems'**, *Tata McGraw Hill,* (2nd Edition), (2010).

Websites:

1. http://nptel.ac.in/courses/117103063/24
2. http://nptel.ac.in/courses/117103063/17
3. http://www.iitg.ac.in/apvajpeyi/ph218.html
4. http://nptel.ac.in/courses/117101105/3

List of Tutorials:

1. Design biasing circuit for JFET.
2. Analyse JFET amplifier.
3. Analyse MOSFET amplifier.
4. Analyse Multistage amplifiers.
5. Analyse effect of negative feedback on amplifiers.
6. Design Oscillator Circuit.
7. Analyse Power Amplifiers.

EC 2102 Network Theory

Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorial: 1 Hr/Week

Examination Scheme:
In-Semester: 50 Marks
End-Semester: 50 Marks
Credits: 4

Course Objectives:

1. Explain and apply fundamentals of network simplification techniques
2. Explain and apply network theorems to find network quantities
3. Impart knowledge of series and parallel resonant circuits
4. Analyse and apply transient analysis of RL,RC and RLC circuits
5. Familiarize students with two-port network and filter design analysis

Course Outcomes:
Having successfully completed this course, the student will be able to:

1. Apply fundamental laws and theorems to find current and voltage in elements of electrical network
2. Determine bandwidth and selectivity in resonant circuit
3. Find and analyse initial conditions and responses of RL,RC and RLC circuits for standard excitation signals
4. Design and analyse prototype filter and attenuator
5. Simplify two port network to determine the network parameters

Unit 1: Network Theorems **(10)**
Basic Circuit Analysis and Simplification Techniques such as Mesh Analysis, Nodal Analysis, Source Transformation and Source Shifting, Superposition Theorem, Thevenin's Theorem, Norton's Theorem and Maximum Power Transfer Theorem (AC & DC analysis)

Unit 2: Resonance **(06)**
Series Resonance: Impedance, voltage and current variations with frequency, Bandwidth, Selectivity. Effect of generator resistor on bandwidth and Selectivity, Parallel resonance: Admittance variation with frequency, Bandwidth and selectivity Comparison and applications of series and parallel resonant circuits

Unit 3: Transient Analysis **(10)**
Transient response of R-L, R-C, R-L-C circuits (Series and Parallel combinations) for D.C. and sinusoidal excitations, Initial conditions, Classical method and Laplace transform method of solutions. Transient response of R-L, R-C, R-L-C circuits for standard inputs such as step, ramp, pulse and impulse by using Laplace transforms method

Unit 4: Filters and Attenuator **(08)**
Filters and Attenuators- Classifications of Networks in Symmetrical and Asymmetrical networks.

Properties of two port Symmetrical Networks (T and Π only): Characteristic Impedance (Z0) and Attenuation Constant (γ) in terms of circuit components. Filters: Filter fundamentals, Constant K-Low Pass Filter (LPF), High Pass Filter (HPF), Band Pass Filter (BPF) and Band Stop Filter (BSF). Attenuators: Introduction to Neper and Decibel. Symmetrical T and Π type attenuators

Unit 5: Two Port Network **(08)**

Two Port Network Parameters and Functions- Terminal characteristics of network: Z, Y, h and ABCD Parameters, Reciprocity and Symmetry conditions, Applications of the parameters

Text Books:

1. D Roy Choudhury, '**Networks and Systems**', *New Age International Publishers,* (1^{st} Edition), Reprint, (2005).
2. Ravish R. Singh, '**Network analysis and Synthesis**', *McGraw Hill Education*, (2013).

Reference Books:

1. John D. Ryder, '**Network Lines and Fields**', *PHI Publications,* (1^{st} Edition), (1990).
2. M. E. Van Valkenburg, '**Network Analysis**', *PHI / Pearson Education,* (3^{rd} Edition), Reprint (2002).

Website:

1. http://nptel.ac.in/courses/108102042/

List of Tutorials:

1. Calculation of voltage, current and power using KVL, KCL, Mesh and Nodal analysis.
2. Calculation of voltage, current and power using Superposition & Thevinin's Theorem.
3. Calculation of voltage, current and power using Norton's & Maximum Power Transfer Theorem.
4. Bandwidth and selectivity calculation in Series and Parallel Resonant Circuits.
5. Determination of initial conditions of RL, RC and RLC circuits with laplace transform.
6. Determination of network quantities in RL, RC and RLC circuits with laplace transform.
7. Designing of Constant K-LPF, HPF, BPF and BSF.
8. Calculation of Z, Y, h, ABCD parameters for given circuit.

EC 2103 Digital Electronics

Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorial: 1Hr/Week

Examination Scheme:
In-Semester: 50 Marks
End-Semester: 50 Marks
Credits: 4

Course Objectives:

1. Introduce the techniques for the simplification of logic function and design arithmetic circuits
2. Make students familiar with design and applications of combinational circuits using basic logic gates and MSI chips
3. Introduce the sequential circuits, their functionality, design and applications
4. Acquaint the students with the design and implementation of state machines
5. Make students familiar with logic families, Programmable Logic Devices and VHDL

Course Outcomes:
Having successfully completed this course, the student will be able to:

1. Apply reduction techniques to design basic combinational circuits
2. Design combinational and sequential circuits using basic gates and MSI chips
3. Design sequential circuits using state machines
4. Explain digital logic families and Programmable Logic Devices
5. Explain modelling styles of VHDL and design combinational and sequential circuits using VHDL

Unit 1: Combinational Logic Design **(07)**
Standard representations for logic functions, k map representation of logic functions, SOP and POS forms, min-terms and max-terms, minimization of logical functions up to 4 variables, don't care conditions. Design Examples: Arithmetic Circuits: Adders and subtractors, Digital Comparator, ALU, code converters.

Unit 2: Combinational Logic Design using MSI chips **(06)**
Circuit design using adder, comparator ICs. Multiplexers and their use in combinational logic designs, multiplexer trees, Demultiplexers and their use in combinational logic designs, Demultiplexer trees, Decoders.

Unit 3: Sequential Logic Design **(08)**
One bit memory cell, Clocked SR, D, MS J-K flip-flop and T flip-flops, Use of preset and clear terminals, Excitation table for flip-flops, Conversion of flip-flops. Application of flip-flops: Shift registers, sequence generators, counters: ripple counters, up/down counters, synchronous counters.

Unit 4: State Machines **(06)**
Mealy and Moore machines representation. Design of state machines using State diagram, State table, State reduction, State assignment. Design of sequential circuit using Finite state machine

Unit 5: Digital Logic Families **(05)**

Classification of logic families, Characteristics of digital ICs: Speed of operation, power dissipation, figure of merit, fan in, fan out, current and voltage parameters, noise immunity, operating temperatures and power supply requirements. Operation of TTL NAND gate, active pull up, wired logic. CMOS logic: CMOS inverter, NAND, NOR gates, Comparison between TTL, CMOS technologies.

Unit 6: Introduction to VHDL, Programmable Logic Devices **(06)**

Introduction to VHDL, Entity declaration, architecture, modelling styles, data objects, concurrent and sequential statements. Simple design examples using VHDL for basic combinational and sequential circuits, attributes. Introduction to Programmable logic devices and their types: ROM, PLA, CPLD, FPGA.

Text Books:

1. R.P. Jain, **'Modern digital electronics'**, *TMH Publication,* (4th edition), (2007).
2. Anand Kumar, **'Fundamentals of digital circuits',** *PHI Publication,* (1st edition),(2001).
3. J. Bhaskar, **'VHDL Primer'**, *PHI Publication,*(3rd Edition), (2015).

Reference Books:

1. Wakerly, **'Digital Design Principles and Practices'**, *Pearson Education,* (3rd edition),(2004.)
2. Stephen Brown, **'Fundamentals of digital logic design with VHDL'**, *TMH Publication,* (1st edition), (2002).

Website:

1. http://nptel.ac.in/courses/117106086/1

List of Tutorials:

1. Minimize the logic functions and realize using universal gates.
2. Design code converters using basic gates.
3. Design a combinational circuits using multiplexer.
4. Realize the multiple output functions using decoder.
5. Conversion from one type of Flip- Flop to another type.
6. Design mod-N asynchronous counter.
7. Design mod-N synchronous counter.
8. Design sequence generator using shift register.

EC 2104 Data Structures

Teaching Scheme
Lecture: 3 Hours/Week

Examination Scheme
In Semester: 50Marks
End Semester: 50Marks

Credits:3

Course Objectives:

1. Introduction to the theory, practice and methods of data structures
2. Introduce elementary data structures such as Arrays, Linked lists and model other data structures
3. Learn modelling of linear data structures like stacks and queues
4. Learn modelling of non-linear data structures like trees and graphs

Course Outcomes:

Having successfully completed this course, the student will be able to:

1. Classify and categorize data structures that make up for a programming language
2. Infer to the modelled data structures from the premise of the baseline models
3. Make use of algorithms on linear and non-linear data structures for performing different operations on data
4. Perceive the importance of appropriate memory allocation and efficient management in the time-space domain

Unit 1: Introduction, Arrays & Functions in C **(09)**

Introduction: Overview of Compiler and the 'C' development life cycle, brief overview of Operating System. Software Development Life Cycle (SDLC), Arrays: Single dimensional & Two dimensional Arrays. Searching Methods: Algorithms for Sequential Search, Indexed Sequential Search, and Binary Search. Sorting Methods: Algorithms for Selection sort, Bubble sort, Insertion sort. Introduction to Time complexity and Space complexity, brief overview of the Big Oh, and other notations as performance metrics for the algorithms. Abstract Data Type (ADT): Definition, ADT for arrays. Functions: Types of functions and their categories with appropriate examples. Parameter passing by value, parameter passing by reference, recursive functions.

Unit 2: Pointers & Structures in C **(07)**

Pointers: Basic concepts. Pointer declaration & initialization. Scale factor. Pointer to a pointer. Strings: Basic concepts. Structures in C: Concept, comparison with arrays as a data structure. Array of structures, pointers and arrays, pointers and structures. Bitwise Operators, Concept of ordered list & polynomial representation using array of structures.

Unit 3: Data Structure Using Linked Organization **(07)**

Concepts and definition of data, data type, data object, data structures. Concept of Singly Linked List: Algorithms for Creation, Insertion, deletion and traversals of above data structure. Concept of Doubly Linked List and Circular Linked List. Applications of Linked lists. Generalized linked list: Representation of polynomial using GLL.

Unit 4: Stacks and Queues **(07)**

Stacks: Definition & example, representation using arrays & linked list. Applications of Stacks: Concept of infix, postfix and prefix expressions, conversion of infix to postfix expression, evaluation of postfix expression. Queues: Definition & example, representation of queue using array and linked list. Concept of circular queue, concept of priority queue, applications of Queue.

Unit 5: Trees **(07)**

Difference between Linear and Non-linear data structures. Binary trees (BT): Basic terminology. Types of Binary Trees. Binary Search Tree (BST): Difference between BST and BT. Representation of BST(Static and Dynamic), Algorithms for BST traversals – pre-order, in-order & post-order(recursive), Primitive operations on BST: Create, insert, delete. Algorithm for Non-recursive in-order traversals for BST.

Unit 6: Graphs **(05)**

Graphs: Concepts and terminology, Types of graphs—directed graph, undirected graph, planar graph, representation of graph using adjacency matrix, adjacency list, Traversals: DFS & BFS. Minimal spanning tree: Kruskal's and Prim's algorithm.

Text Books:

1. Seymour Lipschutz, **'Data Structures with C',** Schaum's Outlines, *McGrawHill Education (India) Pvt. Ltd,* Special Indian Edition, (2013).
2. E Balgurusamy, **'Programming in ANSI C'**, *Tata McGraw-Hill*,(3rd Edition), (2008).

Reference books:

1. Richard F. Gilberg & Behrouz A. Forouzan, **'Data Structures A Pseudocode Approach with C'**, *Cengage Learning*, (2nd Edition) , (2005).
2. Yedidyah Langsam, Moshe J Augenstein, Aaron M Tenenbaum, **'Data structures using C and C++'**, *PHI Publications*, (2nd Edition), (2004).
3. Ellis Horowitz, SartajSahni, **'Fundamentals of Data Structures in C'**, *Universities Press,* (2nd edition), (2008).

BSEC 2101 Engineering Mathematics III

Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorial: 1 Hr/Week

Examination Scheme:
In-Semester: 50 Marks
End-Semester: 50 Marks
Credits: 4

Prerequisite:

1. Basics of integral and multiple integral.
2. Beta function , Gamma function.
3. Partial fractions.
4. First order linear differential equation.
5. Basics of vector algebra, basics of solid Geometry

Course Objectives:
Mathematics is a necessary path to scientific knowledge which opens new perspective of mental activity. Our aim is to provide sound knowledge of engineering mathematics to make the students think mathematically and strengthen their thinking power to analyse and solve engineering problems in their respective areas.

Course Outcomes:
Students will be able to

1. Formulate higher order Linear Differential Equations and apply to solve engineering applications.
2. Obtain Fourier and Laplace Transforms of various functions and apply it to solve integral equations and differential equations.
3. Interpret and evaluate results in Vector Calculus and apply it to obtain work done, surface integrals.
4. Analyse and apply concepts of analyticity of functions of complex variables. Evaluate complex integrals using results in complex analysis.

Unit 1: Higher Order Linear Differential equation and application **(08)**
Higher order Linear differential Equation with constant coefficients, complementary function, Particular integral, General method, short cut methods, Method of variation of parameter, Cauchy's and Legendre's D.E, Modelling of electrical circuits.

Unit 2 : Fourier Transform **(06)**
Fourier integral theorem, , Fourier transform, Fourier Sine transform, Fourier Cosine transform, Inverse Fourier Transform, Inverse Fourier sine Transform, Inverse Fourier cosine Transform.

Unit 3: Laplace Transform **(08)**
Definition of Laplace and Inverse Laplace transform, Properties and theorems, Laplace Transform of standard functions, Laplace Transform of some special functions viz. periodic, unit step, unit impulse, ramp function, Inverse Laplace transform using partial fraction, application of Laplace Transform for solving Linear Differential Equations.

Unit 4 : Vector Differentiation **(06)**
Physical interpretation of vector differentiation, vector differential operator, Gradient, Divergence, Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, vector identities.

Unit 5 : Vector Integration **(06)**

Line integral, Surface integral, Volume integral, Work done, Green's Lemma, Gauss' divergence Theorem, Stokes Theorem.

Unit 6 : Complex Analysis **(08)**

Functions of Complex variables, Analytic Functions, Cauchy - Riemann Equations, Cauchy's Integral Theorem, Cauchy's Integral Formula, Laurent's series, Cauchy's Residue theorem.

Text Books:

1. B. V. Ramana, **'Higher Engineering Mathematics'**, *Tata McGraw Hill Publications,* (2007).
2. B.S. Grewal, **'Higher Engineering Mathematics'**, *Khanna publishers, Delhi(*40th edition), (2008)
3. Peter V. O'neil, **'Advanced Engineering Mathematics'**, *Thomson Brooks / Cole, Singapore* (5th edition), (2007).

Reference books:

1. C.R.Wylie, L.C. Barrette, **'Advanced Engineering Mathematics'**, McGraw Hill Publications, New Delhi (6th edition), (2003).

2. Erwin Kreyszig, **'Advanced Engineering Mathematics'**, *Wiley Eastern Ltd.*(8th Student Edition), (2004).

EC -2105 Electronic Devices And Circuits Lab

Teaching Scheme:
Practical: 4 Hrs/Week

Examination Scheme:
Practical: 25 Marks
Credits:2

Course objectives:

1. To build circuits and take measurements of circuit variables using tools such as oscilloscopes, multimeters, and signal generators
2. To compare the measurements with the behaviour predicted by mathematic models and explain the discrepancies
3. To use simulation tool for verifying circuit performance

Course Outcomes:

Having successfully completed this course, the student will be able to:

1. Plot characteristics for JFET and calculate gm,rd.
2. Design biasing circuit for amplifier and feedback circuit for oscillators.
3. Build electronic circuits like amplifiers and oscillators and measure circuit response.
4. Compare experimental results with theoretical values of performance parameters of amplifiers and oscillators.

List of Experiments:

1. Plot V-I characteristics of JFET.
2. Implement biasing circuit for JFET and verify DC operating point.
3. Implement JFET CS Amplifier and calculate Av, Ri and Ro.
4. Determine f_L and f_H of amplifier using square wave testing method.
5. Implement CG and CD amplifier.
6. Analyze the effect of different capacitors on bandwidth of amplifier.
7. Plot V-I characteristics of MOSFET.
8. Plot voltage transfer characteristics of CMOS inverter.
9. Simulate current mirror circuit.
10. Analyze effect of feedback on Av, Ri and Ro.
11. Simulate Oscillator Circuits.
12. Simulate large signal amplifier.

EC 2106 Digital Electronics Lab

Teaching Scheme:

Practical: 2 Hrs/Week

Examination Scheme:

In-Semester: 25 Marks

Credits: 1

Course Objectives:

1. Design digital circuit based on reduction techniques and digital logic
2. Implement combinational logic circuits using MSI chips
3. Design and implement sequential logic circuits using counter ICs
4. Use software tools for simulation of digital circuits

Course Outcomes:

Having successfully completed this course, the student will be able to:

1. Identify the functionality of ICs as a multiplexer, decoders and counters
2. Design digital building blocks such as multiplexer, code converter, adder and counters
3. Implement and test digital circuits and verify the truth tables
4. Use the software tools for the simulation of digital circuits

List of Experiments

1. Design and implement combinational circuits using Multiplexer.
2. Design and implement multiple output function using decoder.
3. Design and implement 1 digit BCD adder using IC7483.
4. Design 8 bit magnitude comparator.
5. Design and implement MOD-N asynchronous BCD counter using counter ICs.
6. Design and implement 4 bit counter using Synchronous counter IC.
7. Write and simulate VHDL code for D FF using reset input.
8. Write and simulate VHDL code for 4 bit logical and arithmetic operations for ALU.

EC 2107 Data Structures Lab

Teaching Scheme
Practicals: 4 Hours/Week

Examination Scheme
Oral: 50Marks
Credits: 2

Course Objectives:
1. Understand various data searching and sorting methods with pros and cons
2. Understand various algorithmic strategies to approach the problem solution
3. Operate on the various structured data

Course Outcomes:
Having successfully completed this course, the student will be able to:
1. Utilize the principal algorithms of sorting and searching on the given data
2. Perceive the representation of data structures like arrays, records, linked lists and their use
3. Implement stacks & queues from the base models
4. Build, represent and traverse non-linear data structures

List of Assignments
Write a C program to implement:
1. Sorting methods – bubble, selection and insertion.
2. Searching techniques- linear and binary.
3. Data base Management using array of structure with operations Create, display, Modify, Append, Search and Sort.
4. Polynomial addition using array of structures.
5. Create a singly linked list with options:
   a. Insert (at front, at end, in the middle), b. Delete (at front, at end, in the middle),
   c. Display, d. Display Reverse, e. Revert the SLL.
6. Implement Stack using arrays. Perform following operations on a stack a. Push b. Pop c. Display.
7. Implement Stack using Linked List. Perform following operations on a stack a. Push b. Pop c. Display.
8. Evaluation of postfix expressions (input will be postfix expression).
9. Implement Queue using arrays. Write a menu driven program to perform following operations on a Queue a. Insert b. Delete c. Display.
10. Implement Queue using Linked List. Write a menu driven program to perform following operations on a Queue a. Insert b. Delete c. Display.
11. Binary search tree: Create, search, recursive traversals.
12. Graph using adjacency Matrix with BFS and DFS traversals.
13. Hash Table(Beyond the Syllabus)