NEW HORIZON COLLEGE OF ENGINEERING

Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade, Accredited by NBA

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Scheme & Syllabus

SECOND Year BE

As Per the National Education Policy 2020

Academic Year 2022-23

New Horizon College of Engineering

Department of Electronics and Communication Engineering

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 in Electronics and Communication.
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

Department of Electronics and Communication Engineering

Scheme of Third Semester (Autonomous)

B.E Program – Batch: 2021-2025

(Odd Semester AY: 2022-23)

Semester III

Sl. No	Course Code	Course	BOS	Credit Distribution				Overall Credits	Contact hours	Marks		
				L	T	P	S			CIE	SEE	Total
1	21ECE31A	Applied Mathematics - III	AS	3	0	0	0	3	4	50	50	100
2	21ECE322A	Signals & Systems using Python*	ECE	1	0	1	0	2	3	50	50	100
3	21HSS332A/ 21HSS333A	Aadalitha Kannada / Vyavaharika Kannada	HSS	1	0	0	0	1	1	50	50	100
4	21HSS342A	Environmental Science	HSS	1	0	0	0	1	1	50	50	100
5	21ECE35A	Analog Electronic Circuits	ECE	3	0	0	0	3	4	50	50	100
6	21ECL35A	Analog Electronic Circuits Lab	ECE	0	0	1	0	1	2	50	50	100
7	21ECE36A	Digital Electronic Circuits	ECE	3	0	0	0	3	4	50	50	100
8	21ECL36A	Digital Electronic Circuits Lab	ECE	0	0	1	0	1	2	50	50	100
9	21ECE37A	Networks & Control Systems	ECE	3	0	0	0	3	4	50	50	100
10	21ECL37A	Networks & Control Systems Lab	ECE	0	0	1	0	1	2	50	50	100
11	21ECE38A	Mini project - I	ECE	0	0	2	0	2	4	50	50	100
							Total	**21**	**31**	**550**	**550**	**1100**

* Domain based Ability Enhancement Course - I

Semester III (Lateral Entry)

12	21DMAT31A	Basic Applied Mathematics - I	AS	0	0	0	0	0	2	50	50	100
							Total	**21**	**33**	**600**	**600**	**1200**

New Horizon College of Engineering
Department of Electronics and Communication Engineering
Scheme of Fourth Semester (Autonomous)
B.E Program – Batch: 2021-2025
(Even Semester AY: 2022-23)

Semester IV

Sl. No	Course Code	Course	BOS	Credit Distribution				Overall Credits	Contact hours	Marks		
				L	T	P	S			CIE	SEE	Total
1	21ECE41A	Applied Mathematics - IV	AS	3	0	0	0	3	4	50	50	100
2	21HSS421A	Life Skills for Engineers	HSS	1	0	1	0	2	3	50	50	100
3	21HSS431A	Entrepreneurship Development - 2	HSS	1	0	0	0	1	1	50	50	100
4	21HSS441A	Constitution of India & Professional Ethics	HSS	1	0	0	0	1	1	50	50	100
5	21ECE45A	System Design using HDL	ECE	3	0	0	0	3	4	50	50	100
6	21ECL45A	Hardware Description Language Lab	ECE	0	0	1	0	1	2	50	50	100
7	21ECE46A	Microprocessors & Interfacing	ECE	3	0	0	0	3	4	50	50	100
8	21ECL46A	Microprocessors Lab	ECE	0	0	1	0	1	2	50	50	100
9	21ECE47A	Digital Signal Processing	ECE	3	0	0	0	3	4	50	50	100
10	21ECL47A	Digital Signal Processing Lab	ECE	0	0	1	0	1	2	50	50	100
11	21ECE48A	Summer Internship - I	ECE	0	0	0	2	2	0	50	50	100
							Total	**21**	**27**	**550**	**550**	**1100**

Semester IV (Lateral Entry)

12	21DAEC40A	Communicative English	HSS	0	0	0	0	0	2	50	50	100
13	21DMAT41A	Basic Applied Mathematics - II	AS	0	0	0	0	0	2	50	50	100
							Total	**21**	**31**	**650**	**650**	**1300**

THIRD SEMESTER

(SYLLABUS)

APPLIED MATHEMATICS – III	
Course Code: 21ECE31A	**Credits: 3**
L:T:P:S : 3:0:0:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

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

CO1	Use appropriate numerical methods to solve algebraic equations and transcendental equations
CO2	Evaluate a definite integral numerically and use appropriate numerical methods to solve Boundary Value Problems in Partial differential equations
CO3	Justify Z-transforms method to solve continuous/discrete model problems
CO4	Express the periodic functions as Fourier series expansion analytically and numerically
CO5	Solve the continuous model problems using Fourier transforms
CO6	Analyze the Fast Fourier transforms method to solve the discrete model problems

Mapping of Course Outcomes to Program Outcomes:

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

Sl No.	Contents of the Module	Hours	COs
1.	**Numerical Methods-1:** Numerical solution of algebraic and transcendental equations: Regula-falsi method and Newton-Raphson Method-Problems. Interpolation: Newton's forward and backward formulae for equal intervals, Newton divided difference, Lagrange's formula and Lagrange's inverse interpolation formula for unequal intervals (without proofs)-Problems. Case studies on Numerical Analysis.	**9**	**CO1**

2.	**Numerical Methods-2**: Numerical integration: Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rule, Weddle's rule (without proofs)-Problems. Numerical solution of one-dimensional wave equation, heat equation and two-dimensional Laplace's equation. **Applications:** Application of numerical integration to velocity of a particle and volume of solids.	**9**	**CO2**
3.	**Z - Transform**: Definition, Z-transforms of some standard functions, properties, damping rule, shifting rule (without proof), initial and final value theorems, inverse Z- transforms by partial fraction method. **Applications:** Solving difference equations using Z-transform. Case Studies -Application of Z-transform in filter Transformation.	**9**	**CO3**
4.	**Fourier series:** Periodic function, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period $2l$, half range series-Problems. **Applications:** Practical harmonic analysis-Problems. Case studies on Fourier Series.	**9**	**CO4**
5.	**Fourier Transforms:** Infinite Fourier transforms, Fourier Sine and Cosine transforms, Inverse Fourier sine and cosine transforms. **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**	**CO5, CO6**

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, 2014, ISBN: 9788126554232.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.

Reference Books:

1. Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2015, ISBN: 9780273719236.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.
3. H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.
4. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., Ninth Edition, 2014, ISBN: 9788131808320.

Assessment Pattern:

1. CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 Marks)	Assignment-1 (7.5 Marks)	Assignment-2 (7.5 Marks)	Quiz-1 (05 Marks)	Quiz-2 (05 Marks)
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

2. SEE- Semester End Examination (50Marks)

Bloom's Category	SEE Marks
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

SIGNALS & SYSTEMS USING PYTHON	
Course Code: 21ECE322A	**Credits: 2**
L:T:P:S : 1:0:1:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Classify the continuous time and discrete time signals and systems
CO2	Apply the basic operations on signals to perform dependent and independent variable transformation
CO3	Compute the response of an LTI system using Convolution operator
CO4	Solve the system response from differential and difference equations
CO5	Analyze the discrete time system in Z-domain
CO6	Represent a signal in frequency domain using Fourier Transform tool

Mapping of Course Outcomes to Program Outcomes:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ECE322A - SIGNALS & SYSTEMS USING PYTHON														
CO1	3	3	-	-	1	-	-	-	2	-	-	2	3	2
CO2	3	-	-	-	1	-	-	-	2	-	-	2	3	2
CO3	3	3	2	-	1	-	-	-	2	-	-	2	3	2
CO4	3	3	2	-	1	-	-	-	2	-	-	2	3	2
CO5	3	3	-	-	1	-	-	-	2	-	-	2	3	2
CO6	3	3	2	1	1	-	-	-	2	-	-	2	3	2

Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Sl No.	Contents of Module	Hours	COs
1	**CLASSIFICATION OF SIGNALS**: Continuous time and Discrete time signals, Periodic and Aperiodic signals, Even and odd signals, Energy and power signals, Deterministic and random signals **ELEMENTARY SIGNALS / FUNCTIONS:** Unit step, Unit ramp, Unit impulse, Complex exponential and Sinusoidal signals **BASIC OPERATION ON SIGNALS:** Amplitude scaling, addition, multiplication, time scaling, time shift and time reversal **APPLICATION:** Signal Processing: Bio-Signal Representation **Text1: 1.1, 1.2, 1.3, 1.4** **List of Experiments:** 1. Introduction to Python and generation of basic continuous and discrete signals- unit step, unit impulse, ramp, exponential, sine and cosine sequences and signals 2. Basic Operations of signals using time dependent and independent variable transformation 3. Computation of energy and power of a continuous time and discrete time signal using Python	**8**	**CO1, CO2**
2	**CLASSIFICATION OF SYSTEMS**: Continuous and discrete time systems, Linear and non-linear systems, Time variant and invariant systems, causal and non-causal systems, Static system, BIBO system, LTI systems **TIME DOMAIN REPRESENTATION OF LTI SYSTEM:** Convolution, Properties of convolution, Convolution Sum and Convolution Integral for infinite duration sequences **APPLICATION:** Signal Processing in a Digital Camera **Text1: 1.5, 1.6, 2.1, 2.2**	**8**	**CO1, CO3**

	List of Experiments: 1. Verification of properties of a continuous and discrete time LTI system 2. Linear Convolution of discrete time sequences		
3	**SYSTEM RESPONSES OF LTI SYSTEM:** Properties of impulse response representation, Impulse response and step response of a continuous time and discrete time LTI system **DIFFERENTIAL AND DIFFERENCE EQUATION REPRESENTATION OF LTI SYSTEM:** Solution for Differential & Difference equations- Natural Response, Forced Response and Complete response **Text1: 2.3, 2.4** **List of Experiments:** 1. Analysis of discrete and continuous time LTI system responses for various inputs such as i) step ii) impulse	**8**	**CO4**
4	**Z-TRANSFORM**: Z-transforms, properties of the region of convergence, Pole Zero Plot, System Function **INVERSE Z TRANSFORM:** Partial Fraction Expansion**,** Causality and stability **APPLICATION:** Realization of Digital Filters **Text1: 10.1, 10.2, 10.3, 10.5, 10.7** **List of Experiments:** 1. Stability and causality analysis using pole-zero plot in Z-domain	**8**	**CO5**
5	**FOURIER TRANSFORM REPRESENTATION OF A SIGNAL:** Discrete and continuous Fourier transform & its properties (with Proof), Basic exercises, Fourier transform of periodic signals, Magnitude and Phase Spectrum **INTRODUCTION TO WAVELET**: Definition, comparison between wavelet transform and Fourier transform **APPLICATION:** Image Processing, Noise Removal from ECG Signals **Text1: 4.1, 4.2, 4.3, 4.4, 4.5, 5.1, 5.2, 5.3, 5.4, 5.5** **List of Experiments:** 1. Computation of Fourier Transform of given signal and plot of its magnitude and phase spectrum 2. Verification of the properties of Discrete Time Fourier Transform 3. Generation of DTMF Signals 4. Wavelet transforms in Images 5. Noise removal of a signal using frequency domain analysis in Python	**8**	**CO6**

TEXT BOOKS:

1. Signals and Systems, Allen V. Oppenheim, Allen S. Willsiky, S. Hamid Nawab, PHI, 2015
2. Signals and Systems, Simon Haykin and Barry Van Veen, 2nd edition, John Wiley & sons, 2007.

REFERENCE BOOKS:

1. Principles of Linear Systems and Signals, B. P. Lathi, 2nd edition, Oxford University Press, 2009.
2. Signals and Systems, Uday kumar S, 6th edition, Prism book House, 2012.
3. Insight into Wavelets: From Theory to practice, Soman K P & Rama chandran K I, Prentice Hall, 2004.

Assessment Pattern

CIE-Continuous Internal Evaluation Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	-	5
Understand	5	-	5
Apply	10	5	-
Analyze	5	5	-
Evaluate	-	5	-
Create	-	-	-

Note: Assessment of Assignments 1 & 2 is based on simulation based validation process. Students can choose a unique problem statement from the syllabus, and then implement it in Python.

SEE-Semester End Examination Theory (50 Marks)

Bloom's Taxonomy	SEE Marks
Remember	10
Understand	20
Apply	10
Analyze	10
Evaluate	-
Create	-

ಆಡಳಿತ ಕನ್ನಡ (Kannada for administration)	
Course Code: 21HSS332A	**Credits: 1**
L: T: P: S : 1:0:0:0	**CIE Marks: 50**
Exam Hours : 2	**SEE Marks:50**

ಆಡಳಿತ ಕನ್ನಡ ಅಧ್ಯಯನದ ಕಲಿಕಾಂಶಗಳು

CO1	ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಹಾಗೂ ಭಾಷಾ ರಚನೆ ನಿಯಮಗಳನ್ನು ಅರ್ಥೈಸಿಕೊಳ್ಳುತ್ತಾರೆ
CO2	ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿನ ದೋಷಗಳು, ನಿವಾರಣೆ ಮತ್ತು ಲೇಖನ ಚಿಹ್ನೆಗಳನ್ನು ಅರಿತುಕೊಳ್ಳುವರು
CO3	ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ತಿಳುವಳಿಕೆ ಪಡೆಯುವರು
CO4	ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಆಸಕ್ತಿ ವಹಿಸಿಕೊಳ್ಳುವರು

Mapping of Course Outcomes to Program Outcomes:

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

ಪರಿವಿಡಿ (ಪಠ್ಯ ಪುಸ್ತಕದಲ್ಲಿರುವ ವಿಷಯಗಳ ಪಟ್ಟಿ)

ಅಧ್ಯಾಯ –1 ಕನ್ನಡ ಭಾಷೆ–ಸಂಕ್ಷಿಪ್ತ ವಿವರಣೆ

ಅಧ್ಯಾಯ –2 ಭಾಷಾ ಪ್ರಯೋಗದಲ್ಲಾಗುವ ಲೋಪದೋಷಗಳು ಮತ್ತುಅವುಗಳ ನಿವಾರಣೆ

ಅಧ್ಯಾಯ –3 ಲೇಖನ ಚಿಹ್ನೆಗಳು ಮತ್ತು ಅವುಗಳ ಉಪಯೋಗ

ಅಧ್ಯಾಯ –4 ಪತ್ರ ವ್ಯವಹಾರ

ಅಧ್ಯಾಯ –5 ಆಡಳಿತ ಪತ್ರಗಳು

ಅಧ್ಯಾಯ –6 ಸರ್ಕಾರದ ಆದೇಶ ಪತ್ರಗಳು

ಅಧ್ಯಾಯ –7 ಸಂಕ್ಷಿಪ್ತ ಪ್ರಬಂಧ ರಚನೆ (ಪ್ರಿಸೈಸ್ ರೈಟಿಂಗ್),ಪ್ರಬಂಧ ಮತ್ತು ಭಾಷಾಂತರ

ಅಧ್ಯಾಯ –8 ಕನ್ನಡ ಶಬ್ದ ಸಂಗ್ರಹ

ಅಧ್ಯಾಯ –9 ಕಂಪ್ಯೂಟರ್ ಹಾಗೂ ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ

ಅಧ್ಯಾಯ –10 ಪಾರಿಭಾಷಿಕ ಆಡಳಿತ ಕನ್ನಡ ಪದಗಳು ಮತ್ತು ತಾಂತ್ರಿಕ /ಕಂಪ್ಯೂಟರ್ ಪಾರಿಭಾಷಿಕ ಪದಗಳು

ಆಡಳಿತ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕದ ಲೇಖಕರು

ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ, ಪ್ರೋ. ವಿ . ಕೇಶವಮೂರ್ತಿ, ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ, ವಿ.ತಾ.ವಿ.ಬೆಳಗಾವಿ

ಪರೀಕ್ಷೆಯ ವಿಧಾನ:

ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ (Continuous Internal Evaluation) : 50 ಅಂಕಗಳು

ಸೆಮಿಸ್ಟರ್ ಪರೀಕ್ಷೆ (Semester End Examination) : 50 ಅಂಕಗಳು

Bloom's Category	**CIE (50)**	**SEE (50)**
Remember	25	25
Understand	25	25

VYAVAHARIKA KANNADA (KANNADA FOR USE)	
Course Code: 21HSS333A	**Credits: 1**
L: T: P: S : 1:0:0:0	**CIE Marks: 50**
Exam Hours : 2	**SEE Marks:50**

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Understand Kannada Language
CO2	Communicate in Kannada Language
CO3	Read simple Kannada words
CO4	Pronounce Kannada words correctly

Mapping of Course Outcomes to Program Outcomes:

PO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-

Syllabus

Chapter – 1: Vyavaharika Kannada – Parichaya (Introducton to Vyavaharika Kannada)

Chapter – 2: Kannada Aksharamale haagu uchharane (Kannada Alphabets and Pronunciation)

Chapter – 3: Sambhashanegaagi Kananda Padagalu (Kannada Vocabulary for Communication)

Chapter – 4: Kannada in Conversations (Sambhashaneyalli Kannada)

Chapter – 5: Activities in Kannada. (Kannada Sambhashanegaagi Chatuvatikegalu)

Text Book: Vyavaharika Kannada by Dr. L. Thimmesh, Prof. V. Keshavamurthy, published by: VTU, Belagavi

Continuous Internal Evaluation & Semester End Examination: (50 marks Each)

Bloom's Category	**CIE (50)**	**SEE (50)**
Remember	25	25
Understand	25	25

ENVIRONMENTAL SCIENCE	
Course Code: 21HSS342A	**Credits: 1**
L: T: P: S : 1:0:0:0	**CIE Marks: 50**
Exam Hours : 2	**SEE Marks:50**

Course Outcomes: At the end of the Course, the student will be able to:

CO1	Understand the concepts of Environment, ecosystem and biodiversity
CO2	Explain the strategies for management of natural resources to achieve sustainability
CO3	Analyze the control measures of Environmental pollution and global Environmental issues
CO4	Apply the knowledge of Environment Impact Assessment, Technology, Environmental acts and laws in protecting Environment and human health

Mapping of Course Outcomes to Program Outcomes:

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

Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Module No.	Content of Module	Hrs	Cos
1	**Introduction to Environment, Ecosystem and Biodiversity**: Environment: Definition, Components of Environment; Ecosystem: Types & Structure of Ecosystem, Energy flow in the ecosystem; Biodiversity: Types, Hot-spots, Threats and Conservation of biodiversity.	**03**	**CO1**
2	**Natural Resources:** Advanced Energy resources (Hydrogen, Solar, OTEC, Tidal and Wind), merits and demerits, Water resources – cloud seeding, Mineral resources, Forest resources. Strategies of management, concept of sustainability.	**03**	**CO2**
3	**Environmental Pollution:** Definition, Causes, effects and control measures of Air Pollution, Water Pollution, soil Pollution and Noise pollution. Solid wastes and its management. Role of society, NGO and Govt. agencies in prevention of pollution.	**03**	**CO3**
4	**Global Environmental issues, Environment acts and amendments:** Fluoride problem in drinking water, Acid Rain**,** Ozone layer depletion, Global warming and climate change. National forest policy, Environmental laws and acts. International agreements and protocols.	**03**	**CO3 & CO4**
5	**Human Population and Environment Impact Assessment:** Population growth & explosion, Population pyramids. Negative impact of agriculture and urbanization, Role of Technology in protecting environment and human health. Environment Impact Assessment.	**03**	**CO4**

Text Books:

1. Environmental studies by Benny Joseph, Tata McGraw Hill Education Private Limited, 2009, ISBN: 9870070648135.
2. "Environmental Studies: Basic Concepts" by Ahluwalia, V. K. The Energy and Resources Institute (TERI) Publication, 2nd edition, 2016. ISBN: 817993571X, 9788179935712.
3. "Textbook of Environmental Studies for Undergraduate Courses of all branches of Higher Education" by Bharucha, Erach for UGC, New Delhi, 2004. ISBN: 8173715408, 9788173715402.

Reference Books:

1. Handbook of Environmental Engineering by Rao Surampalli, Tian C. Zhang, Satinder Kaur Brar, Krishnamoorthy Hegde, Rama Pulicharla, Mausam Verma; McGraw Hill Professional, 2018. ISBN: 125986023X, 9781259860232
2. Environmental Science and Engineering by P. Venugopala, Prentice Hall of India Pvt. Ltd, New Delhi, 2012 Edition. ISBN: 978-81-203-2893-8.
3. Environmental Science- Working with the earth by G Taylor Miller Jr, Brooks Cole Thompson Publications, 10th Edition. ISBN: 10: 0534424082.
4. Elements of Environmental Science and Engineering by P. Meenakshi, Prentice Hall of India Pvt. Ltd, 2005 Edition. ISBN: 8120327748, 9788120327740.

CIE- Continuous Internal Evaluation (50 Marks):

Bloom's Category	**Tests**	**Assignments**	**Seminar**
Marks (Out of 50)	**25**	**15**	**10**
Remember	5	-	-
Understand	15	-	-
Apply	5	8	5
Analyze	-	7	5
Evaluate	-	-	-
Create	-	-	-

SEE – Semester End Examination (50 Marks):

Bloom's Category	SEE Marks
Remember	10
Understand	30
Apply	10
Analyze	-
Evaluate	-
Create	-

Percentage Evaluation of Various Blooms' levels:

Bloom's Category	CIE	SEE	Total	%
Remember	5	10	15	15
Understand	15	30	45	45
Apply	18	10	28	28
Analyze	12	-	12	12
Evaluate	-	-	-	-
Create	-	-	-	-

ANALOG ELECTRONIC CIRCUITS	
Course Code: 21ECE35A	**Credits: 3**
L: T: P: S : 3:0:0:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks:50**

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

CO1	Compare the BJT and JFET configurations and their respective biasing methods, to perform the load line analysis
CO2	Examine the AC model of BJT as well as JFET to perform the small signal analysis, to obtain the gain and impedance of amplifier circuits
CO3	Distinguish between the equivalent circuits of BJT as well as JFET configurations, to obtain the frequency response of amplifier circuits
CO4	Differentiate between the different feedback topologies that are applied to the general amplifier block
CO5	Employ the positive feedback topology to BJT as well as JFET amplifiers, to obtain the various oscillator circuits
CO6	Demonstrate the working principles of various types of power amplifiers, using the BJT circuits

Mapping of Course Outcomes to Program Outcomes:

PO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
21ECE35A - ANALOG ELECTRONIC CIRCUITS														
CO1	3	3	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	3	3	-	-	-	-	-	-	-	-	2	1
CO4	3	3	3	3	-	-	-	-	-	-	-	-	2	1
CO5	3	3	3	3	-	2	-	-	-	-	-	-	2	1
CO6	3	3	3	3	-	2	-	-	-	-	-	-	2	1

Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Sl No.	Contents of Module	Hours	COs
1	**BJT BIASING AND AC ANALYSIS**: Transistor configurations (CE, CB, CC), Need for Biasing, Load Line(AC and DC) analysis for CE configuration and Q-point, Biasing Circuits- Fixed Bias, Emitter Bias, Voltage Divider bias with their stability factors. Analysis of various bias configurations using r_e transistor model. Numerical Examples **Text Book 1 -** 4.1 to 4.5, 4.7, 4.8, 4.18 (221-223: Derived equations are excluded), 5.4 to 5.6, 5.8, 5.9 **Text Book 3 -** 8.9, 8.11	**8**	**CO1**
2	**JFET BIASING AND AMPLIFIERS:** Construction and characteristics of JFET, JFET configurations (CS, CG, CD), JFET Biasing (Fixed bias, Self-bias and Voltage divider bias), JFET small signal model for CS configuration. Numerical Examples **Text Book 1 -** 6.1 to 6.3, 7.1 to 7.5, 8.1 to 8.5	**8**	**CO2**
3	**BJT AND JFET FREQUENCY RESPONSE:** Introduction (Logarithms and Decibels), Low Frequency Analysis - Bode plot, Low-Frequency Response of BJT and FET amplifiers, Impact of Rs on the BJT low frequency response, Miller Effect Capacitance, High frequency response of BJT and FET amplifiers **Text Book 1 -** 9.1 to 9.3, 9.6 to 9.12, 5.19, 5.20	**8**	**CO3**
4	**FEEDBACK AND OSCILLATOR CIRCUITS:** The feedback concept, Feedback connection types, Practical Feedback Circuits, Theory of Sinusoidal Oscillation, Phase Shift Oscillator, Wien Bridge Oscillator, Tuned Oscillator Circuits (Colpitts, Hartley), and Crystal Oscillator **Text Book 1 -** 14.1 to 14.9	**8**	**CO4, CO5**
5	**POWER AMPLIFIERS:** Introduction (Amplifier Types and Efficiency), Class A amplifier (Series fed, Transformer coupled), Class B amplifier (Transformer coupled, push-pull),Class AB Complementary Symmetry, Amplifier Distortion, Power Transistor Heat Sinking, Class C and Class D amplifiers **Text Book 1 -** 12.1 to 12.8	**8**	**CO6**

TEXT BOOKS:

1. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, 11th edition, Pearson Education/PHI, 2008.
2. Electronic Principles, Albert Malvino and David Bates, 7th edition, McGraw-Hill, 2015.
3. Electronics Devices and Circuits, Millman J and Halkias C, 3rd edition, 2007, TMH.

REFERENCE BOOKS:

1. Electric Circuits, (Schaum's Outline Series) by M Nahvi, Joseph Edminister, K Rao , 5th edition, McGraw-Hill Education.
2. ONLINE COURSES: MOOC's

Assessment Pattern

CIE- Continuous Internal Evaluation Theory (50 marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	-	5
Understand	5	-	5
Apply	5	5	-
Analyze	10	5	-
Evaluate	-	5	
Create	-	-	-

SEE- Semester End Examination Theory (50 Marks)

Bloom's Taxonomy	SEE Marks
Remember	20
Understand	10
Apply	10
Analyze	10
Evaluate	-
Create	-

ANALOG ELECTRONIC CIRCUITS LAB	
Course Code: 21ECL35A	**Credits: 1**
L:T:P:S : 0:0:1:0	**CIE Marks: 50**
Exam Hours : 03	**SEE Marks: 50**

Course outcomes: On the completion of this laboratory course, students will be able to:

CO1	To understand BJT and JFET amplifier parameters, gain and frequency response and test and analyze the diode application circuits
CO2	To appreciate the switching characteristics of BJT, JFET and MOSFET, test and measure the performance parameters of tuned amplifiers
CO3	To predict the frequency of oscillation of various oscillators and analyze the performance on various parameters
CO4	To compare the theoretical results with the simulated outputs of power amplifiers, BJT feedback amplifiers using simulation tools.

Mapping of Course Outcomes to Program Outcomes:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ECL35A - ANALOG ELECTRONIC CIRCUITS LAB														
CO1	3	2	2	3	-	1	1	1	2	2	1	2	1	-
CO2	3	2	2	3	-	1	1	1	2	2	1	2	1	-
CO3	3	2	2	3	-	1	1	1	2	2	1	2	1	-
CO4	3	2	2	3	-	1	1	1	2	2	1	2	1	2

Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Sl. no	Laboratory Experiments	COs
1	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)	**CO1**
2	1. Plotting the transfer curve of transistor switch (BJT, JFET, MOSFET). (Hardwired) 2. Wiring of RC coupled Single stage BJT amplifier and Determination of the gain-frequency response, input and output impedances. (Hardwired)	**CO2,CO3**
3	1. Wiring of RC coupled Single stage JFET amplifier and Determination of the gain-frequency response, input and output impedances. (Hardwired) 2. Simulation of BJT Darlington Emitter follower with and without bootstrapping and determination of the gain, input and output impedances. (Simulation using Multisim / Pspice).	**CO2,CO4**
4	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. 2. Wiring and Testing for the performance of BJT-RC Phase shift Oscillator for 10 KHz. (Hardwired) 3. Testing for the performance of BJT – Hartley & Colpitts Oscillators for RF range. (Hardwired)	**CO3,CO4**

OPEN ENDED EXPERIMENTS:

5	Simulation of a transformer less Class – B push-pull power amplifier and determination of its conversion efficiency.	**CO4**
6	Testing of Class-C tuned amplifier, measurement of conduction angle and calculation of efficiency. (Hardwired)	**CO4**

TEXT BOOKS:

1. Electronic Principles, Albert Malvino and David Bates, 7th edition, 2015, McGraw-Hill
2. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, 11th edition, 2008, Pearson Education/PHI

REFERENCE BOOKS:

1. Electronics Devices and Circuits, Millman J and Halkias C, 3rd edition, 2007, TMH
2. Electric Circuits, (Schaum's Outline Series) by M Nahvi, Joseph Edminister, K Rao , 5th edition, McGraw-Hill Education

CIE- Continuous Internal Evaluation (25 Marks X 2 Tests = 50)

Bloom's Taxonomy	**Test**	**Conduction**	**Viva**	**Observation**	**Record**
Marks	**25**	**10**	**5**	**5**	**5**
Remember	5	5	-	-	-
Understand	10	5	-	-	5
Apply	5	-	5	-	-
Analyze	5	-	-	5	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	**Tests**	**Write-up**	**Conduction**	**Viva**
Marks	**50**	**10**	**30**	**10**
Remember	20	5	5	5
Understand	20	5	5	5
Apply	10	-	20	-
Analyze		-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

DIGITAL ELECTRONIC CIRCUITS	
Course Code: 21ECE36A	**Credits: 3**
L: T: P: S : 3:0:0:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

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

CO1	Describe the fundamental concepts of Digital logic
CO2	Illustrate the simplification of Boolean expressions using standard methods
CO3	Employ the simplification methods for designing combinational logic circuits
CO4	Demonstrate the design of general sequential logic circuits
CO5	Sketch the circuits of common Registers and Counters by utilizing flip flops
CO6	Examine the significance of state machines in Digital system design

Mapping of Course Outcomes to Program Outcomes:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ECE36A - DIGITAL ELECTRONIC CIRCUITS														
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	2	1
CO4	3	3	3	3	-	-	-	-	-	-	-	-	2	1
CO5	3	3	3	3	-	-	-	-	-	-	-	-	2	1
CO6	3	3	3	3	-	1	1	-	-	-	-	-	2	1

Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Module No	Module Contents	Hours	COs
1	**Principles of Combinational Logic:** Binary Logic functions, passgates & Logic Gates using n-MOS, p-MOS and CMOS, DeMorgan's Theorem, Definition of combinational logic, Canonical forms, Generation of switching equations from truthtable, Karnaugh maps (3, 4 and 5 variables), Incompletely specified functions(Don't care terms), QM method, Map entered Variables (3 and 4 variables), Realizing functions using MOS Logic. **(Text1, Chapter3)**	**8**	**CO1,CO2**

2	**Analysis and design of combinational logic:** General Approach to combinational logic, Decoders, Encoders, Priority Encoders, Digital Multiplexers, Adders and Subtractor, Cascading full adders, Look Ahead carry adder, Binary Comparators, Code Conversion, Array multiplier, MUX using Pass Gates and Inverters, realization of different logics using 2X1 Multiplexer. **(Text1,Chapter4)**	**8**	**CO3**
3	**Sequential Circuits:** Sequential circuit models, Basic Bistable Element, Latches-SR Latch, Application of SR Latch-A Switch Debouncer, S'R' Latch, The gated SR Latch, The gated D Latch, Timing Considerations, Flip-Flops – JK Clocked Flip-Flops, Clocked T Flip-flop, Clocked D Flip-flop, The Master-Slave Flip-Flops, Edge Triggered Flip-Flop, Characteristic equations, D Flip Flop using CMOS Pass gates and inverters, Conversion of Flip-Flops. **(Text2,Chapter6)**	**8**	**CO4**
4	**Simple flip-flop Applications:** Shift Registers: PIPO, SIPO, PISO, SISO, Universal Shift register. Counter : Ripple Counters, synchronous binary counter, Counters based on Shift Registers, Design of synchronous counters- using clocked JK Flip-Flops, clocked D, T, or SR Flip-Flops, Ring counter, Johnson counter, Design of asynchronous counters – 3bit asynchronous up/down counter, decade counter, frequency divider. **(Text2,Chapter6)**	**8**	**CO5**
5	**Sequential circuit Design:** Moore and Mealy State models, state machine notations, Synchronous Sequential Circuit Analysis, Construction of state diagrams, Sequence detector Serial Ex-3 to BCD code converter, counter design, Design of ALU, Applications of Mealy and Moore machines – Design of ALU, Full adder. **(Text1,Chapter6)**	**8**	**CO6**

TEXT BOOKS:

1. Digital Logic: Applications and Design, John M. Yarbrough, Cengage Learning,2015 reprint
2. Digital Principles and Design, Donald D. Givone, 2003, Tata McGraw Hill Edition2002.
3. Digital Logic and Computer Design: M. Morris Mano, Pearson Education.

REFERENCE BOOKS:

1. Digital Fundamentals, Thomas Floyd, 11th edition,2014, Pearson Education
2. An Illustrative Approach to Logic Design, R.D. Sudhakar Samuel, 2010, Pearson Education

Assessment Pattern

CIE- Continuous Internal Evaluation Theory (50 marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	-	5
Understand	5	-	5
Apply	10	5	-
Analyze	5	5	-
Evaluate	-	5	-
Create	-	-	-

SEE- Semester End Examination Theory (50 Marks)

Bloom's Taxonomy	SEE Marks
Remember	10
Understand	20
Apply	10
Analyze	10
Evaluate	-
Create	-

DIGITAL ELECTRONIC CIRCUITS LAB	
Course Code: 21ECL36A	**Credits: 1**
L:T:P:S : 0:0:1:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

Course outcomes: On the completion of this laboratory course, students will be able to:

CO1	Demonstrate the truth table of various expressions and combinational circuits using logic gates
CO2	Design, test and evaluate various combinational circuits such as adders, subtractors, comparators, multiplexers and de-multiplexers
CO3	Design, test and evaluate flips-flops
CO4	Design and demonstrate various types of Shift registers, up/down counters, Mealy and Moore model

Mapping of Course Outcomes to Program Outcomes:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ECL36A - DIGITAL ELECTRONIC CIRCUITS														
CO1	3	3	3	3	1	2	-	-	2	2	3	2	3	2
CO2	3	3	3	3	1	2	-	-	2	2	3	2	3	2
CO3	3	3	3	3	1	2	-	-	2	2	3	2	3	2
CO4	3	3	3	3	1	2	1	-	2	2	3	2	3	2

Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Sl. no	Laboratory Experiments	COs
1	Simplification of Boolean expressions using K-map and realization Of simplified expressions using basic and universal gates **(Text1,Chapter3)**	**CO1**
2	Realization of Half/Full adder and Half/Full Subtractor using Logic gates. **(Text1,Chapter4)**	**CO1,CO2**
3	**a)** Realization of parallel adder/ Subtractors using7483chip **b)** BCD to Excess-3code conversion and vice versa. **(Text1,Chapter4)**	**CO1,CO2**
4	Realization of Binary to Gray code conversion and vice versa **(Text1,Chapter4)**	**CO1,CO2**
5	MUX/DEMUX–use of 74153, 74139 for arithmetic circuits and code Converter. **(Text1, Chapter4)**	**CO1,CO2**
6	Realization of One/Two bit comparator and study of 7485 Magnitude comparator. **(Text1, Chapter4)**	**CO1,CO2**
7	a) Use of Decoder chip to drive LED display b) Verifying the functionality of Priority encoder **(Text1 ,Chapter4)**	**CO1,CO2**
8	Truth table verification of Flip-Flops: a) JK Master slave b) T type c) D type **(Text2, Chapter6)**	**CO3**

9	Shift left; Shift right, SIPO, SISO, PISO, PIPO operations using74S95. **(Text2, Chapter6)**	**CO3, CO4**
10	Realization of Johnson and Ring counter **(Text2,Chapter6)**	**CO3, CO4**

OPEN ENDED EXPERIMENTS:

11	Realization of synchronous and asynchronous counters	**CO3, CO4**
12	Design and implementation of synchronous or clocked sequential circuits using Mealy and Moore model	**CO3, CO4**

TEXTBOOKS:

1. Digital Logic: Applications and Design, John M. Yarbrough, Cengage Learning,2015 reprint
2. Digital Principles and Design, Donald D.Givone,2003, Tata McGraw Hill Edition 2002
3. Digital Logic and Computer Design: M. Morris Mano, Pearson Education.

REFERENCEBOOKS:

1. Digital Fundamentals, Thomas Floyd, 11th edition, 2014, Pearson Education
2. An Illustrative Approach to Logic Design, R. D. Sudhakar Samuel, 2010, Pearson Education

CIE- Continuous Internal Evaluation (25 Marks X 2 Tests = 50)

Bloom's Taxonomy	Test	Conduction	Viva	Observation	Record
Marks	**25**	**10**	**5**	**5**	**5**
Remember	5	-	-	-	5
Understand	5	5	-	-	-
Apply	10	5	-	5	-
Analyze	5	-	5	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests	Write-up	Conduction	Viva
Marks	**50**	**10**	**30**	**10**
Remember	10	-	15	-
Understand	10	5	-	-
Apply	20	5	15	-
Analyze	10	-	-	10
Evaluate	-	-	-	-
Create	-	-	-	-

NETWORKS & CONTROL SYSTEMS	
Course Code: 21ECE37A	**Credits: 3**
L: T: P: S : 3:0:0:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

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

CO1	Apply the concepts of basic laws and network theorems to solve the given electrical circuits
CO2	Analyze the AC circuits using frequency domain approach
CO3	Evaluate two-port parameters for the given electrical network
CO4	Make use of transfer function concepts to develop the Mathematical Models in control systems
CO5	Examine the steady and transient response for first order and second order systems
CO6	Verify the system performance and stability in Time and Frequency Domain

Mapping of Course Outcomes to Program Outcomes:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ECE37A - NETWORKS & CONTROL SYSTEMS														
CO1	3	-	-	-	-	2	-	-	2	-	-	1	2	-
CO2	3	3	-	-	-	2	-	-	2	-	-	1	2	2
CO3	3	3	-	-	-	2	-	-	2	-	-	1	2	2
CO4	3	3	-	-	-	2	-	-	2	-	-	1	2	2
CO5	3	3	2	-	-	2	-	-	2	-	-	1	2	2
CO6	3	3	2	-	1	2	-	-	2	-	-	1	2	2

Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Module No	Module Contents	Hours	COs
1	**Circuit Analysis & Theorems:** **Circuit Analysis (AC and DC circuits):** Introduction to Basic laws, Wye-Delta Transformation, Nodal Analysis, Mesh Analysis, Nodal and Mesh Analysis by inspection. **Circuit Theorems (DC circuits):** Classification of network elements, Superposition Theorem, Thevenin's Theorem,	**8**	**CO1**

	Norton's and Maximum power transfer theorems. **Application:** Lighting systems, Source Modeling **Text book 1 : Chapter 2, 3, 4**		
2	**Resonance and Two Port Networks:** **Resonant Circuits:** Synthesis of RL, RC and RLC series Circuits. **Two-port networks:** Impedance parameter, Admittance Parameter, Hybrid parameter, Transmission parameter, Relationships between parameters. **Application:** Touch Tone telephone, Ladder Network Synthesis. **Text Book 1: Chapter 14.5, 14.6, 19.1-19.5**	**8**	**CO2, CO3**
3	**Control System Modeling and Reduction of systems:** **Concept of Modeling:** Closed Loop system verses open loop systems, Laplace transform overview, Transfer function of closed loop and open loop systems, Modeling in frequency domain- Electrical system, Mechanical Translational system. **Reduction of Systems:** Block diagrams, Signal flow Graphs, Mason's Rule. **Application:** Modeling of active electrical element- First order filter. **Text Book 2: Chapter 1, 3.1, 3.2, 4.1.1, 4.2**	**8**	**CO4**
4	**Time Response and stability:** Introduction to Time response, order and Type of the system, Time domain specification, transient response of second order systems. steady state error and error constants. Stability of linear Control systems, stability conditions, Routh Hurwitz Criterion. **Root locus:** Basic Properties of Root locus, Sketching the root locus. **Frequency Response techniques:** Frequency domain specifications, Stability analysis with Bode Plots. **Text Book 2: Chapter 5.1-5.6, 2.13, Chapter 7.1-7.3, 8.2, 8.10**	**8**	**CO5, CO6**
5	**Controller Design:** Control system design, Unmanned Aerial Vehicle Control system, Under watered Robotics vehicle control system. Introduction to PID controller, PID controller Block diagram, Ziegler and Nicholas method for Tuning PID controller. **Text Book 3: chapter 1: 1.4.2, 1.4.3, 1.5, 2.4.1**	**8**	**CO6**

TEXT BOOKS:

1. Fundamentals of Electric Circuits, Charles K. Alexander and Matthew N. O. Sadiku, 6th Edition, McGraw Hill Education, 2019.

2. Automatic Control Systems, Dr. Farid Golnaraghi, Dr. Benjamin C. Kuo, 10th Edition, McGraw-Hill Education, 2017.
3. Computer-Aided Control Systems Design -Practical Applications Using MATLAB® and Simulink® , Cheng Siong Chin, 1st edition, 2013.

REFERENCE BOOKS:

1. Network Theory, K Channa Venkatesh, D Ganesh Rao, Pearson Education Limited, 2010
2. Control Systems Engineering, Nagarath I. J. and Gopal M., New Age International Publishers, 2010

Assessment Pattern

CIE- Continuous Internal Evaluation Theory (50 marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	-	5
Understand	10	-	5
Apply	5	5	-
Analyze	5	5	-
Evaluate	-	5	-
Create	-	-	-

Note: Assignments 1 & 2 are based on the analysis of real-time application of circuit theory concepts and control systems.

SEE- Semester End Examination Theory (50 Marks)

Bloom's Taxonomy	SEE Marks
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-

NETWORKS & CONTROL SYSTEMS LAB	
Course Code: 21ECL37A	**Credits: 1**
L:T:P:S : 0:0:1:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

Course Outcomes: At the end of the Course, the student will be able to:

CO1	Apply different approaches for analysis of electrical circuits
CO2	Make use of two-port network formulation for analyzing the electric circuits
CO3	Evaluate the various parameters of transient and steady state analysis of a control system
CO4	Examine the stability criteria for a control system

Mapping of Course Outcomes to Program Outcomes:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ECL37A - NETWORKS & CONTROL SYSTEMS LAB														
CO1	3	3	-	-	3	-	-	-	2	-	-	3	2	2
CO2	3	3	-	-	3	-	-	-	2	-	-	3	2	2
CO3	3	3	3	-	3	-	-	-	2	-	-	3	2	2
CO4	3	3	3	-	3	-	-	-	2	-	-	3	2	2

Sl. no	Laboratory Experiments	COs
1	a) Introduction to Pspice b) Network Reduction using Star-Delta Transformation	**CO1**
2	a) Network Analysis using Mesh-current method b) Network Analysis using Node-voltage method	**CO1**
3	Verification of Superposition Theorem	**CO1**
4	Verification of Thevenin's Theorem and Norton's Theorem	**CO1**
5	Determination of impedance (Z) parameters and admittance (Y) parameters of two port networks using PSpice	**CO2**
6	Develop a program for an electric circuit.	**CO2**
7	a) Introduction to Matlab b) Plot the pole-zero configuration in s-plane for the given transfer function	**CO4**
8	Determine the transfer function for given closed loop system in block diagram representation.	**CO3**
9	Plot unit step response of given transfer function and finds delay time, rise time, peak time and peak overshoot.	**CO3**
10	Determine the steady state errors of a given transfer function.	**CO3**

OPEN ENDED EXPERIMENTS:

11	Plot root locus of given transfer function, locate closed loop poles for different values of k.	**CO4**
12	Plot bode plot of given transfer function. Also determine the relative stability by measuring gain and phase margins.	**CO4**

TEXT BOOKS:

1. Fundamentals of Electric Circuits, Charles K. Alexander and Matthew N. O. Sadiku, 6th Edition, McGraw Hill Education, 2019.
2. Automatic Control Systems, Dr. Farid Golnaraghi, Dr. Benjamin C. Kuo, 10th Edition, McGraw-Hill Education, 2017.
3. Analysis And Design Of Control System Using Matlab , Rao V Dukkipati, 2nd edition 2019, New Age International (P) Ltd.

REFERENCE BOOKS:

1. Network Theory, K Channa Venkatesh, D Ganesh Rao, Pearson Education Limited, 2010
2. Control Systems Engineering, Nagarath I. J. and Gopal M., New Age International Publishers, 2010

Assessment Pattern

CIE- Continuous Internal Evaluation (25 Marks X 2 Tests = 50)

Bloom's Taxonomy	Tests	Conduction	Viva	Observation	Record
Marks	25	10	5	5	5
Remember	5	-	-	-	5
Understand	5	5	-	-	-
Apply	10	5	-	5	-
Analyze	5	-	5	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

SEE-Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests	Write-up	Conduction	Viva
Marks	50	10	30	10
Remember	10	-	15	-
Understand	10	5	-	-
Apply	20	5	15	-
Analyze	10	-	-	10
Evaluate	-	-	-	-
Create	-	-	-	-

MINI PROJECT - I	
Course Code: 21ECE38A	**Credits: 2**
L: T:P :S : 0:0:2:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

Course Outcomes: At the end of the Course, the student will be able to:

CO1	Understand the methodologies of technical projects
CO2	Work as an individual or in a team in development of technical projects
CO3	Articulate the project related activities and findings
CO4	Enhance the idea of project for extended applications

Mapping of Course Outcomes to Program Outcomes:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ECE38A - MINI PROJECT-I														
CO1	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	3	3	3	3	3
CO3	3	-	-	-	-	3	2	3	3	-	3	3	-	-
CO4	3	3	3	3	3	3	2	3	3	3	3	3	3	3

CIE – Continuous Internal Evaluation (50)

Bloom's Taxonomy	Mini Project-I
Remember	-
Understand	-
Apply	20
Analyze	10
Evaluate	10
Create	10

SEE – Semester End Examination (50)

Bloom's Taxonomy	Mini Project-I
Remember	-
Understand	-
Apply	20
Analyze	10
Evaluate	10
Create	10

BASIC APPLIED MATHEMATICS - I	
Course Code: 21DMAT31A	**Credits: 0**
L: T:P :S : 0:0:0:0	**CIE Marks: 50**
Exam Hours : 2	**SEE Marks: 50**

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

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

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	3
CO2	3	3	3	-	-	-	-	-	-	-	-	3
CO3	3	3	3	-	-	-	-	-	-	-	-	3
CO4	3	3	3	-	-	-	-	-	-	-	-	3

Module No.	Contents of the Module	Hours	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. Maclaurin's theorem for function of one variable (statement only)-Problems.	**5**	**CO1, CO2**
2.	**Partial differentiation:** Definition and Simple problems, Euler's theorem for Homogeneous function (NO Derivation and NO extended theorem)-Problems, Jacobians of order two - definition and problems.	**5**	**CO1**
3.	**Integral Calculus and Differential Equations:** Problems on evaluation of $\sin^n x$ and $\cos^n x$ 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**
4.	**Linear Algebra-1:** Problems on rank of a matrix by elementary transformations, Solution of system of linear equations by Gauss elimination method-Problems.	**5**	**CO4**
5.	**Linear Algebra-2:** Linear transformation, Eigen values and Eigen Vectors of a square matrix-Problems.	**5**	**CO4**

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, 2014, ISBN: 9788126554232.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.

Reference Books:

1. Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2015, ISBN: 9780273719236.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.

3. H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.
4. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., Ninth Edition, 2014, ISBN: 9788131808320.

Assessment Pattern:

1. CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 Marks)	Assignment-1 (7.5 Marks)	Assignment-2 (7.5 Marks)	Quiz-1 (05 Marks)	Quiz-2 (05 Marks)
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

2. SEE- Semester End Examination (50Marks)

Bloom's Category	SEE Marks
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

FOURTH SEMESTER

(SYLLABUS)

APPLIED MATHEMATICS – IV	
Course Code: 21ECE41A	**Credits: 3**
L:T:P:S : 3:0:0:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

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

CO1	Solve initial value problems using appropriate numerical methods
CO2	Apply the concepts of Complex variables to solve Engineering Problems
CO3	Apply the concepts of Transformations, Complex integration, Poles and Residuals in the stability analysis of engineering problems
CO4	Gain ability to use probability distributions to analyze and solve real time problems
CO5	Apply the concept of sampling distribution to solve engineering problems
CO6	Use the concepts to analyze the data to make decision about the hypothesis

Mapping of Course Outcomes to Program Outcomes:

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

Course Syllabus			
Module No.	**Contents of the Module**	**Hours**	**CO's**
1.	**Numerical Methods:** Numerical solution of ordinary differential equations of first order and of first degree: Taylor's series method, Modified Euler's method and Runge-Kutta method of fourth-order-Problems. Milne's predictor and corrector methods-Problems. Numerical Solutions of second order ordinary differential equations by Runge-Kutta method of fourth-order-Problems. Case studies on Numerical Analysis.	**9**	**CO1**

2.	**Complex Variables**: Functions of complex variables, Analytical functions, Cauchy-Riemann Equations in Cartesian and Polar forms, Harmonic functions and Construction of analytic functions-Problems using Milne-Thompson's method. **Applications:** Flow Problems-Velocity potential, Stream functions and complex potential functions.	**9**	**CO2**
3.	**Conformal Transformations and Complex Integrations:** $w = z^2$, and $w = e^z$**.** Cauchy's Theorem (with proof), Generalized Cauchy's integral formula, Singularities, Poles and Residues, Residue theorem (without proof)-Problems.	**9**	**CO3**
4.	**Probability distributions:** Random variables (discrete and continuous), probability density functions, moment generating function. Discrete Probability distributions: Binomial and Poisson Distributions-Problems. Continuous Probability distributions: Exponential and Normal Distributions-Problems. **Case Studies**: 1. Application of Probability Theory in signal and image processing. 2. Application of Probability Theory in Optical communication system.	**9**	**CO4**
5.	**Sampling Theory:** Sampling, Sampling distributions, test of hypothesis of large samples for means and proportions, Inferences for variance and proportion. Central limit theorem (without proof), Confidence limits for means, Student's t-distribution and F-distribution for test of goodness of fit for small samples. **Case Studies**: 1. Sampling Theorem in multi band signal Analysis 2. Extension of Sampling Theorem in speech Compression.	**9**	**CO5, CO6**

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, 2014, ISBN: 9788126554232.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.

Reference Books:

1. Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2015, ISBN: 9780273719236.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.
3. H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.
4. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., Ninth Edition, 2014, ISBN: 9788131808320.

Assessment Pattern:

1. CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 Marks)	Assignment-1 (7.5 Marks)	Assignment-2 (7.5 Marks)	Quiz-1 (05 Marks)	Quiz-2 (05 Marks)
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

2. SEE- Semester End Examination (50Marks)

Bloom's Category	SEE Marks
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

LIFE SKILLS FOR ENGINEERS	
Course Code: 21ECE421A	**Credits: 2**
L:T:P:S : 1:0:1:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

Course Outcomes: At the end of the course, the student will be able to:

CO1	Relate "SMART GOALS" to personal and professional life
CO2	Articulate and communicate ideas and thoughts with clarity and focus
CO3	Develop critical and creative thinking skills for problem solving and decision making for leadership.
CO4	Analyze the importance of the concepts of personality development and grooming in corporate life
CO5	Determine personal and professional responsibility by using ownership task bar

Mapping of Course Outcomes to Program Outcomes:

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

Module No.	Module Contents	Hours	COs
1	Goal Setting: Importance of Goals: Achiever's goal - Creating SMART for personal and professional life, Right action at right time, career planning, overcoming fear and face uncertainty, Mind Mapping. Communication – Intellectual preparation/Idea generation.	6	CO1, CO2
2	You are the creator - Taking Ownership, Being Responsible and Accountable. Meaning of Ownership, Responsibility and Accountability, Practicing these philosophies in course, career. Social responsibility. Communication – Organising thought flow.	6	CO2, CO5
3	Self-Awareness and Self-Management: Emotional Intelligence, know yourself- understanding personality, perception, techniques to understand self – Johari window and SWOT, reason for fall and opportunities to grow. Individual behaviour, attitude towards change and work in industry, being proactive and positive. Interpersonal skills - Knowing others, working well with others. Communication – Structured articulation	9	CO2, CO5
4	Leadership, meaning, self- motivation, coming out of comfort zone, mental preparation - accepting failure and resilience, decision making, thinking skills – critical and creative, six thinking hats, watchfulness - proactive risk management, problem solving mind set. Communication – Tips for Jam session, GD and Presentation	9	CO2, CO3
5	Personality Development and Grooming: - Expectations from the industry, building personal presence, corporate grooming, corporate etiquettes, Personal branding and image management. Communication – Mock GD sessions	6	CO2, CO4

REFERENCE BOOKS:

1. The 7 – Habits of Highly Effective People, Stephen R Covey, Neha Publishers.
2. Seven Habits of Highly Effective Teens, Convey Sean, New York, Fireside Publishers, 1998.
3. Emotional Intelligence, Daniel Coleman, Bantam Book, 2006.
4. How to win friends and influence people Dale Carnegie
5. BHAGAVDGITA for college students Sandeepa Guntreddy

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests	Assignments	Self-Study	Peer Evaluation
Marks (out of 50)	**10**	**15**	**15**	**10**
Remember	-	-	-	-
Understand	-	-	-	-
Apply	5	5	-	5
Analyze	-	-	5	-
Evaluate	-	-	-	
Create	5	10	10	5

SEE- Semester End Examination (50 Marks)

NOTE: Being a Life skills course we felt it would be suitable to do the final assessment through a structured group discussion which will provide an opportunity to test students in all levels of Bloom's Taxonomy.

Bloom's Category	Group Discussion
Remember	**5**
Understand	**10**
Apply	**10**
Analyze	**10**
Evaluate	**5**
Create	**10**

ENTREPRENEURSHIP DEVELOPMENT-2

Course Code	**: 21HSS431A**	**Credits**	**: 01**
L: T: P	**: 1:0:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 2**	**SEE Marks**	**: 50**

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

CO1	Identify the problem and understand the concept of blue ocean strategy
CO2	Create Minimum viable product
CO3	Analyze customer segment, Niche and early adopters
CO4	Interpret the cost revenue Structure and feasibility of the venture
CO5	Analyze and develop financial model for venture
CO6	Create sustainable venture through step wise process (problem solution fit, MVP and financial model)

Mapping of Course Outcomes to Program Outcomes:

PO CO	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	-	-	-	3	1	2	-	-	-	1
CO2	-	3	-	-	-	3	1	2	-	-	-	-
CO3	-	3	-	-	-	3	1	2	-	-	-	-
CO4	-	3	-	3	-	3	1	2	-	-	-	3
CO5	-	3	-	3	-	3	1	2	-	-	-	3
CO6	-	3	-	3	-	3	1	2	-	-	-	3

Module No.	Contents of Module	Hrs	Cos
1	**Refining Problem and solution** Identify and refining the problem, Brainstorming Solutions, Problem-Solution Fit	**3**	**CO1**
2	**Blue ocean strategy**– Meaning, concept, Implementation	**3**	**CO2**
3	**Minimum Viable Product-**Meaning of MVP, ways to Build an MVP, Present Your MVP	**3**	**CO3**
4	**Business Model** – Cost Revenues and Pricing- concept, Business model- Lean Canvas – components, implementation	**3**	**CO4**
5	**Financing and Financial Model** - Bootstrapping meaning and concept and Initial Financing, Financial Model- concept and implementation	**3**	**CO5, CO6**

Suggested Case Studies:

1. Kent RO water purifier business idea case study | Business
2. Red Bus Start up story Phanindra Sama: The RedBus journey - YouTube

Books for reference

1. Blue Ocean Strategy: How to Create Uncontested Market Space and Make the Competition Irrelevant – Illustrated, 10 February 2015, by Kim
2. Financial Modeling, 4th edition (The MIT Press), Illustrated, 18 April 2014, by Simon Benninga
3. Positioning: The Battle for Your Mind, by Al Ries, Jack Trout

INTERNAL ASSESSMENT PATTERN – 50 Marks

Assessment format	Weightage to be awarded	Comments
Quiz	20 Marks	To be administered as a part of CI
Venture Milestone	30 Marks	Student should create VM 1, VM2, VM3

- **VM1- Presentation- Forming team, Identifying problem, identifying solution (Module 1& 2)**
- **VM2- Presentation- Validate solution Identify customer segment, and early adopter, Create value proposition canvas (Module-3 & 4)**
- **VM3- Presentation -Create business plan using lean canvas (Module-5)**

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks
Remember	10
Understand	10
Apply	10
Analyze	5
Evaluate	5
Create	10

CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS	
Course Code: 21HSS441A	**Credits: 1**
L:T:P:S : 1:0:0:0	**CIE Marks: 50**
Exam Hours : 2	**SEE Marks: 50**

COURSE OUTCOMES: On completion of the course, student would be able to:

CO1	Gain knowledge of Indian Constitution and be able to solve the legal and societal issues
CO2	Understand the powers and functions of the Union, State and Local Governments in detail
CO3	Understand Electoral Process, Emergency provisions and Amendment procedure
CO4	Acquire the knowledge of their Ethical Duties, Responsibilities and the decision making Ability
CO5	Understand the cybercrimes and cyber laws for cyber safety measures

Mapping of Course Outcomes to Program Outcomes:

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

Sl No	Module Contents	Hours	COs
1	**INTRODUCTION TO CONSTITUTION OF INDIA** Introduction to Constitution of India. The making and salient features of the constitution. The necessity of the constitution. The Role of the Constituent Assembly-Preamble to Indian constitution. Fundamental rights and its restrictions and Limitations. Decided case studies. Directive principles of state policy. Fundamental Duties and its Scope and significance in Nation building.	**3**	**CO1**
2	**UNION EXECUTIVE and STATE EXECUTIVE** President, prime minister, parliament and supreme court of India. Judicial activism and judicial review. Important parliamentary terminology. Center- state relations. Attorney General of India, Comptroller and Auditor General of India. State Executive- Governor, Chief Minister, State Legislature. High Court and Subordinate Court. Advocate General of the State .Controller and Auditor General of State. Special Provisions (Articles 370,371,371J) for some States.	**3**	**CO2**
3	**Amendments and Procedure, Elections and Emergency Provisions:** Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments – Types and Important Constitutional Amendments.Amendments-42,44,61,86,73,74,91,95,100,101,118. Emergency Provisions, types of Emergencies and its effects. **Special provisions:** Special Provisions for SC and ST, OBC, Women, Children and Backward Classes.	**3**	**CO3**

4	**ENGINEERING ETHICS:** Scope & aim of engineering ethics. Responsibility of engineers, Impediments to responsibility. Clash of ethics. Risk, safety and liability of Engineers. Trust and reliability in Engineering. IPR (Intellectual Property Right).Corporate Ethics.	**3**	**CO4**
5	**Internet Laws, Cyber Crimes and Cyber Laws:** Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types and causes for Cyber Crimes, Cyber Crimes land mark judgments in India and the information Technology Act 2000, Cybercrimes and enforcement agencies.	**3**	**CO5**

Text Books

1. Durga Das Basu: "Introduction to the constitution", Lexis Nexis; Twentieth edition, 2011

2. Shubham Singles, Charles E. Haries: Constitution of India and Professional Ethics, Cengage Learning India Private Limited, 2019

3. Cyber Security and Cyber Laws, Alfred Basta and et al, Cengage Learning India, 2018

Reference Books

1. M. Govindarajan, Natarajan, V. S. Senthilkumar, "Engineering Ethics", Prentice Hall India Learning Private Limited, 2013

2. M. V. Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002

Assessment Pattern

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests	Assignment
Marks (out of 50)	**25**	**25**
Remember	10	10
Understand	10	10
Apply	5	5

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (50)
Remember	20
Understand	20
Apply	10

SYSTEM DESIGN USING HDL	
Course Code: 21ECE45A	**Credits: 3**
L:T:P:S : 3:0:0:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

Course Outcomes: On completion of the course, students should be able to:

CO1	Recognize the importance of HDL for the automation of VLSI design
CO2	Employ VHDL and / or Verilog data types and operators for describing the electronic hardware
CO3	Examine the usage of various types of assignments in Verilog
CO4	Identify the need of synthesis in the implementation of HDL
CO5	Write Verilog code for the design of specific applications
CO6	Distinguish between the commonly used programmable devices

Mapping of Course Outcomes to Program Outcomes:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ECE45A - SYSTEM DESIGN USING HDL														
CO1	3	3	-	-	-	-	-	-	-	-	-	-	1	1
CO2	3	3	3	-	-	-	-	-	-	-	-	-	1	1
CO3	3	3	3	-	-	-	-	-	-	-	-	-	1	1
CO4	3	3	3	2	-	-	-	-	-	-	-	-	2	2
CO5	3	3	2	2	-	-	-	-	-	-	-	-	2	2
CO6	3	3	2	2	-	1	-	-	-	-	1	-	2	2

Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Sl No	Module Contents	Hours	COs
1	**INTRODUCTION TO VHDL:** A brief history of HDL, Structure of HDL module, Design Flow, Translation of VHDL Code into a Circuit, Operators, Data types, Types of Descriptions (Behavioral, structural, Data-flow), Procedures and functions, Brief comparison of VHDL and Verilog. **(Text 1 – chapter 1,6; Text 3 – chapter 1)**	8	CO1, CO2, CO3
2	**INTRODUCTION TO VERILOG:** Computer-Aided Design, Hardware Description Languages, Verilog Data Types and Operators, Verilog Description of Combinational Circuits, Verilog Modules, Verilog Assignments **(Text 2 – chapter 2)**	8	CO1, CO2, CO3
3	Procedural Assignments, Modeling Flip-Flops Using Always Block, Always Blocks Using Event Control Statements, Verilog Models for Multiplexers, Modeling Registers and Counters Using Verilog Always Statements, Behavioral and Structural Verilog, SRAM model **(Text 2 – chapter 2, 8.6)**	8	CO1, CO2, CO3
4	**SIMULATION AND SYNTHESIS:** Delays in Verilog, Compilation, Simulation, and Synthesis of Verilog Code, Simple Synthesis Examples. Constants, Arrays, Loops in Verilog, Testing Verilog Model, Verilog functions, Verilog Tasks, System functions **(Text 2 – chapter 2, 8)** DESIGN EXAMPLES: A BCD Adder, 32-Bit Adders, Array Multiplier. **(Text 2 – chapter 4)**	8	CO3, CO5
5	**INTRODUCTION TO PROGRAMMABLE LOGIC DEVICES AND DESIGNING WITH FPGA:** Brief Overview of Programmable Logic Devices. Simple Programmable Logic Devices (SPLDs) - Read Only Memories, Programmable Logic Arrays, Programmable array Logic. Complex Programmable Logic Devices (CPLDs). Field Programmable Gate Arrays (FPGAs) - Organization of FPGAs (Intel), FPGA Programming techniques, Programmable Logic block Architecture, Programming file generation, Implementation on Intel FPGA boards **(Text 2 – chapter 3,6 & Reference Website)**	8	CO4, C06

TEXT BOOKS:

1. HDL Programming(VHDL and Verilog), Nazeih M. Botros, 2015, John-Weily India Pvt.Ltd
2. Digital System design Using Verilog, Charles H. Roth Jr., Lizy Kurian John, Byeong Kil Lee, 1st Edition, 2015,CLEngineering.
3. Volnei A. Pedroni, "Circuit Design with VHDL", The MIT Press, 2004.

REFERENCE BOOKS:

1. Digital Systems Design using VHDL, Charles H Roth, Jr., 2007,Thomson
2. Digital Design: An Embedded Systems approach Using VERILOG, Peter J. Ashenden, 2014, Elesvier
3. J Bhaskar, "A Verilog HDL Primer (3/e)", Kluwer, 2005.

REFERENCE WEBSITE:

www.intel.com

Assessment Pattern

CIE- Continuous Internal Evaluation Theory (50 marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	-	5
Understand	5	-	5
Apply	10	5	-
Analyze	5	5	-
Evaluate	-	5	-
Create	-	-	-

SEE- Semester End Examination Theory (50 Marks)

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

HARDWARE DESCRIPTION LANGUAGE LAB	
Course Code : 21ECL45A	**Credits: 1**
L:T:P:S : 0:0:1:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

Course outcomes: On the completion of this laboratory course, students will be able to:

CO1	Write the Verilog / VHDL programs to simulate Combinational circuits in Dataflow, Behavioral and Gate level Abstractions.
CO2	Describe sequential circuits like flip flops and counters in Behavioral description and obtain simulation waveforms.
CO3	Design and verify the functionality of digital circuit/system by writing test benches.
CO4	Program FPGAs to synthesize the digital designs.

Mapping of Course Outcomes to Program Outcomes:

PO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
21ECL45A - HARDWARE DESCRIPTION LANGUAGE LAB														
CO1	3	3	3	3	1	1	-	-	2	2	1	2	3	2
CO2	3	3	3	3	1	1	-	-	2	2	1	2	3	2
CO3	3	3	3	3	1	1	-	-	2	2	1	2	3	2
CO4	3	3	3	3	2	1	1	1	2	2	1	2	3	2

Correlation levels: 1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Sl. no	**Laboratory Experiments**	**COs**
1	Quartus Prime Design Software tool flow (www.intel.com)	**CO1,CO2,** **CO3,CO4**
2	Write an HDL code to describe the functions of a Full Adder using three modeling styles. **(Text1 – chapter 1, Text2- chapter2)**	**CO1,CO3**

3	Write a model for 16 bit ALU using the 4bit opcodes; the requisite functions can be defined for the chosen opcodes. **(Text1 – chapter 1, Text2- chapter2)**	**CO1,CO3**
4	a) Write an HDL program for the following designs: **a.** Decoder & Encoder **(Text1 – chapter 1, Text2- chapter2)** b) Develop the HDL code for the following flipflops: T, D, SR, JK. **(Text1 – chapter 1, Text2- chapter 2)**	**CO1,CO3** **CO2,CO3**
5	Write an HDL program for the following designs: a. 4 bit Binary to Gray converter b. 4-bit Binary Comparator **(Text1 – chapter 1, Text2- chapter 2)**	**CO1,CO3**
6	Design 4-bit Binary and BCD counters (Synchronous reset and Asynchronous reset and "any sequence" counters). **(Text1 – chapter 1, Text2- chapter 2)**	**CO2,CO3**
7	Synthesize the code of above experiments and generate gate level netlist. **(Text2- chapter 2)**	**CO4**
8	Study the use of clocks in timed circuits: Timers and Real-Time Clocks **(Reference Website)**	**CO3,CO4**
9	Implement a finite state machine (FSM) that recognizes two specific sequences of applied input symbols, namely four consecutive 1s or four consecutive 0s. **(Reference Website)**	**CO2,CO3**
10	Examine the general issues involved in implementing Memory Blocks **(Reference Website)**	**CO2,CO3**
11	Write an HDL code to display messages on the given seven segment display **(Text2- chapter 2,3,6)**	**CO3,CO4**
12	Write the HDL code to control speed, direction of dc and stepper motor **(Text2- chapter 2,3,6)**	**CO3,CO4**
13	Write the HDL code to generate different waveforms (sawtooth, sine wave, square, triangle, ramp etc) using DAC and FPGA kit **(Text2- chapter 2,3,6)**	**CO4**

OPEN ENDED EXPERIMENTS:

14	Design and implement a simple processor **(Reference Website)**	**CO1,CO2, CO3,CO4**
15	Extend the capability of the processor: An Enhanced Processor **(Reference Website)**	**CO1,CO2, CO3,CO4**

16	Using algorithmic state machine charts, implement algorithms as hardware circuits (Reference Website)	**CO1,CO2, CO3,CO4**
17	Implement Basic Digital Signal Processing using the audio coder/decoder (CODEC) on the DE1-SoC or DE2-115 board. **(Reference Website)**	**CO1,CO2, CO3,CO4**

TEXT BOOKS:

1. HDL Programming (VHDL and Verilog), Nazeih M. Botros, 2015, John-Wiley India Pvt. Ltd
2. Digital System design Using Verilog, Charles H. Roth Jr., Lizy Kurian John, Byeong Kil Lee, 1st Edition, 2015, CL Engineering.
3. Volnei A. Pedroni, "Circuit Design with VHDL", The MIT Press, 2004.

REFERENCE BOOKS:

1. Digital Systems Design using VHDL, Charles H Roth, Jr., 2007, Thomson
2. Digital Design: An Embedded Systems approach Using VERILOG, Peter J. Ashenden, 2014, Elsevier.
3. Verilog HDL: A Guide to Digital Design and Synthesis, 2nd Ed, Samir Palnitkar, PHI, 2003

REFERENCE WEBSITE:

https://www.intel.com/content/www/us/en/developer/topic-technology/fpga-academic/materials-digital-logic.html

Assessment Pattern

CIE- Continuous Internal Evaluation (25 Marks X 2 Tests = 50)

Bloom's Taxonomy	Test	Conduction	Viva	Observation	Record
Marks	**25**	**10**	**5**	**5**	**5**
Remember	5	-	-	-	5
Understand	5	5	-	-	-
Apply	10	5	-	5	-
Analyze	5	-	5	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

SEE-Semester End Examination (50 Marks)

Bloom's Taxonomy	Tests	Write-up	Conduction	Viva
Marks	**50**	**10**	**30**	**10**
Remember	10	-	15	-
Understand	10	5	-	-
Apply	20	5	15	-
Analyze	10	-	-	10
Evaluate	-	-	-	-
Create	-	-	-	-

MICROPROCESSORS AND INTERFACING	
Course Code: 21ECE46A	**Credits: 3**
L:T:P:S : 3:0:0:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

Course Outcomes: At the end of the Course, the student will be able to:

CO1	Explain the functional features of 8086 Microprocessor
CO2	Apply the knowledge of addressing modes to write assembly language program in 8086
CO3	Make use of assembler directives and interrupt methods in 8086 programming
CO4	Understand advanced architectures and enhancement in Microprocessors
CO5	Demonstrate the peripheral Interfacing concepts in 8086
CO6	Demonstrate the applications of interfacing of 8086

Mapping of Course Outcomes to Program Outcomes

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ECE46A - MICROPROCESSORS AND INTERFACING														
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	-	-	-	3	-	-	-	3	-	-	3	3	-
CO3	3	3	-	-	3	-	-	-	3	-	-	3	3	2
CO4	3	3	-	3	3	-	-	-	-	-	-	-	3	-
CO5	3	3	2	2	3	-	-	-	3	-	-	3	3	-
CO6	3	3	2	2	3	-	-	-	3	-	-	3	3	-

Sl No	Module Contents	Hours	COs
1	**ARCHITECTURE OF 8086:** Overview of 8086 Microprocessor Family, Architecture of 8086, Addressing Modes, Machine language Instruction formats, Instruction set. Introduction to Programming of 8086.	8	CO1, CO2
	Text-1: 2.11, 2.12,2.13,2.14,2.15, 2.16, Text-2: 2.1, 2.2, 2.3		
2	**SIGNAL DESCRIPTION AND INTERRUPTS:** Pin Description of 8086, Memory Organization, Assembler Directives, Interrupts, Interrupt cycle of 8086 and Interrupt Service Routines. Minimum Mode and Maximum Mode configuration	8	CO3
	Text-1: 6.30 -6.36 Text-2: 1.3 1.4, 2.4, 4.3, 4.4, 4.5, 4.6, 4.7,1.8,1.9		
3	**ADVANCED MICROPROCESSORS:** 80186/80188 architecture and the enhancements, Introduction to 80286, Virtual memory machine, The memory paging mechanism, Pentium and Pentium Pro microprocessors, Special Pentium registers, Pentium instructions, Special Pentium Pro-features	8	CO4
	Text-3:16.1,16.2,16.5,17.6,18.1,18.2,18.4,18.6		
4	**PERIPHERAL INTERFACING**: Interfacing I/O Ports, Programmable Peripheral Interface (8255), Keyboard Display controller (8279), Programmable interrupt controller (8259), Programmable DMA Controller (8257)	8	CO5
	Text-2: 5.3,5.4,5.5,6.2,6.3,7.1.7.2		
5	**APPLICATIONS OF 8086:** Interfacing simple switches and LEDs using 8255, Stepper Motor Interfacing. ADC-0808/0809, DAC-0800, Timer Operating Modes of 8254, Interfacing programs	8	CO6
	Text-2: 5.5, 5.6, 5.7.2, 5.8		

TEXT BOOKS:

1. Microprocessor and Interfacing- Douglas V Hall, SSSP Rao, 3rd edition, TMH, 2012.
2. Advanced Microprocessors and Peripherals- A.K. Ray and K.M. Bhurchandi, TMH, 3rd Edition, 2015.
3. The Intel Microprocessor, Architecture, Programming and Interfacing - Barry B. Brey, 6e, Pearson Education / PHI, 2003.

REFERENCE BOOKS:

1. Microcomputer systems-The 8086 / 8088 Family – Y.C. Liu and A.Gibson, 2nd edition, PHI -2003.
2. The 8086 Microprocessor: Programming & Interfacing the PC – Kenneth J Ayala, CENGAGE Learning, 2011.

Assessment Pattern

CIE- Continuous Internal Evaluation Theory (50 marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	-	5
Understand	5	-	5
Apply	10	5	-
Analyze	5	5	-
Evaluate	-	5	-
Create	-	-	-

Note: Assignments 1 & 2 are based on the study of the data-sheets and the programming of the current industrial standard microprocessors.

SEE- Semester End Examination Theory (50 Marks)

Bloom's Taxonomy	SEE Marks
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

MICROPROCESSORS LAB	
Course Code: 21ECL46A	**Credits: 1**
L:T:P:S : 0:0:1:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

Course Outcomes: At the end of the Course, the student will be able to:

CO1	Write assembly level programs using 8086 to perform arithmetic and logical operations
CO2	Develop assembly code for string operations, sorting of numbers and branch instructions of 8086
CO3	Write 8086 assembly level programs to perform Seven Segment Display and Keyboard interfacing
CO4	Demonstrate the interfacing of 8086 with stepper motor and LCD modules, and other relevant peripherals

PO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
21ECL46A - MICROPROCESSORS LAB														
CO1	3	-	-	-	3	-	-	-	3	-	-	-	3	-
CO2	3	3	3	-	3	-	-	-	3	-	2	-	3	-
CO3	3	3	3	-	3	-	-	-	3	-	-	-	3	3
CO4	3	3	3	2	3	-	-	-	3	-	2	2	3	3

Mapping of Course Outcomes to Program Outcomes:

Sl. No	**LIST OF EXPERIMENTS**	**COs**
1	Write an assembly level programs for basic arithmetic operations using 8086 (i) Signed and Unsigned Addition(32 bit and 16 bit) (ii) Subtraction(32 and 16 bit) (iii) Signed and Unsigned Multiplication (8 and 16 bit)(iv) Signed and Unsigned Division (8 and 16 bit)	**CO1**
2	Write an assembly level programs assembly level programs for basic logical operation using 8086 (i)To check number is positive or negative (ii)To count number of one's & zero's	**CO1**

3	Write an assembly Level programs for code conversion of 8086 (i) ASCII to binary; (ii) Decimal to Hex; (iii) ASCII to Decimal; (iv) Binary to BCD and vice versa	**CO2**
4	Write an assembly level programs for String operations using 8086 (i) Reverse the string (ii) To check whether the string is palindrome or not	**CO3**
5	Write an assembly level programs using 8086 for sorting operations like ascending, descending, largest and smallest in microprocessor	**CO3**
6	Interfacing of 8086 with (Assembly Level Programming) LED modules, switches and Logic controller (BCD up counter and Down counter)	**CO4**
7	Interfacing of Keyboard Display and Seven segment using microprocessor 8086	**CO4**
8	Assembly Level Programming to illustrate the interfacing of stepper motor and LCD with the 8086	**CO4**

OPEN ENDED EXPERIMENTS:

9	Programming to illustrate the working of an elevator using 8086.	**CO4**
10	Programming to illustrate the working of display of Route no: Source to Destination in BUS transport using seven segment display	**CO4**

CIE- Continuous Internal Evaluation (25 Marks X 2 Tests = 50)

Bloom's Taxonomy	**Test**	**Conduction**	**Viva**	**Observation**	**Record**
Marks	**25**	**10**	**5**	**5**	**5**
Remember	5	5	-	-	-
Understand	10	5	-	-	5
Apply	5	-	5	-	-
Analyze	5	-	-	5	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy	**Tests**	**Write-up**	**Conduction**	**Viva**
Marks	**50**	**10**	**30**	**10**
Remember	20	5	5	5
Understand	20	5	5	5
Apply	10	-	20	-
Analyze		-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

DIGITAL SIGNAL PROCESSING	
Course Code : 21ECE47A	**Credits: 3**
L:T:P:S : 3:0:0:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

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

CO1	Apply the knowledge of Fourier analysis to compute Discrete Fourier Transforms of signals
CO2	Use the concept of convolutional operators for linear filtering techniques
CO3	Determine the DFT and inverse DFT using Fast Fourier Transform algorithms
CO4	Design the digital filters to obtain the desired response
CO5	Understand the basic features of programmable Digital Signal Processor
CO6	Appraise the different applications of DSP

Mapping of Course Outcomes to Program Outcomes:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ECE47A - DIGITAL SIGNAL PROCESSING														
CO1	3	-	-	-	-	-	-	-	2	2	-	2	3	2
CO2	3	3	-	-	3	-	-	-	2	2	-	2	3	2
CO3	3	3	2	-	-	-	-	-	2	2	-	2	3	2
CO4	3	3	2	-	3	2	-	-	2	2	-	2	3	2
CO5	3	-	-	-	-	-	-	-	2	2	-	2	3	2
CO6	3	-	-	1	3	2	-	-	2	2	-	2	3	2

Correlation levels: 1-Less (Low) 2-Moderate (Medium) 3-Substantial (High)

Sl No	Module Contents	Hours	COs
1	**Introduction to Signal Processing and Discrete Fourier Transforms (DFT):** Frequency domain sampling and reconstruction of discrete time signals, DFT as a linear transformation, its relationship with other transforms, Computation of N -point DFT and IDFT, Properties of DFT **(Text 1: Chapter 7 - 7.1, 7.2)**	**8**	**CO1**
2	**Convolution:** Linear Convolution, Circular convolution, Linear Convolution using circular convolution, Circular Convolution using DFT and IDFT method **Fast Convolution** overlap-save and overlap-add method, **FFT algorithm:** Need for efficient computation of the DFT, Radix-2 FFT algorithm for the computation of DFT and IDFT, decimation-in-time and decimation-in-frequency algorithms. **(Text1: Chapter 8 - 8.1.1, 8.1.3)**	**8**	**CO2, CO3**
3	**Design of FIR and IIR Filters:** **Realization of FIR and IIR filters:** Introduction, Structure, comparison of FIR and IIR filter. **Design of FIR filter**-need, types and characteristics of window, design of FIR filters using Rectangular and Hamming window. **Design of IIR Filter:** Analog to analog frequency transformations, Impulse Invariance method, Bilinear Transformation, Digital Butterworth filter design. **(Text1: Chapter 9-9.2.1,Chapter 10-10.2.1, 10.2.2)** **(Text1: Chapter 9-9.3.1, 9.3.3, 9.3.4, Chapter10-10.3.2, 10.3.3, 10.3.4, 10.4.1)**	**8**	**CO4, CO6**
4	**An Introduction to Programmable Digital Signal Processor:** DSP system, Features of Digital Signal Processors, shifter, Barrel Shifter, MAC unit, Pipelining in DSP Processor **Number formats**: Fixed point and Floating-Point formats, Q notation. **(Text 2: Chapter 1-1.1,1.2,1.3, Chapter 3-3.1,3.2 Chapter 4-4.1,4.2,4.3 Chapter 7-7.2)**	**8**	**CO4, CO6**
5	**Multi-Rate Digital Signal Processing:** Introduction**,** decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by the factor of I/D, Digital Filter Banks. **Application of DSP:** Radar signal Processing, DSP based measurement system. **(Text1: Chapter11-11.1,11.2,11.3,11.4,11.10)**	**8**	**CO5, CO6**

TEXTBOOKS:

1. Digital signal processing: Principles, Algorithms & Applications, Proakis & Monalakis, 4th Edition, 2014, Pearson education.
2. Digital Signal Processing, Avtar Singh & S. Srinivasan, Thomson Brooks /Cole, 2004
3. Digital Signal Processing, P. Ramesh Babu, 6th Edition, 2014, Scitech Publications.

REFERENCE BOOKS:

1. Discrete Time Signal Processing, Oppenheim & Schaffer, 7th Edition, 2010, TMH.
2. Digital Signal Processing, S. K. Mitra, 4th Edition, 2014, Tata Mc-GrawHill.

Assessment Pattern

CIE- Continuous Internal Evaluation Theory (50marks)

Bloom's Taxonomy	**Tests**	**Assignments**	**Quizzes**
Marks	**25**	**15**	**10**
Remember	**5**	**-**	**5**
Understand	**10**	**-**	**5**
Apply	**10**	**7.5**	**-**
Analyze	**-**	**7.5**	**-**
Evaluate	**-**	**-**	**-**
Create	**-**		**-**

Note: Assessment of Assignments 1 & 2 is based on simulation based validation process. Students can choose a unique problem statement from the syllabus, and then implement it in Matlab programming or Simulink.

SEE- Semester End Examination Theory (50 Marks)

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

DIGITAL SIGNAL PROCESSING LAB	
Course Code: 21ECL47A	**Credits: 1**
L:T:P:S : 0:0:1:0	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

Course out comes: On the completion of this laboratory course, students will be able to:

CO1	Analyze the signals in Time domain and Frequency domain, and compute the output of the LTI system using Convolution
CO2	Design FIR and IIR filters for the desired frequency response and compare signals using the concept of Correlation
CO3	Implement discrete computations using DSP processor and appraise the applications of DSP
CO4	Realize digital filters using a simulation tool and analyze the response of the filter

Mapping of Course Outcomes to Program Outcomes:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ECL47A - DIGITAL SIGNAL PROCESSING LAB														
CO1	3	2	2	2	3	1	-	-	1	-	1	2	3	2
CO2	3	2	2	2	3	1	-	-	1	-	1	2	3	2
CO3	3	2	2	2	3	1	1	-	1	-	1	2	3	2
CO4	3	2	2	2	3	1	1	-	1	-	1	2	3	2

Correlation levels: 1-Less (Low) 2-Moderate (Medium) 3-Substantial (High)

Sl. No	Laboratory Experiments	COs
1	**LIST OF EXPERIMENTS USING MATLAB** **1.** Computation of N-point DFT of a given sequence and plotting of Magnitude and phase spectrum. **2.** Linear convolution of two sequences using time domain and DFT/IDFT **3.** Circular convolution of two given sequences using time domain DFT/IDFT **4.** Auto correlation of two sequences using time domain and DFT/IDFT **5.** Cross correlation of two sequences using time domain and DFT/IDFT **6.** Computation of FFT and IFFT using User defined function **7.** Design and implementation of IIR filters of different types(Butter worth and Chebyshev: low pass, high pass, band pass and band reject)to meet given specifications **8.** Design and implementation of FIR filters to meet given specifications	**CO1, CO2,** **CO3, CO4**
2	**LIST OF EXPERIMENTS USING DSPPROCESSOR** **1.** Computation of N-Point DFT of a given sequence. **2.** Impulse response of first order and second order system. **3.** Linear convolution of two given sequences. **4.** Circular convolution of two given sequences.	**CO4**
3	**LIST OF EXPERIMENTS USING SIMULINK** **1.** Sampling of a signal **2.** Design of IIR filter of different types (Butter worth and Chebyshev): low pass, high pass, band pass and band reject) to meet given specifications. **3.** Design of FIR filter to meet given specifications. **4.** Design of Radar system using Simulink	**CO4**

OPEN ENDED EXPERIMENTS:

4	Audio applications such as to plot a time and frequency display of microphone plus a cosine using DSP. Read a wav file and match with their respective spectrograms.	**CO4**
5	Application of filtering techniques to a noisy signal -ECG and EEG Signal	**CO4**

TEXT BOOKS:

1. Digital signal processing: Principles, Algorithms & Applications, Proakis & Monalakis, 4th Edition, 2014, Pearson education.
2. Digital Signal Processing. Ramesh Babu, 6thEdition, 2014, Scitech Publications.

REFERENCE BOOKS:

1. Discrete Time Signal Processing, Oppenheim & Schaffer, 7thEdition, 2010, TMH.
2. Digital Signal Processing, S. K. Mitra, 4thEdition, 2014, Tata Mc-Graw Hill.

Assessment Pattern

CIE- Continuous Internal Evaluation (25 Marks X 2 Tests = 50)

Bloom's Taxonomy	**Test**	**Conduction**	**Viva**	**Observation**	**Record**
Marks	**25**	**10**	**5**	**5**	**5**
Remember	5	-	-	-	-
Understand	5	5	-	-	-
Apply	10	5	5	5	5
Analyze	5	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-

SEE-Semester End Examination (50 marks)

Bloom's Taxonomy	**Tests**	**Write-up**	**Conduction**	**Viva**
Marks	**50**	**10**	**30**	**10**
Remember	10	5	5	5
Understand	10	5	5	5
Apply	20	-	20	-
Analyze	10	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

SUMMER INTERNSHIP - I	
Course Code: 21ECE48A	**Credits: 2**
L: T:P :S : 0:0:0:2	**CIE Marks: 50**
Exam Hours : 3	**SEE Marks: 50**

Course Outcomes: At the end of the Course, the student will be able to:

CO1	Understand the work culture of the various industries / enterprises
CO2	Examine the different job profiles that are present in the industries
CO3	Prepare oneself for the general or specific requirements of the industry
CO4	Develop one's own model for opening a start-up after graduation

Mapping of Course Outcomes to Program Outcomes:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ECE48A – SUMMER INTERNSHIP-I														
CO1	2	1	1	-	2	2	-	2	3	3	3	3	3	3
CO2	2	1	1	-	2	2	-	2	3	3	3	3	3	3
CO3	2	-	-	-	2	2	-	2	3	3	3	3	3	3
CO4	2	-	-	-	2	2	-	2	3	3	3	3	3	3

CIE - Continuous Internal Evaluation (50)

Bloom's Taxonomy	Summer Internship-I
Remember	-
Understand	-
Apply	20
Analyze	10
Evaluate	10
Create	10

SEE – Semester End Examination (50)

Bloom's Taxonomy	Summer Internship-I
Remember	-
Understand	-
Apply	20
Analyze	10
Evaluate	10
Create	10

COMMUNICATIVE ENGLISH	
Course Code: 21DAEC40A	**Credits: 0**
L: T:P :S : 0:0:0:0	**CIE Marks: 50**
Exam Hours : 2	**SEE Marks: 50**

Course Outcomes: At the end of the Course, the student will be able to:

CO1	Recognise the grammatical structures in English and identify errors in sentences
CO2	Demonstrate conversational skills using situational vocabulary
CO3	Examine the importance of sub skills of listening for effective communication
CO4	Analyse the importance of receptive and productive skills of communication

Mapping of Course Outcomes to Program Outcomes:

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

Module No	Module Contents	Hours	Cos
1	Self-introduction – Talking about self, ambition, hobbies, likes, dislikes, talents and achievements. Asking for and Giving Information (Pair work) **(SEE Task 1)** Asking question. (WH, Aux Verbs), Helping Verbs usage chart, question tags. Nouns, Pronouns	5	CO1
2	Talking about Routine, Repeated activities (Frequency adverbs) Verb: Main / Assistant, Forms of Verbs, Use of Do, Does in negative and question forms **Verbal Ability** Error Detection: Subject Verb Agreement	5	CO1, CO2

3	Describing people, things, actions, process **(SEE Task 2)** Describing on going actions Situational conversations, role plays Adjectives, Adverbs **Verbal Ability:** Sentence correction, Sentence completion.	5	CO1 CO2 CO4
4	**Listening Skills:** Importance of listening for effective communication Traits of a good listener Listening sub skills Listening to audio files of short stories, news, TV clips, Documentaries Gap filling exercise and Paraphrasing **Verbal Ability:** Common Errors in English 1 (articles, prepositions) Cloze Exercises	4	CO2 CO4
5	**Presentation Skills:** **Nonverbal Communication (Body Language):** Kinesics, Oculesics, Paralanguage. Overcoming stage fear, Organising a speech - Preparation, Practise, Delivery **Articulation of Ideas:** How to generate ideas and express them. Fluency development activities like comparing, expressing opinions, agreeing & disagreeing **(SEE Task 3)** Group Discussion	5	CO1,

Text Books:

1. Grammar Practice Activities- Penny Ur, Cambridge University Press
2. Intermediate English Grammar Raymond Murphy Cambridge University Press

Reference Books:

1. Grammar & Composition. New Delhi: S. Chand. ISBN 81-219- 2197-X.
2. Wren, P.C.; Martin, H., A Final Course of Grammar & Composition, S Chand.

Assessment Pattern

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests
Remember	10
Understand	10
Apply	20
Analyse	10
evaluate	
create	

SEE – Semester End Examination (50 Marks)

Bloom's Category	SEE Marks
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	-
Create	-

BASIC APPLIED MATHEMATICS - II	
Course Code: 21DMAT41A	**Credits: 0**
L: T:P :S : 0:0:0:0	**CIE Marks: 50**
Exam Hours : 2	**SEE Marks: 50**

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	Know the basic concepts of Laplace transform to solve the Periodic functions and also solve initial and boundary value problems using Laplace transform method

Mapping of Course Outcomes to Program Outcomes:

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

Sl. No.	Contents of the Module	Hours	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:** Vector differential operator-Gradient of a scalar function, Divergence of a vector function, Curl of a 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 (Shifting property-without proof), Periodic functions (without proof)-problems.	5	CO4
5.	**Inverse Laplace Transform:** Inverse Laplace Transform by partial fractions-Problems, Solution of linear differential equations using Laplace Transforms-Problems.	5	CO4

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, 2014, ISBN: 9788126554232.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.

Reference Books:

1. Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2015, ISBN: 9780273719236.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.
3. H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.
4. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., Ninth Edition, 2014, ISBN: 9788131808320.

Assessment Pattern:

1. CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 Marks)	Assignment-1 (7.5 Marks)	Assignment-2 (7.5 Marks)	Quiz-1 (05 Marks)	Quiz-2 (05 Marks)
Remember	5	2.5	2.5	-	-
Understand	5	2.5	2.5	-	-
Apply	10	2.5	2.5	05	05
Analyze	2.5	-	-	-	-
Evaluate	2.5	-	-	-	-
Create	-	-	-	-	-

2. SEE- Semester End Examination (50Marks)

Bloom's Category	SEE Marks
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	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.

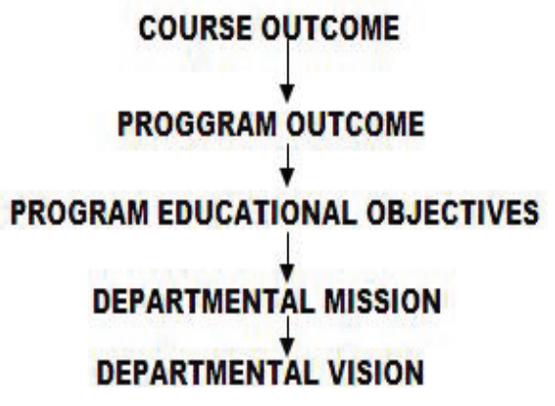
There are three educational Outcomes as defined by the National Board of Accreditation:

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 by straightforward 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 and norms of the engineering practice.

Individual and team work: Function effectively as an individual, and as a member or leader in 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.

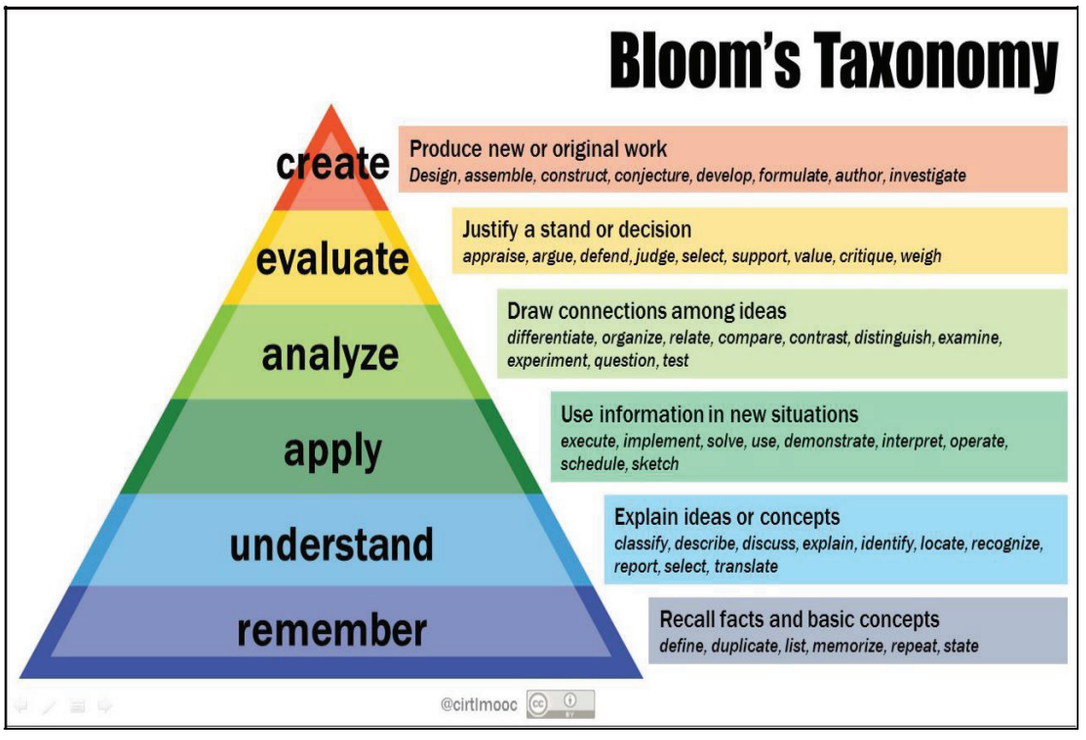
Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Life-long learning: 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.

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.



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