NEW HORIZON COLLEGE OF ENGINEERING

Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC

Accredited by NAAC with 'A' Grade, Accredited by NBA

The Trust is a Recipient of Prestigious Rajyotsava State Award 2012 Conferred by the Government of Karnataka

Awarded Outstanding Technical Education Institute in Karnataka

Ring Road, Bellandur Post, Near Marathalli, Bangalore -560 103, INDIA

Academic Year 2016-17

ECE - Electronics & Communication Engineering

Third and Fourth Semesters

Scheme and Syllabus

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VISION

To create high quality engineering professionals who can serve the society and earn global recognition.

MISSION

- To build strong foundation in Electronics and Communication Engineering aspects by exposing students to state of the art technology and research.
- To strengthen the curriculum through interaction with industry experts to equip the students with the required competency.
- To mould students to share technical knowledge and to practice professional and moral values.

Program Education objectives (PEOs)

PEO1	To produce graduates with understanding of fundamentals and applications of Electronics and Communication Engineering.
PEO2	To hone graduates with ability to apply, analyze, design and develop electronic systems.
PEO3	To enhance graduates with latest technologies to enable them to engineer products for real world problems.
PEO4	To build leadership qualities, management skills, communication skills, moral values, team spirit and lifelong learning ability for the graduates.

PEO to Mission Statement Mapping

Mission Statements	**PEO1**	**PEO2**	**PEO3**	**PEO4**
To build strong foundation in Electronics and Communication Engineering aspects by exposing students to state of the art technology and research.	3	3	3	2
To strengthen the curriculum through interaction with industry experts to equip the students with the required competency.	2	3	3	2
To mould students to share technical knowledge and to practice professional and moral values.	1	2	2	3

Correlation: 3- High, 2-Medium, 1-Low

Program Outcomes (PO) with Graduate Attributes

	Graduate Attributes	Program Outcomes (POs)
1	**Engineering knowledge**	**PO1:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems in Electronics and Communication Engineering.
2	**Problem analysis**	**PO2:** Identify, formulate, review research literature, and analyze complex engineering problems in Electronics and Communication Engineering reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions**	**PO3:** Design solutions for complex engineering problems and design system components or processes of Electronics and Communication Engineering that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems**	**PO4:** Use research-based knowledge and research methods including design of experiments in Electronics and Communication Engineering, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage**	**PO5:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities in Electronics and Communication Engineering with an understanding of the limitations.
6	**The engineer and society**	**PO6:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice in Electronics and Communication Engineering.
7	**Environment and sustainability**	**PO7:** Understand the impact of the professional engineering solutions of Electronics and Communication Engineering in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics**	**PO8:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work**	**PO9:** Function effectively as an individual, and as a member or leader in

		diverse teams, and in multidisciplinary settings.
10	**Communication**	**PO10:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance**	**PO11:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	**Life-long learning**	**PO12:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1	To demonstrate the ability to design and develop complex systems in the areas of next generation Communication Systems, IoT based Embedded Systems, Advanced Signal and Image Processing, latest Semiconductor technologies, RF and Power Systems.
PSO2	To demonstrate the ability to solve complex Electronics and Communication Engineering problems using latest hardware and software tools along with analytical skills to contribute to useful, frugal and eco-friendly solutions.

Mapping of PEOs to POs & PSOs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
PEO1	3	3	2	2	2	1	1	1	1	1	1	1	1	1
PEO2	3	3	3	3	3	2	2	2	2	2	2	2	3	2
PEO3	3	3	3	3	3	3	3	2	2	2	2	2	3	3
PEO4	1	1	1	1	1	2	2	3	3	3	3	3	1	1

Correlation: 3- High, 2-Medium, 1-Low

New Horizon College of Engineering, Bangalore

B.E. Program - Batch: 2015 -2019

Department of Electronics and Communication Engineering

Scheme of Third and Fourth Semester

Second Year / Third Semester												
Sl. No.	**Course code**	**Course title**	**Credit Distribution**				**Overall credits**	**Theory hours**	**Lab hours**	**Marks**		
			L	**P**	**T**	**S**				**CIE**	**SEE**	**Total**
1	16MAT31	Engineering Mathematics-III	4	0	1	0	5	6	0	50	50	100
2	16HSS322	Life Skills for Engineers	2	0	0	1	3	2	0	50	50	100
3	16ECE33	Programming with Data Structures	3	0	0	1	4	4	0	50	50	100
4	16ECE34	Electronic Circuits-I	4	1	0	0	5	4	3	75	75	150
5	16ECE35	Network Analysis	3	0	1	0	4	5	0	50	50	100
6	16ECE36	Signals and Systems	3	1	0	0	4	4	2	75	75	150
7	16ECE37	Logic Design	0	2	0	0	2	0	4	25	25	50
		TOTAL					**27**	**25**	**9**	**375**	**375**	**750**

Second Year / Fourth Semester												
Sl. No.	**Course code**	**Course title**	**Credit Distribution**				**Overall credits**	**Theory hours**	**Lab hours**	**Marks**		
			L	**P**	**T**	**S**				**CIE**	**SEE**	**Total**
1	16MAT41	Engineering Mathematics-IV	4	0	1	0	5	6	0	50	50	100
2	16HSS421	Introduction to Economics	2	0	0	1	3	2	0	50	50	100
3	16ECE43	Electronic Circuits-II	4	1	0	0	5	4	3	75	75	150
4	16ECE44	Digital Signal Processing	4	1	0	0	5	4	3	75	75	150
5	16ECE45	Control Systems	3	0	1	0	4	5	0	50	50	100
6	16ECE46	System Design using HDL	4	1	0	0	5	4	3	75	75	150
		TOTAL					**27**	**25**	**9**	**375**	**375**	**750**

New Horizon College of Engineering, Bangalore

B.E. Program - Batch: 2015 -2019

Department of Electronics and Communication Engineering

Academic Year: 2016 – 2017

Syllabus of Third Semester

Sl. No.	Course code	Course title	Credit Distribution				Overall Credits	Theory Hours	Lab Hours	Marks		
			L	P	T	S				CIE	SEE	Total
1	16MAT31	Engineering Mathematics-III	4	0	1	0	5	6	0	50	50	100
	16HSS322	Life Skills for Engineers	2	0	0	1	3	2	0	50	50	100
3	16ECE33	Programming with Data Structures	3	0	0	1	4	4	0	50	50	100
4	16ECE34	Electronic Circuits-I	4	1	0	0	5	4	3	75	75	150
5	16ECE35	Network Analysis	3	0	1	0	4	5	0	50	50	100
6	16ECE36	Signals and Systems	3	1	0	0	4	4	2	75	75	150
7	16ECE37	Logic Design	0	2	0	0	2	0	4	25	25	50
		TOTAL					**27**	**25**	**9**	**375**	**375**	**750**

ENGINEERING MATHEMATICS – III			
Course Code	**: 16MAT31**	**Credits**	**:05**
L: P: T: S	**:4:0:1:0**	**CIE Marks**	**:50**
Exam Hours	**:03**	**SEE Marks**	**:50**

Course Outcomes: At the end of the Course, the student will have the ability to:

CO1	Solve the Fourier series expansion of functions analytically and numerically
CO2	Solve the Continuous model a problem using Fourier transforms
CO3	Solve the discrete model problems using Z-transforms and Fast Fourier transform
CO4	Fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data
CO5	Use appropriate numerical methods to solve algebraic and transcendental equations and also to calculate a definite integral
CO6	Use appropriate numerical methods to solve Boundary Value Problems in Partial differential equations

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	-	-	3	3	-	-
CO2	3	3	3	3	3	-	-	-	-	-	3	3	-	-
CO3	3	3	3	3	-	-	-	-	-	-	3	3	-	-
CO4	3	3	3	3	3	1	3	-	-	1	3	3	-	-
CO5	3	3	3	3	3	-	3	-	-	-	3	3	-	-
CO6	3	3	3	3	3	-	3	-	-	-	3	3	-	-

Module No.	Module Contents	Hrs.	COs
1	**Fourier series:** Periodic function, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period $2l$, half range series. Fourier series and half Range Fourier series of periodic square wave, half wave rectifier, full wave rectifier, Saw- tooth wave with graphical representation, practical harmonic analysis.	9	CO1
2	**Fourier Transforms:** Infinite Fourier transforms, Fourier Sine and Cosine transforms, Inverse Fourier transform.**Z - Transform:** Definition, Z-transforms of some standard functions properties, damping rule, shifting rule (without proof), initial and final value theorems, inverse Z- transforms. **Applications:** Solving difference equations using Z-transform.	9	CO2 CO3
3	**Statistical Methods:** Fitting of the curves of the form $y = a+bx$, $y=a+bx+c\,x^2$, $y = ae^{bx}$, $y = ab^x b^y$ the method of least square and Correlation and Regression and Regression coefficients, lines of regression –problems. **Discrete Fourier Transform and Fast Fourier Transform:** Definition of N-Point DFT, problems for 4-Points and inverse DFT for four points only. FFT algorithm to compute the Fourier transforms 4-Point only.	9	CO3 CO4

4	**Numerical methods-1:** Numerical solution of algebraic and transcendental equations; Regula- falsi method and Newton Raphson's method. Solution of a system of equation using Gauss Siedeland Relaxation method.Interpolation & extrapolation – Newton's forward and backward formulae for equal intervals, Newton divided difference formula and Lagrange's formula for unequal intervals.	9	CO5
5	**Numerical methods-2:** Numerical integration - Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule (without proof). Partial differential equations-Numerical solution of one dimensional wave equation and heat equation, Numerical solution of two dimensional Laplace's equation and Poisson's equation.	9	CO6

Text Books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 10th edition,2014, Wiley-India publishers.
2. Higher Engineering Mathematics, B.S.Grewal, 43rdedition, 2014, Khanna Publishers.

Reference Books:

1. Advanced Modern Engineering Mathematics, Glyn James, 4th edition, 2015, Pearson Education.
2. Advanced Engineering Mathematics, Dennis G. Zill, Michael R. Cullen, 4th edition, 2015, Jones and Barlett Publishers Inc.
3. Engineering Mathematics, B. V. Ramana, 4th edition, 2005, Tata McGraw Hill Publications.
4. Engineering Mathematics, Anthony Craft, 4th edition, 2013, Pearson Education.

Assessment Pattern

CIE- Continuous Internal Evaluation

Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**30**	**10**	**5**
Remember	10	3	5
Understand	5	5	5
Apply	5	2	-
Analyze	5	-	-
Evaluate	5	-	-
Create	-	-	-

SEE- Semester End Examination

Theory (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

LIFE SKILLS FOR ENGINEERS			
Course Code	**:16HSS322**	**Credits**	**:03**
L: P: T: S	**:2:0:0:1**	**CIE Marks**	**:50**
Exam Hours	**:03**	**SEE Marks**	**:50**

Course Outcomes: At the end of the Course, the student will have the ability to:

CO1	To transform as stronger individuals to handle life challenges of professional life
CO2	To apply the concept of Personality development & Grooming in real life
CO3	Understand the concept of self and Creativity so that they can align with their life better
CO4	To understand the role of motivation and leadership on behavior
CO5	To enhance holistic development of personality to equip the student with employability skills
CO6	Determine the significance of goal setting & decision making in their professional life

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	2	3	3	3	3	3	1	3	-	-
CO2	1	1	1	1	2	3	3	3	3	3	1	3	-	-
CO3	1	1	1	1	2	3	3	3	3	3	1	3	-	-
CO4	1	1	1	1	2	3	3	3	3	3	1	3	-	-
CO5	1	1	1	1	2	3	3	3	3	3	1	3		
CO6	1	1	1	1	2	3	3	3	3	3	1	3	-	-

Module No	Module Contents	Hrs.	Cos
1	**Personality development & Grooming:** Expectations from the industry & Career Planning / Reality Check; Building personal presence; Corporate grooming; Corporate etiquettes; Developing personal workcode.	6	CO1 CO5
2	**Self-Analysis & Creativity:** SWOC analysis, Who am I attributes, Importance of Self Confidence, Self-Awareness, Self-Management, Social Awareness, Emotional Intelligence, out of box thinking, lateral Thinking & Johari windows.	4	CO2 CO3
3	**Motivation & Leadership:** Basic concepts & theories, factor, types of Motivation, Good Leadership skill, Traits of a leader & Assessment of Leadership Skill.	4	CO4
4	**Interpersonal Skill:** Assessment of interpersonal skills, situation detail of interpersonal skill, Team Working, leading a team, and Strategies for influencing people. Understanding the relationship among motivation, leadership and teamwork	4	CO5
5	**Goal Setting and Decision Making:** identifying goals like (short term, long term, lifetime goals), Time management, importance of work scheduling, importance and necessity of decision making.	4	CO6

Text Books:

1. Soft Skill, 2015, Career development Centre, Green Pearl Publication

Reference Books:

1. The 7 – Habits of Highly Effective People, Stephen R Covey, Neha Publishers.
2. Convey Sean, Seven Habits of Highly Effective Teens, New York, Fireside Publishers, 1998.
3. Daniel Coleman, Emotional Intelligence, Bantam Book, 2006

Assessment Pattern

CIE- Continuous Internal Evaluation

Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**30**	**10**	**10**
Remember	-	-	-
Understand	-	-	5
Apply	5	-	5
Analyze	10	5	-
Evaluate	5	-	-
Create	5	-	-

SEE- Semester End Examination

Theory (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	5
Understand	10
Apply	15
Analyze	10
Evaluate	5
Create	5

PROGRAMMING WITH DATA STRUCTURES			
Course Code	**:16ECE33**	**Credits**	**:04**
L: P: T: S	**:3:0:0:1**	**CIE Marks**	**:50**
Exam Hours	**:03**	**SEE Marks**	**:50**

Course Outcomes: At the end of the Course, the student will have the ability to:

CO1	Develop programs using concepts of memory allocation, Pointers and Arrays
CO2	Compare stacks and queues using dynamic arrays
CO3	Build projects to investigate and resolve environmental problems using linked lists
CO4	List the types of trees and their operations performed
CO5	Analyze searching and sorting tree algorithms to solve complex engineering problems
CO6	Engage for lifelong learning and work on multidisciplinary projects to overcome societal problems

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	1	-	-	1	-	2	2	2	-	2	3
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	-	3
CO6	3	3	2	-	-	1	-	-	2	2	2	1	2	3

Module No	Module Contents	Hrs.	Cos
1	**POINTERS AND ARRAYS:** Dynamic Memory Allocation, Algorithm Specification, Data Abstraction, Dynamically Allocated Arrays, Structures and Unions, Polynomials, Sparse Matrices, Representation of Multidimensional Arrays.	9	CO1
2	**STACKS AND QUEUES:** Stacks, Stacks Using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues.	9	CO1 CO2
3	**LINKED LISTS:** Singly Linked lists and Chains, Representing Chains in C, Linked Stacks and Queues, Polynomials, Additional List operations, Sparse Matrices, Doubly Linked Lists.	9	CO3 CO6
4	**TREES:** Introduction, Binary Trees, Binary Tree Traversals, Threaded Binary Trees, Heaps. Binary Search Trees, Selection Trees, Forests, Representation of Disjoint Sets, Counting Binary Trees.	9	CO4 CO6
5	**SEARCHING & SORTING: Sorting:** sort concepts-sort order, sort stability, sort efficiency, Types of sorting: Insertion sort, Quick Sort, Merge Sort, Heap sort. **Types of Searching:** Binary Search, Linear Search. Efficient Binary Search Trees: Optimal Binary Search Trees, AVL Trees.	9	CO1 CO4 CO5 Co6

Text Books:

1. Fundamentals of Data Structures in C, Horowitz, Sahni, Anderson-Freed, 2nd Edition, 2011, Universities Press.

Reference Books:

1. Data Structures: A Pseudocode Approach with C, Richard F. Gilberg and Behrouz A. Forouzan, 2012, CengageLearning.

2. Data Structures using C, Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, 2nd Edition, 2013, PearsonEducation.

Assessment Pattern

CIE- Continuous Internal Evaluation

Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes	Self - Study
Marks	**20**	**10**	**10**	**10**
Remember	10	-	5	-
Understand	10	5	-	-
Apply	-	5	-	5
Analyze	-	-	5	5
Evaluate	-	-	-	-
Create	-	-	-	-

SEE- Semester End Examination

Theory (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	10
Understand	20
Apply	15
Analyze	5
Evaluate	-
Create	-

ELECTRONIC CIRCUITS – I			
Course Code	**:16ECE34**	**Credits**	**:05**
L: P: T: S	**:4:1:0:0**	**CIE Marks**	**:50+25**
Exam Hours	**:03+03**	**SEE Marks**	**:50+25**

Course Outcomes: At the end of the Course, the student will have the ability to:

CO1	Interpret the applications of diode circuits
CO2	Design of BJT biasing circuits and perform load line analysis
CO3	Analyze the BJT amplifier circuits and their high frequency response
CO4	Analyze the FET circuits using DC and AC analysis, along with their high frequency response
CO5	Examine the working of constant current source and current mirror for BJT
CO6	Model the applications of diode, BJT and FET circuits using discrete components and simulation tools

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	3	-	-	-	-	-
CO2	3	3	-	-	3	-	-	-	3	-	-	-	3	-
CO3	3	3	-	-	3	-	-	-	3	-	-	3	3	-
CO4	3	3	-	-	3	-	-	-	3	-	-	3	3	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO6	3	3	2	1	3	-	-	-	3	-	-	3	-	-

Module No	Module Contents	Hrs.	COs
1	**DIODE APPLICATIONS:** Filter circuits for power supply design, Design of low voltage power supply for the given specifications, Types of regulators and their characteristics, Design of series and shunt regulators for the given specifications, Dual tracking power supply, Clippers, Clampers, Voltage multipliers (doublers, triplers, quadruplers)	9	CO1 CO6
	List of Experiments 1. Testing of Diode clipping (Single/Double ended)circuits. (Hardwired) 2. Testing of Clamping circuits: positive clamping/negative clamping.(Hardwired) **3.** Testing of voltage multipliers: doublers, triplers,quadruplers.(Simulation using Multisim / Pspice)	6	
2	**BJT BIASING:** Discussion on specifications of BJT, Design of transistor switch for the given specs, BJT biasing circuits, Load line analysis, Bias stabilization, Comparison of biasing circuits based on the stability conditions, Analysis of dual supply operated circuit, Transistor configurations (CE, CB, CC) – their characteristicsand comparisons.	9	CO2 CO3 CO6
	List of Experiments 1. Plotting the transfer curve of transistor switch (BJT, JFET, MOSFET).(Hardwired) 2. Stability analysis of different biasing circuits.(Hardwired)	6	
3	**BJT AMPLIFIERS:** CE small signal modeling (r_e and hybrid), AC load line, Maximum signal swing, CB amplifiers, CC amplifiers, Their applications, Cascading of stages, Cascode configuration and its advantages	9	CO3 CO4 CO6
	List of Experiments 1. Wiring of RC coupled Single stage BJT amplifier and Determination of the	6	

	gain-frequency response, input and output impedances.(Hardwired) 2. Simulation of BJT cascode configuration and determination ofthe gain, Frequency response, input and output impedances.		
4	**FIELD EFFECT TRANSISTORS:** Construction of JFET, Its characteristics, Specification sheets, Biasing of JFET, Bias stability, Small signal analysis, JFET amplifiers (CS, CG, CD), Practical applications.	9	CO4 CO6
	List of Experiments **1.** Wiring of RC coupled Single stage JFET amplifier and Determination of the gain-frequency response, input and output impedances. (Hardwired)	6	
5	**OTHER CIRCUITS:** Design of BJT current source, BJT current mirror, BJT and JFET mid and high frequency response (single stage), Logic families, BJT NAND gate circuit – (totem pole, multi-emitter, open collector, high impedance state, floating state)	9	CO3 CO4 CO5 CO6
	List of Experiments 1. Simulate the different configurations of BJT/JFETamplifiers. 2. Simulate the Schmitt trigger circuit, and sine wave shaperusing diodes	6	

Text Books:

1. Electronic Principles, Albert Malvino and David Bates, 8th edition, 2015, McGraw-Hill.
2. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, 10th Edition, 2008, Pearson Education / PHI.

Reference Books:

1. Electronic Devices and Circuits, Millman J and Halkias C., 2nd edition, 2007, TMH.
2. Equipment manuals as applicable.

Assessment Pattern

CIE- Continuous Internal Evaluation

Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**30**	**10**	**10**
Remember	10	-	-
Understand	5	-	-
Apply	5	5	-
Analyze	10	-	5
Evaluate	-	-	-
Create	-	5	-

Practical (25 Marks)

Bloom's Taxonomy	Tests	Quizzes
Marks	**20**	**5**
Remember	10	-
Understand	5	5
Apply	5	-
Analyze	-	-
Evaluate	-	-
Create	-	-

SEE- Semester End Examination

Theory (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	20
Understand	10
Apply	10
Analyze	10
Evaluate	-
Create	-

Practical (25 Marks)

Bloom's Taxonomy	Tests
Marks	**25**
Remember	10
Understand	5
Apply	10
Analyze	-
Evaluate	-
Create	-

NETWORK ANALYSIS			
Course Code	**:16ECE35**	**Credits**	**:04**
L: P: T: S	**:3:0:1:0**	**CIE Marks**	**:50**
Exam Hours	**:03**	**SEE Marks**	**:50**

Course Outcomes: At the end of the Course, the student will have the ability to:

CO1	Solve the electrical networks using nodal and mesh analysis techniques
CO2	Make use of the concepts of network theorems to solve the given electric circuits
CO3	Analyze the electric circuits using the Laplace transformation to solve for complex electrical circuits
CO4	Examine the electric circuits using network topology and formulate network equations
CO5	Model the parameters of two port networks
CO6	Evaluate the steady state and transient response of the electric circuits

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	-	-	-	-	-	-	-	-	-	-	3	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	3	3	-	-	-	-	-	-	-	-	-	3	3	-
CO5	3	3	-	-	3	-	-	-	-	-	-	3	3	3
CO6	3	3	-	-	3	-	-	-	-	-	-	3	3	3

Module	Module Contents	Hrs.	Cos
1	**Circuit Analysis (AC and DC circuits):** Nodal and Mesh Analysis, Super Node, Super Mesh, Delta-Wye Conversion.**Circuit Analysis Techniques**: Superposition, Reciprocity, Thevenin's, Norton's and Maximum power transfer theorems, Source Transformation, Concept of dependent sources.	9	CO1 CO2
2	**Network Topology and Equations**: Basic Definitions, Matrices of Graphs, Node and Mesh Transformations, Generalized Element, Formulation of Network Equations.	9	CO4
3	**Initial conditions**: Behaviour of circuit elements under switching condition and their Representation, Evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations. **Waveforms synthesis and transient response:** Shifted Unit Step Function, Ramp and Impulse Functions, Waveform Synthesis, Initial and final value of f(t) from F(s). Solution of networks.	9	CO3 CO6
4	**Two-port networks:** two-port parameters of networks: Z, Y, h and transmission parameters, relationships between 2-port parameters	9	CO5
5	**Synthesis of One – Port Networks:** Network functions, Driving point impedance, Synthesis of L-C, R-C, R-L networks. **Resonant Circuits:** Series and parallel resonance (with varying frequency), frequency response of series and Parallel circuits, Q – factor, Bandwidth.	9	CO6

Text Books:

1. Network Analysis, M. E. Van Valkenburg, 3rd Edition, 2014, PHI / Pearson Education.

Reference Books:

1. Engineering Circuit Analysis, Hayt, Kemmerly and Durbin, 8th Edition, 2013, TMHEducation
2. Networks and systems, Roy Choudhury, 2nd edition, 2013, New Age International Publications.

Assessment Pattern

CIE- Continuous Internal Evaluation

Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**30**	**10**	**10**
Remember	10	5	-
Understand	10	-	5
Apply	5	5	5
Analyze	5	-	-
Evaluate	-	-	-
Create	-	-	-

SEE- Semester End Examination

Theory (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	10
Understand	10
Apply	30
Analyze	-
Evaluate	-
Create	-

SIGNALS AND SYSTEMS			
Course Code	**:16ECE36**	**Credits**	**:04**
L: P: T: S	**:3:1:0:0**	**CIE Marks**	**:50+25**
Exam Hours	**:03+03**	**SEE Marks**	**:50+25**

Course Outcomes: At the end of the Course, the student will have the ability to:

CO1	Classify the continuous time and discrete time signals and systems
CO2	Apply the knowledge of systems to obtain the properties of LTI systems
CO3	Use the convolution operator to compute the response of LTI system
CO4	Design the spectral characteristics of signals using Fourier analysis
CO5	Examine the properties of Fourier analysis for solving complex problems
CO6	Analyze the discrete time systems in Z domain

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	3	-	-	-	-	-	-	-	3	-
CO2	3	3	3	3	3	-	-	-	3	-	-	-	3	-
CO3	3	3	3	3	3	-	-	-	3	-	-	3	3	-
CO4	3	3	3	3	3	-	-	-	3	-	-	3	3	3
CO5	3	3	3	3	3	-	-	-	3	-	-	3	3	3
CO6	3	3	-	-	3	-	-	-	3	-	-	-	3	3

Module No	Module Contents	Hrs.	COs
1	**Classification of Signals**: Continuous time signals, Discrete time signals, Periodic and Aperiodic signals, Even and odd signals, Energy and power signals, Deterministic and random signals, Complex exponential and Sinusoidal signals. Unit step, Unit ramp, Unit impulse, Representation of signals in terms of unitimpulse.**Classification of Systems**: Continuous time systems, Discrete time systems, Linear system, Time Invariant system, causal system, BIBO system, Systems with and without memory, LTI systems.	9	CO1 CO2
	List of Experiments 1. Introduction to MATLAB and generation of basic continuous and discrete signals- unit step, unit impulse, ramp, exponential, sine, cosineetc. 2. Time domain and amplitude domain operations such as shifting, scaling, and folding on varioussignals. 3. Classification of various types of signals –Energy and Power signals, Periodic and Nonperiodic. 4. Nodal and loop analysis of a circuit (using MATLab as wellas using pSPICE) 5. Verification of Thevenin and Norton and Maximum Power Transfer Theorem (using MATLab as well as usingpSPICE). 6. Study of Transient Response of a R-C, R-L and R-L-C Circuit (Hardwired as well as usingpSPICE). 7. FrequencyresponseofseriesandparallelresonanceRLC Circuit (Hardwired as well as using pSPICE).	12	
2	**Time-domain representations for LTI systems:** Convolution, Properties of convolution, Convolution Sum and Convolution Integral for infinite duration sequences, Properties of impulse response representation, Solutions of differential and difference equations.	9	CO1 CO2 CO3

	List of Experiments 1. Response of LTI system for various inputs such as i)step ii) impulse iii) real exponential iv) complex exponential. 2. Verification of linear convolution for two given sequences 3. Autocorrelation of a given sequence and verification of its properties. 4. Cross correlation of a given sequence and verification of its properties.	8	
3	**Fourier series representation of periodic signals:** Representation of Fourier series, Properties of Fourier series, Dirichlet conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum.	9	CO4 CO5
	List of Experiments 1. Fourier series representation of a signal.	2	
4	**Fourier transform representation of a signal:** Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform.	9	CO4 CO5
	List of Experiments 1. Fourier transform representation of a signal and verification of Fourier transform properties.	4	
5	**Z-transform**: Unilateral & Bilateral Z transforms - properties. Inverse Z transform: Power series expansion - Partial fraction. Analysis and characterization of DT system using Z transform.	9	CO4 CO5 CO6
	List of Experiments 1. Verification of Sampling Theorem. 2. Finding the Z transform and inverse Z transform. 3. Finding the solution of a given differential and difference equations.	4	

Text Books:

1. Signals and Systems, Simon Haykin and Barry Van Veen, 2nd edition, 2007, John Wiley & sons.
2. Principles of Linear Systems and Signals, B.P.Lathi , 2nd edition, 2009, Oxford University Press.

Reference Books:

1. Signals and Systems, Allen V.Oppenheim, Allen S.Willsiky, S. Hamid Nawab, 2015,PHI.
2. Signals and Systems, Udaykumar S, 6th edition, 2012, Prism bookHouse.

Assessment Pattern

CIE- Continuous Internal Evaluation

Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**30**	**10**	**10**
Remember	10	-	5
Understand	15	-	5
Apply	5	-	-
Analyze	-	-	-
Evaluate	-	-	-
Create	-	10	-

Practical (25 Marks)

Bloom's Taxonomy	Tests	Quizzes
Marks	**20**	**5**
Remember	10	-
Understand	5	-
Apply	5	5
Analyze	-	-
Evaluate	-	-
Create	-	-

SEE- Semester End Examination

Theory (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	10
Understand	15
Apply	10
Analyze	15
Evaluate	-
Create	-

Practical (25 Marks)

Bloom's Taxonomy	Tests
Marks	**25**
Remember	10
Understand	10
Apply	5
Analyze	-
Evaluate	-
Create	-

LOGIC DESIGN			
Course Code	**:16ECE37**	**Credits**	**:02**
L: P: T: S	**:0:2:0:0**	**CIE Marks**	**:25**
Exam Hours	**:03**	**SEE Marks**	**:25**

Course Outcomes: At the end of the Course, the student will have the ability to:

CO1	Recall the fundamental concepts of digital design
CO2	Demonstrate the simplification of Boolean expressions using standard methods
CO3	Employ the design & Implementation of combinational logic circuits
CO4	Solve sequential logic circuits with the acquired knowledge of flip flop , Registers & Counters
CO5	Examine the significance of state machines in system design
CO6	Employ synchronous and asynchronous circuits to meet the given specifications

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO2	3	3	3	-	3	-	-	-	3	-	-	-	-	-
CO3	3	3	3	-	3	-	-	-	3	-	-	-	-	-
CO4	3	3	3	3	3	-	-	-	3	-	-	-	2	-
CO5	3	3	3	3	3	-	-	-	3	-	-	-	2	1
CO6	3	3	3	3	3	-	-	-	3	-	-	-	-	-

ModuleNo	Module Contents	Hrs.	Cos
1	**Combinational Logic Design:** Sum of product and Product of sum Form, Karnaugh Map, Karnaugh Map with 'Don't Care' Conditions, Five Variable Karnaugh Map	2	CO1 CO2 CO3
	1. Implementation of simple Boolean expressions using universal gates. **2.** Simplification of Boolean expressions using K map and realization using basic and universal gates (Half adder,full adder and subtractors)	2	
2	Quine McCluskey Minimization Procedure. Exercise problems on above simplification techniques.	2	CO1 CO2 CO6
	Implementation of code converters (BCD to excess 3, Binary to gray vice versa) using Q-M minimization technique.	2	
3	**Design of combinational circuits:** Combinational Circuit, Binary Adder, Binary Subtractor, Binary Parallel Adder, Ripple Carry Adder, The Look Ahead Carry Adder.	2	CO2 CO3 CO6
	Simplification and Implementation of encoder, decoder, priority encoder.	2	
4	Implementation of combinational circuits using multiplexerand demultiplexers.	2	CO2 CO3 CO6
	MUX and DEMUX design and implementation using gatesand IC version.	2	
5	Comparator. Relevant Problems. Exercise problems using any engineering simulation tool, design and analyze of combinational circuits	2	CO2 CO3 CO6
	Realization of One/Two bit comparator and study of 7485 magnitude comparator.	2	
6	**Flip-Flops, Registers, Counters:** Introduction to sequential circuits, Notations, Preview of flip flops	2	CO1 CO4 CO6
	Truth table verification of Flip-Flops: RS, JK, MS , T, D.	2	
7	Excitation tables of RS, JK, T and D Flip Flops.	2	CO1 CO4, CO6
	Conversion of FF and verification TT of IC 7476.	2	

8	Implementation of shift registers using Flip flops, Universal shift registers.	2	CO1 CO4 CO6
	Shift left; Shift right, SIPO, SISO, PISO, PIPO operations using 74S95.	2	
9	Synchronous counter operation, asynchronous counters operation, up/down synchronous counter, design of synchronous counters.	2	CO4 CO6
	Realization and study of synchronous and asynchronous counters	2	
10	**Design of Sequential Circuits:** Moore Sequential Circuits, Mealy Sequential Circuits	2	CO4 CO5 CO6
	Design and implementation of synchronous or clocked sequential circuits using Mealy and Moore model.	2	
11	Analysis of Asynchronous Sequential Circuits, Relevant Problems.	2	CO5 CO6
	Revision of relevant experiments and assessment	2	

Text Books:

1. An Illustrative Approach to Logic Design, R. D. Sudhakar Samuel, 2010,Pearson Education
2. Digital Logic: Applications and Design, John M. Yarbrough, 1st edition, 2006, Nelson Engineering

Reference Books:

1. Digital Principles and Design, Donald D. Givone, 2003, McGrawHill
2. Digital Fundamentals, Thomas Floyd, 11th edition, 2014, PearsonEducation

Assessment Pattern

CIE- Continuous Internal Evaluation

Practical (25 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**15**	**5**	**5**
Remember	-	-	-
Understand	5	-	-
Apply	5	-	-
Analyze	5	-	-
Evaluate	-	5	-
Create	-	-	**5**

SEE- Semester End Examination

Practical (25 Marks)

Bloom's Taxonomy	Tests
Marks	**25**
Remember	-
Understand	5
Apply	10
Analyze	10
Evaluate	-
Create	-

New Horizon College of Engineering, Bangalore

B.E. Program - Batch: 2015 -2019

Department of Electronics and Communication Engineering

Academic Year: 2016 – 2017

Syllabus of Fourth Semester

Sl. No.	Course code	Course title	Credit Distribution				Overall credits	Theory hours	Lab hours	Marks		
			L	P	T	S				CIE	SEE	Total
1	16MAT41	Engineering Mathematics-IV	4	0	1	0	5	6	0	50	50	100
2	16HSS421	Introduction to Economics	2	0	0	1	3	2	0	50	50	100
3	16ECE43	Electronic Circuits-II	4	1	0	0	5	4	3	75	75	150
4	16ECE44	Digital Signal Processing	4	1	0	0	5	4	3	75	75	150
5	16ECE45	Control Systems	3	0	1	0	4	5	0	50	50	100
6	16ECE46	System Design using HDL	4	1	0	0	5	4	3	75	75	150
TOTAL							**27**	**25**	**9**	**375**	**375**	**750**

ENGINEERING MATHEMATICS – IV			
Course Code	**:16MAT41**	**Credits**	**:05**
L: P: T: S	**:4:0:1:0**	**CIE Marks**	**:50**
Exam Hours	**:03**	**SEE Marks**	**:50**

Course Outcomes: At the end of the Course, the student will have the ability to:

CO1	Solve initial value problems using appropriate numerical methods
CO2	Understand the concepts of Complex variables and Complex Integration for solving Engineering Problems
CO3	Understand the concepts of zeros, Poles and Residuals in the stability analysis of engineering problems
CO4	To gain ability to use probability methods to analyze and solve real time problems
CO5	Apply the stochastic process and Markov Chain in prediction of future events
CO6	Analyze, interpret, and evaluate scientific hypotheses and theories using rigorous statistical methods

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	2	-	-	-	3	3	-	-
CO2	-	3	-	-	3	-	-	-	-	-	3	3	-	-
CO3	-	3	-	-	3	-	-	-	-	-	3	3	-	-
CO4	3	3	3	3	3	3	-	-	2	1	3	3	-	-
CO5	3	3	3	3	3	3	-	-	-	-	3	3	-	-
CO6	3	3	3	3	3	3	2	-	2	-	3	3	-	-

Module No	Module Contents	Hrs.	COs
1	**Numerical Methods:** Numerical solution of ordinary differential equations of first order and of first degree; Picard's Method, Taylor's series method, modified Euler's method and Runge-Kutta method of fourth-order. Milne's and Adams- Bashforth predictor and corrector methods (No derivations of formulae). Numerical solution of simultaneous first order differential equations; Picard's Method and Runge-Kutta Method of fourth-order.	9	CO1
2	**Complex Variables**: Functions of a complex Variables, Analytical functions, Cauchy's Riemann Equations in Cartesian and Polar forms, Harmonic functions and Construction of analytic functions. Discussion of Transformations: $w = z^2$, $w = e^Z$and $w = z + (1 / z)$ and Bilinear Transformations.	9	CO2
3	**Complex Integrations:** Complex line integrals – Cauchy's theorem and Cauchy's Integral formula. Power Series, Laurent's series. Singularities, Poles and Residuals, Residual Theorem (without proof)	9	CO3
4	**Probability distributions:** Random variables (discrete and continuous), probability density function, cumulative density function. Discrete Probability distributions: Binomial and Poisson distributions. Continuous Probability distributions; Exponential and normal distributions.**Joint Probability distributions:**, Mathematical expectation, correlation, covariance (discrete random variables only).	9	CO4

5	**Sampling Theory:** Sampling, Sampling distributions, standard error, test of hypothesis for means and proportions, confidence limits for means, student's t-distribution, Chi-square distribution as a test of goodness of fit. **Stochastic Processes:** Stochastic processes, Probability Vectors, Stochastic matrices, Regular stochastic matrices, Markov chains, Higher transition probabilities, Stationary distribution of regular Markov chains and absorbing states.	9	CO5 CO6

Text Books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 10th edition,2014, Wiley-India publishers.
2. Higher Engineering Mathematics, B.S.Grewal, 43rdedition, 2014, Khanna Publishers.

Reference Books:

1. Advanced Modern Engineering Mathematics, Glyn James, 4th edition, 2015, Pearson Education.
2. Advanced Engineering Mathematics, Dennis G. Zill, Michael R. Cullen, 4th edition, 2015, Jones and Barlett Publishers Inc.
3. Engineering Mathematics, B. V. Ramana, 4th edition, 2005, Tata McGraw Hill Publications.
4. Engineering Mathematics, Anthony Craft, 4th edition, 2013, Pearson Education.

Assessment Pattern

CIE- Continuous Internal Evaluation

Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**30**	**10**	**10**
Remember	10	3	5
Understand	5	5	5
Apply	5	2	-
Analyze	5	-	-
Evaluate	5	-	-
Create	-	-	-

SEE- Semester End Examination

Theory (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

INTRODUCTION TO ECONOMICS			
Course Code	**:16HSS421**	**Credits**	**:03**
L: P: T: S	**:2:0:0:1**	**CIE Marks**	**:50**
Exam Hours	**:03**	**SEE Marks**	**:50**

Course Outcomes: At the end of the Course, the student will have the ability to:

CO1	Understand the basics of economics and different types of economics
CO2	Understand the macro-economic environment of the business and its impact on enterprise
CO3	Evaluate the national income by using various methods
CO4	Examine the money and banking system of India
CO5	Have an in depth knowledge about budget and the economy
CO6	Analyze the balance of payments and foreign exchange markets

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	-	-	-	3	2	2	-	1	3	-	-	-
CO2	1	2	3	-	1	3	2	2	1	1	3	2	-	-
CO3	1	2	3	3	1	3	2	2	1	1	-	2	-	-
CO4	1	2	3	3	1	3	2	2	1	1	3	2	-	-
CO5	1	2	3	3	1	3	2	2	1	1	3	2	-	-
CO6	1	2	3	3	1	3	2	2	1	1	3	2	-	-

Module No	Module Contents	Hrs.	COs
1	Introduction: Open, closed and mixed economy, central problems of an economy, Organization of economic activities: the centrally planned economy and The market economy, positive economics and Normative economics. Microeconomics: Consumer Behaviour: rationality, revealed preferences and utility, indifference curves, utility maximization, demand functions, substitution and income effects, demand elasticity- substitutes and complements.	5	CO1
2	Introduction to Macroeconomics: Definition, Introduction to National income, circular flow of income, methods of calculating national income: value added, expenditure and income method, macroeconomic identities, goods and prices, Role of LPG and FDI, Inflation.	5	CO2 CO3
3	Money and Banking: Role of money, Transaction motive & Speculation motive, the supply of money, instruments of monetary policy and the Reserve bank of India.	4	CO4
4	Budget and the Economy: Components of the government budget: The revenue account, the capital account, measures of government deficit, Fiscal policy: changes in government expenditure, changes in taxes and debt.	4	CO5
5	Open economy Macroeconomics: The balance of payments, the foreign exchange market, determination of the exchange rate, flexible exchange rates, fixed exchange rates and managed floating, trade deficits, savings and investment.	4	CO6

Text Books:

1. K KDewett, Modern economic theory, S.Chand publishing
2. Begg, D., S. Fischer and R. Dornbusch, Economics. (McGraw Hill), 2014
3. Lipsey, R.G. and K.A. Chrystal, Economics. (Oxford University Press), 2015
4. Chopra P. N., Principle of Economics, Kalyani Publishers.
5. Agrawal AN, Indian Economy, Wiley Eastern Ltd, New Delhi, 2012

Reference Books:

1. Introductory to Macroeconomics, Textbook for class 12th, NCERT

Assessment Pattern

CIE- Continuous Internal Evaluation

Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**30**	**10**	**10**
Remember	-	-	5
Understand	-	-	-
Apply	10	-	-
Analyze	10	-	-
Evaluate	10	-	5
Create	-	10	-

SEE- Semester End Examination

Theory (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	-
Understand	-
Apply	10
Analyze	10
Evaluate	30
Create	-

ELECTRONIC CIRCUITS – II			
Course Code	**:16ECE43**	**Credits**	**:05**
L: P: T: S	**:4:1:0:0**	**CIE Marks**	**:50+25**
Exam Hours	**:03+03**	**SEE Marks**	**:50+25**

Course Outcomes: At the end of the Course, the student will have the ability to:

CO1	List the measuring techniques and acquire knowledge on characteristic behavior of measuring equipments
CO2	Analyze the performance parameters of BJT multistage amplifiers
CO3	Compare the effect of feedback topologies in amplifier circuits
CO4	Illustrate the working principles of oscillators and power amplifiers
CO5	Construct the BJT application circuits using simulation tools
CO6	Operate electronic equipment to characterize the working behavior of testing instruments

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	3	-	-	-	-	-	-	-	-
CO2	3	3	3	3	3	3	-	-	-	-	-	1	3	-
CO3	3	3	3	3	3	3	-	-	-	-	-	-	3	-
CO4	3	3	3	3	3	3	-	-	-	-	-	-	3	-
CO5	3	3	3	3	3	3	-	-	-	-	-	-	-	-
CO6	3	3	3	3	3	3	-	-	1	1	-	-	-	1

Module No	Module Contents	Hrs.	Cos
1	**ELECTRONIC INSTRUMENTATION:** Introduction to measurements, Electronic measurement techniques, Elements of generalized measurement system, Static and dynamic characteristics, Types of errors and their calculation, Oscilloscope's detailed block diagram, Significance of ALT mode and CHOP mode.	9	CO1 CO6
	List of Experiments 1. Study of front panel control of Function Generator, Frequency Counter andOscilloscope. 2. Finding the horizontal and vertical bandwidth of Oscilloscope, Calibration of Electronicmultimeter.	6	
2	**MULTISTAGE BJT AMPLIFIERS:** DC and AC analysis, Calculation of individual and overall gain, Input and output impedances, Overall gain and frequency response, Design of multistage amplifiers for the given specifications, Darlington configuration, Sziklai pair.	9	CO2 CO5 CO6
	List of Experiments 1. Simulation of BJT Darlington Emitter follower with and without bootstrapping and determination of the gain, input and output impedances. (Simulation using Multisim / Pspice)	3	
3	**FEEDBACK AMPLIFIERS:** General Feedback Structure, Properties of negative feedback, Basic Feedback Topologies, Feedback amplifiers (Series – Shunt, Series – Series, Shunt – Shunt and Shunt – Series), Determining the Loop Gain, Stability Problem, Nyquist Plot, Effect of feedback on amplifier poles, Frequency Compensation.	9	CO3 CO5

	List of Experiments 1. Simulation of a two stage BJT Voltage series feedback amplifier and determination of the gain, Frequency response, input and output impedances with and without feedback.	3	
4	**OSCILLATORS AND WAVESHAPING CIRCUITS:** Barkhausen criterion, General form of an oscillator, LC oscillators, RC oscillators, Crystal oscillators, BJT astable multivibrator, Monostable multivibrator with design equations, Schmitt trigger circuit (BJT version), Sinewave shaper using diodes, Sweep generators, Exponential charging, Constant current charging, Miller and Bootstrap circuits.	9	CO4 CO5 CO6
	List of Experiments 1. Wiring and Testing for the performance of BJT-RC Phase shift Oscillator for 10 KHz.(Hardwired) 2. Testing for the performance of BJT – Hartley &Colpitts Oscillators for RF range.(Hardwired) 3. Testing the BJT astable and Monostablemultivibrator. (Hardwired) 4. Simulation of different timer circuits using555.	12	
5	**POWER AMPLIFIERS:** Class-A amplifier, Efficiency calculations, Class AB amplifier, Class-B amplifiers (push-pull, complementary symmetry), Unloaded and loaded Q of tank circuits, Small signal tuned amplifiers, Stagger tuned amplifiers, Large signal tuned amplifiers, Class-C tuned amplifier, Efficiency and applications of Class C tuned amplifier.	9	CO4 CO5 CO6
	List of Experiments 1. Simulation of a transformer-less Class – B push-pullpower amplifier and determination of its conversionefficiency. Testing of Class-C tuned amplifier, measurement of conduction angle and calculation of efficiency.(Hardwired)	6	

Text Books:

1. Electronic Principles, Albert Malvino and David Bates, 8th edition, 2015,McGraw-Hill.

2. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, 10th Edition, 2008, Pearson Education /PHI

Reference Books:

1. Pulse Digital and Switching Waveforms, Millman J. and Taub H., 2000,TMH.

2. Modern Electronic Instrumentation and Measurement Techniques, W. D. Cooper, 1998, PHI.

3. Electronics & electrical measurements, A K Sawhney, 9th edition, 2002, Dhanpat Rai &sons.

4. Equipment manuals as applicable.

Assessment Pattern

CIE- Continuous Internal Evaluation

Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**30**	**10**	**10**
Remember	10	-	5
Understand	5	-	-
Apply	5	-	-
Analyze	10	-	5
Evaluate	-	-	-
Create	-	10	-

Practical (25 Marks)

Bloom's Taxonomy	Tests	Quizzes
Marks	**20**	**5**
Remember	10	-
Understand	5	5
Apply	5	-
Analyze	-	-
Evaluate	-	-
Create	-	-

SEE- Semester End Examination

Theory (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	20
Understand	15
Apply	5
Analyze	10
Evaluate	-
Create	-

Practical (25 Marks)

Bloom's Taxonomy	Tests
Marks	**25**
Remember	10
Understand	5
Apply	10
Analyze	-
Evaluate	-
Create	-

DIGITAL SIGNAL PROCESSING			
Course Code	**:16ECE44**	**Credits**	**:04**
L: P: T: S	**:4:1:0:0**	**CIE Marks**	**:50+25**
Exam Hours	**:03+03**	**SEE Marks**	**:50+25**

Course Outcomes: At the end of the Course, the student will have the ability to:

CO1	Apply Fourier analysis to compute Discrete Fourier Transform
CO2	Analyze the properties of Discrete Fourier Transform
CO3	Demonstrate the efficient algorithms of FFT in DFT calculations
CO4	Realise digital filters to compute the response of the system
CO5	Design digital filters with desired frequency response
CO6	Appraise the different applications of digital signal processing

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	3	-	-	-	3	-	-	-	3	-
CO2	3	3	-	-	3	-	-	-	3	-	-	-	3	-
CO3	3	3	3	-	3	-	-	-	3	-	-	3	3	3
CO4	3	3	3	-	3	-	-	-	3	-	-	3	3	3
CO5	3	3	3	-	3	-	-	-	3	-	-	3	3	3
CO6	3	3	3	-	3	-	-	-	3	-	-	3	3	3

Module No	Module Contents	Hrs.	Cos
1	**Introduction to Signal Processing and Discrete Fourier Transforms (DFT):** Basic elements of a digital signal processing system, Advantages and limitations of digital signal processing, Applications of DSP. Frequency domain representation of discrete time signals and systems. Frequency domain sampling and reconstruction of discrete time signals, Introduction, DFT as a linear transformation, its relationship with other transforms.	9	CO1 CO2
	LIST OF EXPERIMENTS USING MATLAB 1. Computation of N point DFT of a given sequence and to plot Magnitude and phase spectrum. **LIST OF EXPERIMENTS USING DSP PROCESSOR** 1. Computation of N- Point DFT of a given sequence 2. Impulse response of first order and second order system **LIST OF EXPERIMENTS USING SIMULINK** 1. Sampling of a signal 2. Computation of N- Point DFT of a given sequence	6	

2	**Properties of Discrete Fourier Transforms (DFT) and FFT algorithms:** Properties of DFT, multiplication of two DFTs- the circular convolution, additional DFT properties, use of DFT in linear filtering, overlap-save and overlap-add method.**FFT algorithms:** Direct computation of DFT, need forefficientcomputation of the DFT, Radix-2 FFT algorithm for the computation of DFT and IDFT, decimation-in-time and decimation-in-frequency algorithms	9	CO2 CO3
	LIST OF EXPERIMENTS USING MATLAB 1. Linear convolution of two sequences using DFT and IDFT 2. Circular convolution of 2 given sequences using DFT &IDFT 3. Autocorrelation of two sequences using DFT and IDFT 4. Cross correlation of two sequences using DFT and IDFT 5. Circular convolution of two given sequences **LIST OF EXPERIMENTS USING DSP PROCESSOR** 1. Linear convolution of two given sequences. **2.** Circular convolution of two given sequences.	6	
3	**Design and Implementation of IIR Filters:** Introduction**,** IIR filter design: Characteristics of commonly used analog filters – Butterworth and Chebyshev filters, analog to analog frequency transformations, Design of IIR filters from analog filters, Mapping o transfer functions: impulse invariance method and bilinear transformation, Structures for IIR filters (DF1, DF2, cascade and parallel)	9	CO4 CO5
	LIST OF EXPERIMENTS USING MATLAB 1. Design and implementation of IIR filters of different types (Butterworth and Chebyshev: low pass, high pass, band pass and band reject) to meet given specifications **LIST OF EXPERIMENTS USING SIMULINK** 1. Design of IIR filter of different types (Butterworth and Chebyshev: low pass, high pass, band pass and band reject) to me given specifications.	6	
4	**Design and Implementation of FIR Filters:** Introduction, FIR filter design: Introduction to FIR filters, design of FIR filters using - Rectangular, Hamming, Bartlet and Kaiser windows, Structures for FIR filters systems (Only DF1 and DF2)	9	CO4 CO5
	LIST OF EXPERIMENTS USING MATLAB 1. Design and implementation of FIR filters to meet given specifications **LIST OF EXPERIMENTS USING DSP PROCESSOR** 1. Realization of an FIR filter (any type) to meet given specification. The input can be a signal from function generator / speech signal **LIST OF EXPERIMENTS USING SIMULINK** 1. Design of FIR filter to meet given specifications	6	
5	**Applications:** Introduction to speech processing, speech analysis, Sub-band coding, Channel vocoder, homomorphic vocoder, digital processing of audio signals, Radar signal processing, DSP based measurement system.	9	CO6
	LIST OF EXPERIMENTS USING DSP PROCESSOR 1. Audio applications such as to plot time and frequency (Spectrum) display of Microphone output using DSP	6	

Text Books:

1. Digital signal processing: Principles, Algorithms & Applications, Proakis & Monalakis, 4th Edition, 2014, Pearson education.
2. Digital Signal Processing, S. K. Mitra, 4th Edition, 2014, Tata Mc-GrawHill

Reference Books:

1. Discrete Time Signal Processing, Oppenheim & Schaffer,7th Edition,2010,TMH.
2. Discrete Time Signal Processing, Oppenheim & Schaffer, 2003,PHI.

Assessment Pattern

CIE- Continuous Internal Evaluation

Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**30**	**10**	**10**
Remember	10	-	5
Understand	10	-	-
Apply	10	-	5
Analyze	-	-	-
Evaluate	-	-	-
Create	-	10	-

Practical (25 Marks)

Bloom's Taxonomy	Tests	Quizzes
Marks	**20**	**5**
Remember	5	-
Understand	5	5
Apply	5	-
Analyze	-	-
Evaluate	-	-
Create	**5**	-

SEE- Semester End Examination

Theory (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-

Practical (25 Marks)

Bloom's Taxonomy	Tests
Marks	**25**
Remember	5
Understand	5
Apply	15
Analyze	-
Evaluate	-
Create	-

CONTROL SYSTEMS			
Course Code	**:16ECE45**	**Credits**	**:04**
L: P: T: S	**:3:0:1:0**	**CIE Marks**	**:50**
Exam Hours	**:03**	**SEE Marks**	**:50**

Course Outcomes: At the end of the Course, the student will have the ability to:

CO1	Illustrate the basic concepts of control systems with various examples
CO2	Apply the transfer function concepts to develop the Mathematical Models for electrical and mechanical systems
CO3	Examine the system response in Time domain for first order and second order systems
CO4	Differentiate the stability of the system in S-Domain and frequency domain
CO5	Infer the stability of the open and closed loop system from the frequency domain specifications
CO6	Model the system using state space analysis

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CO4	3	3	3	2	-	-	-	-	-	-	-	3	3	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-	3	-
CO6	3	3	-	-	-	-	-	-	-	-	-	3	3	-

Module No	Module Contents	Hrs.	Cos
1	**Introduction:** Basic Elements of Control System - Open loop and Closed loop systems, Feed-Back Characteristics, Effects of feedback, Differential equation - Transfer function, Modeling of Electric systems - Translational and rotational mechanical systems, Block diagram reduction Techniques, Signal flow graph using masons gain formula. **Case study:** Different examples on open loop and closed loop systems, Revision of Laplace Transform Concepts.	9	CO1 CO2
2	**Time Response Analysis:** Standard test signals, Time response of first order and second order systems, Steady state analysis: steady state error and error constants, transient response of second order systems. Effects of proportional derivative, proportional integral and proportional derivative and integral systems. **Case Study:** Analysis of second order time response using Matlab.	9	CO3
3	**Stability Analysis in S-Domain**: The concept of stability, Routh – Hurwitz's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability. **Root Locus Technique:** The root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the rootloci. **Case Study:** Analysis of Root Locus using Matlab.	9	CO4 CO5
4	**Frequency Response Analysis:** Introduction, Correlation between time and frequency domain, Frequency domain specifications, Bode diagrams, Determination of Frequency domain specifications, Phase margin and Gain margin, Stability analysis from Bode Plots, Determination of transfer function from Bode	9	CO4 CO5

	plots, Polar plots, Stability analysis using Nyquist plots ,Compensation techniques– Lag,Lead, Lead-Lag Controllers in frequency domain.		
5	**State Space Analysis of Continuous Systems:** Concept of state, state variables and state model, State models for continuous time systems (SISO, MIMO) – derivation of transfer function from state models and vice versa, Diagonalization- Solution of stateequations, state transition matrix and its properties, Controllability and Observability	9	CO1 CO6

Text Books:

1. Control Systems Engineering, Nagrath I. J. and M. Gopal, 5th Edition, 2016, New Age Publications.
2. Control System Engineering, Norman S. Nise, 5th Edition, 2007,Wiley.

Reference Books:

1. Modern Control Engineering, Ogata Katsuhiko, 5th Edition, 2010,PHI.
2. Control Systems, 3rd Edition, 2013, Schaum'sOutlines.

Assessment Pattern

CIE- Continuous Internal Evaluation

Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**30**	**10**	**10**
Remember	10	-	5
Understand	10	-	-
Apply	-	-	5
Analyze	10	-	-
Evaluate	-	10	-
Create	-	-	-

SEE- Semester End Examination

Theory (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	20
Understand	10
Apply	10
Analyze	10
Evaluate	-
Create	-

SYSTEM DESIGN USING HDL			
Course Code	**:16ECE46**	**Credits**	**:05**
L: P: T: S	**:4:1:0:0**	**CIE Marks**	**:50+25**
Exam Hours	**:03+03**	**SEE Marks**	**:50+25**

Course Outcomes: At the end of the Course, the student will have the ability to:

CO1	Identify the necessity of HDL for the automation of VLSI design
CO2	Employ Verilog for the combinational, sequential and mixed designs
CO3	Recognize the necessity of synthesis of HDL in the form of RTL
CO4	Write the design that is in the form of state machine into Verilog code
CO5	Examine the usage of the programmable devices and their architectures
CO6	Demonstrate the HDL code for digital applications by means of verification and implementation

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	1	3	-
CO6	3	3	3	2	1	1	-	-	-	-	-	-	3	-

Module No	Module Contents	Hrs.	COs
1	**INTRODUCTION TO VERILOG:** Computer-Aided Design, Hardware Description Languages, Verilog Description of Combinational Circuits, Verilog Modules, Verilog Assignments, Procedural Assignments, Modeling Flip- Flops Using Always Block, Always Blocks Using Event Control Statements, Delays in Verilog, Compilation, Simulation, and Synthesis of Verilog Code, Verilog Data 1ypes and Operators, Simple Synthesis Examples	9	CO1 CO2
	List of Experiments 1. Write HDL code to realize all logic gates. 2. Write a HDL code to describe the functions of a full Adder Using three modeling styles. 3. Write a model for 16 bit ALU using the 4 bit opcodes; the requisite functions can be defined for the chosen opcodes.	6	
2	**PROGRAMMING EXAMPLES**: Verilog Models for Multiplexers, Modeling Registers and Counters Using Verilog Always Statements, Behavioral and Structural Verilog, Constants, Arrays, Loops in Verilog, Testing Verilog Model.	9	CO2 CO3
	List of Experiments 1. Write a HDL program for the following combinational designs. a) Decoder b) Encoder (with and without priority) c) Multiplexer and Demultiplexer d) 4-bit Binary to Gray Converter e) 4-bit Binary Comparator	6	

3	**INTRODUCTION TO PROGRAMMABLE LOGIC DEVICES:** Brief Overview of Programmable Logic Devices. Simple Programmable Logic Devices (SPLDs). Complex Programmable Logic Devices (CPLDs). Field Programmable Gate Arrays (FPGAs**).**State Machine charts, Derivation of SM charts, Realization of SM charts, Implementation of the dice game	9	CO3 CO4 CO5
	List of Experiments 1. Develop the HDL code for all the flip-flops SR, JK, D and T.	6	
4	**DESIGN EXAMPLES:** BCD to 7-Segment Display Decoder. A BCD Adder. 32-Bit Adders. Traffic Light Controller. State Graphs for Control Circuits. Scoreboard and Controller. Synchronization and Debouncing. A Shift-and-Add Multiplier. Array Multiplier. Keypad Scanner	9	CO2 CO5
	List of Experiments 1. Design 4 bit Binary, BCD counter (Synchronous reset and Asynchronous reset and "any sequence" counters). 2. Write an HDL code to display messages on the given Seven Segment Display.(INTERFACING EXPERIMENT)	6	
5	**DESIGNING WITH FIELD PROGRAMMABLE GATE ARRAYS:** Implementing Functions in FPGAs, Implementing Functions Using Shannon's Decomposition, Carry Chains in FPGAs, Cascade Chains in FPGAs, Examples of Logic Blocks in Commercial FPGAs. Dedicated Memory in FPGAs, Dedicated Multipliers in FPGAs, Cost of Programmability, FPGAs and One-Hot State Assignment, FPGA Capacity: Maximum Gates versus Usable Gates. Design Translation (Synthesis), Mapping, Placement, and Routing	6	CO5 CO6
	List of Interfacing Experiments 1. Write a HDL code to control Speed, direction of DC and Stepper Motor. 2. Write HDL code to generate different waveforms (sawtooth, sine wave, square, triangle, ramp etc)using DAC; vary the frequency and amplitude during conduction.	3	

Text Books:

1. Digital System design Using Verilog, Charles H. Roth Jr., Lizy Kurian John, Byeong KilLee, 1st Edition, 2015, CLEngineering.
2. Digital Systems Design using VHDL, Charles H Roth, Jr., 2007,Thomson.

Reference Books:

1. HDL Programming (VHDL and Verilog), Nazeih M.Botros, 2015, John-Weily India Pvt.Ltd.
2. Digtal Design: An Embedded Systems approach Using VERILOG, Peter J. Ashenden,2014, Elesvier.

Assessment Pattern

CIE- Continuous Internal Evaluation

Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**30**	**10**	**10**
Remember	5	-	5
Understand	5	5	-
Apply	10	5	5
Analyze	10	-	-
Evaluate	-	-	-
Create	-	-	-

Practical (25 Marks)

Bloom's Taxonomy	Tests	Quizzes
Marks	**20**	**5**
Remember	5	-
Understand	5	5
Apply	10	-
Analyze	-	-
Evaluate	-	-
Create	-	-

SEE- Semester End Examination

Theory (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	20
Understand	20
Apply	10
Analyze	-
Evaluate	-
Create	-

Practical (25 Marks)

Bloom's Taxonomy	Tests
Marks	**25**
Remember	5
Understand	10
Apply	5
Analyze	-
Evaluate	-
Create	-

APPLIED MATHEMATICS-I			
Course Code	**: 16DMAT31**	**Credits**	**:0**
L: P: T: S	**: 1:0:0**	**CIE Marks**	**:25**
Exam Hours	**: 02**	**SEE Marks**	**:25**

Course Outcomes: At the end of the Course, the Student will be able to do the following:

CO1	Learn the principles of engineering mathematics through calculus
CO2	Determine the power series expansion of a function
CO3	Find the definite integrals with standard limits
CO4	Develop the ability to solve different types of differential equations
CO5	Apply ideas from linear algebra in solving systems of linear equations
CO6	Determine Eigen values and Eigen vectors of a matrix

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	2	-	-	-	1	1	-	1
CO2	3	2	3	2	2	-	-	-	1	1	-	1
CO3	3	2	3	2	2	-	-	-	1	1	-	1
CO4	3	2	3	2	2	-	-	-	1	1	-	1
CO5	3	2	3	2	2	-	-	-	1	1	-	1
CO6	3	2	3	2	2	-	-	-	1	1	-	1

Module No	Module Contents	Hrs.	Cos
1	**Differential Calculus:** Polar curves-Problems on angle between the radius vector and tangent, Angle between two curves-Problems, Pedal equation for polar curves-Problems. Macluren's theorems for function of one variable (statement only)-Problem**s.**	5	CO1 CO2
2	**Partial differentiation:** Definition and Simple problems, Euler's theorem for Homogeneous function (NO Derivation and NO extended theorem)-Problems, Partial differentiation of composite functions (chain rule)-Problems, Jacobians of order two - definition and problems.	5	CO1
3	**Integral Calculus and Differential Equations:** Problems on reduction formulae for functions sin n x, cos n x, Problems on evaluation of these integrals with standard limits (0 to $\pi/2$). Solution of first order and first degree differential equations-Variable separable, Linear and Exact differential equations.	5	CO3 CO4

4	**Linear Algebra-1:** Problems on rank of a matrix by elementary transformations, consistency of a system of linear equations and solution (homogeneous and non-homogeneous)-Problems. Solution of system of linear equations by Gauss elimination method-Problems.	5	CO5
5	Linear Algebra-2: Linear transformation, Eigen values and Eigen vectors, diagonalisation of a square matrix-Problems.	5	CO6

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, 10th Edition, 2014, ISBN: 978-81-265-5423-2.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014, ISBN: 978-81-7409-195-5.

Reference Books:

1. Glyn James, Modern Engineering Mathematics, Prentice Hall, 4th Edition, 2015, ISBN: 978-0-273-73409-3
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, 4th Edition, 2016, ISBN: 978-0-07-063419-0.
3. H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 28th Edition, 2012, ISBN: 81-219-0345-9.
4. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., 9th Edition, 2014, ISBN: 978-81-318-0832-0.

Assessment Pattern

CIE- Continuous Internal Evaluation (25 Marks)

Bloom's Category	Tests (20 Marks)	Assignment (5 Marks)
Remember	5	-
Understand	5	5
Apply	5	-
Analyze	2.5	-
Evaluate	2.5	-
Create	-	-

SEE- Semester End Examination (25 Marks)

Bloom's Category	Questions (25 Marks)
Remember	5
Understand	10
Apply	5
Analyze	2.5
Evaluate	2.5
Create	-

APPLIED MATHEMATICS-II			
Course Code	**: 16DMAT41**	**Credits**	**:0**
L: P: T: S	**: 1:0:0**	**CIE Marks**	**:25**
Exam Hours	**: 02**	**SEE Marks**	**:25**

Course Outcomes: At the end of the Course, the Student will be able to do the following:

CO1	Gain knowledge of basic operations of vectors
CO2	Use curl and divergence of a vector function in three dimensions
CO3	Develop the ability to solve higher order Linear differential equations
CO4	Understand basic concepts of Laplace transform to engineering problems
CO5	Solve the Laplace transform of Periodic and Step functions
CO6	Solve initial and boundary value problems using Laplace transform method

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	2	-	-	-	1	3	-	1
CO2	3	2	3	2	2	-	-	-	1	3	-	1
CO3	3	2	3	2	2	-	-	-	1	3	-	1
CO4	3	2	3	2	2	-	-	-	1	3	-	1
CO5	3	2	3	2	2	-	-	-	1	3	-	1
CO6	3	2	3	2	2	-	-	-	1	3		1

Module No	Module Contents	Hrs.	Cos
1.	Vectors: Definition of scalar and vector, Vector addition, Subtraction and Multiplication-Dot product, Cross product, Scalar triple product. Orthogonal, Co-planar and Angle between vectors-Problems.	5	CO1
2.	Vector Differentiation: Velocity and Accelerations, Vector differential operator-Gradient of a scalar function, Divergence of a vector function, Curl of vector function-Problems. Solenoidal and irrotational vector fields-Problems.	5	CO2
3.	Linear differential equations with constant coefficients: Solution of initial and boundary value problems, Inverse differential operator techniques for the functions-e^{ax}, $\mathrm{Sin}\,(ax+b)$ and $\mathrm{Cos}\,(ax+b)$.	5	CO3
4.	Laplace Transform: Definition and Laplace transforms of elementary functions-Problems. Properties of Laplace transforms (without proof), Periodic functions(without proof), Heaviside function(without proof) -Problems.	5	CO4, CO5
5.	Inverse Laplace Transform: Inverse Laplace Transform by partial fractions, completing the square method-Problems. Solution of linear differential equations using Laplace Transforms-Problems.	5	CO6

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, 10th Edition, 2014, ISBN: 978-81-265-5423-2.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014, ISBN: 978-81-7409-195-5.

Reference Books:

1. Glyn James, Modern Engineering Mathematics, Prentice Hall, 4th Edition, 2015, ISBN: 978-0-273-73409-3
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, 4th Edition, 2016, ISBN: 978-0-07-063419-0.
3. H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 28th Edition, 2012, ISBN: 81-219-0345-9.
4. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., 9th Edition, 2014, ISBN: 978-81-318-0832-0.

Assessment Pattern

CIE- Continuous Internal Evaluation (25 Marks)

Bloom's Category	Tests (20 Marks)	Assignment (5 Marks)
Remember	5	-
Understand	5	5
Apply	5	-
Analyze	2.5	-
Evaluate	2.5	-
Create	-	-

SEE- Semester End Examination (25 Marks)

Bloom's Category	Questions (25 Marks)
Remember	5
Understand	10
Apply	5
Analyze	2.5
Evaluate	2.5
Create	-

APPENDIX A

Outcome Based Education

Outcome-based education (OBE) is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience each student should have achieved the goal. There is no specified style of teaching or assessment in OBE; instead classes, opportunities, and assessments should all help students achieve the specified outcomes.

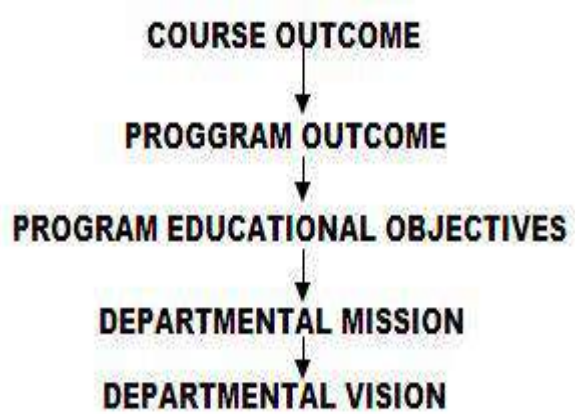
There are three educational Outcomes as defined by the National Board of Accreditation:

Program Educational Objectives: The Educational objectives of an engineering degree program are the statements that describe the expected achievements of graduate in their career and also in particular what the graduates are expected to perform and achieve during the first few years after graduation. [nbaindia.org]

Program Outcomes: What the student would demonstrate upon graduation. Graduate attributes are separately listed in Appendix C

Course Outcome: The specific outcome/s of each course/subject that is a part of the program curriculum. Each subject/course is expected to have a set of Course Outcomes

Mapping of Outcomes



APPENDIX B

The Graduate Attributes of NBA

Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Conduct investigations of complex problems: The problems that cannot be solved bystraightforward application of knowledge, theories and techniques applicable to the engineering discipline that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions that require consideration of appropriate constraints/requirements not explicitly given in the problem statement (like: cost, power requirement, durability, product life, etc.) which need to be defined (modeled) within appropriate mathematical framework that often require use of modern computational concepts and tools.

Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Ethics: Apply ethical principles and commit to professional ethics and responsibilities andnorms of the engineering practice.

Individual and team work: Function effectively as an individual, and as a member or leaderin diverse teams, and in multidisciplinary settings.

Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Life-long learning: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

APPENDIX C

BLOOM'S TAXONOMY

Bloom's taxonomy is a classification system used to define and distinguish different levels of human cognition—i.e., thinking, learning, and understanding. Educators have typically used Bloom's taxonomy to inform or guide the development of assessments (tests and other evaluations of student learning), curriculum (units, lessons, projects, and other learning activities), and instructional methods such as questioning strategies.