COLLEGE OF ENGINEERING
Since 1982
Engineering A Better Tomorrow
An Autonomous Institution

Bachelor of Engineering in Computer Science and Engineering (Data Science)

Scheme and Syllabus

(2025 Scheme)

III Semester

MVJ College of Engineering, Bengaluru (Autonomous)
B.E. in Computer Science & Engineering (Data Science) - 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	#THS/S	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	SL						
1	ASC	MVJ25CS31	Probability, Statistics and Stochastic Processes	56	0	0	64	120	3	50	50	100	4
2	IPCC	MVJ25CS32	Object-Oriented Programming using Java	42	0	28	50	120	3	50	50	100	4
3	PCC	MVJ25CS33	Data Structures	56	0	0	64	120	3	50	50	100	4
4	PCC	MVJ25CD34	Introduction to Data Science	56	0	0	64	120	3	50	50	100	4
5	PCCL	MVJ25CSL35	Data Structures Lab	0	0	28	2	30	3	50	50	100	1
6	BSC	MVJ25BI36	Biology for Engineers	28	0	0	32	60	2	50	50	100	2
7	AEC	MVJ25AECS37	Scientific Foundation of Health	14	0	0	16	30	2	50	50	100	1
8	SDC	MVJ25CS38SL	Networking and Trouble Shooting Lab	0	0	0	30	30	3	50	50	100	1
9	NCMC	MVJ25PE39	Physical Education (PE) (Sports and Athletics)	0	0	0	30	30	---	100	---	100	PP
		MVJ25YO39	Yoga										
10	NCMC	MVJ25MATDIP310	Additional Mathematics – I*	42	0	0	56	90	---	100	---	100	PP
	TOTAL												21

*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	#THS /S	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	SL						
1	ASC/PCC	MVJ25CS41	Discrete Mathematical Structure and Graph Theory	56	0	0	64	120	3	50	50	100	4
2	IPCC	MVJ25CS42	Analysis and Design of Algorithms	42	0	28	50	120	3	50	50	100	4
3	PCC	MVJ25CS43	Database Management System	56	0	0	64	120	3	50	50	100	4
4	PCC	MVJ25CS44	Operating System	56	0	0	64	120	3	50	50	100	4
5	PCC	MVJ25CD45	Data Warehouse & Mining	42	0	0	48	90	3	50	50	100	3
6	PCCL	MVJ25CSL46	Database Management System Lab	0	0	28	2	30	3	50	50	100	1
7	AEC	MVJ25AECS47	Sustainable Engineering and SDGs	14	0	0	16	30	2	50	50	100	1
8	SDC	MVJ25CS48SL	Ethical Hacking Lab	0	0	0	30	30	3	50	50	100	1
9	NCMC	MVJ25PE49	Physical Education (PE) (Sports and Athletics)	0	0	0	30	30	---	100	---	100	PP
		MVJ25YO49	Yoga										
10	NCMC	MVJ25MATDIP410	Additional Mathematics – II*	42	0	0	56	90	---	100	---	100	PP
	TOTAL												22

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Semester - V

Sl. No	Course	Course Code	Course Title	Teaching & Learning Scheme					Examination				Credits
				CI		LI	TW & SL	#THS/ S	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	SL						
1	HSMC	MVJ25CS51	Software Engineering & Project Management	42	0	0	48	90	3	50	50	100	3
2	IPCC	MVJ25CS52	Machine Learning	42	0	28	50	120	3	50	50	100	4
3	PCC	MVJ25CS53	Computer Networks	42	0	0	48	90	3	50	50	100	3
4	PCC	MVJ25CD54	Business Intelligence	42	0	0	48	90	3	50	50	100	3
5	PEC	MVJ25CD55X	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	MVJ25AECS57	Economics for Engineers	14	0	0	16	30	2	50	50	100	1
7	SDC	MVJ25CS58SL	MATLAB for CSE	0	0	0	30	30	3	50	50	100	1
8	PCCL	MVJ25CSL59	Data Visualization Lab	0	0	28	2	30	3	50	50	100	1
9	SDC	MVJ25HBP510	Hackathon-Based Project	0	0	0	60	60	3	50	50	100	2
	TOTAL												23

Professional Elective Course-I				
MVJ25CD55A	Digital Image Processing	MVJ25CD55C		AI Algorithm
MVJ25CD55B	Exploratory Data Analysis	MVJ25CD55D		NoSQL Databases

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Semester - VI

Sl. No	Course	Course Code	Course Title	Teaching & Learning Scheme					Examination				Credits
				CI		LI	TW & SL	#THS/S	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	SL						
1	IPCC	MVJ25CD61	Big Data Analytics	42	0	28	50	120	3	50	50	100	4
2	PCC	MVJ25CD62	Deep Learning	42	0	0	48	90	3	50	50	100	3
3	PCC	MVJ25CD63	Theory Of Computation	42	0	0	48	90	3	50	50	100	3
4	PCC	MVJ25CD64	Data Privacy and Security	42	0	0	48	90	3	50	50	100	3
5	PEC	MVJ25CD65X	Professional Elective Courses-II	42	0	0	48	90	3	50	50	100	3
6	PCCL	MVJ25CDL66	Deep Learning lab	0	0	28	2	30	3	50	50	100	1
	AEC	MVJ25AECS67	Human Resources Management	14	0	0	16	30	2	50	50	100	1
7	SDC	MVJ25CD68SL	Cyber Security Lab	14	0	0	16	30	3	50	50	100	1
9	SDC	MVJ25CD69	Capstone Project – Phase I	0	0	0	90	90	3	100	--	100	3
10	NCMC	MVJ25UHV610	Universal Human Value	14	0	0	16	30	--	100	---	100	PP
	TOTAL												22

Professional Elective Course-II			
MVJ25CD65A	Blockchain Technology	MVJ25CD65C	Internet of Things
MVJ25CD65B	Distributed System	MVJ25CD65D	Computer Vision

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Semester - VII

Sl. No	Course	Course Code	Course Title	Teaching & Learning Scheme					Examination				Credits
				CI		LI	TW & SL	#THS/S	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	SL						
1	IPCC	MVJ25CD71	Natural Language Processing	56	0	28	50	120	3	50	50	100	4
2	PEC	MVJ25CD72x	Professional Elective Course-III	42	0	0	48	90	3	50	50	100	3
3	PEC	MVJ25CD73x	Professional Elective Course -IV	42	0	0	48	90	3	50	50	100	3
4	OEC	MVJ25CD74x	Open Elective Course-I	42	0	0	48	90	3	50	50	100	3
5	SDC	MVJ25AE75	Capstone Project - Phase-II	0	0	0	210	210	3	100	100	200	7
6	NCMC	MVJ25IKS76	Indian Knowledge System	14	0	0	16	30	---	100	--	100	PP
7	AEC	MVJ25AECS77	Ability Enhancement Course	14	0	0	16	30	2	50	50	100	1
8	SDC	MVJ25CD78SL	GEN AI Lab	0	0	28	2	30	3	50	50	100	1
	TOTAL												22

Professional Elective Course-III			
MVJ25CD72A	Reinforcement Learning	MVJ25CD72C	Gen AI & LLM
MVJ25CD72B	UI/UX Design	MVJ25CD72D	Quantum Computing
Professional Elective Course-IV			
MVJ25CD73A	Social Network Analysis	MVJ25CD73C	Edge Computing
MVJ25CD73B	VR & AR	MVJ25CD73D	DevOps and MlOps
Open Elective Course-I			

MVJ25CD74A	Introduction to Data Structure	MVJ25CD74C	Introduction to Data Science
MVJ25CD74B	Fundamentals of Operating System	MVJ25CD74D	**Foreign Language** (NPTEL/SWAYAM/online VTU)

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Semester – VIII

Sl. No	Course	Course Code	Course Title	Teaching & Learning Scheme					Examination				Credits
				CI		LI	TW & SL	#THS /S	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	SL						
1	PEC	MVJ25CD81x	Professional Elective-V (NPTEL/VTU Online Course)	0	0	0	90	90	3	50	50	100	3
2	OEC	MVJ25CD82x	Open Elective-II (NPTEL/VTU Online Course)	0	0	0	90	90	3	50	50	100	3
3	SDC	MVJINT83x	Internship (15 weeks or 90 working days)	0	0	0	270	270	3	100	100	200	9
	TOTAL												15

	Professional Elective Course (Online courses)-V				
MVJ25CD81A	NPTEL/VTU Online Course	MVJ25CD81C		NPTEL/VTU Online Course	
MVJ25CD81B	NPTEL/VTU Online Course	MVJ25CD81D		NPTEL/VTU Online Course	
	Open Elective Courses -II (Online Courses)				
MVJ25CD82A	NPTEL/VTU Online Course	MVJ25CD82C		NPTEL/VTU Online Course	
MVJ25CD82B	NPTEL/VTU Online Course	MVJ25CD82D		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 Internship**: Shall be opted by students unable to secure internships, offering credit equivalence through curated online courses available at http:// www.online.vtu.ac.in

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VII and VIII semesters for the candidates who opt for a two-semesters internship along with Capstone Project (Scheme B)

Sl. No	Course	Course Code	Course Title	Teaching & Learning Scheme				#THS/S	Examination				Credits
				CI		LI	TW & SL		Duration in	CIE Marks	SEE Marks	Total Marks	
				L	T	P	SL						
1	PEC	MVJ25CS81X	Professional Elective-V (NPTEL/VTU Online Course)	0	0	0	90	90	3	50	50	100	3
2	OEC	MVJ25CS82X	Open Elective-II (NPTEL/VTU Online Course)	0	0	0	90	90	3	50	50	100	3
3	SDC	MVJ25INT83X	Internship (15 weeks or 90 working days)	0	0	0	270	270	3	100	100	200	9
	7^{th} semester and 8^{th} semester Credits Total												15

Professional Elective Course-III			
MVJ25CD72A	NPTEL/VTU Online Course	MVJ25CD72C	NPTEL/VTU Online Course
MVJ25CD72B	NPTEL/VTU Online Course	MVJ25CD72D	NPTEL/VTU Online Course
Professional Elective Course-IV			
MVJ25CD73A	NPTEL/VTU Online Course	MVJ25CD73C	NPTEL/VTU Online Course
MVJ25CD73B	NPTEL/VTU Online Course	MVJ25CD73D	NPTEL/VTU Online Course

Open Elective Course-I			
MVJ25CD74A	NPTEL/VTU Online Course	MVJ25CD74C	NPTEL/VTU Online Course
MVJ25CD74B	NPTEL/VTU Online Course	MVJ25CD74D	NPTEL/VTU Online Course
Professional Elective Course-V			
MVJ25CD81A	NPTEL/VTU Online Course	MVJ25CD81C	NPTEL/VTU Online Course
MVJ25CD81B	NPTEL/VTU Online Course	MVJ25CD81D	NPTEL/VTU Online Course
Open Elective Course-II			
MVJ25CD82A	NPTEL/VTU Online Course	MVJ25CD82C	NPTEL/VTU Online Course
MVJ25CD82B	NPTEL/VTU Online Course	MVJ25CD82D	NPTEL/VTU Online Course

Types of Internships (Course Code: MVJ25xx83)

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, Centres 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**.

Semester: III			
Probability, Statistics and Stochastic Processes			
Course Code	MVJ25CS31	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:

- Understand and apply probability distribution, sampling theory and joint probability distributions.
- Organize, manage and present data using statistical methods.

Syllabus

Random variables and probability distributions, discrete and continuous distributions, probability mass and density functions, Binomial, Poisson, Exponential, Uniform and Normal distributions, joint probability distributions, expectation, covariance and correlation; Sampling theory, sampling distributions, standard error, hypothesis testing, confidence limits, t-distribution, Chi-square and F-test distributions; Markov chains, states, transitions, transition probabilities, transition matrices, state and chain classification, and Gambler's Ruin; Statistical methods - correlation, regression, curve fitting using least-squares methods, and K-means clustering; Design of experiments using ANOVA, one-way and two-way classifications, completely randomized design, randomized block design, and Latin square design.

Course Plan

Module I

Probability Distributions

Sl. No.	**Topics to be covered**	**Hours required**
1	Random variables (discrete and continuous), probability mass/density functions.	**11 Hrs**
2	Binomial distribution, Poisson distribution.	
3	Exponential , Uniform and Normal distributions.	
4	Joint Probability distribution for two discrete random variables.	
5	Expectation, covariance, correlation coefficient.	

Module II

Sampling Theory

Sl. No.	**Topics to be covered**	**Hours required**
1	Sampling, Sampling distributions, Standard error.	

2	Test of hypothesis for means.	**12 Hrs**
3	Test of hypothesis for Proportions.	
4	Confidence limits for means.	
5	Student's t-distribution.	
6	Chi-square distribution.	
7	F – test distribution.	

Module III

Markov Chains

Sl. No.	Topics to be covered	Hours required
1	States and transitions, Transition probabilities.	**11 Hrs**
2	General two-state Markov chain.	
3	Powers of the transition matrix for the m-state chain.	
4	Gambler's ruin as a Markov chain.	
5	Classification of states.	
6	Classification of chains.	

Module IV

Statistical Methods

Sl. No.	Topics to be covered	Hours required
1	Correlation Coefficients.	**11 Hrs**
2	Regression Coefficients.	
3	Line of regression problems.	
4	Fitting of the curves of the form $y = ax + b$.	
5	Fitting of the curves of the form $y = ax^2 + bx + c$.	
6	Fitting of the curves of the form $y = ae^{bx}$ by the method of least squares.	
7	K-Clustering: Definition & Basic Problems.	

Module V

Design of Experiments (ANOVA):

Sl. No.	Topics to be covered	Hours required
1	Design of Experiments (ANOVA): One-way classifications.	**11 Hrs**
2	Design of Experiments (ANOVA): Two-way classifications.	
3	Completely randomized design.	
4	Randomized block design.	
5	Latin square design.	

Textbooks:

1. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 45th Edition, 2023.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers & Keying Ye, *Probability and* Statistics for Engineers and Scientists, Pearson, 10th Edition, 2018.
3. T. Veerarajan, *Probability, Statistics and Random Processes*, 3rd Edition, 2016, McGraw Hill Education.
4. A. M. Haghighi, I. Wickramasinghe, E. A. Appiah, *Probability, Statistics, and*

Stochastic Processes for Engineers and Scientists, 1st Edition, 2020, CRC Press.

Reference Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley-India publishers, 10th edition, 2014.
2. S.C. Gupta and V.K. Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons, Latest Edition.
3. Sheldon M. Ross, *Introduction to Probability Models*, Academic Press, 12th Edition, 2019.

Other References:

Ex: NPTEL, SWAYAM:

1. https://youtu.be/ZfbWC4rqIiE?si= Q91xzGzM4fyJ1PC
2. https://youtu.be/RwauwRcJOhA?si=WQH2j8cpb62kDymS
   https://youtu.be/6zslEdMGGiQ?si=GPImZMvCHNdMoGoS
3. https://youtu.be/Q0z4YKfrlMM?si=YQersroRgW5R7nCW
4. https://youtu.be/n9qpktdFfLU?si=9OJPAlaUdK-TANGK
5. https://youtu.be/AuDgWSx7gMo?si=9W5b7EJa-j8W4iAP

Course Outcomes:

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

CO1: Apply probability distributions to engineering problems.
CO2: Perform sampling and hypothesis testing.
CO3: Analyze Markov chains and stochastic processes.
CO4: Apply regression and curve fitting techniques.
CO5: Use statistical and analytical methods for decision making.

CO-PO Mapping

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

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 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)
3	Flipped Classes	3	AAT(Seminar, quiz, mini projects)
		4	Semester End Examination

Semester: III

Object Oriented Programming with Java

Course Code	MVJ25CS32	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	**4**	Total Marks	**100**
Examination type (SEE)	Theory + Lab	Exam Hours	**3**

Course Objectives:

This course will give the ability to:

- Learn primitive constructs in the Java programming language.
- Understand Object Oriented Programming Features of JAVA.
- Gain knowledge on: packages, multi-threaded programming and exceptions.

Syllabus

Java programming fundamentals, variables, data types, arrays, operators, and control flow; object-oriented programming with classes, objects, constructors, methods, overloading, access control, static and final keywords; inheritance and polymorphism through method overriding, dynamic method dispatch, abstract classes, and interfaces; packages and exception handling using try-catch, throw, throws, finally, and custom exceptions; multithreading concepts such as thread lifecycle, synchronization, and inter-thread communication; and Java utility features including enumerations, wrapper classes, autoboxing, and unboxing.

Course Plan

Module I

An Overview of Java

Sr. No	Topics to be covered	Hours required
1	Introduction to Object-Oriented Programming	8-Hrs
2	Two Paradigms, Abstraction, The Three OOP Principles Using Blocks of Code	
3	Lexical Issues (Whitespace, Identifiers, Literals, Comments, Separators, The Java Keywords).	
4	Data Types, Variables, and Arrays: The Primitive Types (Integers, Floating-Point Types, Characters, Booleans)	
5	Automatic Type Promotion in Expressions, Arrays, Introducing Type Inference with Local Variables.	
6	Operators: Arithmetic Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator	
7	Control Statements: Java's Selection Statements (if, The Traditional switch), Iteration Statements (while, do-while, for, The For-Each Version of the for Loop	

8	Local Variable Type Inference in a for Loop, Nested Loops), Jump Statements (Using break, Using continue, return).	
Module II		
Introducing Classes and Objects		
Sr. No	Topics to be covered	Hours required
1	Introducing Classes: Class Fundamentals, Declaring Objects	8-Hrs
2	Assigning Object Reference Variables, Introducing Methods	
3	Constructors with a block of code	
4	This Keyword, Garbage Collection	
5	Methods and Classes: Overloading Methods, Recursion	
6	Creating objects as a parameter, and Returning Objects	
7	Access Control (Public, Private, Protected)	
8	Understanding static, Introducing final Keyword	
Module III		
Inheritance and Interfaces		
Sr. No	Topics to be covered	Hours required
1	Inheritance basics, superclass, subclass, extends, IS-A relationship	8-Hrs
2	super, constructor chaining, multilevel inheritance	
3	Method overriding, overriding rules, @Override, final methods and classes	
4	Dynamic method dispatch and runtime polymorphism	
5	Abstract classes, abstract methods, concrete methods	
6	Interfaces, implementation, multiple interfaces, default and static interface methods	
7	Collections: Generics, List, ArrayList, LinkedList	
8	Map, map implementations, and concurrency overview	
Module IV		
Packages and Exception Handling		
Sr. No	Topics to be covered	Hours required
1	Packages, package declaration, directory structure, package naming	10-Hrs
2	import, static import, member access, access control across packages	
3	Exception hierarchy, checked versus unchecked exceptions, uncaught exceptions	
4	try, catch, multiple catch, nested try, multi-catch	
5	throw, throws, finally, built-in and custom exceptions	
6	JDBC architecture, JDBC driver, URL, DriverManager, Connection, SQLException	
7	Statement, PreparedStatement, parameterized queries, ResultSet	
8	CRUD operations, try-with-resources, transactions, commit(), rollback()	
Module V		
Multithreaded Programming		
Sr. No	Topics to be covered	Hours required
1	Multithreaded Programming: The Java Thread Model,	
2	The Main Thread, Creating a Thread	

3	Creating Multiple Threads, Using isAlive() and join()	8-Hrs
4	Thread Priorities, Synchronization	
5	Interthread Communication, Suspending, Resuming, and Stopping Threads	
6	Obtaining a Thread's State. Enumerations, Type Wrappers and Autoboxing: Enumerations (Enumeration Fundamentals, The values() and valueOf() Methods)	
7	Type Wrappers (Character, Boolean, The Numeric Type Wrappers)	
8	Autoboxing (Autoboxing and Methods, Autoboxing/Unboxing Occurs in Expressions, Autoboxing/Unboxing Boolean and Character Values)	

List of Laboratory Programs — 28 Hrs

1. a) Write a java program to find the Fibonacci series using recursive and non-recursive functions.
   b) Write a java program to multiply two given matrices.

2. A class called Employee, which models an employee with an ID, name and salary, is designed as shown in the following class diagram. The method raiseSalary (percent) increases the salary by the given percentage. Develop the Employee class and suitable main method for demonstration.
3. Write a Java program to demonstrate the OOP principles. [i.e., Encapsulation, Inheritance, Polymorphism and Abstraction]
4. A class called MyPoint, which models a 2D point with x and y coordinates, is designed as follows:
   - Two instance variables x (int) and y (int).
   - A default (or "no-arg") constructor that construct a point at the default location of (0, 0).
   - A overloaded constructor that constructs a point with the given x and y coordinates.
   - A method setXY() to set both x and y.
   - A method getXY() which returns the x and y in a 2-element int array.
   - A toString() method that returns a string description of the instance in the format "(x, y)".
   - A method called distance(int x, int y) that returns the distance from this point to another point at the given (x, y) coordinates
   - An overloaded distance(MyPoint another) that returns the distance from this point to the given MyPoint instance (called another)
5. Develop a JAVA program to create a class named shape. Create three sub classes namely: circle, triangle and square, each class has two member functions named draw () and erase (). Demonstrate polymorphism concepts by developing suitable methods, defining member data and main program.
6. Develop a JAVA program to create an abstract class Shape with abstract methods calculateArea() and calculatePerimeter(). Create subclasses Circle and Triangle that extend the Shape class and implement the respective methods to calculate the area and perimeter of each shape.
7. Develop a JAVA program to create an interface Resizable with methods resizeWidth(int width) and resizeHeight(int height) that allow an object to be resized. Create a class Rectangle that implements the Resizable interface and implements the resize methods
8. Develop a JAVA program to create a package named mypack and import & implement it in a suitable class.

9. Develop a JAVA program to raise a custom exception (user defined exception) for DivisionByZero using try, catch, throw and finally.
10. Write a JAVA program that creates threads by extending Thread class. First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds (Repeat the same by implementing Runnable).
11. Develop a Java program to manage student records using the Java Collections Framework. Create a Student class with student ID, name, and marks. Store student objects using an ArrayList and maintain ID-based retrieval using a HashMap. Implement suitable methods to add, search, update, remove, and display student records.
12. Develop a Java program using JDBC to connect to a relational database and perform CRUD operations on a student table. Use Prepared Statement for insert, search, update, and delete operations; use ResultSet to display records; and handle database exceptions using appropriate exception-handling mechanisms.

Textbooks:

1. Java: The Complete Reference, Twelfth Edition, by Herbert Schildt, November 2021, McGraw-Hill, ISBN: 9781260463422

Reference Books:

1. Programming with Java, 6th Edition, by E Balagurusamy, Mar-2019, McGraw Hill Education, ISBN: 9789353162337.
2. Thinking in Java, Fourth Edition, by Bruce Eckel, Prentice Hall, 2006 (https://sd.blackball.lv/library/thinking_in_java_4th_edition.pdf)

Other References:

1. NPTEL course:Object Oriented Programming: IIT Roorkee
https://youtu.be/K3g4srbkUNM?si=iiGoBNz0e3OOrUkc
2. NPTEL course:Programming inJava:IIT Kharagpur
https://youtu.be/J_d1fJy90GY?si=jC0OZZTF0ArLlJM-

Course Outcomes:

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

1. Develop Java programs using fundamental programming concepts.
2. Implement object-oriented Java programs using classes and objects
3. Design reusable Java applications using inheritance, polymorphism, abstract classes, interfaces, and Collections.
4. Develop robust Java applications using JDBC for database connectivity.
5. Implement Java applications using multithreaded programming and Java utility features.

CO-PO Mapping

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

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 best two will be taken. The student should score minimum 30% marks of the average test score to avoid NSSR. **(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)/2 for 50 marks.**

- **Weekly Evaluation for 30 Marks:** Weekly evaluation should be conducted for

Continuous Internal Evaluation (CIE) for Practical:

every experiment. Marks of each evaluation includes Preparedness / Observation (6 Marks) + Experiment Conduction/ Execution (9 Marks) + Viva Voce (9 Marks) + Record Book (6 Marks) for each experiment. All weekly marks are added and scaled to 30 marks **(C).**

- Two CIE tests for 20 Marks each should be conducted and averaged to 20 Marks. The student should score minimum 30% in the average test marks (i.e. 6 marks) to avoid NSSR. (**D).**

Final CIE Marks of practical should be calculated as C+D for 50 marks

For IPCC, Final CIE Marks will be calculated as Sum of Theory CIE and Practical CIE for 100 marks.

Semester End Examination (SEE) for Theory:

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.

Semester End Examination (SEE) for Practical:

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 (Y)**

The Final mark for the SEE is X+Y of total 100 marks

The Final mark for the course is the sum of CIE and SEE marks, scaled to 100.

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)		

Semester: III			
Data Structures			
Course Code	MVJ25CS33	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:

- Understand basic concepts of data structures and memory management.
- Learn and implement linear and non-linear data structures.
- Apply data structures for solving computational problems efficiently.

Syllabus

Fundamentals of data structures and operations; memory concepts and arrays; stacks and expression evaluation; queues, circular queues, and priority queues; linked lists and their representations; advanced linked structures; sparse matrices; memory fragmentation and allocation strategies; trees, binary trees, and binary search trees; AVL trees; hashing and collision resolution; dynamic hashing; and optimal binary search trees with numerical problem solving.

Course Plan

Module I

Basic Concepts of Data Structures

Sr. No	Topics to be covered	Hours required
1	Introduction to Data Structures	**10- Hrs**
2	Data Structure Operations & Algorithm Analysis	
3	Stacks,Polynomial Representation	
4	Expressions- Infix to Postfix, Evaluating Postfix Expressions.	
5	Stack Applications: Undo and Redo Operations in Software Systems	

Module II

Queues and Linked List

Sr. No	Topics to be covered	Hours required
1	Linear queue	**10- Hrs**
2	Circular Queues	
3	Priority Queue, Linked Stacks and Queue	
4	Singly Linked List	
5	Polynomial Representation using Linked List	
6	Applications of Queues: Printer Spooling Systems	

Module III

Linked List and Memory Management		
Sr. No	Topics to be covered	Hours required
1	Doubly Linked List	**12- Hrs**
2	Circular Linked List- Definition	
3	Sparse Matrix, Sparse matrix Representation using arrays and linked list	
4	Memory allocation - First-fit, Best-fit, and Worst-fit allocation schemes	
5	Garbage collection and compaction, Fragmentation-Internal and External	
Module IV		
Trees and Graphs		
Sr. No	Topics to be covered	Hours required
1	Representation Of Trees, Binary Trees	**12- Hrs**
2	Binary Trees - Types, BST and Its operations	
3	AVL Tree, Disjoint Set	
4	Balance Factor, Rotations (LL, RR, LR, RL). Red-Black Tree - Properties, Insertion (Concept only). Comparison of AVL vs Red-Black	
5	Advanced Trees: B-Tree and B+ Tree, Trie (Prefix Tree)	
6	Trees & Applications: Heap, and Expression Tree	
Module V		
Hashing & Sorting		
Sr. No	Topics to be covered	Hours required
1	Introduction on Static Hashing and Dynamic Hashing	**12- Hrs**
2	Hashing functions: Mid square, Division, Folding, Digit Analysis	
3	Dynamic Hashing-Extendible and Linear Hashing	
4	Collision Resolution: Linear probing, Quadratic Probing, Double hashing, Open hashing.	
5	Real-world Applications of Data Structures - Hashing for Password Storage, Trie for Spell Checker, B+ Tree for DBMS Indexing	

Textbooks:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", MIT Press, 2022.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson, 2022.

Reference Books:

1. Narasimha Karumanchi, "Data Structures and Algorithms Made Easy", CareerMonk Publications, 2023.
2. Michael T. Goodrich, Roberto Tamassia, David M. Mount, "Data Structures and Algorithms in C++", Wiley, 2021.
3 Reema Thareja, "Data Structures Using C", Oxford University Press, 2021.

Other References: (NPTEL/SWAYAM. Any Other) :

1. NPTEL Course: Programming, Data Structures and Algorithms using C, by Prof. N. S. Narayanaswamy, Prof. Hema A. Murthy, Prof. Shankar Balachandran and Prof. Sudarshan Iyengar,IITMadras

https://nptel.ac.in/courses/106106127

2. NPTEL Course: Data Structures and Algorithms Design, by Prof. Nitin Saxena, IIT Kanpur.
   https://nptel.ac.in/courses/106104697

Course Outcomes: :

The student will be able to:

CO1: Explain the fundamental concepts, operations, representations, and applications of linear and non-linear data structures.

CO2: Implement stacks, queues and linked lists and solve computational problems using appropriate data structures.

CO3: Apply trees, graphs, and memory management techniques, including BST, AVL trees, heaps, and memory allocation strategies to solve practical problems.

CO4: Analyse and compare the performance and suitability of different data structures for given application.

CO5: Apply hashing, collision-resolution, and dynamic hashing techniques to develop solutions for real-world applications such as password storage, spell checking, and database indexing

CO-PO Mapping :

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	2		2				1		2	3	2
CO2	3	2	3	2	2			1	1		2	3	2
CO3	3	2	3	3	2			2	1		2	3	2
CO4	3	2	3	3	2			2	1		2	3	2
CO5	3	2	3	3	2			1	2		2	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 best two will be taken. The student should score minimum 30% marks of the average test score to avoid NSSR. **(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)/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

Semester: III

Introduction to Data Science

Course Code	**MVJ25CD34**	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:

- Understand basic concepts of Data Science and its applications
- Learn data handling and pre-processing using Python
- Develop proficiency in applying descriptive statistics and exploratory data analysis (EDA) techniques.
- Apply sampling, hypothesis testing, confidence intervals, Z-tests, t-tests, and ANOVA for statistical analysis.
- Use Python tools for analysis and visualization

Syllabus

Types of data and attributes, measurement concepts, nominal, ordinal, binary and numeric attributes, discrete and continuous data, single-valued and multi-valued attributes, asymmetric attributes, measures of central tendency and dispersion, and graphical data representation; Python and data engineering basics using NumPy and Pandas, indexing, slicing, file handling, data collection, and data cleaning; Probability, hypothesis testing, exploratory data analysis, visualization, correlation, and pattern detection using tools such as Matplotlib and Seaborn; Inferential statistics, samples, sampling distributions, standard error, hypothesis testing, Z-tests, confidence intervals, t-tests, and ANOVA; and statistical computing using Python, regression analysis, goodness of fit, R^2, multiple regression, time series analysis, and Chi-square tests.

Course Plan

Module I

Types of Data & Basic Statistical Descriptions

Sr. No	Topics to be covered	Hours required
1	Types of Data and Attributes **–** attributes, attribute types and measurement concepts	**10- Hrs**
2	Types of Attributes – nominal, ordinal, binary and numeric attributes	
3	Discrete and Continuous Attributes	
4	Describing Attributes by Number of Values – single-valued and multi-valued attributes	
5	Asymmetric and Binary Attributes – concepts and examples	
6	Measures of Central Tendency – mean, median and mode	
7	Measures of Dispersion – range, quartiles, variance, standard deviation and interquartile range	
8	Graphical Representation of Data – basic plots for understanding distributions and statistical description	

Module II		
Python & Data Engineering Basics		
Sr. No	Topics to be covered	Hours required
1	NumPy Library: Basic Operations	**10- Hrs**
2	Indexing and Slicing	
3	Reading and Writing array data on files	
4	Pandas Library: Functionalities on indexes	
5	Reading and writing data in CSV or text files	
6	Data collection: CSV, APIs, databases	
7	Data cleaning: missing values, duplicates, outliers	
Module III		
EDA & Visualization		
Sr. No	Topics to be covered	Hours required
1	Probability basics & distributions (normal, skewness)	**12- Hrs**
2	Hypothesis testing (p-value, confidence intervals)	
3	Exploratory Data Analysis (EDA concepts)	
4	Visualization: histogram, boxplot, scatter plot	
5	Correlation & pattern detection	
6	Tools: Matplotlib, Seaborn, dashboards intro	
Module IV		
Inferential Statistics & Statistical Analysis		
Sr. No	Topics to be covered	Hours required
1	Population and Sample – population, sample, sampling concepts	**12- Hrs**
2	Random Sampling & Sampling Distribution	
3	Standard Error of the Mean – concept and interpretation	
4	Hypothesis Testing – null and alternative hypotheses, significance level	
5	Z-test – concept and basic procedure	
6	Confidence Intervals – point estimate, confidence level and interpretation	
7	t-test & Introduction to ANOVA – purpose and applications	
Module V		
Statistical Computing & Advanced Data Analysis		
Sr. No	Topics to be covered	Hours required
1	Statistical Analysis using Python – introduction to statistical libraries	**12- Hrs**
2	Regression Analysis for Statistical Interpretation **–** regression line and least squares concept	
3	Goodness of Fit & R^2 **–** interpretation of statistical relationships	
4	Multiple Regression – basic interpretation	
5	Time Series Analysis – time-dependent data and trends	
6	Introduction to Chi-Square Tests – categorical data analysis	

Textbooks

1. Igual L, & Seguí S, Introduction to Data Science, Springer, 1st Edition, 2017.
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley

Publications,2017
3. Jiawei Han, Micheline Kamber and Jian Pei, *Data Mining: Concepts and Techniques, 3rd Edition*.
4. Wagh S, Bhende M & Thakare A. Fundamentals of Data Science, CRC Press, 1st Edition, 2022..

Reference Books:

1. Jake VanderPlas, Python Data Science Handbook O'Reilly Media, First Edition, 2016
2. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, *Keras*, and TensorFlow O'Reilly Media, Second Edition, 2019
3. Avrim Blum, John Hopcroft, Ravindran Kannan, *Foundations of Data Science* Cambridge University Press, First Edition, 2020

Other References: (NPTEL/SWAYAM. Any Other) :

1. NPTEL course: Data Science for Engineers, IIT Madras. https://nptel.ac.in/courses/106106179
2. NPTEL course: Python for Data Science, IIT Madras. https://nptel.ac.in/courses/106106212

Course Outcomes: :

The student will be able to:

CO1: Understand fundamental concepts of Data Science, its lifecycle, roles, and real-world applications

CO2: Perform data collection, preprocessing, and management using Python, SQL, and basic data engineering techniques

CO3: Apply statistical methods and exploratory data analysis (EDA) techniques to extract meaningful insights from data

CO4: Apply sampling and inferential statistical techniques to analyse datasets using hypothesis testing, confidence intervals, Z-tests, t-tests, and ANOVA.

CO5: Analyse datasets using Python-based statistical techniques to develop data-driven solutions for real-world problems

CO-PO Mapping :

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

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 best two will be taken. The student should score minimum 30% marks of the average test score to avoid NSSR. **(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)/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)		

Semester: III

Data Structures Lab

Course Code:	MVJ25CSL35	Scheme	2025
Type of Course	PCCL	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 give ability to:

- Introduce the fundamental concepts and classification of data structures and their applications.
- Develop proficiency in dynamic memory allocation techniques for efficient memory management in C programming.
- Develop the ability to implement linear data structures such as arrays, stacks, and queues, and apply suitable algorithms and hashing techniques for efficient searching and data retrieval.

Guidelines/ Specific Requirements, if any:

Implement all the programs in "C" Programming Language.

Sl. No.	Experiments List
1.	Write a C program to dynamically allocate memory for an array of *n* integers using malloc(). The program should: a) Read and display the elements b) Resize the array using realloc() to a new size c) Read and display the new elements d) Deallocate the memory using free()
2.	Develop a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an element onto stack b. Pop an element from stack c. Demonstrate how stack can be used to check palindrome d. Demonstrate overflow and underflow situations on stack e. Display the status of stack f. Exit Support the program with appropriate functions for each of the above operations.
3.	Develop a Program in C for converting an Infix Expression to Postfix Expression. Program should support both parenthesized and free parenthesized expressions with the operators: + , - , * , / , % (Remainder) , ^ (Power) and alphanumeric operands.
4.	Develop a menu driven Program in C for the following operations on a Linear Queue of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an element onto QUEUE

	b. Delete an element from QUEUE c. Demonstrate overflow and underflow situations on QUEUE d. Display the status of QUEUE e. Exit Support the program with appropriate functions for each of the above operations.
5.	Develop a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an element onto Circular QUEUE b. Delete an element from Circular QUEUE c. Demonstrate overflow and underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations.
6.	Develop a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Programme, Sem, PhNo a. Create a SLL of N students' data by using front insertion b. Display the status of SLL and count the number of nodes in it c. Perform insertion / deletion at end of SLL d. Perform insertion / deletion at front of SLL (Demonstration of stack) e. Exit
7.	Develop a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo a. Create a DLL of N employee's data by using end insertion b. Display the status of DLL and count the number of nodes in it c. Perform insertion and deletion at end of DLL d. Perform insertion and deletion at front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue f. Exit
8.	Develop a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers. a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8. b. Traverse the BST in • Inorder • Preorder • Postorder c. Search the BST for a given element (KEY) and report the appropriate message d. Exit
9.	Develop a Program in C for the following operations on Graph (G) of Cities. a. Create a Graph of N cities using Adjacency Matrix. b. Print all the nodes reachable from a given starting node in a digraph using • DFS method • BFS method
10.	Write a C program to implement a hash table using the division (modulo) hash function. Handle collisions using the linear probing technique. The program should support the following operations:

	Insert elements into the hash table Display the contents of the hash table Assume a suitable size for the hash table and initialize it properly.

Course Outcomes:

The student will be able to:

CO1: Implement stack and queue operations using array-based data structures.

CO2: Apply dynamic memory allocation techniques and perform various operations stacks, queues, linked lists

CO3: Apply tree and graph data structures and perform traversal and searching operations.

CO4: Apply hashing and collision-resolution techniques to implement efficient data storage, retrieval, and searching using hash tables.

CO5: Apply appropriate data structures and algorithms to design efficient solutions for real-world computational problems.

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	PSO 1	PSO 2
CO1	3	2	1		1				1	1		2	1
CO2	3	2	1	1	1				1	1		2	1
CO3	3	3	2	2	3			1	2	1	1	3	2
CO4	2	3	2	2	2			1	1	1	1	2	3
CO5	2	3	3	2	3	1	1	1	2	2	2	3	2

High-3: Medium-2: Low-1

Evaluation Method

Continuous Internal Evaluation (CIE):

- **Weekly Evaluation for 30 Marks:** Weekly evaluation should be conducted for every experiment. Marks of each evaluation includes Preparedness / Observation (6 Marks) + Experiment Conduction/ Execution (9 Marks) + Viva Voce (9 Marks) + Record Book (6 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. The student should score minimum 30% in the average test marks (i.e. 6 marks) to avoid NSSR. (**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.

Course delivery methods		Assessment methods	
1	Chalk and Talk	1	Lab Test
2	Practice session/Demonstrations in Labs	2	Semester End Examination

Semester: III

Biology For Engineers

Course Code	**MVJ25BI36**	Scheme	2025
Type of Course	AEC	Semester	III
Teaching Hours/Week (L: T:P)	2:0:0	CIE Marks	50
Total Hours of Pedagogy (L; T:P:SL &TW)	28: 0:0:32	SEE Marks	50
Credits	02	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	2

Course Objectives:

This course will give ability to:

- To familiarize the students with the basic biological concepts and their engineering applications.
- To enable the students with an understanding of bio design principles to create novel devices and structures.
- To provide the students with an appreciation of how biological systems can be re-designed as substitute products for natural systems.
- To motivate the students to develop interdisciplinary vision of biological engineering.

Module I	
Cell Basic Unit of Life: Introduction, Structure and functions of a cell. Stem cells and their application. **Biomolecules**: Properties and functions of Carbohydrates, Nucleic acids, proteins, lipids**.** **Importance of special biomolecules:** Properties and functions of enzymes, vitamins and hormones.	**6 Hrs**
Module II	
Application of Biomolecules: Carbohydrates in cellulose-based water filters production, PHA and PLA in bioplastics production, Nucleic acids in vaccines and diagnosis, Proteins in food production, lipids in biodiesel and detergents production, Enzymes in biosensors fabrication, food processing, detergent formulation and textile processing.	**6 Hrs**
Module III	
Adaptation of Anatomical Principles for Bioengineering Design: Brain as a CPU system. Eye as a Camera system. Heart as a pump system. Lungs as purification system. Kidney as a filtration system.	**6 Hrs**
Module IV	
Nature-Bioinspired Materials and Mechanisms: Echolocation, Photosynthesis. Bird flying, Lotus leaf effect, Plant burrs, Shark skin, Kingfisher beak. Human Blood substitutes – haemoglobin-based oxygen carriers (HBOCs) and perfluoro carbons (PFCs).	**5 Hrs**
Module V	
Trends in Bioengineering: Muscular and Skeletal Systems as scaffolds, scaffolds and tissue engineering, Bioprinting techniques and materials, Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis, Bio concrete, Bioremediation, Biomining.	**5 Hrs**

Textbooks:

1. Rajendra Singh C and Ratnakar Rao N, "Biology for Engineers", Rajendra Singh C and Ratnakar Rao N Publishing, Bengaluru, 2023.
2. Stuart Fox, Krista Rompolski, "Human Physiology", McGraw-Hill eBook, 16th Edition, 2022.
3. Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., "Biology for Engineers", Tata McGraw-Hill, New Delhi, 2012.

Reference Books:

1. Arthur T. Johnson," Biology for Engineers", CRC Press, Taylor and Francis, 2011.
2. Leslie Cromwell, "Biomedical Instrumentation", Prentice Hall 2011.
3. Sohini Singh and Tanu Allen, "Biology for Engineers", Vayu Education of India, New Delhi, 2014.
4. Yoseph Bar Cohen," Biomimetics: Nature-Based Innovation", CRC Press, 1st edition, 2012.

Course Outcomes:

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

CO1: Elucidate the basic biological concepts via relevant industrial applications and case studies.

CO2: Evaluate the principles of design and development, for exploring novel bioengineering projects.

CO3: Corroborate the concepts of biomimetics for specific requirements.

CO4: Think critically towards exploring innovative biobased solutions for socially relevant problems.

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 (A).

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 (B).

NOTE:

- 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 must announce the methods of Assignment for the course.

Final CIE marks will be calculated as A+B for 50 marks

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 mark for the course the Sum of SEE and CIE Marks.

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

B.E, Semester III (CSE, AIML. CSE(Data Science), ISE, CSD)

Scientific Foundations of Health

Course Code	**MVJ25AECS37**	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
Credit	01	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	60 Minutes / 01 Hour

Course objectives:

The course will enable the students:

- To know about Health and Wellness (and its Beliefs)
- To acquire Good Health & It's balance for positive mind-set
- To Build healthy lifestyles for good health for their better future
- To Create Healthy and caring relationships to meet the requirements of MNC and LPG world
- To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future
- To Prevent and fight against harmful diseases for good health through positive mindset

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

- ✓ Teachers shall adopt suitable pedagogies for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software's to meet the present requirements of the Global employment market.
  - (i) Direct instructional method (Low /Old Technology),
  - (ii) Flipped classrooms (High/advanced Technological tools),
  - (iii) Blended learning (combination of both),
  - (iv) Enquiry and evaluation-based learning,
  - (v) Personalized learning,
  - (vi) Problems based on learning through discussion,
  - (vii) Following the method of expeditionary learning Tools and techniques,
- ✓ Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretically applied and practical skills in teaching of the concepts of Health and Wellness in general.

Module-1: Good Health and It's balance for positive mindset: 3 Hrs

What is Health, Why is Health very important Now? – What influences your Health? Health and Behaviour, Health beliefs and advertisements, Advantages of good health (Short term and long-

term benefits), Health and long-term Health and family, Health and Personality - Profession. Health and behaviour, Disparities of health in different vulnerable groups. Health and psychology, Methods to improve good psychological health. Psychological disorders (Stress and Health - Stress management), how to maintain good health, Mindfulness for Spiritual and Intellectual health, Changing health habits for good health. Health and personality.

Module-2 Building healthy lifestyles for better future: 3 Hrs

Developing a healthy diet for good health, Food and health, Nutritional guidelines for good health and well beingness, Obesity and overweight disorders and its management, eating disorders - proper exercises for its maintenance (Physical activities for health), Fitness components for health, Wellness and physical function,

Module-3 Creation of Healthy and caring relationships: 3 Hrs

Building communication skills (Listening and speaking), Friends and friendship - education, the value of relationships and communication, Relationships for Better or worsening of life, understanding of basic instincts of life (more than a biology), Changing health behaviours through social engineering,

Module-4 Avoiding risks and harmful habits: 3 Hrs

Characteristics of health compromising behaviors, Recognizing and avoiding of addictions, How addiction develops and addictive behaviors, Types of addictions, influencing factors for addictions, Differences between addictive people and non-addictive people and their behavior with society, Effects and health hazards from addictions Such as..., how to recovery from addictions.

Module-5 Preventing and fighting against diseases for good health 2 Hrs

Process of infections and reasons for it, how to protect from different types of transmitted infections such as Current trends of socio-economic impact of reducing your risk of disease, How to reduce risks for good health,
Reducing risks and coping with chronic conditions, Management of chronic illness for Quality of life,
Health and Wellness of youth: a challenge for the upcoming future Measuring of health and wealth status.

Course outcome (Course Skill Set)

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

CO 1: To understand Health and wellness (and its Beliefs)

CO 2: To acquire Good Health & It's balance for positive mindset

CO 3: To inculcate and develop healthy lifestyle habits for good health.

CO 4: Create Healthy and caring relationships to meet the requirements of MNC and LPG world

CO 5: To adopt innovative & positive methods to avoid risks from harmful habits on their campus & outside the campus.

CO 6: To positively fight against harmful diseases for good health through positive mindset.

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 (A).

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 (B).

NOTE:

- 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 must announce the methods of Assignment for the course.

Final CIE marks will be calculated as A+B for 50 marks

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 mark for the course the Sum of SEE and CIE Marks.

Suggested Learning Resources:

1. **Health Psychology** (Second edition) by Charles Abraham, Mark Conner, Fiona Jones and Daryl O'Connor – Published by Routledge 711 Third Avenue, New York, NY 10017.
2. **Health Psychology - A Textbook,** FOURTH EDITION by Jane Ogden McGraw Hill Education (India) Private Limited - Open University Press
3. **HEALTH PSYCHOLOGY (Ninth Edition)** by SHELLEY E. TAYLOR - University of California, Los Angeles, McGraw Hill Education (India) Private Limited - Open University Press
4. **Scientific Foundations of Health (Health & Wellness) - General Books** published for university and Colleges references by popular authors and published by the reputed publisher.

B.E, Semester III (CSE, AIML. CSE(Data Science), ISE, CSD)

Semester: III

Networking and Trouble Shooting Lab

Course Code	MVJ25CS38SL	Scheme	2025
Type of Course	SDC	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
Credit	1	Total Marks	100
Examination type (SEE)	Practical	Exam Hours	3

Course Objectives:

This course will give the ability to:

- Understand and apply fundamental concepts of networking including IP addressing, subnetting, and protocols.
- Demonstrate skills in troubleshooting common network issues using diagnostic tools.
- Configure and validate network devices and services such as routers, switches, and firewalls.
- Apply systematic approaches to identify, isolate, and resolve connectivity problems in LAN/WAN environments.
- Gain proficiency in using utilities like `ping`, `traceroute`, `netstat`, and packet analysers for debugging.

Guidelines/ Specific Requirements, if any:

- All experiments must be implemented using Windows/Linux OS.
- Use simulation tools (e.g., Cisco Packet Tracer, Wireshark) where physical devices are unavailable.

Sl. No.	Experiments List
1.	Configure IP addresses on systems and test communication using `ping`. Demonstrate successful and failed connectivity cases.
2.	Divide a given network into subnets with calculated masks. Verify communication within and across subnets.
3.	Set up static routes between networks. Implement dynamic routing using RIP/OSPF and compare results.
4.	Apply `traceroute`, `netstat`, and `ipconfig` to diagnose issues. Document steps to isolate connectivity problems.
5.	Configure firewall rules to block or allow services. Test packet filtering before and after applying rules (Use Open source software to set up and configure firewall)
6.	Set up DNS for name resolution and DHCP for IP assignment. Validate client-server communication with multiple clients.
7.	Capture packets using Wireshark during network activity. Analyse headers, protocols, and traffic behaviour.
8.	Configure a wireless access point with security settings. Troubleshoot connectivity issues and validate secure access.

9.	Set up a client-server application and simulate errors. Diagnose and resolve issues at both network and application levels.

Course Outcomes:

The student will be able to:

CO1: Apply fundamental networking concepts to configure and validate connectivity.

CO2: Utilize diagnostic tools and systematic troubleshooting methods to resolve issues.

CO3: Integrate problem-solving skills to optimize network performance and security.

CO4: Develop proficiency in debugging and testing network setups across diverse scenarios.

CO-PO Mapping:

High-3: Medium-2: Low-1

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

Evaluation Method

Continuous Internal Evaluation (CIE):

- **Weekly Evaluation for 30 Marks:** Weekly evaluation should be conducted for every experiment. Marks of each evaluation includes Preparedness / Observation (6 Marks) + Experiment Conduction/ Execution (9 Marks) + Viva Voce (9 Marks) + Record Book (6 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. The student should score minimum 30% in the average test marks (i.e. 6 marks) to avoid NSSR. (**B).**

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

Semester End Examination (SEE) for Practical:

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 (Y)**

The Final mark for the SEE is X+Y of total 100 marks

Course delivery methods		Assessment methods	
1	Chalk and talk	1	Lab Test

2	Practice session/Demonstrations in Labs	2	Semester End Examination

Yoga			
Course Code	MVJ25YO39	Scheme	**2025**
Type of Course	**NCMC**	Semester	**III**
Teaching Hours/Week (L:T:P)	**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.

The Health Benefits of Yoga:

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.
- Reduces 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: **7 Hrs**

- **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, Jnana yoga.
- Surya namaskar
  Surya namaskar prayer and its meaning, benefits and importance.
- Yoga asanas
  Asanas it's need, importance, name and technique.
  Sitting: -Vajrasana, - adasana, Ardhachakrasana, **Prone line: -**

Advasana, Bhujangasana **Supine line: -**Shavasana, Supta baddhakonasana, **Balancing posture: -**Vrikshasana, Garudasana	
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. • **Yoga asanas** Standing: -Virabhadrasana, Parshvakona Sitting: -Vajrasana, Paschimottanasana Prone Line: -Dhanurasana, Shalabhasana, Supine Line: -Ananda Balasana, Supta Matsyendrasana , Balancing: -Natarajasana (Dancer Pose	**7 Hrs**
MODULE -III	
Awareness and inner balance: Finding how focused is the mind • Dharana: Concentration • Dhyana: Meditation • Swasthya, Smrithi, 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:	**7 Hrs**
• **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)	

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"

PHYSICAL EDUCATION (SPORTS & ATHLETICS)			
Course Code	**MVJ25PE39**	Scheme	**2025**
Type of Course	**NCMC**	Semester	**III**
Teaching Hours/Week (L:T:P)	**0:0:0:1**	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

5 Hours

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

6 Hours

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	• 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.
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**	

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.

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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	-	-

B.E (Common to all branches)

Additional Mathematics-I			
Course Code	MVJ25MATDIP310	Scheme	**2025**
Type of Course	2:0:0:0	Semester	**III**
Teaching Hours/Week (L:T:P)	0	CIE Marks	100
Total Hours of Pedagogy (L:T:P:SL&TW)	14:0:0:14	SEE Marks	0
Credits	0	Total Marks	100
Examination type (SEE)	------	Exam Hours	**3**

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 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 - *div*$(\emptyset\, \vec{A})$, *curl*$(\emptyset\ \vec{A})$, *curl*(*grad* $(\emptyset)$) , *div*(*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	**5 Hrs**
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 $\sin^n(x)$, $\cos^n(x), \sin^n x, \cos^m x$	**5 Hr**
2	Evaluation of these integrals with standard limits-problems	
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	**5 Hr**
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 - $div(\emptyset\,\vec{A})$, $curl(\emptyset\,\vec{A})$, $curl(grad\,(\emptyset))$, $div(curl\,\vec{A})$.	
Module IV		
Probability		
Sr. No	Topics to be covered	Hours required
1	Probability: Basic terminology, Sample space and events	**5 Hr**
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 Hr**
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:

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

Other References:(NPTEL/SWAYAM. Any Other)

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 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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2
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)/ Project
3	Flipped Classes	3	AAT(Quiz ,Mini project)