



Bachelor of Engineering
in
Electronics and Communication
(Advanced Communication Technology)

Scheme and Syllabus
(2025 Scheme)

III Semester



VISION OF THE INSTITUTE

Be an Institution of Excellence with International Standards.

MISSION OF THE INSTITUTE

- Impart quality education, along with industrial exposure
- Provide world-class facilities to undertake research activities relevant to industrial and professional needs.
- Promote Innovation, Entrepreneurship and Value-added education that is socially relevant, along with economic benefits.

VISION OF THE DEPARTMENT

Imparting state-of-the-art technological education with a focus on Industry-aligned requirements, ethical research and human values

MISSION OF THE DEPARTMENT

- **Professional Growth:** To provide quality technological education that is supported by the latest research facilities
- **Skill Development:** To offer solutions for Industry needs
- **Research Culture:** To contribute prospective, outcome-based research in relevant domains
- **Lifelong Learning:** To inculcate ethics and human values among faculty, staff and students, through the practice of various social initiatives

PROGRAM OUTCOMES:

1. **Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.
3. **Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.
4. **Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.
5. **Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.
6. **The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.
7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.
8. **Individual and Collaborative Teamwork:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
9. **Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
10. **Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply

these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

11. **Life-Long Learning:** Recognize the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

PROGRAM EDUCATIONAL OBJECTIVES (PEOS):

- **Professional Development:** Graduates will engage in continuous learning and professional development, staying abreast of emerging trends, technologies, and best practices in the dynamic field of communication systems.
- **Attitude towards Lifelong Learning:** Graduates will excel as professionals in the field of advanced communication systems, applying their knowledge and skills to design, develop, implement, and manage complex communication networks and technologies.
- **Innovative Research:** Graduates will demonstrate leadership and innovation in addressing challenges and advancing the state-of-the-art in communication systems, contributing to technological advancements and industry growth.

PROGRAM SPECIFIC OUTCOMES (PSOS):

- **Core Competency:** Graduates will be able to innovate and adapt to emerging communication technologies, keeping up with industry trends and advancements to address evolving communication needs and challenges.
- **Interpretation Skills:** Graduates will possess strong interpersonal and communication skills, enabling them to collaborate effectively with multidisciplinary teams, communicate technical concepts clearly, and engage in professional interactions within the communication industry.

MVJ College of Engineering, Bengaluru (Autonomous)
B.E. in Electronics and Communication (Advanced Communication Technology) - Scheme 2025
 Outcome-Based Education (OBE) and Choice-Based Credit System (CBCS)
 (Applicable for 2025-26 admitted students)

Semester - III														
Sl. No	Course	Course Code	Course Title	Teaching & Learning Scheme						Examination				Credits
				CI		LI	TW & SL	# TH / S	Duration in hours	CIE Marks	SEE Marks	Total Marks		
													L	
1	ASC	MVJ25EC31	Probability and Transformation Techniques	56	0	0	64	120	3	50	50	100	4	4
2	IPCC	MVJ25EC32	Digital Circuits and Verilog HDL	42	0	28	50	120	3	50	50	100	4	
3	PCC	MVJ25EC33	Analog Electronics and Linear Integrated Circuits	56	0	0	64	120	3	50	50	100	4	
4	PCC	MVJ25EC34	Network Analysis	56	0	0	64	120	3	50	50	100	4	
5	PCC	MVJ25EC35	Engineering Electromagnetics	42	0	0	48	90	3	50	50	100	3	3
6	PCCL	MVJ25ECL36	Analog and Digital Electronics Lab	0	0	28	2	30	3	50	50	100	1	
7	AEC	MVJ25AECK37	Sustainable Engineering and SDGs	14	0	0	16	30	2	50	50	100	1	1
8	SDL	MVJ25EC38SL	LabVIEW for ECE	0	0	28	2	30	3	50	50	100	1	
9	NCMC	MVJ25PE39	Physical Education (PE) (Sports and Athletics)	0	0	0	28	28	---	100	---	100	PP	
		MVJ25YO39	Yoga											
10	NCMC	MVJ25MATDIP310	Additional Mathematics – I*	28	0	0	0	28	----	100	---	100	PP	22
TOTAL														

*Applicable for Lateral entry students only

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Semester – IV														
Sl. No	Course	Course Code	Course Title	Teaching & Learning Scheme						Examination				Credits
				CI		LI	TW & SL	# TH / S	Duration in hours	CIE Marks	SEE Marks	Total Marks		
													L	
1	PCC	MVJ25EC41	Control Systems	56	0	0	0	64	120	3	50	50	100	4
2	IPCC	MVJ25EA42	Computer Communication Networks	42	0	28	50	50	120	3	50	50	100	4
3	PCC	MVJ25EA43	Analog Communication Systems	56	0	0	64	64	120	3	50	50	100	4
4	PCC	MVJ25EC44	Signals and Systems	56	0	0	64	64	120	3	50	50	100	4
5	PCCL	MVJ25EAL45	Analog Communication Systems Lab	0	0	28	2	32	30	3	50	50	100	1
6	BSC	MVJ25BI46	Biology for Engineers	28	0	0	32	60	60	2	50	50	100	2
7	AEC	MVJ25AECK47	Scientific Foundation of Health	14	0	0	16	30	30	2	50	50	100	1
8	SDL	MVJ25EC48SL	Semiconductor Devices Simulation Lab	0	0	28	2	30	30	3	50	50	100	1
9	NCMC	MVJ25PE49	Physical Education (PE) (Sports and Athletics)	0	0	0	28	28	28	---	100	---	100	PP
		MVJ25YO49	Yoga											
10	NCMC	MVJ25MATDIP410	Additional Mathematics – II*	28	0	0	0	0	28	---	100	---	100	PP
TOTAL														21

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Semester – V

Sl. No	Course	Course Code	Course Title	Teaching & Learning Scheme						Examination				Credits
				CI		LI	TW & SL		# TH / S	Duration in hours	CIE Marks	SEE Marks	Total Marks	
							L	T						
1	HSMC	MVJ25EC51	Engineering Economics and Management	42	0	0	48	90	3	50	50	100	3	
2	IPCC	MVJ25EC52	Digital Signal Processing	42	0	28	50	120	3	50	50	100	4	
3	PCC	MVJ25EA53	Digital Communication Systems	42	0	0	48	90	3	50	50	100	3	
4	PCC	MVJ25EA54	Antenna and Wave Propagation	42	0	0	48	90	3	50	50	100	3	
5	PEC	MVJ25EA55X	Professional Elective Course-I	42	0	0	48	90	3	50	50	100	3	
6	BSC	MVJ25RM56	Research Methodology and IPR (Online)	28	0	0	32	60	2	50	50	100	2	
7	AEC	MVJ25AECK57	Ability Enhancement Course	14	0	0	16	30	2	50	50	100	1	
8	SDL	MVJ25EC58SL	MATLAB and Simulink programming and modelling	0	0	28	2	30	3	50	50	100	1	
9	PCCL	MVJ25EAL59	Digital Communication Lab	0	0	28	2	30	3	50	50	100	1	
10	SDC	MVJ25HBP510	Hackathon-Based Project	0	0	0	60	60	---	50	50	100	2	
TOTAL														23
Professional Elective Course-I														
MVJ25EA55A		Optical Communication		MVJ25EA55C				Digital Image Processing						
MVJ25EA55B		Data Structures and Algorithms		MVJ25EA55D				Computer Organization and Microcontroller						

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Semester – VI														
Sl. No	Course	Course Code	Course Title	Teaching & Learning Scheme						Examination				Credits
				CI		LI	TW & SL	# TH / S	Duration in hours	CIE Marks	SEE Marks	Total Marks		
				L	T	P	SL							
1	IPCC	MVJ25EA61	Software Defined Radio	42	0	28	50	120	3	50	50	100	4	
2	PCC	MVJ25EA62	Cryptography and Network Security	42	0	0	48	90	3	50	50	100	3	
3	PCC	MVJ25EA63	Information Theory and Coding	42	0	0	48	90	3	50	50	100	3	
4	PCC	MVJ25EA64	RF and Microwave Engineering	42	0	0	48	90	3	50	50	100	3	
5	PEC	MVJ25EA65X	Professional Elective Courses-II	42	0	0	48	90	3	50	50	100	3	
6	PCCL	MVJ25EAL66	RF and Microwave Engineering laboratory	0	0	28	2	30	3	50	50	100	1	
7	AEC	MVJ25AECK67	Ability Enhancement Course	14	0	0	16	30	2	50	50	100	1	
8	SDL	MVJ25EC68SL	AI for Communication Systems	0	0	28	2	30	3	50	50	100	1	
9	SDC	MVJ25EA69	Capstone Project – Phase 1	0	0	0	90	90	3	100	--	100	3	
10	NCMC	MVJ25UHV610	Universal Human Values	14	0	0	14	28	---	100	---	100	PP	
TOTAL													22	
Professional Elective Course-II														
MVJ25EA65A	Satellite and RADAR Systems			MVJ25EA65C			Machine Learning							
MVJ25EA65B	Virtual and Augmented Reality			MVJ25EA65D			Real Time Systems							

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VII and VIII semesters for the candidates who opt for a two-semester internship along with Capstone Project (Scheme B)														
Sl. No.	Course	Course Code	Course Title	Teaching & Learning Scheme						Examination				Credits
				CI		LI	TW & SL	# TH / S	Duration in hours	CIE Marks	SEE Marks	Total Marks		
				L	T	P	SL							
1	IPCC	MVJ25EA71	Wireless Cellular and 5G Technology	42	0	28	50	120	3	50	50	100	4	
2	PEC	MVJ25EA72X	Professional Elective Course-III (NPTEL/VTU Online Course)	42	0	0	48	90	--	50	50	100	3	
3	PEC	MVJ25EA73X	Professional Elective Course-IV (NPTEL/VTU Online Course)	42	0	0	48	90	--	50	50	100	3	
4	OEC	MVJ25EA74X	Open Elective Course - I (NPTEL/VTU Online course)	42	0	0	48	90	---	50	50	100	3	
5	SDC	MVJ25EA75	Capstone Project - Phase-II	0	0	0	210	210	3	100	100	200	7	
6	NCMC	MVJ25IKS76	Indian Knowledge System	14	0	0	14	28	--	100	--	100	PP	
7	AEC	MVJ25AECK77	Ability Enhancement Course	14	0	0	16	30	2	50	50	100	1	
8	SDL	MVJ25EC78SL	Design Flow for VLSI Chips	0	0	28	2	30	3	50	50	100	1	
Total														22
1	PEC	MVJ25EA81X	Professional Elective-V (NPTEL/VTU Online Course)	42	0	0	48	90	---	50	50	100	3	
2	OEC	MVJ25EA82X	Open Elective-II (NPTEL/VTU Online Course)	42	0	0	48	90	---	50	50	100	3	
3	SDC	MVJ25INT83X	Internship (Two- semester internship for a minimum Period of 180 working days or -30 weeks)	--	--	--	--	360	3	50	50	100	9	
Total														15
VII semester and VIII semester Credits Total														37

Professional Elective Course-III		
MVJ25EA72A	NPTEL/VTU Online Course	MVJ25EA72C NPTEL/VTU Online Course
MVJ25EA72B	NPTEL/VTU Online Course	MVJ25EA72D NPTEL/VTU Online Course
Professional Elective Course-IV		
MVJ25EA73A	NPTEL/VTU Online Course	MVJ25EA73C NPTEL/VTU Online Course
MVJ25EA73B	NPTEL/VTU Online Course	MVJ25EA73D NPTEL/VTU Online Course
Open Elective Course-I		
MVJ25EA74A	NPTEL/VTU Online Course	MVJ25EA74C NPTEL/VTU Online Course
MVJ25EA74B	NPTEL/VTU Online Course	MVJ25EA74D NPTEL/VTU Online Course
Professional Elective Course-V		
MVJ25EA81A	NPTEL/VTU Online Course	MVJ25EA81C NPTEL/VTU Online Course
MVJ25EA81B	NPTEL/VTU Online Course	MVJ25EA81D NPTEL/VTU Online Course
Open Elective Course-II		
MVJ25EA82A	NPTEL/VTU Online Course	MVJ25EA82C NPTEL/VTU Online Course
MVJ25EA82B	NPTEL/VTU Online Course	MVJ25EA82D NPTEL/VTU Online Course

Types of Internships (Course Code: MVJ25INT83X)

Students shall undertake one of the following internship types during the eighth semester, as per academic guidelines:

1. **MVJ25INT83A – Industry Internship:** Shall involve practical exposure and training within an industrial or corporate setting.
2. **MVJ25INT83B – Research Internship:** Shall focus on academic or applied research under the guidance of faculty or research institutions.
3. **MVJ25INT83C – Post-Placement Internship:** Shall be undertaken by students who have secured placement, aligning with their future employment domain.
4. **MVJ25INT83D – Societal Internship:** Shall engage students in community-based or social impact projects with NGOs, government bodies, or civic organizations.
5. **MVJ25INT83E – Online Internship:** Shall be conducted through recognized digital platforms offering structured internship modules.
6. **MVJ25INT83F – Skill Enhancement Courses (SEC):** Shall be opted by students unable to secure internships, offering credit equivalence through curated online courses available at <http://www.online.vtu.ac.in>

To ensure uniformity, quality, and transparency in the internship process, **VTU has launched a centralized web portal** that serves as a **single platform** for all internships opportunities. Reputed industries, Centers of Excellence, Research Laboratories, and other recognized bodies will be registered on this portal. **Students must choose internships exclusively through this portal. No other mode of internship selection will be permitted.**

Probability and Transformation techniques			
Course Code	MVJ25EC31	Scheme	2025
Type of Course	ASC	Semester	III
Teaching Hours/Week (L:T:P)	4:0:0	CIE Marks	50
Total Hours of Pedagogy (L:T:P:SL&TW)	56:0:0:64	SEE Marks	50
Credits	4	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	3
Course Objectives: This course will give ability to: • Apply discrete and continuous probability distributions in analysing the probability models arising in engineering field. • Understand the concepts of Complex variables and transformation for solving Engineering Problems. • Demonstrate and present data using statistical method and fit the best curve for the data.			
Syllabus			
This course equips students with the ability to apply Discrete and continuous probability distributions to analyse engineering systems, signal behaviour, and data-driven models. It strengthens their understanding of complex variables and transformations, enabling effective problem-solving in areas such as communication systems, circuit design, and embedded technologies. Additionally, it develops skills in statistical analysis, data interpretation, and curve fitting, which are essential for performance evaluation, optimization, and decision-making in modern electronic and IoT-based applications.			
Course Plan			
Module I			
Probability Theory			
S. No	Topics to be covered		Hours required
1	Random variables for discrete and continuous time functions.		12
2	probability density function.		
3	Cumulative density function.		
4	Probability Distributions: Binomial distribution.		
5	Poisson distribution. Normal distribution, Exponential distribution.		
6	Joint probability distributions.		
Module II			
Complex Variables			
S. No	Topics to be covered		Hours required
1	Functions of complex variables, Analytic function, Properties of analytic functions.		11
2	Cauchy-Riemann equations in Cartesian form and polar coordinates.		
3	Construction of analytic function by using Milne-Thomson method.		
4	Transformations: Bi-linear Transformation, Conformal Transformation.		
5	Discussion of the transformations: $w = z^2$, $w = e^z$ and $w = z + \frac{1}{z}$ ($z \neq 0$).		

Module III		
Fourier series		
S. No	Topics to be covered	Hours required
1	Definition of Periodic functions, Dirichlet's condition.	11
2	Fourier series of periodic functions of period 2π .	
3	Fourier series of periodic functions of arbitrary period $2c$.	
4	Half-range Fourier Sine and cosine series.	
5	Practical Harmonic Analysis and Problems.	
Module IV		
Fourier transforms and Z-transforms		
S. No	Topics to be covered	Hours required
1	Infinite Fourier transforms, Fourier sine and cosine transform.	11
2	Inverse Fourier cosine and sine transform.	
3	Definition of Z-transforms, standard z-transforms, Damping, and shifting rules.	
4	Inverse Z-transforms by the partial fraction method.	
5	Solving difference equations by using Inverse Z-transform.	
Module V		
Statistical and Sampling theory		
S. No	Topics to be covered	Hours required
1	Definition of Correlation, Regression coefficients.	11
2	Line of regression problems.	
3	Fitting of the curves in the form $y = ax + b$ by the method of least squares.	
4	Sampling, Sampling distributions, Standard error.	
5	Student's t-distribution.	
6	Chi-square distribution.	
Textbooks: 1. B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2013. 2. G.B.Gururajachar, "Engineering Mathematics-III" Academic Excellent Series Publications, 2016.		
Reference Books: 1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley-India publishers, 10th edition, 2014. 2. B.V. RAMANA, "Higher engineering mathematics", Tata McGraw-Hill. 3. R.K. Jain and S.R.K. Iyengar, "advanced engineering mathematics", Narosa Publishing House, 5th Edition.		
Course Outcomes: At the end of the course, the student will be able to: CO1: Develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, information theory and Design engineering. CO2: Understand the analytic functions and application of Bi-linear, Conformal Transformation. CO3: Communications, Know the use of periodic signals and Fourier series to analyze circuits and		

system.

CO4: To use and to apply Fourier Transform, Z-Transform techniques to solve difference equations in Engineering.

CO5: Fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data.

CO-PO Mapping

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

High-3: Medium-2: Low-1

The Evaluation Method

Continuous Internal Evaluation (CIE):

- Three Internal Tests will be conducted for 50 marks each and average of three will be taken. The student should score minimum 30% marks of the average of the three tests to avoid NSSR. (A).
- Alternative Assessment Tools (AAT) are used to complete a project / Quiz/Seminar / Presentation/ other suitable alternate assessment method for 30 marks. Two evaluations will be conducted (B).
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C).

Final CIE Marks will be calculated as $(A+B+C)/3$ for 50 marks.

Semester End Examination (SEE):

The question paper consists of two parts, A and B.

Part A: Consists of 10 questions (2 questions from each module) of 2 marks each.

Part B: The question paper should have 10 questions. Each question carries 16 marks. There should be 2 questions from each module, with a maximum of 2 subdivisions. Students must answer any 5 questions choosing one full question from each module.

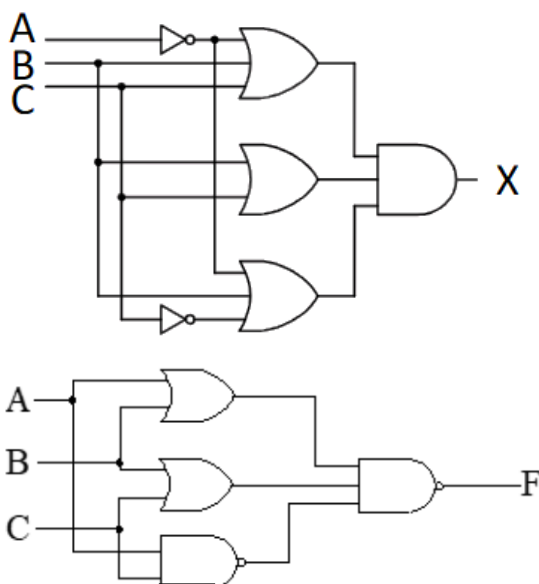
The SEE Theory marks of 100 will be scaled down to 50.

Final mark for the course is sum of the CIE and SEE Marks.

B.E, Electronics and Communication (Advanced Communication technology)

Digital circuits and Verilog HDL			
Course Code	MVJ25EC32	Scheme	2025
Type of Course	IPCC	Semester	III
Teaching Hours/Week (L: T:P)	3:0:2	CIE Marks	50
Total Hours of Pedagogy (L; T:P:SL &TW)	42:0:28:50	SEE Marks	50
Credits	04	Total Marks	100
Examination type (SEE)	Theory & Practical	Exam Hours	3 Hrs
Course Objectives: The course aims to: • To understand the principles of combinational logic and Boolean function minimization. • To learn the fundamentals of Verilog HDL and its dataflow, behavioural, and structural modelling styles. • To design and model combinational and sequential circuits using Verilog HDL. • To develop digital systems using registers, counters, and hierarchical structural design methodologies.			
Syllabus			
This course introduces the fundamentals of Verilog HDL and digital logic design, covering dataflow, behavioral, and structural modelling techniques for designing combinational and sequential circuits. Students learn the implementation of basic arithmetic and logic circuits such as adders, subtractors, multiplexers, decoders, and comparators, along with Boolean function simplification using Karnaugh maps. The course also focuses on latches, flip-flops, shift registers, counters, and their Verilog-based modelling, enabling students to develop the skills required for digital system design, simulation, and hardware implementation.			
Course Plan			
Module I			
Verilog HDL and Dataflow Modelling			
Sr. No	Topics to be covered		Hours required
1	Structure of a Verilog module, Ports, Data Types, and Operators.		8
2	Verilog Dataflow Modelling: Signal Declaration and assignment statement.		
3	Dataflow Modelling of Half Adder and Full Adder.		
Module II			
Verilog Behavioral and Structural Modelling			
Sr. No	Topics to be covered		Hours required
1	Behavioral Modelling: Structure, Sequential Statements, Loop Statements.		8
2	Behavioral Modelling of 2:1 Multiplexer.		
3	Structural Modelling: Organization, Binding, Structural description of ripple carry adder.		
Module III			
Combinational Logic and Circuits			
Sr. No	Topics to be covered		Hours required
1	Combinational Logic: Canonical forms, Simplification of Boolean functions using		

	K-Map (3 variable and 4 variable).	8
2	Combinational Circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor, Mux (2:1, 4:1), Demux (1:2, 1:4), Encoder, Decoder, Magnitude comparator (1 bit, 2 bit), Ripple carry adder and Carry Look ahead adder.	
3	Structural Modelling of 4-bit Ripple Carry Adder.	
Module IV		
Sequential circuits		
Sr. No	Topics to be covered	Hours required
1	Latches (SR, JK, D and T).	8
2	Flip Flops (SR, JK, D and T), Master-Slave JK FF.	
3	Behavioral Modelling of Sequential Circuits: D, JK, Latches and Flip Flops, Master-slave JK Flip Flop.	
Module V		
Shift Registers and Counters		
Sr. No	Topics to be covered	Hours required
1	Shift Registers (SISO, SIPO, PISO and PIPO).	10
2	Counters: Synchronous and Asynchronous Counters, BCD Counter.	
3	Design of Synchronous mod-n counters using D, JK flip flops.	
4	Adders: Serial adder, Parallel adder.	
5	Modelling of circuits using Behavioral Description - Synchronous and Asynchronous Counters.	
Laboratory Experiments		
1. For the Given Boolean Expressions realize them Using Dataflow Modelling. i) $F1=A'BC+ABC+AB'C$ ii) $F2=(A+B)(A'+C)(B+C)$ 2. Design a Half Adder and a Full Adder Using Dataflow Modelling. 3. Design a Half Subtractor and a Full Subtractor Using Dataflow Modelling. 4. Design a BCD to Excess 3 code converter using Dataflow modelling. 5. Design a 2-Bit Magnitude Comparator using Dataflow modelling. 6. Design a 8:1 Multiplexer and a 1:8 Demultiplexer Using Behavioural Modelling. 7. Design a 4:2 Encoder and 2:4 Decoder Using Behavioural Modelling. 8. Design an 8:3 Priority Encoder Using Behavioural Modelling. 9. Design JK and D Flip-Flops Using Behavioural Modelling. 10. Design SR and T Flip-Flops Using Behavioural Modelling. 11. Design Up/Down Counters Using Behavioural Modelling. 12. Design a Full Adder Using Half Adders Through Structural Modelling. 13. Design a 4-Bit Ripple Carry Adder Using Structural Modelling. 14. Design the Given Digital Circuit Using Structural Modelling.		



Textbooks:

1. John M. Yarbrough, Digital Logic Applications and Design, Thomson Learning.
2. Nazeih M. Botros, HDL Programming (VHDL and Verilog), John Wiley India Pvt. Ltd., 2008.
3. Donald D. Givone, Digital Principles and Design, McGraw Hill, 2002.

Reference Books:

1. Samir Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, Pearson Education, Second Edition.
2. Charles H. Roth Jr., Larry L. Kinney, Fundamentals of Logic Design, Cengage Learning, 7th Edition

Course Outcomes:

At the end of the course, the students will be able to:

CO1: Explain the fundamentals of Verilog HDL, including module structure, data types, operators, and apply dataflow, Behavioral, and structural modelling techniques to design basic digital circuits.

CO2: Analyze and design combinational logic circuits using Boolean algebra, Karnaugh maps, and Verilog HDL for realizing adders, subtractors, multiplexers, demultiplexers, encoders, decoders, and comparators.

CO3: Design and model sequential circuits, including latches, flip-flops, and master-slave configurations, using Verilog HDL and analyze their functional behavior.

CO4: Design and implement shift registers, counters, serial and parallel adders, and develop behavioural models for synchronous and asynchronous sequential circuits using Verilog HDL.

CO5: Design, model, and simulate combinational and sequential circuits using Verilog HDL dataflow, behavioral, and structural modelling techniques with Xilinx Vivado.

CO-PO Mapping

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

High-3: Medium-2: Low-1

The Evaluation Method

Continuous Internal Evaluation (CIE):

- Three Internal Tests will be conducted for 50 marks each and average of three will be taken. The student should score minimum 30% marks of the average of the three tests to avoid NSSR. (A).
- Alternative Assessment Tools (AAT) are used to complete a project / Quiz/Seminar / Presentation/ other suitable alternate assessment method for 30 marks. Two evaluations will be conducted (B).
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C).

Final CIE Marks will be calculated as $(A+B+C)/2$ for 50 marks.

Semester End Examination (SEE):

The question paper consists of two parts, A and B.

Part A: Consists of 10 questions (2 questions from each module) of 2 marks each.

Part B: The question paper should have 10 questions. Each question carries 16 marks. There should be 2 questions from each module, with a maximum of 2 subdivisions. Students must answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

Final mark for the course is sum of the CIE and SEE Marks.

Course delivery methods		Assessment methods	
1	Chalk and talk	1	IA tests & SEE
2	PPT and Videos	2	Open Book Assignments (OBA)/ Lab Project
3	Flipped Classes	3	Lab Test
4	Practice session/Demonstrations in Labs	4	Semester End Examination
5	Virtual Labs (if present)		

Analog Electronics and Linear Integrated Circuits			
Course Code	MVJ25EC33	Scheme	2025
Type of Course	PCC	Semester	III
Teaching Hours/Week (L:T:P)	4:0:0	CIE Marks	50
Total Hours of Pedagogy (L:T:P:SL&TW)	56:0:0:64	SEE Marks	50
Credits	4	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	3
Course Objectives: This course will give ability to: - Analyze and evaluate transistor biasing and feedback configurations in analog electronic circuits. - Design and examine various oscillator topologies using bipolar junction transistors. - Understand the operation, biasing, and AC analysis of field-effect transistors including JFETs and MOSFETs. - Utilize operational amplifiers in linear and non-linear signal processing applications such as amplifiers, rectifiers, and Schmitt triggers. - Implement integrated circuits for active filters, data converters, and timing circuits using the 555 timer IC.			
Syllabus			
This course on Analog Electronics and Linear Integrated Circuits covers fundamental semiconductor devices, feedback mechanisms, and integrated circuit applications across five core modules. It begins with BJT DC biasing, feedback topologies, and oscillator configurations. It then explores JFET and MOSFET device structures, operational characteristics, DC biasing, and detailed AC small-signal amplifier configurations. Finally, the syllabus covers practical linear and non-linear operational amplifier applications—including AC amplifiers, precision rectifiers, Schmitt triggers, active filters, DAC/ADC converters, and 555 timer multivibrators.			
Course Plan			
Module I			
Sr. No	Topics to be covered		Hours required
1	BJT DC Biasing: Voltage divider biasing circuits -Exact method & Approximate method, Emitter stabilized Circuit.		11
2	Feedbacks: Concepts, Feedback connection types (Voltage Series, Current Series, Voltage Shunt & Current Shunt), Analysis of input impedance and output impedance with feedback.		
3	Oscillator: Operation, RC Phase Shift Oscillator using BJT, Wein Bridge Oscillator. Tuned Oscillator circuit- Hartley & Colpitts Oscillator using BJT, Crystal Oscillator – Series and parallel type using BJT.		
Module II			
Sr. No	Topics to be covered		Hours required
1	JFET: Construction, Working Principle, Output Characteristics and Transfer Characteristics of n-channel and p-channel JFETs.		11
2	MOSFET: Construction, Working Principle and Characteristics of n-channel Depletion type and Enhancement type MOSFETs.		
3	MOSFET DC Biasing: D-MOSFET & E-MOSFET – Voltage divider Configuration and Self bias configuration.		
Module III			
Sr. No	Topics to be covered		Hours required

1	MOSFET AC Analysis: Analysis of E-MOSFET Voltage Divider Configuration, D-MOSFET Self bias bypassed Rs Configuration	11
2	Basic MOSFET Amplifier Configurations: Analysis of Common Gate Configuration, Common Source Configuration & Common Drain Configuration	
3	Cascade Configuration.	
Module IV		
Sr. No	Topics to be covered	Hours required
1	Op-Amps as AC Amplifiers: Capacitor coupled voltage follower, Capacitor coupled inverting amplifier, Capacitor coupled non-inverting amplifiers, Setting the upper cut-off frequency, Capacitor coupled difference amplifier	12
2	OP-Amp Applications: Instrumentation amplifier, Precision rectifiers, Sample and hold circuits, Inverting Schmit Trigger.	
Module V		
Sr. No	Topics to be covered	Hours required
1	Active Filters: First order and second order active Low-pass and high pass filters. Bandpass Filter, Band stop Filter.	11
2	DAC and ADC convertor: DAC using R-2R. ADC using Successive approximation.	
3	Other IC Applications: 555 timer, Basic timer circuit, 555 timer used as Astable and monostable multivibrator.	
Textbooks: 1. Robert L. Boylestad and Louis Nashelsky, "Electronics devices and Circuit theory", 10th Edition, Pearson, 2012. 2. Thomas L. Floyd, "Electronic Devices, Conventional Current Version", 7 th Edition, Pearson, 2004. 3. David A. Bell, "Operational Amplifiers and Linear IC 's", 2nd edition, PHI/Pearson, 2004. 4. D. Roy Choudhry, Shail Jain, "Linear Integrated Circuits", 5th ed., New Age International Pvt. Ltd., 2015		
Reference Books: 1. J. Millman & C. C. Halkias, Integrated Electronics", 2 nd edition, 2010, TMH. 2. Ramakant A Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson, 4 th edition, 2015.		
Other References: (NPTEL/SWAYAM, Any other) 1. NPTEL Course: Analog Electronic Circuit, Prof. Shouribrata Chatterjee, IIT Delhi https://nptel.ac.in/courses/108102112 2. Virtual Lab: Analog Electronic Circuit, IIT Kharagpur https://aec-iitkgp.vlabs.ac.in/		
Course Outcomes: At the end of the course, the student will be able to: CO1: Analyse a given analog electronic circuit to compute required parameters. CO2: Design analog electronic circuits for a given specification. CO3: Design and Demonstrate op -amp as AC amplifier. CO4: Design and analyse the non-linear applications circuits & applications of op-amp as filters, 555 timers IC as Multivibrators.		

CO-PO Mapping

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

High-3: Medium-2: Low-1

Evaluation Method

Continuous Internal Evaluation (CIE):

- Three Internal Tests will be conducted for 50 marks each and average of three will be taken. The student should score minimum 30% marks of the average of the three tests to avoid NSSR. **(A)**.
- Alternative Assessment Tools (AAT) are used to complete a project / Quiz/ Seminar cum Presentation / other suitable alternate assessment methods for 30 marks. Two evaluations will be conducted **(B)**.
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks **(C)**.

Final CIE Marks will be calculated as $(A+B+ C)/2$ for 50 marks.

Semester End Examination (SEE):

The question paper consists of two parts, A and B.

Part A: Consists of 10 questions (2 questions from each module) of 2 marks each.

Part B: The question paper should have 10 questions. Each question carries 16 marks. There should be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The Final mark for the course is sum of the CIE and SEE Marks.

Course delivery methods		Assessment methods	
1	Chalk and talk	1	IA tests & SEE
2	PPT and Videos	2	Open Book Assignments (OBA)/ Lab Project
3	Flipped Classes	3	Lab Test
4	Practice session/Demonstrations in Labs	4	Semester End Examination
5	Virtual Labs (if present)		

B.E, Electronics and Communication (Advanced Communication Technology)

Network Analysis			
Course Code	MVJ25EC34	Scheme	2025
Type of Course	PCC	Semester	III
Teaching Hours/Week (L:T:P)	4:0:0	CIE Marks	50
Total Hours of Pedagogy (L:T:P:SL&TW)	56:0:0:64	SEE Marks	50
Credits	4	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	3
Course Objectives: This course will give ability to: - Describe basic network concepts emphasizing source transformation source shifting, mesh and nodal techniques to solve for resistance/impedance, voltage, current and power. - Explain network Thevenin's, Millman's, Superposition, Reciprocity, Maximum Power transfer and Norton's Theorems and apply them in solving the problems related to Electrical Circuits. - Describe Series and Parallel Combination of Passive Components as resonating circuits, related parameters and to analyze frequency response. - Explain the behavior of networks subjected to transient conditions. Use applications of Laplace transform to solve network problems. - List the two port network parameters like Z, Y, T and h and their inter-relationships.			
Syllabus			
The syllabus covers fundamental electrical network concepts including practical sources, source transformations, and DC circuit analysis using loop and node methods. It introduces graph theory concepts such as trees, matrices, and network equations for systematic analysis. Key network theorems like Superposition, Thevenin's, Norton's, and Maximum Power Transfer are studied for simplifying circuits. Transient behaviour of RL, RC, and RLC circuits is analysed using initial/final conditions and Laplace transforms. Finally, two-port network parameters (Z, Y, h, and transmission) and their interrelationships are explored.			
Course Plan			
Module I			
Sr. No	Topics to be covered	Hours required	
1	Basic Concepts: Introduction, Practical sources.	11	
2	Source transformation.		
3	Star to Delta transformation, Delta to Star transformation.		
4	Loop and node analysis with linearly dependent and independent sources for DC networks.		
5	Concepts of super node and super mesh.		
Module II			
Sr. No	Topics to be covered	Hours required	
1	Graph Theory and Network equations: Graph of a network, Trees, Co-trees and Loops.	11	
2	Incidence Matrix.		
3	Tie-set Matrix and loop currents.		
4	Cut-set Matrix.		
5	Analysis of networks, Duality.		

Module III		
Sr. No	Topics to be covered	Hours required
1	Network Theorems: Superposition Theorem.	12
2	Millman's theorem.	
3	Thevenin's theorem and Norton's theorem.	
4	Reciprocity theorem.	
5	Maximum Power transfer theorem (DC networks).	
Module IV		
Sr. No	Topics to be covered	Hours required
1	Transient behaviour and initial conditions: Behaviour of circuit elements under switching condition and their Representation.	11
2	Transient response analysis of series RL Circuits for DC Excitation.	
3	Transient response analysis of series RC Circuits for DC Excitation.	
4	Transient response analysis of series RLC circuit for DC excitations.	
5	Applications of Laplace Transform in circuit Analysis.	
Module V		
Sr. No	Topics to be covered	Hours required
1	Two port network parameters: Introduction, open circuit impedance parameters.	11
2	Short circuit admittance parameters.	
3	Hybrid parameters.	
4	Transmission parameters.	
5	Relationship between parameters, Two port Symmetry and Reciprocity.	
Textbooks: 1. M.E. Van Valkenberg, "Network analysis", Prentice Hall of India, 3 rd edition, 2000. 2. Roy Choudhury, "Networks and systems", New Age International Publications, 2 nd edition 2006.		
Reference Books: 1. Hayt, Kemmerly and Durbin –Engineering Circuit Analysis", TMH, 7 th edition, 2010. 2. J. David Irwin /R. Mark Nelms, "Basic Engineering Circuit Analysis", John Wiley, 8 th edition, 2006.		
Other References:(NPTEL/SWAYAM. Any Other) 1. NPTEL course: Network Analysis, by Prof. Tapas Kumar Bhattacharya, IIT Kharagpur. https://onlinecourses.nptel.ac.in/noc20_ee46		
Course Outcomes: At the end of the course, the student will be able to: CO1: Determine currents and voltages in a circuit using network simplification techniques. CO2: Solve the network problems using graphical methods. CO3: Simplify the complex circuits using network theorems. CO4: Analyse simple DC circuits and apply the concepts to transient conditions. CO5: Solve the given network using specified two port network parameters like Z or Y or T or h and Evaluate frequency response related parameters through the RLC elements, in resonant circuits.		

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS O1	PS O2
CO1	3	3	3	2	2	1					1	2	1
CO2	3	3	3	2	2	1					1	2	2
CO3	3	3	3	2	2	1					1	3	1
CO4	3	3	3	2	2	1					1	3	1
CO5	3	3	3	2	2	1					1	3	2

High-3: Medium-2: Low-1

Evaluation Method

Continuous Internal Evaluation (CIE):

- Three Internal Tests will be conducted for 50 marks each and average of three will be taken. The student should score minimum 30% marks of the average of the three tests to avoid NSSR. **(A)**.
- Alternative Assessment Tools (AAT) are used to complete a project / Quiz/ Seminar cum Presentation / other suitable alternate assessment methods for 30 marks. Two evaluations will be conducted **(B)**.
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks **(C)**.

Final CIE Marks will be calculated as $(A+B+C)/2$ for 50 marks.

Semester End Examination (SEE):

The question paper consists of two parts, A and B.

Part A: Consists of 10 questions (2 questions from each module) of 2 marks each.

Part B: The question paper should have 10 questions. Each question carries 16 marks. There should be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The Final mark for the course is sum of the CIE and SEE Marks.

Course delivery methods		Assessment methods	
1	Chalk and talk	1	IA tests
2	PPT and Videos	2	Open Book Assignments (OBA)/ Lab Project
3	Flipped Classes	3	Lab Test
4	Practice session/Demonstrations in Labs	4	Semester End Examination
5	Virtual Labs (if present)		

B.E, Electronics and Communication (Advanced Communication Technology)

Engineering Electromagnetics			
Course Code	MVJ25EC35	Scheme	2025
Type of Course	PCC	Semester	III
Teaching Hours/Week (L:T:P)	4:0:0	CIE Marks	50
Total Hours of Pedagogy (L:T:P:SL&TW)	42:0:0:48	SEE Marks	50
Credits	3	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	3
Course Objectives: This course will give ability to: - Understand the applications of Coulomb's law and Gauss law to different charge Distributions. - Analyze the physical significance of Biot-Savart's Law, Amperes' Circuital Law and Stokes' theorem for different current distributions. - Interpret of Maxwell's equations and their applications in plane waves. - Acquire knowledge on different types of transmission lines. - Inspect concepts of Smith Chart for impedance matching.			
Syllabus			
This course provides a comprehensive understanding of electromagnetic field theory and its applications in engineering. It introduces electrostatics, including electric fields, potential and energy density, followed by Gauss's law, divergence and boundary conditions. The course also covers magnetostatics, including Biot-Savart law, Ampere's law and magnetic field analysis. Further, it explains time-varying electromagnetic fields through Maxwell's equations and wave propagation in different media. The course also includes transmission line theory, impedance matching techniques and the use of Smith charts. This subject forms a foundation for advanced studies in antennas, microwave engineering and wireless communication.			
Course Plan			
Module I			
Sr. No	Topics to be covered		Hours required
1	Electrostatics: Coulomb's law, Electric field intensity		8
2	Electric field due to line charge, Electric field due to Sheet of charge		
3	Electric flux, Electric flux density, Electric potential, Potential difference		
4	Relation between Electric field intensity (E) & potential (V), potential gradient, Electric dipole		
5	Energy density in electrostatic fields		
Module II			
Sr. No	Topics to be covered		Hours required
1	Gauss law, Maxwell's First equation, Application of Gauss' law		8
2	Divergence theorem, Current density, Conductor, Continuity equation		
3	Boundary conditions (dielectric-dielectric, conductor-dielectric, conductor-free space)		
4	Poisson's and Laplace's Equations		
5	Uniqueness theorem		
Module III			
Sr. No	Topics to be covered		Hours required

1	Magnetostatics: Biot-Savart Law, Magnetic field due to line current, Ampere's circuital law	10
2	Applications of Ampere's law, Curl, Stokes' theorem, Gauss's law for magnetic fields	
3	Magnetic flux, Magnetic flux density, Maxwell's equations for static fields, Scalar and Vector Potentials	
4	Magnetic forces: force on moving charge, force due to differential current element, force between current elements	
5	Magnetization, permeability, boundary conditions, torque, energy, magnetic circuit	
Module IV		
Sr. No	Topics to be covered	Hours required
1	Time varying fields, Faraday's law	8
2	Transformer and motional EMF, displacement current	
3	Maxwell's equations for time varying fields, time varying potentials	
4	Wave equations, relation between E and H	
5	Wave propagation in lossy dielectrics, lossless dielectrics, perfect conductor and good conductor	
6	Skin effect, Poynting's theorem	
Module V		
Sr. No	Topics to be covered	Hours required
1	Transmission line: Introduction and parameters, Transmission line equations	8
2	Input impedance, Characteristic impedance, Reflection coefficient SWR and power	
3	Smith chart fundamentals and transmission line types	
4	Impedance Matching Circuits	
Textbooks:		
1. Matthew N. O. Sadiku, "Elements of Electromagnetics", Oxford University Press, 7th Edition, 2018.		
2. W.H. Hayt. J.A. Buck & M. Jaleel Akhtar, "Engineering Electromagnetics," Tata McGraw Hill, 8th Edition, 2014.		
Reference Books:		
3. David M Pozar, "Microwave Engineering", John Wiley & Sons, Inc., 4th Edition, 2014.		
Other References: (NPTEL, SWAYAM, IEEE Xplore)		
1. Electromagnetic Theory, By Prof. Pradeep Kumar K, IIT Kanpur nptel.ac.in/courses/108104087		
Course Outcomes:		
At the end of the course, the student will be able to:		
CO1: Apply the fundamental laws of electromagnetics to the problems related to electric and magnetic fields.		
CO2: Analyse the behaviour of electrostatic and magnetostatic fields in different media using Maxwell's Equations, Boundary Conditions and Potential Theory.		
CO3: Evaluate electromagnetic wave propagation in different materials by deriving wave equations integrating the principles of static and time varying fields.		
CO4: Design transmission line models for impedance matching and tuning using Smith Chart techniques, ensuring efficient signal transmission.		

CO-PO Mapping

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

High-3: Medium-2: Low-1

Evaluation Method

Continuous Internal Evaluation (CIE):

- Three Internal Tests will be conducted for 50 marks each and average of three will be taken. The student should score minimum 30% marks of the average of the three tests to avoid NSSR. **(A)**.
- Alternative Assessment Tools (AAT) are used to complete a project / Quiz/ Seminar cum Presentation / other suitable alternate assessment methods for 30 marks. Two evaluations will be conducted **(B)**.
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks **(C)**.

Final CIE Marks will be calculated as $(A+B+ C)/2$ for 50 marks.

Semester End Examination (SEE):

The question paper consists of two parts, A and B.

Part A: Consists of 10 questions (2 questions from each module) of 2 marks each.

Part B: The question paper should have 10 questions. Each question carries 16 marks. There should be 2 questions from each module, with a maximum of 2 subdivisions. Students must answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The Final mark for the course is sum of the CIE and SEE Marks.

Course delivery methods		Assessment methods	
1	Chalk and talk	1	IA tests & SEE
2	PPT and Videos	2	Open Book Assignments (OBA)/ Lab Project
3	Flipped Classes	3	Lab Test
4	Practice session/Demonstrations in Labs	4	Semester End Examination
5	Virtual Labs (if present)		

Analog and Digital Electronics Lab			
Course Code	MVJ25ECL36	Scheme	2025
Type of Course	PCCL	Semester	III
Teaching Hours/Week (L:T:P)	4:0:0	CIE Marks	50
Total Hours of Pedagogy (L:T:P:SL&TW)	0:0:28:2	SEE Marks	50
Credits	1	Total Marks	100
Examination type (SEE)	Practical	Exam Hours	3
Course Objectives: This course will give ability to: • Demonstrate various circuits using hardware components. • To analyze circuit characteristics with signal analysis using Op-amp ICs. • To understand the concepts of oscillators. • To provide a fundamental understanding of combinational logic design, enabling students to simplify Boolean expressions and implement circuits. • To introduce the principles of sequential logic circuits, focusing on the practical application of flip-flops, shift registers, and counters in digital system design.			
Sl. No.	Experiments List		
1.	Conduct experiment to test diode clipping (single/double ended) and clamping circuits (positive/negative).		
2.	Design and set up the RC coupled Single stage BJT amplifier and determine the gain-frequency response, input, and output impedances		
3.	Design and setup the following tuned oscillator circuits using BJT and determine the frequency of oscillation. (a) Hartley Oscillator (b) Colpitts Oscillator		
4.	Plot the transfer and drain characteristics of n - channel MOSFET and calculate its parameters, namely; drain resistance, mutual conductance and amplification factor.		
5.	Design active second order Butterworth low pass filters.		
6.	Design Astable Multivibrator using 555 Timer.		
7.	Verify the sum-of product and product-of-sum expressions using universal gates. (i) $Y = \sum m(5,6,7,13,14,15)$ (ii) $Y = \prod M(0,1,2,4,5,8,10)$		
8.	Design and implement (a) Full Adder using basic logic gates. (b) Full subtractor using basic logic gates.		
9.	Design and implement 4-bit Parallel Adder/ Subtractor using IC 7483.		
10.	Realize the following flip-flops using NAND Gates (a) Clocked SR Flip-Flop (b) JK Flip-Flop (c) D-Flip-Flop		

11	Realize the following shift registers using IC7495 (a)SISO (b) SIPO (c) PISO (d) PIPO
12	Design and realize a Mod – N Synchronous Up Counter using 7490

Course Outcomes:

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

CO1: Design and test various Electronics Devices and Circuits

CO2: Compute the parameters from the characteristics of MOSFET devices.

CO3: Design and Test various types of oscillators.

CO4: Design and validate combinational logic systems by simplifying complex Boolean expressions and implementing it using circuits

CO5: Construct and troubleshoot sequential logic circuits by realizing various flip-flop architectures from NAND gates and configuring advanced modules such as shift registers and synchronous Mod-N counters

Evaluation Method

Continuous Internal Evaluation (CIE):

- **Weekly Evaluation for 30 Marks:** Weekly evaluation should be conducted for every experiment. Marks of each evaluation includes Lab Attendance (5 Marks) + Experiment conduction along with Record / Observation (15 Marks) + Viva (10 Marks) for each experiment. All weekly marks are added and scaled to 30 marks **(A)**.
- Two CIE tests for 20 Marks each should be conducted and averaged to 20 Marks **(B)**.

Final CIE Marks of practical should be calculated as A+B for 50 marks.

Semester End Examination (SEE):

The SEE of practical is evaluated for 50 marks, distributed as follows:

- Experiment Conduction with Results: 40 marks
- Viva Voce: 10 marks
- Total 50 marks

The Final mark for the course is the sum of CIE and SEE Marks.

CO-PO Mapping

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

High-3: Medium-2: Low-1

B.E, Electronics and Communication (Advanced Communication Technology)

Sustainable Engineering and SDGs			
Course Code	MVJ25AECK37	Scheme	2025
Type of Course	AEC	Semester	III
Teaching Hours/Week (L:T:P)	1:0:0	CIE Marks	50
Total Hours of Pedagogy (L:T:P:SL&TW)	14:0:0:16	SEE Marks	50
Credits	1	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	2 Hrs.
Course Objectives: This course will give ability to: • Explain the basic concepts of sustainability, sustainable development and the role of engineers. • Describe the 17 Sustainable Development Goals (SDGs) and relate selected SDGs to engineering disciplines. • Explain basic sustainable-engineering principles including resource efficiency, systems thinking, life cycle thinking and circular economy. • Identify environmental, social and economic impacts associated with engineering products, processes and services. • Apply simple sustainability thinking to propose an improved solution to a real-life engineering problem.			
Syllabus			
Objective of this course is to inculcate in students an awareness of environmental issues and the global initiatives towards attaining sustainability. The student should realize the potential of technology in bringing in sustainable practices.			
Module I			
Sr. No	Topics to be covered		Hours required
1	Foundations of Sustainability and Role of Engineers: Sustainability: Introduction, concept, evolution of the concept; Social, environmental and economic sustainability concepts; Sustainable development, Nexus between Technology and Sustainable development; Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs)-Overview of the 17 SDGs, Clean Development Mechanism (CDM), Introduction to the UN 2030 Agenda.		3
Module II			
Sr. No	Topics to be covered		Hours required
1	Environmental Pollution: Air Pollution and its effects, Water pollution and its sources, Zero waste concept and 3 R concepts in solid waste management; Greenhouse effect, Global warming, Climate change, Ozone layer depletion, Carbon credits, carbon trading and carbon footprint, legal provisions for environmental protection.		3
Module III			
Sr. No	Topics to be covered		Hours required

1	Environmental management standards: ISO 14001:2015 framework and benefits, Scope and goal of Life Cycle Analysis (LCA), Sustainable Engineering Principles and Circular Economy, Bio-mimicking, Environment Impact Assessment (EIA), Industrial ecology and industrial symbiosis.	3
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Module IV

Sr. No	Topics to be covered	Hours required
1	Resources and its utilisation: Basic concepts of Conventional and non-conventional energy, Environmental footprints, General idea about solar energy, Fuel cells, Wind energy, Small hydro plants, biofuels, Energy derived from oceans and Geothermal energy.	3

Module V

Sr. No	Topics to be covered	Hours required
1	Sustainable design and practices/Case Studies/Student Activity: Sustainability practices: Basic concept of sustainable habitat, conventional design Vs sustainable design, Methods for increasing energy efficiency in buildings, Green Engineering, Sustainable Urbanisation, Sustainable cities, Sustainable transport.	2

Textbooks:

1. Toolseeram Ramjeawon, Introduction to Sustainability for Engineers, CRC Press, 1st Edition, 2020.
2. Rag, R. L. and Ramesh Lakshmi Dinachandran, Introduction to Sustainable Engineering, PHI Learning.
3. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
4. Bradley. A.S; Adebayo,A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning
5. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.

Reference Books:

1. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System
2. Environment Impact Assessment Guidelines, Notification of Government of India, 2006
3. Allenby, B. R., The Sustainability Engineering Handbook, McGraw-Hill.
4. Mihelcic, J. R. and Zimmerman, J. B., Environmental Engineering: Fundamentals, Sustainability, Design, Wiley.
5. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998
6. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
7. Purohit, S. S., Green Technology - An approach for sustainable environment, Agrobios Publication

Course Outcomes:

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

CO1: Explain sustainability, sustainable development and the role of engineers

CO2: Explain different types of environmental pollution problems, SDGs, relate them to engineering applications, and their sustainable solutions

CO3: Explain life cycle thinking and environmental footprints

CO4: Apply basic principles of sustainable engineering and circular economy

CO5: Propose a basic sustainable engineering solution to a real-life problem

CO-PO Mapping

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

High-3: Medium-2: Low-1

Evaluation Method**Continuous Internal Evaluation (CIE) – 50 Marks**

The CIE for the mandatory credit courses common across all disciplines comprises of two components as follows:

Internal Assessment Tests (30 Marks):

Two Internal Assessment tests will be conducted, each comprising 50 multiple choice questions for a total of 50 marks. The average of the two test scores will be scaled down to 30 marks.

Assignments (20 Marks):

Students are required to complete two assignments, each carrying 10 marks. These assignments may include projects*, poster presentations*, seminars*, or similar academic activities. The marks of the two assignments are added to get 20 marks.

*Each assignment will undergo two rounds of evaluation to assess progress and quality

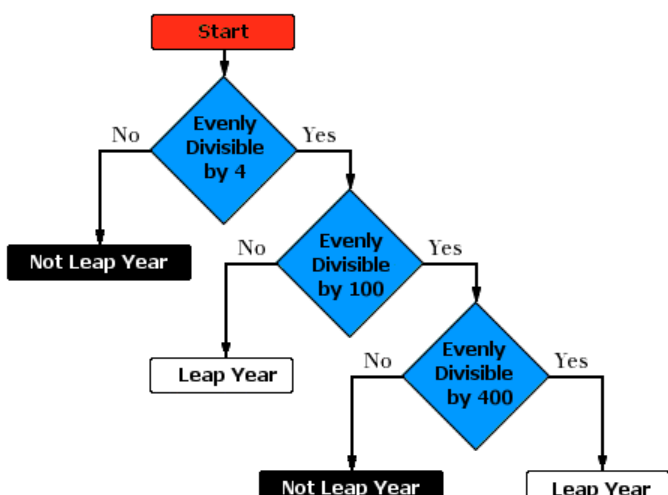
At the beginning of the semester, the instructor/faculty teaching the course has to announce the methods of Assignment for the course.

Together, these two components are added to get the Final CIE marks of 50.

Semester End Examination (SEE) – 50 Marks

A Semester End Examination is conducted for 50 marks comprising of multiple-choice questions (MCQ) type each of one mark.

The final score for the course out of 100 is the SumTotal of SEE and CIE.

LabVIEW for ECE			
Course Code	MVJ25EC38SL	Scheme	2025
Type of Course	SDL	Semester	III
Teaching Hours/Week (L:T:P)	0:0:2	CIE Marks	50
Total Hours of Pedagogy (L:T:P:SL&TW)	0:0:28:2	SEE Marks	50
Credits	1	Total Marks	100
Examination type (SEE)	Practical	Exam Hours	3
Course Objectives: This course will enable students to, • Introduce the basics of LabVIEW environment and the basic concept of Data Flow programming. • Familiarize the common LabVIEW functions with the different palettes. • Understand the graphical programming and the debugging methods. • Understand the advanced operations of LabVIEW programming in developing stand alone applications. • Understand the modularity in different data types and modularity in different operations of LabVIEW.			
Sl. No.	Experiments List		
1.	Build a VI to develop code converters like binary to gray, gray to binary, BCD to Excess 3.		
2.	Build a VI to perform the operation of Half adder and Full adder.		
3.	Build a VI to find whether the given input year is a leap year or not.  <pre> graph TD Start([Start]) --> D1{Evenly Divisible by 4} D1 -- No --> NLY1[Not Leap Year] D1 -- Yes --> D2{Evenly Divisible by 100} D2 -- No --> LY1[Leap Year] D2 -- Yes --> D3{Evenly Divisible by 400} D3 -- No --> NLY2[Not Leap Year] D3 -- Yes --> LY2[Leap Year] </pre>		
4.	Build a VI for Tank level measurement. (Single tank level filling and then draining, Two tank with one filling and other draining after first tank filling, two tanks simultaneously One filling and other draining)		
5.	Build a VI to add 'n' Natural numbers according to the input of the user.(Using feedback node and shift register)		
6.	Build a VI to find the Fibonacci series according to the given input of the user.		
7.	Build a VI to find the factorial of a given number.		
8.	Build a VI to display only the odd numbers and even numbers separately using conditional tunnel modes.		

9.	Build a VI to simulate traffic light control.
Course Outcomes: The student will be able to: CO1: Understand the basic tools for developing the Virtual Instruments environment. CO2: Analyse data structures of of different data types of Numeric, Boolean in LabVIEW and Identify and use various loop structures in LabVIEW environment. CO3: Understand the different operational functions for arrays and clusters to develop different tasks. CO4: Examine Digital waveform graphs and Charts and Implement error handling techniques in LabVIEW.	

CO-PO Mapping

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

High-3: Medium-2: Low-1

Evaluation Method:

Continuous Internal Evaluation (CIE):

The CIE is evaluated for 50 marks, distributed as follows: Regular Laboratory Performance & Conduct (15 Marks) + Module Project Evaluations (3 Projects) (20 Marks) + Laboratory Record / Logbook & Calculations (10 Marks) + Internal Practical Test / Quizzes (5 Marks)

Final CIE Marks of practical should be calculated for 50 marks.

Semester End Examination (SEE):

The question paper consists of two parts, A and B.

Part A: Consists of 10 questions (2 questions from each module) of 2 marks each.

Part B: The question paper should have 10 questions. Each question carries 16 marks. There should be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The Final mark for the course is sum of the CIE and SEE Marks.

Physical Education (Sports & Athletics)			
Course Code	MVJ25PE39	Scheme	2025
Type of Course	NCMC	Semester	III
Teaching Hours/Week (L: T: P)	0:0:0	CIE Marks	100
Total Hours of Pedagogy (L: T: P: SL&TW)	0:0:0:28	SEE Marks	--
Credits	0	Total Marks	100
Examination type (SEE)	--	Exam Hours	--
Course Objectives: the student will be able to			
1	Understand the meaning and importance of the fitness and the benefits of fitness		
2	Types of fitness and fitness tips.		
3	Importance of Sports, and Yoga in a day-to-day life.		
4	Understand the importance of aerobics and other activities for healthy lifestyle.		
5	Know about the different roles of organization and administration in sports events.		
Topics / Activities to be Covered (100Marks)			
Module I			5Hours
Orientation			
➤ Lifestyle			
➤ Fitness			
➤ Food & Nutrition: Sports diet.			
➤ Stress Management			
Module II			5Hours
General Fitness & Components of Fitness			
➤ Warming up (Free Hand Exercises).			
➤ Strength—Push-up/Pull-ups			
➤ Speed—30MtrDash.			
➤ Agility—Shuttle Run			
➤ Flexibility—Sit and Reach			
Module III			5Hours
Specific Games (Anyone to be selected by the student)			
➤ Volleyball— Attack, Block, Service, Upper Hand Pass and Lower Hand and Pass.			
➤ Throw ball—Service, Receive, Spin attack, Net Drop & Jump throw.			
➤ Kabaddi— Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus.			
➤ Basketball-dribbling, passing, shooting etc.			
➤ Table Tennis—Service (Fore Hand & Back Hand)			
➤ Receive (Fore Hand & Back Hand)			
➤ Smash, Athletics (Track / Field Events) -Running, Jumping, Throwing.			
Module IV			6 Hours
Role of Organization and administration			
➤ Planning.			
➤ Organizing.			

➤ Staffing. ➤ Directing. ➤ Coordinating & controlling. ➤ Reporting & Recording. ➤ Budgeting.	
Module V 6Hours	
Aerobics ➤ Dance Aerobics ➤ Sport Aerobics ➤ Warm up Aerobics ➤ Cardiovascular Aerobics	
Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness.
CO2	Familiarization of health-related Exercises, Sports for overall growth and development.
CO3	Create a foundation for the professionals in physical Education and Sports.
CO4	Participate in the competition at regional / state / national / international levels.
CO5	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.
Assessment Details for CIE (both CIE and SEE)	
Weight age	CIE – 100%
Participation of student in all the modules	50 Marks
Final presentation / exhibition / Participation In competitions / practical on specific tasks Assigned to the students	50 Marks
Total marks for the course in each semester	100 Marks
• Implementation strategies of the project (PE work). • The last report should be signed by PED, the HOD and principal. • At last report should be evaluated by the PED of the institute. • Finally, the consolidated marks sheet should be sent to the Controller of Examinations office.	
Marks scored for 100 by the students should be Scale to 50 marks in each semester.	
Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general.	

CO/PO Mapping											
CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO 1	-	-	-	-	-	-	-	2	2	-	-
CO 2	-	-	-	-	-	-	-	2	2	-	-
CO 3	-	-	-	-	-	-	-	2	2	-	-
CO 4	-	-	-	-	-	-	-	2	2	-	-
CO 5	-	-	-	-	-	-	-	3	3	-	-

YOGA			
Course Code	MVJ25YO39	Scheme	2025
Type of Course	NCMC	Semester	III
Teaching Hours/Week (L: T: P)	0:0:0	CIE Marks	100
Total Hours of Pedagogy (L: T: P: SL&TW)	0:0:0:28	SEE Marks	--
Credits	0	Total Marks	100
Examination type (SEE)	--	Exam Hours	--
Course Learning Objectives: The students will be able to			
1	Promote Holistic Wellness Practice in Students.		
2	Develop Physical Awareness and Flexibility		
3	Improve Focus and Academic Performance		
4	Encourage Healthy Lifestyle Habits.		
5	Support mental Health and Emotional balance.		
<u>The Health Benefits of Yoga:</u>			
1)Yoga helps with a person-centered approach to well-being offering physical, mental(cognitive), and spiritual(emotional) benefits for students. These benefits can help students cope with the demands of academic journeys, improve their overall health, and promote personal development.			
• Key Benefits of Various Yoga Techniques: • Enhances Physical Well-being. • Boosts Mental Focus. • Promotes Emotional Stability. • Reduce Stress Levels. • Encourages Inner Growth.			
It is also used as an adjunct therapy to support recovery from various physical health conditions such as:			
• Chronic Pain. • Back Pain. • Arthritis. • Cardiovascular Diseases. • Asthma. • Chronic Fatigue Syndrome. • Menstrual Disorders. • Digestive Issues. • Thyroid Imbalances. • Migraine and headache.			
2) Core observations on how yoga functions as a complementary mind-body intervention to support the psychological, physiological and spiritual healing processes associated with various health conditions.			
Psychological Benefits:			
• Stress reduction. • Anxiety relief. • Trauma healing. • Cognitive and clarity focus. • Emotional Regulation.			

• Aid in managing depression. Physiological Benefits: • Enhance Blood Circulation. • Boost Cardiovascular Health. • Supports Overall Gut Function. • Promotes Thyroid Function. • Relief from Headaches. • Increased Energy level. Spiritual Benefits: • Cultivating gratitude and Compassion • Self –realization • Balance and Harmony • Inner Peace • Sense of oneness. Mindfulness	
MODULE- I	
Discipline and Awareness Reflect Habits s Thoughts: • Basic theory of Yoga, Yamas s Niyamas Yoga definition, Aims and Objectives, importance of yoga in students. • Introduction to Yoga asana Yoga asana meaning, principle and health benefits. • Ashtanga yoga Meaning, breathing techniques. • Four paths of yoga Karma yoga, Bhakthi yoga, Raja yoga, Jnanayoga. • Surya namaskar Surya namaskar prayer and its meaning, benefits and importance. • Yoga asanas Asanas it's need, importance, name and technique. Sitting: -Vajrasana, - adasana, Ardachakrasana, Prone line: -Advasana, Bhujangasana Supine line: -Shavasana, Supta baddhakonasana, Balancing posture: -Vrikshasana, Garudasana	7 Hrs
MODULE -II	
Building strength and focus Finding out the obstacle: • Kriya Yoga Tapas, Svadhyaya, Ishwarapranidhana • Five Kleshas Obstacles. • Pranayama Introduction to Pranayama. • Pratyahara Preparing mind for meditation, Breathe focus techniques.	7 Hrs

• Yoga asanas Standing: -Virabhadrasana, Parshvakona Sitting: -Vajrasana, Paschimottanasana Prone Line: -Dhanurasana, Shalabhasana, Supine Line: -Ananda Balasana, Supta Matsyendrasana , Balancing: -Natarajasana (Dancer Pose)	
MODULE -III	
Awareness and inner balance: Finding how focused is the mind • Dharana: Concentration • Dhyana: Meditation • Swasthya, Smriti, Sankalpa. Tool of academic excellence. • Samyama Patanjali's concept of samyama • Yogasanas Standing: - ArdhaChandrasana, Utkatasana Sitting: - Padmasana (or prep), Gomukhasana Prone Line: - Adho Mukha Svanasana, Naukasana Supine Line: - SuptaBaddhaKonasana, Chakrasana Balancing: - Garudasana (Eagle Pose)	7 Hrs
MODULE -IV	
Integrating Yoga in daily Life: • Yama niyama Acharam: Practice of ethical Discipline (practicing nonviolence, truth, cleanliness) • Ahara- Vihara Samyama: Practice discipline in diet C lifestyle. • Asana- pranayama sadhana: Daily practice of asanas and pranayama • Yogasanas: Standing: -PrasaritaPadottanasana, ParivrttaTrikonasana Sitting: -Baddha Konasana, Marichyasana Prone Line: -Ustrasana (Camel), Makarasana (relaxation) Supine Line: -Sarvangasana, Shavasana Balancing: - Bakasana (Crow – optional or modified)	7 Hrs

Course outcomes	
CO1	Identify and reflect on personal habits and thoughts.
CO2	Explain the basic theory of Yoga, including Yamas C Niyama.
CO3	Understand the definition, aims, objectives, and importance of Yoga, especially for students.
CO4	Enhance physical and mental strength through advanced Yog asanas.

CO/PO Mapping											
CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO 1		2						3	2	2	
CO 2	2						2	2			
CO 3	2					2	2	3			
CO 4					2		3	3			

Weekley assessment will be done by the instructor by giving different poses / Asanas.
The final assessment scaled up to 100 marks.

Text Book

1	Ajitkumar, "Yogapravesha in Kannada"
2	BKS Iyengar "Light on Yoga"

Reference Books

1	M L Gharote & Dr. S K Ganguly, "Teaching Methods for Yogic practices"
2	Yoga Instructor Course hand book published by SVYASA University, Bengaluru
3	Yamini Muthanna," Yoga for Children –step by step"

B.E, Electronics and Communication (Advanced Communication Technology)			
Additional Mathematics-I			
Course Code	MVJ25MATDIP310	Scheme	2025
Type of Course	NCMC	Semester	III
Teaching Hours/Week (L: T: P)	2:0:0	CIE Marks	100
Total Hours of Pedagogy (L: T: P: SL&TW)	28:0:0:0	SEE Marks	--
Credits	0	Total Marks	100
Examination type (SEE)	--	Exam Hours	--
Course Objectives: This course will give ability to: To familiarize the important and introductory concepts of Differential calculus, Integral calculus, Vector differentiation, Probability, ordinary differential equations of first order, and analyze the engineering problems.			
Syllabus			
Differential calculus-nth derivative, Leibnitz theorem, Polar curves - angle between the radius vector and tangent, angle between two curves pedal equation, Taylor's and Maclaurin's series expansions, Integral Calculus: Statement of reduction formulae for the integrals of $\sin^n(x)$, $\cos^n(x)$, $\sin^n x$, $\cos^m x$, Evaluation of these integrals with standard limits-problems, Double - Simple examples, Triple integrals, Vector Differentiation: Differentiation of vector functions, Velocity and acceleration of a particle moving on a space curve, Scalar and Vector point functions, Gradient, Divergence, Curl, Solenoidal and Irrotational vector fields, Vector identities - $\text{div}(\phi \vec{A})$, $\text{curl}(\phi \vec{A})$, $\text{curl}(\text{grad}(\phi))$, $\text{div}(\text{curl} \vec{A})$, Probability: Basic terminology, Sample space and events, Axioms of probability. Addition and multiplication theorems, Conditional probability, Bayes theorem, Introduction – Formation of differential equation, solutions of first order and first-degree differential equations, Variable separable form, homogeneous Exact, linear differential equations, Clairaut's equation.			
Course Plan			
Module I			
Differential calculus			
Sr.No	Topics to be covered		Hours required
1	Differential calculus: Recapitulation of successive differentiation -nth derivative		6
2	Leibnitz theorem (without proof) and Problems		
3	Polar curves - angle between the radius vector and tangent, angle between two curves		
4	pedal equation		
5	Taylor's and Maclaurin's series expansions- Illustrative examples		
Module II			
Integral Calculus			
Sr. No	Topics to be covered		Hours required
1	Integral Calculus: Statement of reduction formulae for the integrals of $\sin^n(x)$, $\cos^n(x)$, $\sin^n x$, $\cos^m x$		

2	Evaluation of these integrals with standard limits-problems	6
3	Double -Simple examples	
4	Triple integrals-Simple examples	

Module III

Vector Differentiation

Sr. No	Topics to be covered	Hours required
1	Vector Differentiation: Differentiation of vector functions	6
2	Velocity and acceleration of a particle moving on a space curve	
3	Scalar and Vector point functions, Gradient, Divergence, Curl	
4	Solenoidal and Irrotational vector fields	
5	Vector identities - $\text{div}(\phi \vec{A})$, $\text{curl}(\phi \vec{A})$, $\text{curl}(\text{grad}(\phi))$, $\text{div}(\text{curl} \vec{A})$.	

Module IV

Probability

Sr. No	Topics to be covered	Hours required
1	Probability: Basic terminology, Sample space and events	5
2	Axioms of probability. Addition and multiplication theorems	
3	Conditional probability – illustrative examples	
4	Bayes theorem-examples	

Module V

Ordinary Differential Equations of First Order

Sr. No	Topics to be covered	Hours required
1	Introduction – Formation of differential equation, solutions of first order and first degree differential equations	5
2	Variable separable form, homogeneous	
3	Exact, linear differential equations	
4	Some special first order equations: Clairaut's equation	
5	Some special first order equations: Clairaut's equation	

Textbooks:

1. B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2013.
2. Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.

Reference Books:

3. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley-India publishers, 10th edition, 2014.
4. G. B. Gururajachar: Calculus and Linear Algebra, Academic Excellent Series Publication, 2018-19

Other References:(NPTEL/SWAYAM. Any Other)

1. https://youtube.com/playlist?list=PL7oBzLzHZ1wXBSiJEgqz_iwVoLiY8qhbv&si=LWY0G3yww0MbHN9G
NPTEL course: Mechanics of Materials by Dr. U Saravanan, IIT Madras

1. <https://youtu.be/rveuCHNkaC4?si=jIJomstkFZySE0tk> Mechanics of Solids by Prof. Priyanka Ghosh, IIT Kanpur.
2. <https://youtu.be/U-5tA9ZMsno?si=Wcl7W7JN3Wmg3McP>
3. <https://youtu.be/COI0BUmNHT8?si=77D82b9BAnf-jVT2>
4. <https://youtu.be/ES741wg3APA?si=igR2QZ5xreoVGo1v>

Course Outcomes:

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

- CO1: Apply the knowledge of calculus to solve problems related to polar curves and its applications
- CO2: Apply the concept of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.
- CO3: Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors and also exhibit the inter dependence of line, surface and volume integrals.
- CO4: Understand the basic Concepts of Probability
- CO5: Recognize and solve first-order ordinary differential equations occurring in different branches of engineering

CO-PO Mapping:

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

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

Evaluation Method:

Continuous Internal Evaluation (CIE):

- Two CIE Will be conducted for 50 marks each and average of two will be taken (A)
- Alternative Assessment Tools (AAT) should be a project / Quiz/ Seminar cum Presentation / other suitable alternate assessment methods for 30 marks. Two evaluations will be conducted (B)
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C) for 100 marks

Course delivery methods		Assessment methods	
1	Chalk and talk	1	IA tests
2	PPT and Videos	2	Open Book Assignments (OBA)/ Lab Project
3	Flipped Classes	3	AAT (Quiz, Mini Project)