RV Educational Institutions ®
RV College of Engineering ®

Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi

Approved by AICTE, New Delhi

Go, change the world

Scheme & Syllabus of

III & IV Semesters (2021 Scheme)

(AS PER NEP-2020 GUIDELINES)

BACHELOR OF ENGINEERING (B.E)

IN

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

(ACADEMIC YEAR 2022-2023)

VISION

Leadership in Quality Technical Education, Interdisciplinary Research & Innovation, with a Focus on Sustainable and Inclusive Technology

MISSION

1. To deliver outcome based Quality education, emphasizing on experiential learning with the state of the art infrastructure.
2. To create a conducive environment for interdisciplinary research and innovation.
3. To develop professionals through holistic education focusing on individual growth, discipline, integrity, ethics and social sensitivity.
4. To nurture industry-institution collaboration leading to competency enhancement and entrepreneurship.
5. To focus on technologies that are sustainable and inclusive, benefiting all sections of the society.

QUALITY POLICY

Achieving Excellence in Technical Education, Research and Consulting through an Outcome Based Curriculum focusing on Continuous Improvement and Innovation by Benchmarking against the global Best Practices.

CORE VALUES

Professionalism, Commitment, Integrity, Team Work, Innovation

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RV COLLEGE OF ENGINEERING®

(Autonomous Institution Affiliated to VTU, Belagavi)
R.V. Vidyaniketan Post, Mysore Road
Bengaluru – 560 059

Bachelor of Engineering (B.E.)
Scheme and Syllabus of III & IV Semesters

2018 SCHEME

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Department Vision

Imparting quality education in Electronics and Telecommunication Engineering through focus on fundamentals, research and innovation for sustainable development

Department Mission

- Provide comprehensive education that prepares students to contribute effectively to the profession and society in the field of Telecommunication.
- Create state-of-the–art infrastructure to integrate a culture of research with a focus on Telecommunication Engineering Education
- Encourage students to be innovators to meet local and global needs with ethical practice
- Create an environment for faculty to carry out research and contribute in their field of specialization, leading to Centre of Excellence with focus on affordable innovation.
- Establish a strong and wide base linkage with industries, R&D organization and academic Institutions.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO	Description
PEO1	Acquire appropriate knowledge of the fundamentals of basic sciences, mathematics, engineering sciences, Electronics & Telecommunication engineering so as to adapt to rapidly changing technology
PEO2	Think critically to analyze, evaluate, design and solve complex technical and managerial problems through research and innovation.
PEO3	Function and communicate effectively demonstrating team spirit, ethics, respectful and professional behavior.
PEO4	To face challenges through lifelong learning for global acceptance.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO	Description
PSO1	Analyze, design and implement emerging Telecommunications systems using devices, sub-systems, propagation models, networking of Wireless and Wire line communication systems.
PSO2	Exhibit Technical skills necessary to choose careers in the design, installation, testing, management and operation of Telecommunication systems.

Lead Society: Institute of Electrical and Electronics Engineers (IEEE)

ABBREVIATIONS

Sl. No.	Abbreviation	Meaning
1.	VTU	Visvesvaraya Technological University
2.	BS	Basic Sciences
3.	CIE	Continuous Internal Evaluation
4.	SEE	Semester End Examination
5.	PE	Professional Core Elective
6.	GE	Global Elective
7.	HSS	Humanities and Social Sciences
8.	PY	Physics
9.	CY	Chemistry
10.	MA	Mathematics
11.	AS	Aerospace Engineering
12.	AI & ML	Artificial Intelligence & Machine Learning
13.	BT	Biotechnology
14.	CH	Chemical Engineering
15.	CS	Computer Science & Engineering
16.	CV	Civil Engineering
17.	EC	Electronics & Communication Engineering
18.	EE	Electrical & Electronics Engineering
19.	EI	Electronics & Instrumentation Engineering
20.	ET	Electronics & Telecommunication Engineering
21.	IM	Industrial Engineering & Management
22.	IS	Information Science & Engineering
23.	ME	Mechanical Engineering

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Bachelor of Engineering in

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

III SEMESTER

Sl. No.	Course Code	Course Title	Credit Allocation				BoS	Category	CIE Duration (H)	Max Marks CIE		SEE Duration (H)	Max Marks SEE	
			L	T	P	Total				Theory	Lab		Theory	Lab
1	21MA31B*	Linear algebra, Integral transforms and Fourier series	3	1	0	4	MA	Theory	1.5	100	****	3	100	****
2	21BT32A	Environmental Technology	2	0	0	2	BT	Theory	1	50	****	2	50	****
3	21EE33	Linear Integrated Circuits (common with EE / ET/ EI)	3	0	1	4	EE	Theory +Lab	1.5	100	50	3	100	50
4	21EC34	Analysis and Design of Digital Circuits (Common with EC/EE/EI/ET)	3	0	1	4	EC	Theory +Lab	1.5	100	50	3	100	50
5	21ET35	Signal Processing - I	3	1	0	4	ET	Theory	1.5	100	****	3	100	****
6	21ET36	Circuit Analysis	2	0	0	2	ET	Theory	1	50	****	2	50	****
7	21DMA37	Bridge Course: Mathematics	2(A)	0	0	AUDIT	MA	Theory	1.5	50	****	****	****	****
8	21HS38A / 21HS38V	Kannada Course: AADALITHA KANNADA / VYAVAHARIKA KANNADA	1	0	0	1	HSS	Theory	1	50	****	2	50	****
9	21HSAE39 A/B/C/D/E **	Ability Enhancement course	0	0	1	1	HSS	Lab	1	****	50	2	****	50
10	21ETI310	Summer Internship- I	0	0	1	1	ET	Internship	1	****	50	2	****	50
						23								

* Summer Internship-1 will be done after the II semester for 03 Weeks. (Will have CIE & SEE)

ENGINEERING MATHEMATICS - III			
Sl. No	**COURSE TITLE**	**COURSE CODE**	**BRANCHES**
1	Linear algebra, Integral transforms and Number Theory	21MA31A	CS & IS
2	Linear algebra, Integral transforms and Fourier series	21MA31B	AS, EC,EE,EI & ET
3	Integral transforms and Advanced Numerical Methods	21MA31C	BT,CH,CV,IM & ME
4	Mathematical Fundamentals	21MA31D	AI & ML
**			
***** Bridge Course: Audit course for lateral entry diploma students**			
Sl. No	**COURSE TITLE**	**COURSE CODE**	**BRANCHES**
1	Bridge Course Mathematics	21DMA37	AS,BT,CH,CV,EC,EE,EI, IM,ME & ET
2	Bridge Course C Programming	21DCS37	CS,IS & AI & ML

Ability Enhancement Courses		
Sl.No	**COURSE TITLE**	**COURSE CODE**
1	National Service Scheme (NSS)	21HSAE39A
2	National Cadet Corps (NCC)	21HSAE39B
3	Physical Education	21HSAE39C
4	Music / Dance / Theatre	21HSAE39D
5	Art work / Painting / Photography & Film making	21HSAE39E

Bachelor of Engineering in

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

IV SEMESTER

Sl. No.	Course Code	Course Title	Credit Allocation				BoS	Category	CIE Duration (H)	Max Marks CIE		SEE Duration (H)	Max Marks SEE	
			L	T	P	Total				Theory	Lab		Theory	Lab
1	21MA41*	Statistics and Probability for Data Science	2	1	0	**3**	MA	Theory	1.5	**100**	****	**3**	**100**	****
2	21EC42**	Materials for Electronics Engineering (Common with EC/EE/ EI/ET)	2	0	0	2	EC	Theory	1	50	****	2	50	****
3	21EI43	Microcontroller & Programming (Common with EC/EE/ EI/ET)	3	0	1	4	EI	Theory+Lab	1.5	100	50	3	100	50
4	21ET44	Communication Engineering-I	3	0	1	**4**	ET	Theory+Lab	1.5	**100**	**50**	**3**	**100**	**50**
5	21ET45	Principles of Electromagnetics (Common to ET/EE)	3	1	0	**4**	ET	Theory	1.5	**100**	****	**3**	**100**	****
6	21ET4AX	Professional Core Elective – **Group A**	2	0	0	**2**	ET	MOOC	1.5	**50**	****	**2**	**50**	****
7	21ET46	Design Thinking Lab	0	0	2	**2**	ET	Lab	1	****	**50**	**2**	****	**50**
	21DCS47	Bridge Course: C Programming	2 (A)	1	0	**AUDIT**	CS	Theory	1.5	**50**	****	****	****	****
8	21HSU48	Universal Human Values and Professional Ethics	2	0	0	**2**	HSS	Theory	1	**50**	****	**2**	**50**	****
						23								

* Summer Internship-II will be done after the IV Semester for 04 Weeks

* ENGINEERING MATHEMATICS - IV			
Sl. No	**COURSE TITLE**	**COURSE CODE**	**BRANCHES**
1	Statistics and Probability for Data Science	21MA41	AS, AI & ML, CH, CV, CS, EC, EE, ET, EI, IS, ME
2	Biostatistics	21MA41	BT
3	Statistics for Data Analytics	21MA41	IM
4	Statistics and Probability for Data Science	21MA41	AS, AI & ML, CH, CV, CS, EC, EE, ET, EI, IS, ME
**** Mandatory Courses**			
Sl. No	**COURSE TITLE**	**COURSE CODE**	**BRANCHES**
1	Materials for Electronics Engineering	21EC42	EC,EE,EI,ET
2	Bio-Inspired Engineering	21BT42	AI&ML, CS, IS & BT
3	Civil Engineering Materials	21CV42	CV
4	Engineering Materials	21ME42	AS, CH, IM & ME
***** Bridge Course: Audit course for lateral entry diploma students**			
Sl. No	**COURSE TITLE**	**COURSE CODE**	**BRANCHES**
1	Bridge Course Mathematics	21DMA48	CS,IS & AI&ML
2	Bridge Course C Programming	21DCS48	AS,BT,CH,CV,EC,EE,EI,IM, ME & ET

# GROUP A: PROFESSIONAL ELECTIVES (MOOC COURSES)			
Sl. No.	**Course Code**	**Course Title**	**Duration**
1.	21ET4A1	Programming, Data Structures And Algorithms Using Python	8 Weeks
2.	21ET4A2	Design and analysis of algorithms	8 Weeks
3.	21ET4A3	Advanced Computer Architecture	8 Weeks
4.	21ET4A4	Data Base Management System	8 Weeks
5.	21ET4A5	Data Science for Engineers	8 Weeks

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Semester: III						
LINEAR ALGEBRA, INTEGRAL TRANSFORMS AND FOURIER SERIES (Theory) (Common to AS, EC, EE, EI, ET)						
Course Code	**:**	21MA31B		**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	3:1:0		**SEE**	**:**	**100 Marks**
Total Hours	**:**	45L+15T		**SEE Duration**	**:**	**3.00 Hours**

Unit - I	**09 Hrs**
Linear Algebra - I: Vector spaces, subspaces, linear dependence and independence, basis and dimension, four fundamental subspaces. Rank and nullity theorem (without proof). Linear transformations - matrix representation, kernel and image of a linear transformation, dilation, reflection, projection and rotation matrices.	
Unit - II	**09 Hrs**
Linear Algebra - II: Inner Products, orthogonal matrices, orthogonal and orthonormal bases, Gram-Schmidt process, QR-factorization. Eigen values and Eigen vectors, diagonalization of a matrix (symmetric matrices) and singular value decomposition.	
Unit - III	**09 Hrs**
Laplace Transform: Existence and uniqueness of Laplace transform (LT), transform of elementary functions, region of convergence. Properties - linearity, scaling, s - domain shift, differentiation in the s - domain, division by t, differentiation and integration in the time domain. LT of special functions - Periodic functions (square wave, saw-tooth wave, triangular wave, full & half wave rectifier), Heaviside unit step function, unit impulse function.	
Unit - IV	**09 Hrs**
Inverse Laplace Transform: Definition, properties, evaluation using different methods. Convolution theorem (without proof) - problems. Application to solve ordinary linear differential equations.	
Unit - V	**09 Hrs**
Fourier series and Fourier Transforms: Periodic function, even and odd functions. Dirichlet's conditions, Euler's formulae for Fourier series, problems on time periodic signals (square wave, half wave rectifier, saw-tooth wave and triangular wave), Fourier sine series, Fourier cosine series. Fourier integral theorem, complex Fourier and inverse Fourier transform, Fourier sine transform, Fourier cosine transform, properties - linearity, scaling, time-shift and modulation - problems.	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Illustrate the fundamental concepts of linear algebra, Laplace and inverse Laplace transforms, Fourier series and Fourier transforms.
CO2:	Apply the acquired knowledge of linear algebra, Laplace and inverse Laplace transforms, Fourier series and Fourier transforms to solve the problems of engineering applications.
CO3:	Analyze the solution of the problems using appropriate techniques of linear algebra, integral transforms and Fourier series to the real world problems arising in many practical situations.
CO4:	Interpret the overall knowledge of linear algebra, integral transforms and Fourier series gained to engage in life-long learning.

Reference Books	
1	Linear Algebra and its Applications, Gilbert Strang, 4th Edition, 2014, Cengage Learning India Edition, ISBN: 9788131501726, 8131501728.
2	A Text Book of Engineering Mathematics, N.P. Bali & Manish Goyal, 7th Edition, 2010, Lakshmi Publications, ISBN: 978-81-7008-992-6.
3	Higher Engineering Mathematics, B.S. Grewal, 44th Edition, 2015, Khanna Publishers, ISBN: 978- 81-933284-9-1.
4	Linear Algebra and its Applications, David C. Lay, 4th Edition, 2012, Pearson Education India, ISBN-13: 970321385178, ISBN-10: 0321385171.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**40**	
MATLAB	**20**	
Model presentation/ case study/ video preparation	**20**	
MAXIMUM MARKS FOR THE THEORY	**100 MARKS**	**100 MARKS**

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

High-3: Medium-2: Low-1

Semester III						
ENVIRONMENTAL TECHNOLOGY						
Course Code	**:**	**21BT32A/21BT42A**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**2:0:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**26 L**		**SEE Duration**	**:**	**90 min**

Course Learning Objectives: The students will be able to

1	Explain the various components of environment and the significance of the sustainability of healthy environment.
2	Identify the implications of different types of the wastes produced by natural and anthropogenic activity.
3	Develop critical thinking for shaping strategies (scientific,social,economic and legal) for environmental protection and conservation od biodiversity, social equity and sustainable development.
4	Design the models that help mitigate or prevent the negative impact of proposed activity on the environment in line with Sustainable Developmental Goals.

Unit I	08 hrs
Introduction: Climate action – Paris convention, Sustainable Developmental Goals in relation to environment, Components of environment, Ecosystem. Environmental education, Environmental acts & regulations, role of non-governmental organizations (NGOs), EMS: ISO 14000, Environmental Impact Assessment. Environmental auditing.	
Unit II	09 hrs
Pollution and its remedies: Air pollution – point and non-point sources of air pollution and their controlling measures (particulate and gaseous contaminants). Noise pollution, Land pollution (sources, impacts and remedial measures), **Water management:** Advanced water treatment techniques, water conservation methods. **Waste management:** Solid waste, e-waste & biomedical waste – sources, characteristics & disposal methods. Concepts of Reduce, Reuse and Recycling of the wastes. **Waste to Energy:** Different types of Energy, Conventional sources & Non-conventional sources of energy: Solar, Hydro Electric, Wind, Nuclear, Biomass & Biogas Fossil Fuels and Hydrogen.	
Unit III	09 hrs
Environmental design: Green buildings, green materials, Leadership in Energy and Environmental Design (LEED), Hydroponics, Organic Farming, Biofuels, IC engine to E mobility transition and its impacts, Carbon Credits, Carbon Foot Prints, Opportunities for Green Technology Markets, Carbon Sequestration. **Resource recovery system:** Processing techniques, Materials recovery systems, Biological conversion (composting and anaerobic digestion). Thermal conversion products (Combustion, Incineration, Gasification, Pyrolysis, use of Refuse Derived Fuels). Case studies.	

Reference Books	
1	Shashi Chawla, A Textbook of Environmental Studies, McGraw Hill Education, 2017, ISBN: 1259006387,
2	Richard A Schneider and Jerry A Nathanson, Basic Environmental Technology, Pearson, 6th Edition, 2022. ISBN: 9789332575134,
3	G. Tyler Miller (Author), Scott Spoolman (Author), (2020) Environmental Science – 15th edition, Publisher: Brooks Cole, ISBN-13: 978-1305090446 ISBN-10: 130509044
4	Howard S. Peavy, Donald R. Rowe and George Tchobanoglous. 2000. Environmental Engineering, McGraw Hill Education, First edition (1 July 2017). ISBN-10**:** 9351340260, ISBN-13**:** 978-9351340263

Course Outcomes: After completing the course, the students will be able to	
CO1:	Identify the components of environment and exemplify the detrimental impact of anthropogenic activities on the environment.
CO2:	Differentiate the various types of wastes and suggest appropriate safe technological methods to manage the waste.
CO3:	Apply different renewable energy resources and can analyse the nature of waste and propose methods to extract clean energy.
CO4:	Adopt the appropriate recovering methods to recover the essential resources from the wastes for reuse or recycling.

Experiential learning topics	
Assessment of the environment of certain big campuses/areas/industries etc, a case study	
1	Development of data sheet
2	Survey and its record
3	Identifying the problems associated
4	Provide a solution for the identified problem

Experiments to be performed	
1	Data development
2	Working model (in silico or demo model)
3	Preparing a report
4	Brainstorming of the work carried out.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 5 marks adding up to 1**0 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		

Test – I	Each test will be conducted for 25 Marks adding upto 50 marks. Final test marks will be reduced to 2**0 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**20**	
Case Study-based Teaching-Learning	**10**	
Experiments performed	**10**	
MAXIMUM MARKS FOR THE THEORY	**50 MARKS**	**50 MARKS**
TOTAL MARKS FOR THE COURSE	**50**	**100**

Experiential learning evaluation will be evaluated based on the experiments and the preparation, presentation of the topics, equal weightage is given for experiments and theory.

CO PO mapping

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

High-3: Medium-2: Low-1

Semester: III						
LINEAR INTEGRATED CIRCUITS (Theory and Practice) (Common with EE/ET/EI)						
Course Code	**:**	21EE33		**CIE**	**:**	**150 Marks**
Credits: L:T:P	**:**	3:0:1		**SEE**	**:**	**150 Marks**
Total Hours	**:**	42L+0+30P		**SEE Duration**	**:**	**3Hours + 3Hours**

Unit-I	**08 Hrs**
Operational Amplifier Characteristics: Operational Amplifier characteristics, DC performance characteristics of Op-Amp, AC performance characteristics of Op-Amp, Frequency Compensation, Noise, Open-loop op-amp Configurations, Closed-loop Op-Amp Configurations, Differential Amplifier, General description, Manufacturer's Specifications and Electrical Characteristics of the Op-Amp, Power supply Connections.	
Unit – II	**08Hrs**
Applications of Operational Amplifiers: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, Voltage-Controlled Voltage Source, Current Sources, Inverting current Amplifier, Current-Controlled Current Source, Voltage to current converter, Current to Voltage Converter, Adder, Subtractor, Adder-Subtractor, Instrumentation Amplifier, AC amplifier, Integrator, Differentiator. **Waveform Generator:** Sine-wave Generators, Multivibrators, Triangular Wave Generators, Sawtooth Wave Generators, Timer IC 555.	
Unit –III	**09 Hrs**
Voltage Regulators: Basics of Voltage Regulator, Linear Voltage Regulators Using Op-amps, IC Voltage Regulators, three terminal Adjustable Voltage Regulator, General Purpose Regulator, Switched Mode Power Supplies, Voltage Controlled Oscillators. **Operational Amplifier-Non-linear Circuits:** Op-Amp Comparators, Schmitt Trigger, Precision Rectifier, Analog Switches, Peak Detectors, Sample and Hold circuits.	
Unit –IV	**09Hrs**
Active Filters: Introduction, Comparison Between Passive and Active Networks, Active Network Design, Filter Approximations, General Second Order Filter with Unity Gain and Variable Gain, Design of Low-pass Filters. **Types:** High-pass Filters, Bandpass Filters, Band-reject filters, All-pass Filters, State-variable Filters, Impedance Converter, Impedance Gyration, Switched Capacitor Filters, Chebyshev Filters, Butterworth Filters.	
Unit –V	**08Hrs**
D/A and A/D Converters: Analog and Digital Data Conversions, Specifications of D/A Converter, Basic D/A Conversion Techniques, Switches for D/A Converters, Multiplying D/A Converters, Monolithic D/A Converter, Microprocessor Compatible D/A Converter, Sampling Process, High Speed Sample and Hold Circuit, A/D Converters, Specifications of A/D Converter, Classification of A/D Converter, Over-Sampling A/D Converters. **Special Function Integrated Circuits:** Voltage-to-frequency and Frequency to voltage Converters, Series Voltage-to-frequency and Frequency-to-Voltage Converters, Function Generator, Integrated Circuit Tuned Amplifier, Audio Power Amplifier,	

Course Outcomes: After completing the course, the students will be able to:-	
CO 1	Understand the basics of operational amplifiers
CO 2	Analyze the performance of OPAMP and build simple circuits using OPAMP
CO 3	Apply the concepts to design various applications of OPAMP
CO 4	Design a system using various ICs for a specific application.

Reference Books	
1.	Linear integrated circuits, S Shalivahanan, V S Kanchana Bhaskaran, Mc.Grawhill Publications, 2018, ISBN: 10:0-07-064818-2
2.	Electronic Devices and Circuit Theory, Robert L.Boylestad, Louis Nashelsky, 8th Edition, 2010, Pantice-Hall India,.ISBN:81-203-2064-6
3.	Microelectronics circuits Analysis and Design, M.H Rashid,2nd Edition, 2011, Thomson Publication, ISBN:0-534-95174-0
4.	Microelectronics circuits, Sedra & Smith, 5th edition, Oxford Publication, ISBN-13: 978-0195338836
5.	Microelectronics, Millman & Grabel, TMH 2nd Edition, And ISBN13:9780074637364.

Laboratory Component

Hardware design and simulation of the following to be carried out

1. Frequency response of CE amplifier.
2. Design of inverting amplifier, non-inverting amplifier, integrator and Differentiator using IC 741.
3. Half wave and full wave Precision Rectifiers using operational amplifier IC741.
4. Design and implementation of peak detector, Sample and Hold circuit.
5. Design and implement a Schmitt trigger circuit for given UTP & LTP using op-amp.
6. Design and simulation of First order High pass filter, Low pass filter, wide Band Pass filter and wide Band reject filter for the given pass band gain and cut-off frequency and plot the frequency response.
7. Realization of 4 bit DAC using R-2R ladder network and asynchronous decade Counter IC 7490.
8. Realization of ADC
9. Waveform generation circuit.

PART B

Innovative Experiments (IE)

A. Design and implementation square and ramp wave generators for given frequency using operational amplifier IC 741.

B. a. Design and implement Astable multivibrator for a given frequency and duty cycle using NE555 Timer.

b. Design of Monostable multivibrator for a given frequency using NE 555 timer.

C. Design of Voltage Regulator using IC 7900.

D. Generation of ramp wave for a given frequency using NE555 timer.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**40**	
Case Study-based Teaching-Learning	**10**	
Applications of Linear Integrated Circuits	**20**	
Video based seminar (4-5 minutes per student)	**10**	
MAXIMUM MARKS FOR THE THEORY	**100 MARKS**	**100 MARKS**
PRACTICALS	**50**	**50**
TOTAL MARKS FOR THE COURSE	**150**	**150**

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

High-3: Medium-2 : Low-1

Semester: III						
ANALYSIS AND DESIGN OF DIGITAL CIRCUITS (Theory & Practice) (Common to EC, EE, EI & ET)						
Course Code	:	21EC34		**CIE**	:	100+50 Marks
Credits: L:T:P	:	3:0:1		**SEE**	:	100+50 Marks
Total Hours	:	42 L+30P		**SEE Duration**	:	3Hours + 3 Hours

Unit-I	**08 Hrs**
Number System: Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray Codes and Conversion. Sum of products and Product of sums, Minterm and Maxterm, Karnaugh map Minimization. (Up to 4 Variables). Quine-McCluskey method of minimization. **Digital Integrated Circuits: Digital IC Logic Families**: TTL family, Propagation delay, Power Dissipation, noise margin,fan-out, and fan-in.	
Unit – II	**08 Hrs**
Combinational Logic Design: Design of Half and Full Adders, Half and Full Subtractors using Universal gates., Binary Parallel Adder /Subtractor– Carry look ahead Adder, BCD Adder, Multiplier, Magnitude Comparator, Multiplexer, Demultiplexer, Decoder, Encoder, Priority Encoder, Parity Bit Generator/Checker.	
Unit –III	**09 Hrs**
Introduction, Latches and Flip Flops: Triggering of Flip Flops, Characteristics Equation Flip Flop Excitation Tables, Flip-Flop conversions. Propagation delay, setup and hold time. **Synchronous Sequential Circuits Design:** Introduction to FSM (Mealy and Moore), Analysis of Clocked Sequential Circuits, State table and Reduction, State Diagram, Design of synchronous Counter (mod-n counter), Integrated Circuit Synchronous Counter.	
Unit –IV	**09 Hrs**
Asynchronous Sequential Circuit Design: Design of Ripple/Asynchronous Counter (mod-n counter), Effects of Propagation delay in Ripple Counter, Integrated Circuit Ripple Counter. **Registers:** Registers, Shift Registers and Various Operations, Ring counters, Johnson counters, Design of Sequence Detector and Sequence Generators (PRBS), Serial Adder/Subtractor Design.	
Unit –V	**08 Hrs**
ALU design: Processor Organization, Design of Arithmetic Unit, Design of Logic unit, Design of Arithmetic and Logic unit, Status Register, Design of Shifter, The Complete Processor unit and op-code generation.	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Analyse and implement different types of digital circuits for area, delay and power constraints.
CO2:	Comprehend the knowledge of digital circuits to construct combinational and sequential sub-systems useful for digital system designs.
CO3:	Design of digital circuits for a particular application using simulation and hardware implementation.
CO4:	Evaluate the performance of different digital circuits to apply in real world applications.

Practical's:

1. Realization of arithmetic circuits using basic gates and IC's
2. Realization of combinational circuits using IC's
3. Realization of sequential circuits using IC's
4. Realization of Memory elements using IC's
5. To study the working of arithmetic logic unit using IC 74181

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**40**	
Simulation Exercises using Logisim/Vivado	**20**	
Self-paced learning & assessment using videos	**10**	
Class room group activity	**10**	
MAXIMUM MARKS FOR THE THEORY	**100 MARKS**	**100 MARKS**
PRACTICALS	**50**	**50**
TOTAL MARKS FOR THE COURSE	**150**	**150**

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

High-3: Medium-2 : Low-1

Semester: III						
Signal Processing - I						
Course Code	**:**	**21ET35**		**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:1:0**		**SEE**	**:**	**100 Marks**
Total Hours	**:**	**45L + 15T**		**SEE Duration**	**:**	**03 Hours**

Unit-I	**09 Hrs**
Introduction to Signals and Systems: Definition of Signals and Systems, Classification of Signals, Basic Operations on Signals: Operations Performed on the Independent and Dependent Variable, Precedence Rule, Elementary Signals, System Viewed as Interconnection of Operations, Properties of Systems.	
Unit – II	**09 Hrs**
Time-Domain Representation of Discrete-Time Systems: Convolution Sum, Convolution Sum evaluation procedure, Interconnections of LTI Systems, Properties of the Impulse Response Representations for DT-LTI Systems, **Fourier Analysis of Signals:** Introduction, Computation of FT and DTFT and its Inverse.	
Unit –III	**09 Hrs**
Frequency Response and Impulse Response of the system using DTFT, Sampling concept, Sampling theorem. **Discrete Fourier Transform:** Computation of DFT and IDFT, DFT and Inverse DFT as a Linear Transformation, Properties of DFT, Spectrum, Numericals.	
Unit –IV	**09 Hrs**
Discrete Fourier Transform: Use of DFT in Linear Filtering, Filtering of Long Data Sequences. **FFT Algorithms:** Direct Computation of the DFT, Comparison with FFT, Implementation of Radix-2 FFT Algorithms for computation of DFT and IDFT. **Applications of FFT Algorithms:** Efficient Computation of the DFT of Two Real Sequences, Efficient computation of DFT of a 2N – Point Real Sequence.	
Unit –V	**09 Hrs**
Z-Transforms: Z-Transform, RoC, Properties of the Z-Transforms, Poles and zeros, Inversion of the Z-Transform. **LTI Systems:** Transfer Function, Causality and Stability, Inverse Systems and System Identification. Unilateral Z-Transform and Solution of Difference Equations.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Explain the fundamental concepts of the signals and systems in time domain.
CO2	Analyze discrete time signals in time, frequency, and Z-domain.
CO3	Apply efficient methods for the computation of frequency domain representation and vice-versa.
CO4	Evaluate the LTI systems in time, frequency, and Z-domain.

Reference Books	
1	Signals and Systems, Simon Haykin and Barry Van Veen, John Wiley & Sons, 2nd Edition, 2014. ISBN: 978-81-265-1265-2
2	Digital Signal Processing, John G. Proakis and Dimitris G. Manolakis, Pearson Education, 4th Edition, 2014. ISBN: 81-317-1000-9
3	Signals and Systems, Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, Prentice Hall, 2nd Edition, 2006. ISBN 0-13–814757–4
4	Signals and Systems, Hwei P. Hsu, Schaum's Outlines, McGraw-Hill, 2nd Edition, 2011. ISBN 0-07-030641-9

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**40**	
Case Study-based Teaching-Learning	**10**	
Applications of Signal and systems	**20**	
Video based seminar (4-5 minutes per student)	**10**	
MAXIMUM MARKS FOR THE THEORY	**100 MARKS**	**100 MARKS**
TOTAL MARKS FOR THE COURSE	**100**	**100**

CO-PO Mapping

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

High-3: Medium-2: Low-1

Semester: III						
Circuit Analysis						
Course Code	**:**	**21ET36**		**CIE**	**:**	**050 Marks**
Credits: L:T:P	**:**	**2:0:0**		**SEE**	**:**	**050Marks**
Total Hours	**:**	**30L**		**SEE Duration**	**:**	**02 Hours**

Unit-I	**10 Hrs**
Introduction: Practical sources, source transformation, source shifting, Loop and Node analysis with linear dependent and independent sources for DC and AC networks. Principle of duality. **Network Theorems:** Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power transfer and Millman's theorems.	
Unit – II	**10 Hrs**
Two port networks: Z, Y, ABCD and Hybrid parameters, their inter-relationship, and numerical problems. **Resonance in Networks:** Series and parallel resonance, Q-factor, Bandwidth, and response by varying R, L, C.	
Unit –III	**10 Hrs**
Transient Behaviour and Initial Conditions: Behavior of circuit elements under switching conditions and their representation. Evaluation of initial and final conditions in R-L, R-C, and R-L-C for DC and AC excitations.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the basic concepts of circuits, theorems, 2 port network parameters, and the applications of resonance circuits.
CO2	Apply the basic concepts and solve circuits with DC or AC excitation using theorems and transformations.
CO3	Apply the concepts of two-port theory in forming the basis for the analysis of linear electronic systems.
CO4	Compare the steady state and transient response of a circuit through application of Laplace transforms.

Reference Books	
1	Engineering Circuit Analysis - William H. Hayt, Jack E. Kemmerly, Jamie D. Phillips, Steven M. Durbin. McGraw Hill, 9th Edition (November 2020), ISBN-10 : 9390185130, ISBN-13: 978-9390185139.
2	Electric circuits - Joseph Edminister and Mahmood Nahvi, McGraw Hill, 7th Edition,2017, ISBN-10 : 1260011968, ISBN-13 : 978-1260011968
3	Schaum's Outline of Electric Circuits - Nahvi, Mahmood, and Joseph A. Edminister, 7th ed. 2018, McGraw-Hill Education, ISBN: 9781260011968

4	Network Analysis and Synthesis - Singh Ravish,R, McGraw-Hill; Second edition (1 May 2019), ISBN-10 : 9353166721 , ISBN-13 : 978-9353166724

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks to **10 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating) scale down		
Test – I	Each test will be conducted for 40 Marks adding up to 80 marks. Final test marks will be reduced to **20 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**20**	
Case Study-based Teaching-Learning	**5**	
Applications of Network and Circuit analysis	**10**	
Video based seminar (4-5 minutes per student)	**05**	
MAXIMUM MARKS FOR THE THEORY	**50 MARKS**	**50 MARKS**
TOTAL MARKS FOR THE COURSE	**50**	**50**

CO-PO Mapping

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

High-3: Medium-2: Low-1

Semester: III						
Bridge Course: MATHEMATICS (AS, BT, CH, CV, EC, EE, EI, IM, ME, TE)						
Course Code	**:**	21DMA37		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	2:0:0				
Audit Course						

Unit-I	**05 Hrs**
Differential Calculus: Partial derivatives – Introduction, simple problems. Total derivative, composite functions. Jacobians – simple problems.	
Unit – II	**05 Hrs**
Vector Differentiation: Introduction, simple problems in terms of velocity and acceleration. Concepts of gradient, divergence – solenoidal vector function, curl – irrotational vector function and Laplacian, simple problems.	
Unit –III	**06 Hrs**
Differential Equations: Higher order linear differential equations with constant coefficients, solution of homogeneous equations-Complementary functions. Non-homogeneous equations –Inverse differential operator method of finding particular integral based on input function (force function).	
Unit –IV	**05 Hrs**
Numerical Methods: Solution of algebraic and transcendental equations – Intermediate value property, Newton-Raphson method. Solution of first order ordinary differential equations – Taylor series and 4^{th} order Runge-Kutta methods. Numerical integration – Simpson's $1/3^{rd}$, $3/8^{th}$ and Weddle's rules. (All methods without proof)**.**	
Unit –V	**05 Hrs**
Multiple Integrals: Evaluation of double integrals, change of order of integration. Evaluation of triple integrals. Applications – Area, volume and mass – simple problems.	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Illustrate the fundamental concepts of partial differentiation, double integrals, vector differentiation, solutions of higher order linear differential equations and numerical methods.
CO2:	Derive the solution by applying the acquired knowledge of total derivatives of implicit functions, Jacobians, homogeneous linear differential equations, velocity and acceleration vectors to the problems of engineering applications.

CO3:	Evaluate the solution of the problems using appropriate techniques of differential and integral calculus, vector differentiation, differential equations and numerical methods to the real-world problems arising in many practical situations.
CO4:	Compile the overall knowledge of differential and integral calculus, vector differentiation, differential equations and numerical methods gained to engage in life – long learning.

Reference Books	
1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2015, ISBN: 978-81-933284-9-1.
2	Higher Engineering Mathematics, B.V. Ramana, 11th Edition, 2010, Tata McGraw-Hill, ISBN: 978-0-07-063419-0.
3	N.P. Bali & Manish Goyal, A Text Book of Engineering Mathematics, Lakshmi Publications, 7th Edition, 2010, ISBN: 978-81-31808320.
4	Advanced Engineering Mathematics, E. Kreyszig, 10th Edition (Reprint), 2016. John Wiley & Sons, ISBN: 978-0470458365.

Continuous Internal Evaluation (CIE); Theory (50 Marks)

CIE is executed by way of quizzes (Q) and tests (T). A minimum of two quizzes are conducted and each quiz is evaluated for 10 marks adding up to 20 marks. The two tests are conducted for 30 marks each and the sum of the marks scored from two tests is reduced to 30. Total CIE is 20(Q) +30(T)=50 Marks.

Semester: III						
Course Title: National Service Scheme (Practical)						
Course Code	**:**	**21HSAE39A/21HSAE46A**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**0:0:1**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**L + T + 13 P**		**SEE Duration**	**:**	**2 Hours**

Prerequisites:
1. Students should have service-oriented mindset and social concern.
2. Students should have dedication to work at any remote place, any time with available resources and proper timemanagement for the other works.
3. Students should be ready to sacrifice some of the timely will and wishes to achieve service-oriented targets ontime.

Content	**13 Hours**

Students must take up any one activity on below mentioned topics and has to prepare contents for awareness and technical contents for implementation of the projects and has to present strategies for implementation of the same. Compulsorily must attend one camp.
CIE will be evaluated based on their presentation, approach, and implementation strategies. (Any one of the below mentioned activity)

1. Helping local schools to achieve good result and enhance their enrolment in Higher/technical/ vocational education.
2. Preparing an actionable business proposal for enhancing the village/ farmer income and approach for implementation.
3. Developing Sustainable Water management system for rural/ urban areas and implementation approaches.
4. Setting of the information imparting club for women leading to contribution in social and economic issues.
5. Spreading public awareness/ government schemes under rural outreach program. (Minimum 5 programs)
6. Contribution to any national level initiative of Government of India. For eg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc..
7. Social connect and responsibilities
8. Plantation and adoption of plants. Know your plants
9. Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing
10. Waste management – Public, Private and Govt organization, 5 R's
11. Water conservation techniques – Role of different stakeholders - Implementation
12. Govt. School Rejuvenation and assistance to achieve good infrastructure.
13. Organize National integration and social harmony events/ workshops / seminars. (Minimum 2

programs)

AND ONE NSS-CAMP

Course Outcomes: After completing the course, the students will be able to	
CO1:	Understand the importance of his/her responsibilities towards society.
CO2:	Analyze the environmental and societal problems/ issues and will be able to design solutions for thesame.
CO3:	Evaluate the existing system and to propose practical solutions for the same for sustainable development.
CO4:	Implement government or self-driven projects effectively in the field.

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1) Justification for Importance, need of the hour withsurveyed data.	**10**	*****

EXPERIENTIAL LEARNING Presentation 2 (phase 2) Content development, strategies for implementationmethodologies.	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the project with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

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

High-3: Medium-2: Low-1

Semester: III						
Course Title: National Cade Corps (NCC) (Practical)						
Course Code	**:**	**21HSAE39B/ 21HSAE46B**		**CIE**	**:**	**50 Marks**
Credits: L: T:P	**:**	**0:0:1**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**15 P**		**SEE Duration**	**:**	**2 Hrs**

Unit 1	**7 Hrs**
Drill (Contact Hrs. 12). Foot Drill- Drill ki Aam Hidayaten, Word ki Command, Savdhan, Vishram, Aram Se, Murdna, Kadvar Sizing, Teen Line Banana, Khuli Line, Nikat Line, Khade Khade Salute Karna	
Unit 2	**3 Hrs**
Weapon Training (WT): Introduction & Characteristics of 7.62 Self Loading rifle, Identification of rifle parts	
Unit 3	**3 Hrs**
Adventure activities: Trekking and obstacle course	
Unit 4	**2 Hrs**
Social Service and Community Development (SSCD): Students will participate in various activities throughout the semester e.g., Blood donation Camp, Swachhata Abhiyan, Constitution Day, All National Festival	

Course Outcomes: Cadets will be able to: -	
CO1	Understand that drill as the foundation for discipline and to command a group for commongoal.
CO2	Understand the importance of a weapon its detailed safety precautions necessary for prevention of accidents and identifying the parts of weapon
CO3	Understand that trekking will connect human with nature and cross the obstacles to experience army way of life.
CO4	Understand the various social issues and their impact on social life, Develop the sense of self-less social service for better social & community life.

Reference Books	
1	NCC Cadet Hand Book by R K Gupta, Ramesh Publishing House, New Delhi, Book code:R-1991, ISBN: 978-93-87918-57-3, HSN Code: 49011010
2	nccindia.ac.in

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	SEE
Drill Skill Test	**20**	*****
Weapon Training	**10**	*****
Adventure activities	**10**	Report on adventure and social service
Social service activities	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

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

High-3: Medium-2: Low-1

Semester: III						
PHYSICAL EDUCATION (SPORTS & ATHLETICS) (Practical)						
Course Code	:	**21HSAE39A/21HSAE46A**		**CIE**	:	**50 Marks**
Credits: L:T:P	:	**0:0:1**		**SEE**	:	**50 Marks**
Total Hours	:	**L + T + 13 P**		**SEE Duration**	:	**2 Hours**

Introduction of Physical Education and Sports			
General & Specific warm up exercises Conditioning exercises Any 2 Major Games Intramural Competitions			
Choose any one according to serial no			
1. Kho-Kho	Giving Kho, Single chain, Poledive, Pole turning, 3-6 Up	**6. Kabaddi**	Hand touch, Chain hold, Anklehold, Thigh hold, Getting bonus
2. Throwball	Service, Receive, Spin pass, Simple pass, Jump throw	**7. Volleyball**	Attack, Block, Service, Upper hand pass, Lower hand pass
3. Netball	Step with ball, Shooting, Passing, Blocking	**8. Handball**	Step with ball, Shooting, Passing, Blocking, Dribbling
4. Softball	Catching, Pitching, Slugging, Base Running, Stealing	**9. Football**	Dribbling, Chest Drop, Ball Control, Thigh Drop, Shooting
5. Ball badminton	Service, Fore hand receive, Backhand receive, Spin smash, Rally	**10. Table Tennis**	Service, Fore hand receive, Backhand receive, Smash, Rally

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the basic principles and practices of Physical Education and Sports.
CO2	Instruct the Physical Activities and Sports practices for Healthy Living
CO3	To develop professionalism among students to conduct, organize & Officiate Physical Education and Sports events at schools and community level

Topics for Viva:

1. On rules and regulations pertaining to the games / sports
2. On dimensions of the court, size / weight of the ball and standards pertaining to that sports / game
3. Popular players and legends at state level / National level/ International level
4. Recent events happened and winner / runners in that particular sport / game
5. General awareness about sport / game, sports happenings in the college campus

Reference Books	
1	Muller, J. P. (2000). Health, Exercise and Fitness. Delhi: Sports.
2	Vanaik.A (2005) Play Field Manual, Friends Publication New Delhi
3	IAAF Manual
4	M.J Vishwanath, (2002) Track and Field Marking and Athletics Officiating Manual, SilverStar Publication, Shimoga
5	Steve Oldenburg (2015) Complete Conditioning for Volleyball, Human Kinestics.
Note: Skills of Sports and Games (Game Specific books) may be referred	

ASSESSMENT AND EVALUATION PATTERN CIE-50 MARKS		
Activity book- **10** marks		
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marksadding up to **20 MARKS.**	
Quiz-II		
Test – I	Demonstration of skills is evaluated for10 marks adding up to **20 MARKS.**	
Test – II		
ASSESSMENT AND EVALUATION PATTERN SEE-50 MARKS		
Practical	**30 marks**	
Viva voce	**20 marks**	
Total	**50 marks**	

Rubric for CIE (2022 Scheme)		
Sl. No.	**Content**	**Marks**
1	Attendance	10
2	Performing Skills (Any Two)	20
3	Court measurement (Markings)	20
	Total:	**50**

Rubric for SEE (2022 Scheme)		
Sl. No.	**Content**	**Marks**
1	Performing Skills (Any Two)	30
2	Viva	20
	Total:	**50**

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

High-3: Medium-2: Low-1

Semester: III						
Course Title: Music (Practical)						
Course Code	**:**	**21HSAE39D1/ 21HSAE46D1**		**CIE**	**:**	**50 Marks**
Credits: L:T:P		**0:0:1**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**13P**		**SEE Duration**	**:**	**2 Hours**

Prerequisites:

1. Students should know basics of music.
2. Students should have dedication to learn and improve on their musical skills.
3. Students should have participated in musical events and have basic knowledge on how to present their music.

Content	**13 Hours**

1. Introduction to different genres of music
2. Evolution of genres in India: Inspiration from the world
3. Ragas, time and their moods in Indian Classical Music
4. Identification of ragas and application into contemporary songs
5. Adding your touch to a composition
6. Maths and Music: A demonstration
7. Harmonies in music
8. Chords: Basics and application into any song
9. Music Production-I
10. Music Production-II

Students have to form groups of 2-4 and present a musical performance/ a musical task which shall be given by the experts. The experts shall judge the groups and award marks for the same.

CIE will be evaluated based on their presentation, approach and implementation strategies. Students need to submit their certificates of any event they participated or bagged prizes in. This shall also be considered for CIE evaluation.

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand basics of Music and improve their skills
CO2	Appreciate the impacts on health and well being

CO3	Perform and present music in a presentable manner
CO4	Develop skills like team building and collaboration

Reference Books	
1.	Music Cognition: The Basics by Henkjan Honing
2.	Basic Rudiments Answer Book - Ultimate Music Theory: Basic Music Theory Answer Book by Glory StGermain
3.	Elements Of Hindustani Classical Music by Shruti Jauhari
4.	Music in North India: Experiencing Music, Expressing Culture (Global Music Series) by George E. Ruckert

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1)	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2)	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the project with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

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

High-3: Medium-2: Low-1

Semester: III						
Course Title: Dance (Practical)						
Course Code	:	**21HSAE39D2/ 21HSAE46D3**		**CIE**	:	**50 Marks**
Credits: L:T:P		**0:0:1**		**SEE**	:	**50 Marks**
Total Hours	:	**13P**		**SEE Duration**	:	**2 Hours**

Prerequisites:

1. Students should have the will and interest to learn dancing.
2. Students should have a positive mindset.
3. Students should be willing to interact and cooperate in group activities.

Content	13 Hours

1. Introduction to Dance
2. Preparing the body for dancing by learning different ways to warm up.
3. Basics of different dance forms i.e. classical, eastern, and western.
4. Assessing the interest of students and dividing them into different styles based on interaction.
5. Advancing more into the styles of interest.
6. Understanding of music i.e. beats, rhythm, and other components.
7. Expert sessions in the respective dance forms.
8. Activities such as cypher, showcase to gauge learning.
9. Components of performance through demonstration.
10. Introduction to choreographies and routines.
11. Learning to choreograph.
12. Choreograph and perform either solo or in groups.

Course Outcomes: After completing the course, the students will be able to	
CO1:	Understand the fundamentals of dancing.
CO2:	Adapt to impromptu dancing.
CO3:	Ability to pick choreography and understand musicality.
CO4:	To be able to do choreographies and perform in front of a live audience.

Reference Books	
1	Dance Composition: A practical guide to creative success in dance making by Jacqueline M. Smith-Autard

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1)	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2)	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the project with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

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

High-3: Medium-2: Low-1

Semester: III						
Course Title: Lights Camera Drama (Practical)						
Course Code	**:**	**21HSAE39D3/ 21HSAE46D3**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**0:0:1**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**13P**		**SEE Duration**	**:**	**2 Hours**

Prerequisites:

1. Students should have creative oriented mindset and social concern.
2. Students should have dedication to work with their classmates for long hours until a collective goal is reached.
3. Students should be ready to sacrifice some of the timely will and wishes to achieve targets on time.

Content	**13 Hours**

1. **Break the ICE**
2. **Introduction to freedom** Talk to each and every single person for a period of 5 complete minutes**.** This is aimedat to make everyone in the room comfortable with each other. This helps everyone get over social anxiety, Shyness and Nervousness.
3. **Ura**
4. **Rhythm Voice Projection, Voice Modulation, Weeping & Coughing** Voice projection is the strength of speaking or singing whereby the voice is used powerfully and clearly. It is a technique employed to command respectand attention, as when a teacher talks to a class, or simply to be heard clearly, as used by an actor in a theatre.
5. **It's Leviosa, Not Leviosaaa!**
6. **Speech work: Diction, Intonation, Emphasis, Pauses, Pitch and Volume Tempo Dialogues delivery.** The artof dialogue delivery plays a vital role in in ensuring the efficacy of communication especially from the dramatic aspect of it, this unit discusses some tips to help the young actors improve their dialogue delivery skills:
7. **Elementary, My dear Watson.**
8. **Responsibilities of an actor tools of an actor character analysis** Observations aspects, Stage presence, concentration, conviction, confidence, energy and directionality.
9. **Show time**
10. **Pick a genre: COMEDY, THRILLER, HORROR, and TRAGEDY: Showcase a performance.** Stylized acting with reference to historical and mythological plays. **Mime**: conventional, occupational and pantomime **Mono acting:** different types of characters

Course Outcomes: After completing the course, the students will be able to	
CO1:	Develop a range of Theatrical Skills and apply them to create a performance.
CO2:	Work collaboratively to generate, develop and communicate ideas.
CO3:	Develop as creative, effective, independent and reflective students who are able to make inform edchoices in process and performance.
CO4:	Develop an awareness and understanding of the roles and processes undertaken in contemporary professional theatre practice.

CIE's will be evaluated through mono-acting or dialogue. The students need to use whatever they've learnt through the course of the drama class. Judges/Teachers can award the marks accordingly. Certificates won outside of college, can be submitted for evaluation as well. For SEE's. Students need to form groups of 4-6. They need to pick a genre and enact a play of at least 20 mins long. The venue will be IEM auditorium. No mics should be used. They will be given 2 weeks to prepare.

Reference Books	
1	The Empty Space by Peter Brook
2	The Viewpoints Book: A Practical Guide to Viewpoints and Composition by Anne Bogart and Tina Landau

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of Script (phase 1)	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2)	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementationstrategies of theproject with report
Interpretation of Script	**10**	
Performance based seminar (20 mins long)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

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

High-3: Medium-2: Low-1

Semester: III						
Course Title: Art (Practical)						
Course Code	:	**21HSAE39D4/ 21HSAE46D4**		**CIE**	:	**50 Marks**
Credits: L:T:P		**0:0:1**		**SEE**	:	**50 Marks**
Total Hours	:	**13P**		**SEE Duration**	:	**2 Hours**

Prerequisites:
Although there are no prerequisite qualifications for this subject, students must have a basic understanding of and interest in the fields of art and design in order to enroll in it.

Content	**13 Hours**

1. Use points, line and curves to create various shapes and forms
2. Use of shapes and forms to create various objects and structures
3. Recognizing distinctions in objects when viewed from various perspectives and grasping basic notions of perspective
4. Students will be introduced to the significance of color in art, as well as the principles of color theory and application.
5. Applied the concepts of unity, harmony, balance, rhythm, emphasis and proportion, abstraction and stylization tocreate a composition.
6. Learn how to use which materials and for what types of art and textures.
7. Use of the above concepts to create art through the medium of collage, mosaic, painting, mural, batik, tie and dye.
8. Real world application of the above concepts in the form of book cover design and illustration, cartoon, poster,advertisements, magazine, computer graphics and animation
9. Familiarization with the many art forms and techniques of expression found throughout India.

AND

ONE EDUCATIONAL VISIT TO AN ART MUSEUM / INSTITUTE / GALLERY

Students must turn in assignments for each of the above said topics on a weekly basis and have to compulsorily take part in the museum visit. CIE will be evaluated based on a still life piece, a composition using any one of the media of composition and a presentation on Indian art styles and creation of a piece pertaining to the presented art style.

Reference Books	
1.	Catching the Big Fish: Meditation, Consciousness, and Creativity by David Lynch
2.	Art & Fear: Observations on the Perils (and Rewards) of Artmaking by David Bayles & Ted Orland

Course Outcomes: After completing the course, the students will be able to	
CO1:	To use lines, shapes, and colors to depict the various sentiments and moods of life and nature.
CO2:	To use one's creativity to develop forms and color schemes, as well as the ability to portray them effectively indrawing and painting on paper.
CO3:	To develop the ability to properly use drawing and painting materials (surfaces, tools and equipment, and so on).
CO4:	To improve their observation abilities by studying everyday items as well as numerous geometrical and non- geometrical (i.e. organic) shapes found in life and nature and to hone their drawing and painting talents in response to these insights.

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	SEE
Presentation 1- Selection of topic- (phase 1)	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2)	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the project with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

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

High-3: Medium-2: Low-1

Semester: III						
Course Title: Photography (Practical)						
Course Code	**:**	**21HSAE39D5/ 21HSAE46D5**		**CIE**	**:**	**50 Marks**
Credits: L:T:P		**0:0:1**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**13P**		**SEE Duration**	**:**	**2 Hours**

Prerequisites:

1. Students should know basics of photography and cinematography.
2. Students should have dedication to learn and improve on their photography and film making skills.
3. Students should have participated in photography events.
4. Students should have a DSLR camera.

Content	**13 hours**
1. Introduction to photography. 2. Understanding the terminologies of DSLR. 3. Elements of photography. 4. Introduction to script writing, storyboarding. 5. Understanding the visualization and designing a set. 6. Basics of film acting 7. Video editing using software 8. Introduction to cinematography. 9. Understanding about lighting and camera angles. 10. Shooting a short film.	

Students must form groups of 2-4 and present a short film which shall be given by the experts. The experts shalljudge the groups and award marks for the same.
CIE will be evaluated based on their presentation, approach and implementation strategies. Students need to submit their certificates of any event they participated or bagged prizes in. This shall also be considered for CIEevaluation.

Course Outcomes: After completing the course, the students will be able to	
CO1:	Understand basics of photography and videography and improve their skills
CO2:	Appreciate the skills acquired from photography
CO3:	Perform and present photos and films in a presentable manner
CO4:	Develop skills like team building and collaboration

Reference Books	
1.	Read This If You Want to Take Great Photographs – Henry Carroll
2.	The Digital Photography Book: Part 1 – Scott Kelby

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1)	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2)	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementationstrategies of theproject with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

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

High-3: Medium-2: Low-1

Semester III							
Course Title: SUMMER INTERNSHIP-I (Practice)							
Course Code	**:**	**21ETI310**			**CIE Marks**	**:**	**50 Marks**
Credits: L:T:P	**:**	**0:0:2**			**SEE Marks**	**:**	**50 Marks**
Total Hours	**:**	**3 Weeks**			**SEE Duration**	**:**	**1 Hours**

Guidelines	**3 Weeks**

1. A minimum of 1 credit of internship after I year may be counted towards B.E. degree program.
2. During II semester to III semester transition, Three weeks of internship is mandatory.
3. Internship report and certificate need to be submitted at the end of the internship to the concerned department for the evaluation.
4. Internship evaluation will be done during III semester for 1 credit in two phases.
5. Students can opt the internship with the below options:

A. **Within the respective department at RVCE (Inhouse)**

Departments may offer internship opportunities to the students through the available tools so that the students come out with the solutions to the relevant societal problems that could be completed within THREE WEEKS.

B. At RVCE Center of Excellence/Competence

RVCE hosts around 16 CENTER OP EIXCELLENCE in various domains and around 05 CENTER OP COMPETENCE. The details of these could be obtained by visiting the website https:/ /rvce.edu.in / rvce-center-excellence. Each center would be providing the students relevant training/internship that could be completed in three weeks.

C. At Intern Shala

Intern Shala is India's no.1 internship and training platform with 40000+ paid internships in Engineering. Students can opt any internship for the duration of three weeks by enrolling on to the platform through https: / /internsha1a.com

D. At Engineering Colleges nearby their hometown

Students who are residing out of Bangalore, should take permission from the nearing Engineering College of their hometown to do the internship. The nearby college should agree to give the certificate and the letter/email stating the name of the student along with the title of the internship held with the duration of the internship in their official letter head.

E. At Industry or Research Organizations

Students can opt for interning at the industry or research organizations like BEL, DRDO, ISRO, BHEL, etc.. through personal contacts. However, the institute/industry should provide the letter of acceptance through hard copy/email with clear mention of the title of the work assigned along with the duration and the name of the student.

Go, change

Procedures for the Internship:

1. Request letter/Email from the office of respective departments should go to

Places where internships are intended to be carried out with a clear mention of the duration of Three Weeks. Colleges/Industry/ CoEs/CoCs will confirm the training slots and the number of seats allotted for the internship via confirmation letter/ Email.

2. Students should submit a synopsis of the proposed work to be done during internship program. Internship synopsis should be assessed or evaluated by the concerned Colleges/Industry/CoEs/CoC. Students on joining internship at the concerned Colleges/Industry/ CoEs/CoCs submit the Daily log of student's dairy from the joining date.

3. Students will submit the digital poster of the training module/project after completion of internship.

4. Training certificate to be obtained from industry.

Course Outcomes: After completing the course, the students will be able to	
CO1:	Develop communication, interpersonal,critical skills,work habits and attitudes necessary for employment.
CO2:	Assess interests,abilities in their field of study, integrate theory and practice and explore career opportunities prior to graduation.
CO3:	Explore and use state of art modern engineering tools to solve societal problems with affinity towards the environment and involve in professional ethical practice.
CO4:	Compile, document and communicate effectively on the internship activities with the engineering community.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
Phase – I	**20**	**50**
Phase- II	**30**	
TOTAL MARKS FOR THE COURSE	**50**	

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

High-3: Medium-2: Low-1

Semester: IV						
STATISTICS AND PROBABILITY FOR DATA SCIENCE (Theory) (Common to ALL Programs)						
Course Code	**:**	21MA41		**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	2:1:0		**SEE**	**:**	**100 Marks**
Total Hours	**:**	30L+15T		**SEE Duration**	**:**	**3.00 Hours**

Unit-I	**06 Hrs**
Statistics: Central moments, mean, variance, coefficients of skewness and kurtosis in terms of moments. Correlation analysis, rank correlation, linear and multivariate regression analysis – problems.	
Unit – II	**06 Hrs**
Random Variables: Random variables-discrete and continuous, probability mass function, probability density function, cumulative density function, mean and variance. Two or more random variables - Joint probability mass function, joint probability density function, conditional distribution and independence, Covariance and Correlation.	
Unit –III	**06 Hrs**
Probability Distributions: Discrete distributions - Binomial, Poisson. Continuous distributions – Exponential, Normal and Weibul.	
Unit –IV	**06 Hrs**
Sampling and Estimation: Population and sample, Simple random sampling (with replacement and without replacement). Sampling distributions of means (σ known), Sampling distributions of mean (σ unknown): t - distribution, Sampling distributions of variance (σ unknown): Chi - squared distribution. Estimation - Maximum Likelihood Estimation (MLE).	
Unit –V	**06 Hrs**
Inferential Statistics: Principles of Statistical Inference, Test of hypothesis - Null and alternative hypothesis, Procedure for statistical testing, Type I and Type II errors, level of significance, Tests involving the normal distribution, one – tailed and two – tailed tests, P – value, Special tests of significance for large and small samples (F, Chi – square, Z, t – test).	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Illustrate the fundamental concepts of statistics, random variables, distributions, sampling, estimation and statistical hypothesis.
CO2:	Apply the acquired knowledge of statistics, random variables, distributions, sampling, estimation and statistical hypothesis to solve the problems of engineering applications.
CO3:	Analyze the solution of the problems using appropriate statistical and probability techniques to the real world problems arising in many practical situations.
CO4:	Interpret the overall knowledge of statistics, probability distributions and sampling theory gained to engage in life-long learning.

Reference Books	
1	Theory and Problems of Probability, Seymour Lipschutz & Marc Lars Lipson, 2nd Edition, Schaum's Outline Series, McGraw – Hill,2000, ISBN: 9780071386517.
2	Applied Statistics and Probability for Engineers, Douglas C. Montgomery and George C. Runger, 7th Edition, John Wiley & Sons, 2019, ISBN: 9781119570615.
3	Probability & Statistics for Engineers & Scientists, Ronald E. Walpole & Raymond H. Myers, 9th edition, 2016, Pearson Education, ISBN-13: 9780134115856.
4	The Elements of Statistical Learning - Data Mining, Inference, and Prediction, Trevor Hastie Robert Tibshirani Jerome Friedman, 2nd Edition, 2009 (Reprint 2017), Springer, ISBN-10: 0387848576, ISBN-13: 9780387848570.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analysing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding up to 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**40**	
MATLAB	**20**	
Model presentation/ case study/ video preparation	**20**	
MAXIMUM MARKS FOR THE THEORY	**100 MARKS**	**100 MARKS**

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

High-3: Medium-2: Low-1

Semester: IV						
ENGINEERING MATERIALS (Theory) (Common to EC, EE, EI & ET)						
Course Code	**:**	21EC42		**CIE**	**:**	50 Marks
Credits: L:T:P	**:**	2:0:0		**SEE**	**:**	50 Marks
Total Hours	**:**	28L		**SEE Duration**	**:**	02 Hours

Unit- I	**10 Hrs**
Introduction: Classification and Properties of Materials, Materials Used in Electrical and ElectronicIndustries, Requirements and Future Developments of Electronic Materials, Characterization Techniques for Electronic Materials **Classical Theory of Electrical Conduction and Conducting Materials:** Resistivity, TCR(Temperature Coefficient of Resistivity) and Matthiessen's Rule, Traditional Classification of Metals, Insulators and Semiconductors, Drude's Free Electron Theory, Hall Effect, Wiedemann–Franz Law,Resistivity of Alloys, Nordheim's Rule, Resistivity of Alloys and Multiphase Solids	
Unit – II	**09 Hrs**
Thin Film Electronic Materials: Techniques for Preparation of Thin Films, Thin Film Conducting Materials, Thin Film Resistors, Transparent and Conductive Thin Films, Thin Film MagneticMaterials. **Organic Electronic Materials**: Conducting Polymers, Charge carriers, Semiconducting Organic Materials, Organic Light Emitting Diode, Organic FET	
Unit –III	**09 Hrs**
Semiconductor devices: Intrinsic & Extrinsic Semiconductors, temperature dependence of conductivity, direct and indirect recombination minority carrier life time **Nanomaterials for Electronic Device Applications:** Micro-/Nano-devices Using Nanostructured Materials: CNT transistor, Single electron transistor	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Explain electronics material classification, different physical properties and to the extenddevice applications.
CO2:	Define the transport mechanism (in solid state & organic), working principle of electronic material and assess material parameters for practical requirement.
CO3:	Summarize various fabrication, characterization and synthesis techniques for the electronicnanomaterials and thin film growth.
CO4:	Identify and calculate material parameters including electrical conductivity, resistivity, magnetic and optical properties for real-time electronic applications.

Reference Books	
1	Introduction to Electronic Materials for Engineers, Wei Gao & Zhengwei Li, Nigel Sammes,2nd Edition, World Scientific Publishing Co. Pvt. Ltd, ISBN:9789814293693
2	Principles of Electronic Materials and Devices, S O Kasap, 4th Edition, 2018, McGraw HillEducation, ISBN-13: 978-0-07-802818-2
3	Electronic Properties of Materials, Rolf E. Hummel, 4th Edition, 2011, Springer, ISBN-13:978-1489998415

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **10 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 30 Marks adding upto 60 marks. Final test marks will be reduced to **20 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**20**	
Case Study-based Teaching-Learning	**10**	
Paper Review	**05**	
Video based seminar (4-5 minutes per student)	**05**	
MAXIMUM MARKS FOR THE THEORY	**50 MARKS**	**50 MARKS**
TOTAL MARKS FOR THE COURSE	**50**	**50**

CO-PO Mapping												
CO/PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	3	1	2	1	-	1	2	-	-	-	-	2
CO2	3	2	2	1	2	1	-	-	-	-	-	2
CO3	3	1	3	1	-	1	3	-	-	-	-	2
CO4	3	3	2	2	2	2	-	-	-	-	-	2

Low-1 Medium-2 High-3

Self-Study/Experience Learning:

Research Paper/ Poster Presentation on following

1. Case studies: Advanced electronics materials and applications
2. Simulation of electrical, optical, magnetic, thermal, mechanical properties for advanced functional materials devices
3. Thin film devices, circuits and system (a field-effect transistor-based CNT, Nanowire FET, Graphene, a laser diode, a quantum cascade laser)
4. Advanced manufacturing process for emerging materials and applications
5. Quantum nanostructured Semiconductor Devices and applications

Semester: IV						
Microcontroller & Programming (common to EI/ET/EC/EE) (Theory and Practice)						
Course Code	**:**	21EI43		**CIE**	**:**	**150 Marks**
Credits: L:T:P	**:**	3:0:1		**SEE**	**:**	**150 Marks**
Total Hours	**:**	45L+30P		**SEE Duration**	**:**	**3Hours + 3Hours**

Unit-I	**9 Hrs**
Introduction to Processing units Computer System, Processor, Block diagram, Processor logic unit, Control unit, Instruction format, Assembly language, High level language, Embedded computing applications, Microcontroller, Instruction set architectures (CISC, RISC), Harvard and Von Neumann, Floating and fixed point, Introduction of controller families: 8-bit, 16-bit,32 bit, 64 bit ARM Processor families, Cortex A, Cortex R and Cortex M, Thumb 2 instruction set	
Unit – II	**9 Hrs**
Cortex M Architecture Advantages of Cortex M CPUs, Programmer's model: Operation modes & states, Registers, Special Registers, APSR, Memory System, Low power modes, Instruction Set: Memory access instructions, Arithmetic, Logical, Shift, Program flow control instructions, Programming examples, IDEs, ST-Link debugger.	
Unit –III	**9 Hrs**
Digital and Analog IO ARM Cortex M4 MCUs, Memory organization, Reset & Clock Control, GPIO, Programming: interfacing LEDs and Push buttons, Analog to digital converters (ADC), Successive Approximation ADC, Programming and interfacing an analog sensor, Digital to Analog Converter(DAC), Programming	
Unit –IV	**9 Hrs**
Serial Port USART: Basics of serial communication(Synchronous, asynchronous), Framing, Sampling, Baud rate generation, Programming USART for character transmission, Serial Peripheral Interface, Programming SPI for data transfer	
Unit –V	**9 Hrs**
Interrupts: Types of interrupts, Nested vector interrupt controller (NVIC) in Cortex-M cores, Interrupt vectors, Priorities, Programming interrupts, Timers, Controlling the operation, Programming with timers, Pulse width modulators, Programming modulators to generate PWM wave for given specifications	

Course Outcomes: After completing the course, the students will be able to:-	
CO1:	Comprehend the architecture of processing units used to build computers and embedded systems.
CO2:	Identify and explain key features of Arm architectures, processors, and more specifically the Arm Cortex-M4.
CO3:	Apply the knowledge of microcontroller for programming peripherals using registers and APIs generated using auto code generators.

CO4:	Engage in assignment to understand, formulate, design and analyse problems to be realized on embedded processors.

Reference Books	
1.	The Definitive Guide to the ARM Cortex-M3& M4 Processors, Joseph Yiu, 3rd Edition, Newnes (Elsevier), 2014, ISBN:978-93-5107-175-4
2.	STM32 Arm Programming for Embedded Systems, Shujen Chen, Eshragh Ghaemi, Muhammad Ali Mazidi, Microdigitaled, ISBN: 978-0997925944
3.	Reference manuals: STM32F411, STMcubeMX, SPI
4.	White Paper: Cortex-M for Beginners - An overview of the Arm Cortex-M processor family and comparison

Laboratory Component

Practical: Programming in ARM Assembly using Keil

1. Data Transfer Programs: Block Moves & Exchange (With & Without Overlap) with &without String Instructions.
2. Arithmetic Operations: Addition, Multiplication & Division on 32-Bit Data.
3. Search for a Key in an Array of Elements using Linear Search, Binary Search.

Programming in Keil using embedded C in STMCubeMX

1. Program digital IOs control LEDs, seven segment interface, push buttons.
2. Program digital IOs to control stepper and motor drivers for given specifications.
3. Program ADC and show analog to digital conversion. Display digital value on suitable interface.
4. Program ADC and show interfacing of analog sensor for given specifications.
5. Program USART and serial data transfer.
6. Program SPI and show the configuration and data transfer between SPI slave device and master
7. Program to configure NVIC and writing interrupt service routines.

PART B

Innovative Experiments (IE)

1. Program SPI and show the configuration and data transfer between SPI slave device and master.
2. Program ADC and show interfacing of analog sensor for given specifications.
3. Data transfer in polling, interrupt and DMA based modes.
4. Real time Audio applications: Flanging effect

ASSESSMENT AND EVALUATION PATTERN

	CIE	SEE
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**40**	
Application development using STMCubeMx	**20**	
Model based design	**10**	
Survey on advanced CPUs/ Supercomputers/ Multicores/ SoC/ NoC	**10**	
MAXIMUM MARKS FOR THE THEORY	**100 MARKS**	**100 MARKS**
PRACTICALS	**50**	**50**
TOTAL MARKS FOR THE COURSE	**150**	**150**

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

High-3: Medium-2: Low-1

Semester: IV					
Communication Engineering - I (Theory and Practice)					
Course Code	**:**	**21ET44**	**CIE**	**:**	**100+50 Marks**
Credits: L:T:P	**:**	**3:0:1**	**SEE**	**:**	**100+50Marks**
Total Hours	**:**	**45L+30P**	**SEE Duration**	**:**	**03Hrs + 03 Hrs**

UNIT-I	**09Hrs**
Introduction: Elements of a Communication System, Communication channels and their characteristics. **Analysis and transmission of signals:** Signal transmission through a linear system: Signal distortion during transmission, Distortion less transmission, Linear distortion, Distortion caused by channel nonlinearities and multipath effects and fading channels, Filters, Low-Pass and Band-pass signals, Band pass systems, Phase delay and Group delay.	
UNIT-II	**09 Hrs**
Amplitude modulation: Hilbert Transform, Basic concepts of AM, DSBSC, SSBSC, VSB modulation techniques. **Angle modulation:** Relationship between FM and PM, FM: Narrowband FM, Wide band FM, Bandwidth of FM, Generation of FM signals, Pre-Emphasis and De- Emphasis in FM, FM radio broadcasting, Stereo multiplexing.	
UNIT-III	**09Hrs**
Random Processes: Random processes, Mean, Correlation and Covariance functions, Power Spectral Density, Properties of PSD. **Noise in Analog modulation:** Noise: Shot noise, Thermal noise, White noise, Noise in AM and FM receivers.	
UNIT-IV	**09 Hrs**
Pulse Modulation: Sampling: Sampling Theorem, signal reconstruction from uniform samples, Practical signal reconstruction, Practical issues in signal sampling and reconstruction, Antialiasing Filter, PCM system: Quantization: Non-uniform quantization, PCM Encoder, Delta Modulation, Adaptive Delta modulation.	
UNIT-V	**09 Hrs**
Bandpass transmission of digital signals: Basic binary carrier modulation: Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Differential PSK, Coherent detection of ASK, FSK, PSK, Quadrature Amplitude Modulation and Demodulation.	

Laboratory Experiments:

Hardware experiments

1. Experiments on Analog Modulation techniques.
2. Experiment on Sampling Theorem and verification
3. Experiments on basic Digital Modulation techniques.

Simulation experiments:

1. Experiments on Analog modulation techniques and their frequency domain analysis.
2. Experiment on basic Digital Modulation techniques.

3. Sampling Theorem and verification

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the basic concepts of a Communication System, Types of Distortions caused during transmission.
CO2	Describe characteristics of a random process.
CO3	Compare & analyze various analog modulation techniques in terms of bandwidth and power usage.
CO4	Evaluate the noise performance of various analog modulation techniques.
Reference Books	
1	Modern Digital and Analog Communication Systems, Lathi, B. P. & Zhi Ding,2010, International fourth edition, Oxford University Press, ISBN: 978-0-19-538493-2.
2	Communication Systems ,Simon Haykin, Michael Moher,2010 , 5th Edition. John Wiley & Sons, ISBN: 978-81-265-2151-7.
3	Communication System Engineering, G. Proakis and M. Salehi, 2005, 2nd Edition. Prentice Hall, ISBN: 978-01-306-1793-4.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding up to 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**40**	
Case Study-based Teaching-Learning	**10**	
Applications of Communication Engineering	**20**	
Video based seminar (4-5 minutes per student)	**10**	
MAXIMUM MARKS FOR THE THEORY	**100 MARKS**	**100 MARKS**

PRACTICALS	**50**	**50**
TOTAL MARKS FOR THE COURSE	**150**	**150**

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

High-3: Medium-2: Low-1

Semester: IV						
Principles of Electromagnetics (Common with ET, EE)						
Course Code	**:**	**21ET45**		**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:1:0**		**SEE**	**:**	**100 Marks**
Total Hours	**:**	**45L+15T**		**SEE Duration**	**:**	**3 Hours**

Unit-I	**09 Hrs**
Electrostatics 1: Coulomb's law, illustrative examples, Electric Field Intensity, Applications (field due to Line charge distribution, Surface charge distribution- sheet, Circular ring, disk), Illustrative examples. Flux, flux density Gauss' Law, Divergence Theorem (qualitative treatment), Application of Gauss's Law (Field due to Continuous Volume Charge, Line Charge, Sheet Charge, Metal sphere, spherical shell) Illustrative examples.	
Unit – II	**09 Hrs**
Electrostatics 2: Work done to move a point charge, Electric potential, Relation between E and V, Applications (field and potential due to Line charge distribution, Surface charge distribution- sheet, Circular ring), Energy Density in an Electric Field, Illustrative examples. Boundary Conditions (dielectric-dielectric, dielectric-conductor), Poisson's and Laplace's Equations, Applications Laplace's and Poisson's Equations (different capacitors, Coaxial conductors), Illustrative examples.	
Unit –III	**09 Hrs**
Magnetostatic Fields 1: Biot -Savart Law, Ampere's Circuital Law, Applications of Ampere's Law, Maxwell's Equation, Magnetic Flux Density, Maxwell's Equations for Static EM Fields. **Magnetic Forces and Materials**: Forces due to Magnetic Fields, Magnetization in Materials, Classification of Magnetic Materials.	
Unit –IV	**09 Hrs**
Magnetostatic Fields 2: Magnetic Boundary Conditions, Inductors, and Inductances, Solanoid, Toroid Inductors **Maxwell's Equations:** Introduction, Faraday's Law, Transformer and Motional EMFs, Displacement Current, Maxwell's Equations in Final Forms, Time-Varying Potentials, Time-Harmonic Fields, Illustrative examples.	
Unit –V	**09 Hrs**
Electromagnetic Waves: Introduction, Waves in General ,Wave Propagation in Lossy Dielectrics, Plane Waves in Lossless Dielectrics, Plane Waves in Free Space, Plane Waves in Good Conductors, Power and the Poynting Vector. Reflection of plane waves, Normal Incidence, Application Note-Microwaves	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the basic concepts of electric fields, magnetic fields and

	electromagnetic waves.
CO2	Apply the basic concepts to solve complex problems in electric fields, magnetic fields and electromagnetic waves
CO3	Analyze different charge and current configurations to derive the electromagnetic field equations
CO4	Design simple solutions for applications in electric and electronic circuits, electrical machines and communication systems.

Reference Books	
1	Principles of Electromagnetics, Matthew N O Sadiku , 4th edition, 2007, Oxford University Press ,ISBN: 9780198062295, 019806229X
2	Electromagnetic Field Theory, S Salivahanan 2nd Edition, 2018, Mc Graw Hill India, ISBN:978-9353162573
3	Field and Wave Electromagnetics, David K. Cheng, 2nd Edition, 1989, Pearson Education Asia, Indian Reprint 2001, ISBN: 9789332535022/9788177585766, 8177585762
4	Engineering Electromagnetics, William H. Hayt Jr. and John A. Buck , 6th Edition, 2001,Tata McGraw Hill, ISBN-13: 978-0071202299

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**50%**	**50%**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to **20 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding up to 100 marks. Final test marks will be reduced to **40 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**40**	
Case Study-based Teaching-Learning	**10**	
Applications of Electromagnetics	**20**	
Video based seminar (4-5 minutes per student)	**10**	
MAXIMUM MARKS FOR THE THEORY	**100 MARKS**	**100 MARKS**
TOTAL MARKS FOR THE COURSE	**100**	**100**

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

High-3: Medium-2 : Low-1

IV Semester			
21ET4AX: PROFESSIONAL ELECTIVES (GROUP A)			
Sl. No.	**Course Code**	**Course Title**	**Duration**
1	21ET4A1	Programming, Data Structures And Algorithms Using Python	8 Weeks
2	21ET4A2	Design and analysis of algorithms	8 Weeks
3	21ET4A3	System Design Through VERILOG	8 Weeks
4	21ET4A4	Data Base Management System	8 Weeks
5	21ET4A5	Data Science for Engineers	8 Weeks

Semester IV							
Course Title: DESIGN THINKING LAB (Practice)							
Course Code	**:**	**21ET46**			**CIE Marks**	**:**	**50 Marks**
Credits: L:T:P	**:**	**0:0:2**			**SEE Marks**	**:**	**50 Marks**
Total Hours	**:**	**39 Hrs**			**SEE Duration**	**:**	**3 Hours**

Unit - I	**10 Hrs**
Understanding Design thinking: Design Thinking Methodology: The 5 Stages of the Design Thinking Process-Empathise, Define (the problem), Ideate, Prototype, and Test. Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – Multivarible product or Prototyping, Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design	
Unit - II	**15 Hrs**
DT For strategic innovations Growth: Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.	
Unit - III	**14 Hrs**
Design Thinking Workshop: The Design Challenge: Define the Design Challenge, Prototyping & Iteration- Feasibility Study, Testing- Documentation and the Pitching: 10 hours design thinking workshop from the expect and then presentation by the students on the learning from the workshop,	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Understanding various design process procedure
CO2:	Explore reverse engineering to understand products
CO3:	Develop technical drawing/prototype for design ideas
CO4:	Create design ideas through different techniques

References Books:	
1	Kilion Langenfeld, Design Thinking for Beginners, Personal Growth Hackers, ISBN: 13-9783967160628
2	Andrew Pressman, Design Thinking: A Guide to Creative Problem Solving for Everyone, Routeldge Taylor & Francis Grovel, 1st Edition, 2018, ISBN: 13-978-1-315-56193-6
3	Walter Brenner, Falk Uebernickel, Design Thinking for Innovation Research and Practice, Springer, 1st Edition, 2016, ISBN: 13-9783319260983

4	Emrah Yayici, Design Thinking Methodology Book, ArtBiz Tech Publishers, 1st Edition, 2016, ISBN:10- 6058603757, 13-9786058603752

ASSESSMENT AND EVALUATION PATTERN		
	CIE	SEE
WEIGHTAGE	50%	50%
PRACTICALS	50	50
TOTAL MARKS FOR THE COURSE	50	50

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

High-3: Medium-2: Low-1

Semester: III						
Bridge Course:C Programming (Theory) (Common to all Branches)						
Course Code	**:**	**21DCS47**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	2:0:0		**SEE**	**:**	**---**
Total Hours	**:**	30L		**SEE Duration**	**:**	**2 Hours**

Unit-I	**08 Hrs**
Introduction-Perspectives **Business Domains:** Programming. **Applications:** Design games, GUI, DBMS, Embedded Systems, Compilers and Operating Systems. **Introduction to Computer Concepts:** Introduction to Computer Hardware, Software and its Types. **Introduction to C programming:** Programming paradigms, Basic structure of C program, Process of compiling and running a C program, Features of C language, Character set, C tokens, Keywords and Identifiers, Constants, Variables, Data types, Pre-processor directives. **Handling Input and Output operations and operators:** Formatted input/output functions, Unformatted input/output functions with programming examples using all functions.	
Unit – II	**10 Hrs**
Operators: Introduction to operator set, Arithmetic operators, Relational operators, Logical Operators, Assignment operators, Increment and Decrement operators, Conditional operators, Bit-wise operators, Special operators. **Expressions:** Arithmetic expressions, evaluation of expressions, Precedence of arithmetic operators, Type conversion in expressions, Operator precedence and associativity. **Decision Making and Branching:** Decision making with 'if' statement, Simple 'if' statement, the 'if…else' statement, nesting of 'if…else' statements, The 'else if' ladder, The 'switch' statement, The '*?:'* operator, The '*goto'* statement.	
Unit –III	**12 Hrs**
Programming Constructs: Decision making and looping: The 'for','while','do-while' statements with examples, Jumps in loops**. Arrays:** Introduction to Arrays, Types of arrays, Declaration arrays, Initializing dimensional arrays (One Dimensional and Multidimensional Array) with examples. **String Operations:** Introduction, Declaration and Initializing String Variables using arrays, String operations and functions with examples. **Functions:** Need for Functions, Types of functions (User Defined and Built –In), working with functions, Definition, declaration and its scope. **Pointers:** Introduction, Benefits of using pointers, Declaration and Initialization of pointers, Obtaining a value of a variable.	

Course Outcomes: After completing the course, the students will be able to:-	
CO 1	Apply logical skills to solve the engineering problems using C programming constructs.
CO 2	Evaluate the appropriate method/data structure required in C programming to develop solutions by investigating the problem.
CO 3	Design a sustainable solution using C programming with societal and environmental concern by engaging in lifelong learning for emerging technology
CO 4	Demonstrate programming skills to solve inter-disciplinary problems using modern tools effectively by exhibiting team work through oral presentation and written reports.

Reference Books	
1.	Programming in C, P. Dey, M. Ghosh, 2011, 2nd Edition, Oxford University press, ISBN (13): 9780198065289.
2.	Algorithmic Problem Solving, Roland Backhouse, 2011, Wiley, ISBN: 978-0-470-68453-5
3.	The C Programming Language, Kernighan B.W and Dennis M. Ritchie, 2015, 2nd Edition, Prentice Hall, ISBN (13): 9780131103627.
4.	Turbo C: The Complete Reference, H. Schildt, 2000, 4th Edition, Mcgraw Hill Education, ISBN-13: 9780070411838.
5.	Rasberry pi: https://www.raspberrypi.org/documentation/
6.	Nvidia: https://www.nvidia.com/en-us/
7.	Ardunio: https://www.arduino.cc/en/Tutorial/BuiltInExamples
8.	Scratch software: https://scratch.mit.edu/

PRACTICE PROGRAMS

Implement the following programs using cc/gcc compiler

1. Develop a C program to compute the roots of the equation $ax^2 + bx + c = 0$.
2. Develop a C program that reads N integer numbers and arrange them in ascending or descending order using selection sort and bubble sort technique.
3. Develop a C program for Matrix multiplication.
4. Develop a C program to search an element using Binary search and linear search techniques.
5. Using functions develop a C program to perform the following tasks by parameter passing to read a string from the user and print appropriate message for palindrome or not palindrome.
6. Develop a C program to compute average marks of 'n' students (Name, Roll_No, Test Marks) and search a particular record based on 'Roll_No'.
7. Develop a C program using pointers to function to find given two strings are equal or not.
8. Develop a C program using recursion, to determine GCD , LCM of two numbers and to perform binary to decimal conversion.

ASSESSMENT AND EVALUATION PATTERN		
	CIE	**SEE**
WEIGHTAGE	**100%**	**---**
QUIZZES		
Quiz-I	Each quiz is evaluated for 10 marks adding up to 1**0 MARKS.**	
Quiz-II		
THEORY COURSE (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to 3**0 MARKS**	
Test – II		
EXPERIENTIAL LEARNING	**10**	
TOTAL MARKS FOR THE COURSE	**50**	**---**

Semester: IV						
Universal Human Values and Professional Ethics (Theory & Practical)						
Course Code	**:**	**21HSU48**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**2:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**28L+0T+14P**		**SEE Duration**	**:**	**2.00 Hours**

Unit-I	**05 Hrs**
Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.	
Unit – II	**06 Hrs**
Understanding Harmony in the Human Being - Harmony in Myself!: Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease	
Unit –III	**06 Hrs**
Understanding Harmony in the Family and Society- Harmony in Human Human Relationship: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence	

as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Unit –IV	**05 Hrs**
Understanding Harmony in the Nature and Existence - Whole existence as Coexistence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all pervasive space, Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.	
Unit –V	**06 Hrs**
Implications of the above Holistic Understanding of Harmony on Professional Ethics, Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations, Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.	

Course Outcomes: After completion of the course the students will be able to	
CO1	By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions,
CO2	While keeping human relationships and human nature in mind. They would have better critical ability.
CO3	They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
CO4	It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction

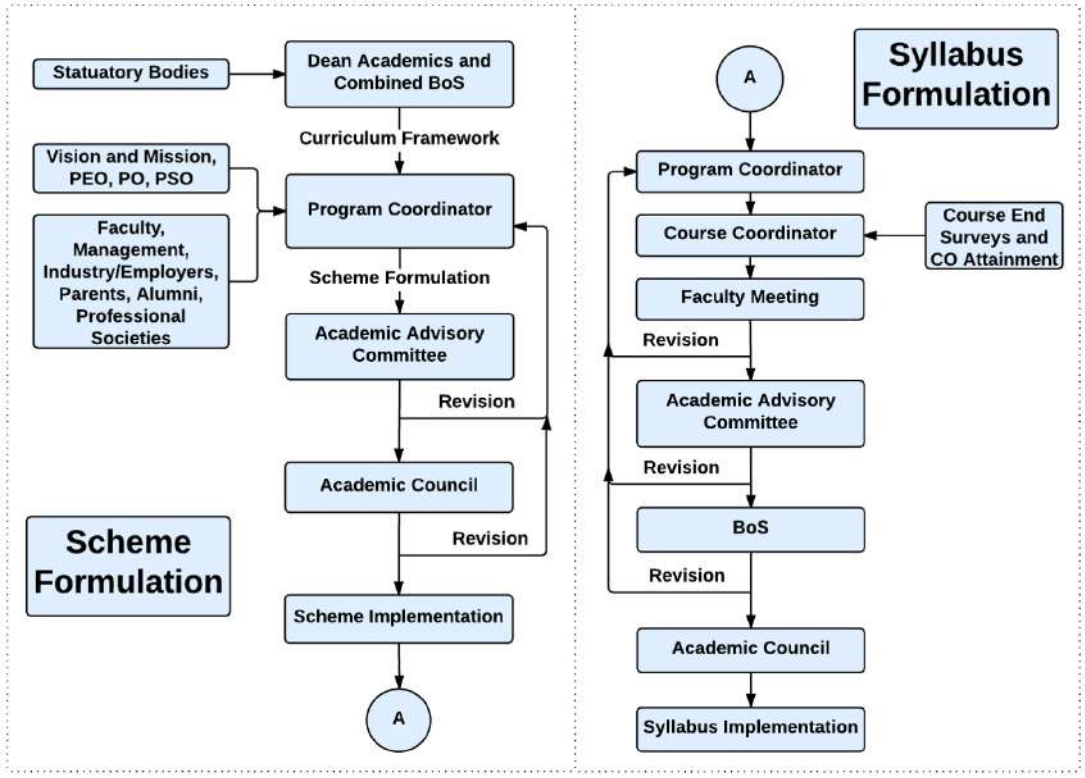
Reference Books	
1	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004
3	The Story of Stuff (Book).
4	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5	Small is Beautiful - E. F Schumacher.
6	Slow is Beautiful - Cecile Andrews.

ASSESSMENT AND EVALUATION PATTERN
This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation. Example: Assessment by faculty mentor: 10 marks Self-assessment: 10 marks Assessment by peers: 10 marks Socially relevant project/Group Activities/Assignments: 20 marks Semester End Examination: 50 marks. The overall pass percentage is 40%. In case the student fails, he/she must repeat the course

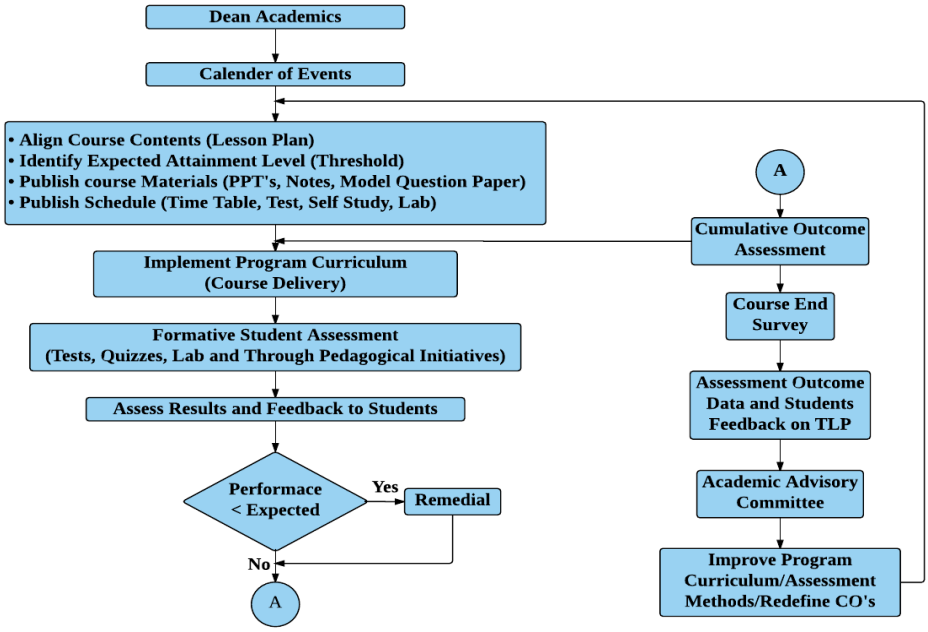
CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	-	-	-	-	-	3	1	3	3	-	-	3
CO2	-	-	-	-	-	2	1	3	3	-	-	3
CO3	-	-	-	-	-	2	1	3	3	-	-	3
CO4	-	-	-	-	-	3	1	3	3	-	-	3

High-3: Medium-2: Low-1

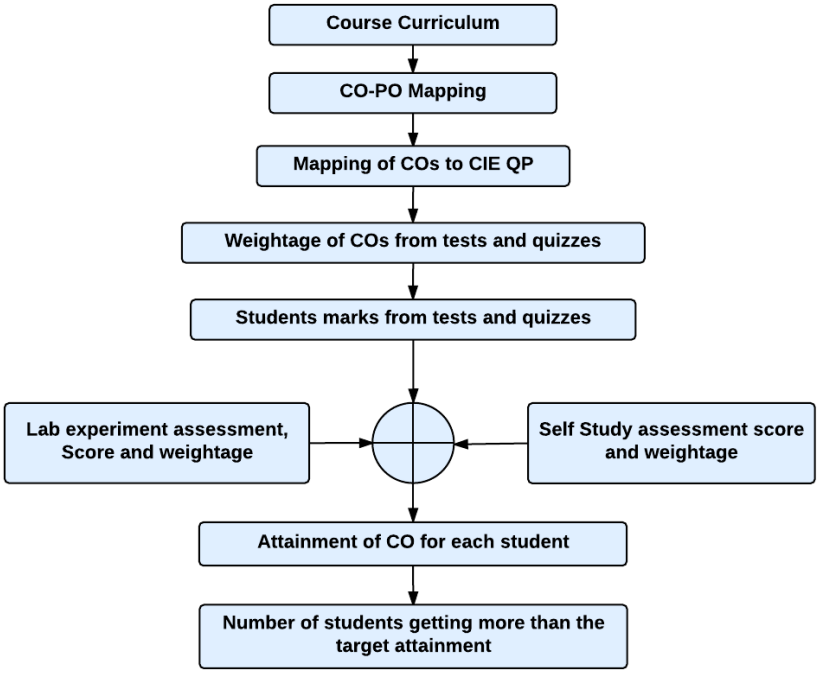
Curriculum Design Process



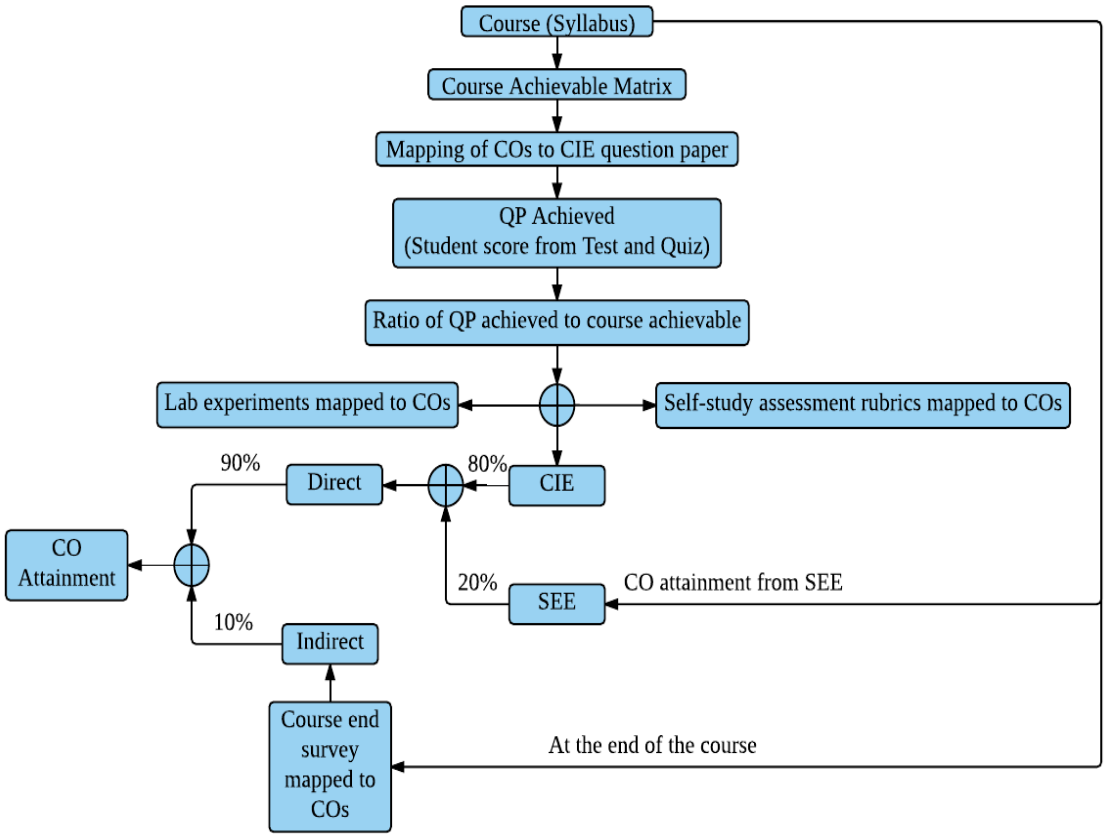
Academic Planning and Implementation



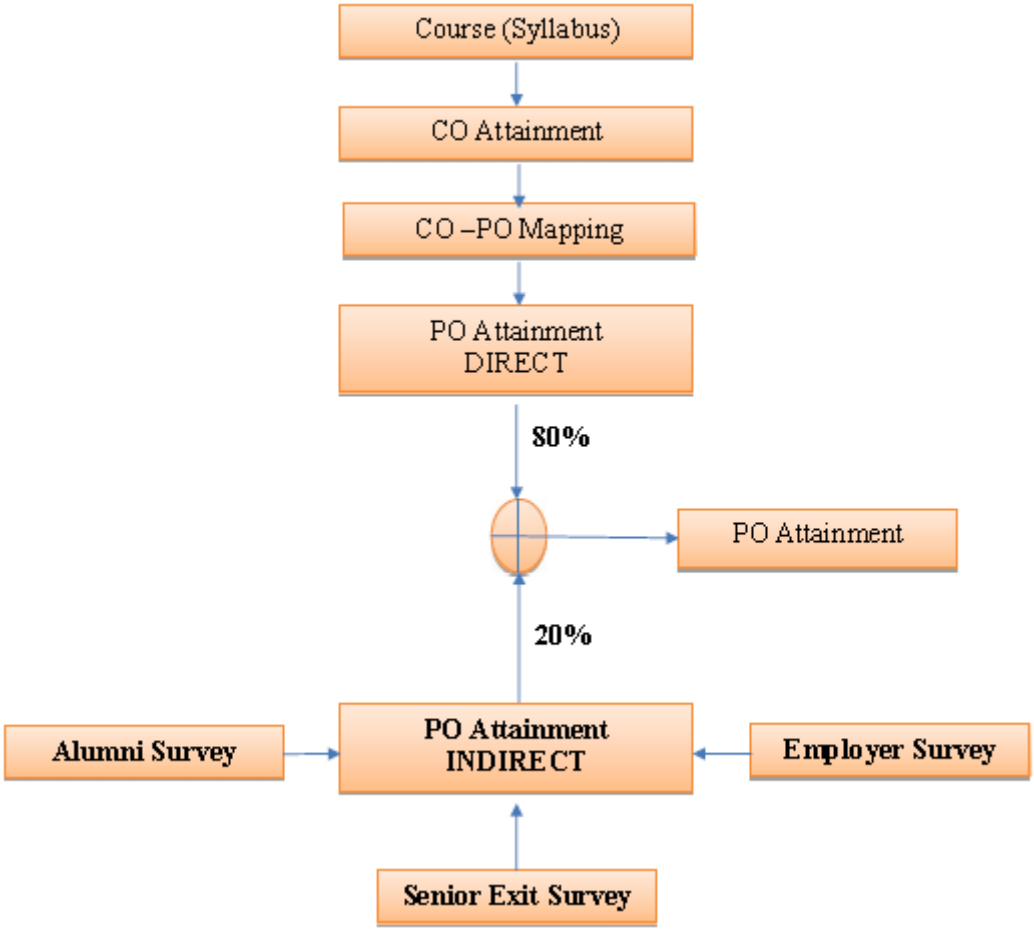
Process for Course Outcome Attainment



Final CO Attainment Process



Program Outcome Attainment Process



PROGRAM OUTCOMES (POs)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.

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

3. **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 public health and safety, and cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **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.

6. **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.

7. **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.

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

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

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with the 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:** 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:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.