MVJ College of Engineering,
Bengaluru (An Autonomous Institute)

Affiliated to VTU, Belagavi, Approved by AICTE, New Delhi, Recognised by UGC with 2(f) & 12 (B), Accredited by NBA & NAAC

Scheme of Teaching and Examination 2024-25

Department of Artificial Intelligence and Data Science

Outcome Based Education (OBE) and Choice Based Credit System (CBCS) Effective from the academic year 2024-25

I SEMESTER

Sl. No.	Course		Course Title	Teaching Department	Teaching Hours/Week				Examination				Credits
					Theory/ lecture	Tutorials	Practical/ Drawing	Self-Study Components	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
	Type	Code			L	T	P	S					
1	PCC	MVJSAD11	Artificial Intelligence	ISE	3	0	0	0	03	50	50	100	3
2	PCC	MVJSAD12	Data Science and Management	ISE	3	0	0	0	03	50	50	100	3
3	PCC	MVJSAD13	Data Structures & Algorithmsfor Problem Solving	ISE	3	0	0	0	03	50	50	100	3
4	IPCC	MVJSAD14	Python for Data Science	ISE	3	0	2	0	03	50	50	100	4
5	PCC	MVJSAD15	Deep Learning	ISE	3	0	0	0	03	50	50	100	3
6	PCCL	MVJSADL16	Algorithms & AI Lab	ISE	2	0	0	0	03	50	50	100	2
7	NCMC	MVJSAD17	Research Methodology and IPR (Online)	Online courses (online.vtu.ac.in)	Online courses (online.vtu.ac.in)								PP
8				Respective Vertical	17	2				300	300	600	18

Note: **BSC**-Basic Science Courses, **PCC**: Professional core. **IPCC**-Integrated Professional Core Courses, **PCC(PB):** Professional Core Courses (Project Based), **PCCL**-Professional Core Course lab **,NCMC**- None Credit Mandatory Course, ,**L-**Lecture**, P-**Practical**, T/SDA-**Tutorial **/** Skill Development Activities(Hours are for Interaction between faculty and students) **MRMI19**-Research Methodology and IPR (**Online**) for the students who have **not studied** this course in the Undergraduate level. This course is not counted for vertical progression, Students have to qualify for the award of the master's degree.

M- Master program **xx** – **ME** for Mechanical Engineering Stream, **CV** for Civil Engineering Stream, **EE** – Electrical & Electronics Engineering Stream, **EC-** Electronics and Communication Engineering Stream, **CS**- Computer Science and Engineering **BA**-Business Administration **AR**- Architecture- etc.

BSC: Basic Science Courses: Courses like Mathematics/ Science are the prerequisite courses that the concerned engineering stream board of Studies will decide. **PCC: Professional Core Course:** Courses related to the stream of engineering, which will have both CIE and SEE components, students have to qualify in the course for the award of the degree. **Integrated Professional Core Course (IPCC)**: Refers to a Professional Theory Core Course Integrated with practical of the same course. The IPCC's theory part shall be evaluated by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. **Project Based Learning Course (PCC(PB):** Project Based Learning course is a professional core Course only Students have to complete a project out of learning from the course and SEE will be viva voce on project work. **PCCL: Professional Core Course Laboratory:** Practical courses whose CIE will be evaluated by the class teacher and SEE will be evaluated by the two examiners.

Skill development activities: Under Skill development activities in a concerning course, the students should

1. Interact with industry (small, medium, and large).
2. Involve in research/testing/projects to understand their problems and help creative and innovative methods to solve the problem.
3. Involve in case studies and field visits/ fieldwork.
4. Accustom to the use of standards/codes etc., to narrow the gap between academia and industry.
5. Handle advanced instruments to enhance technical talent.
6. Gain confidence in the modelling of systems and algorithms for transient and steady-state operations, thermal study, etc.
7. Work on different software/s (tools) to simulate, analyze and authenticate the output to interpret and conclude

All activities should enhance student's abilities to employment and/or self-employment opportunities, management skills, Statistical analysis, fiscal expertise, etc.Students and the course instructor/s are to be involved either individually or in groups to interact together to enhance the learning and application skills of the study they have undertaken. The students with the help of the course teacher can take up relevant technical –activities that will enhance their skills. The prepared report shall be evaluated for CIE marks.

MVJSAD17-Research Methodology and IPR- None Credit Mandatory Course (NCMC) if students have not studied this course in their undergraduate program then he /she has to take this course at http://online.vtu.ac.in and to qualify for this course is compulsory before completion of the minimum duration of the program (Two years), however, this course will not be considered for vertical progression

II SEMESTER

Sl. No.	Course		Course Title	Teaching Department	Teaching Hours/Week				Examination				Credits
					Theory lecture	Tutorials	Practical/ Drawing	Self-Study Component	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
	Type	Code			L	T	P	S					
1	MEC/MDC	MVJSAD21	Internet of Things and Applications	ISE	3	0	2	0	03	50	50	100	4
2	PCC	MVJSAD22	Advances Operating System	ISE	3	0	0	-	03	50	50	100	3
3	PCC	MVJSAD23	Big Data Analytics	ISE	3	0	0	Y	03	50	50	100	3
4	PEC	MVJSAD24x	Professional Elective Course 1	ISE	3	0	0	-	03	50	50	100	3
5	PEC	MVJSAD25x	Professional Elective Course 2	ISE	3	0	0	-	03	50	50	100	3
6	PCC(PB)	MVJSAD26	Mini Project with Seminar	ISE	3	0	0	-	02	50	50	100	3
7	PCCL	MVJSADL27	Big Data Analytics Laboratory	ISE	0	2	0	-	02	50	50	100	2
8	AEC/SEC	MVJSAD28	Skill Enhancement for Research Excellence-1(Online) Online courses (online.vtu.ac.in)	ISE	0	2	0	-	02	50	50	100	1
				Total	18	4	2			400	400	800	22

Note: **PCC**: Professional core. **IPCC**-Integrated Professional Core Courses, **PCC(PB):** Professional Core Courses (Project Based), **PCCL**-Professional Core Course lab, **PEC-** Professional Elective Courses, **MDC-** Multi-Disciplinary Courses, **L-Lecture, P-Practical, T/SDA-Tutorial / Skill Development Activities** (Hours are for Interaction between faculty and students)

L-Lecture, P-Practical, T/SDA-Tutorial / Skill Development Activities (Hours are for Interaction between faculty and students) **PBLC**: Project Based Learning Course,

Note: **xxx** means specialization code for example **MDE-** Design Engineering, **LDN-** Digital Communication and Networking, **SCE-** Computer Engineering,
CCT- Construction Technology, **AUD**- Urban Design, **MBA**- Master of Business Administration, **MCA**-Master of Computer Application, etc

Ability / Skill Enhancement Courses

Course Code	Course title	L	T/SDA	P	https://online.vtu.ac.in/subcategory/co
MVJSAD28A	python essentials and libraries for data science	3	0	0	categories skill enhancement cours
MVJSAD28B	Master coding and emerging technologies or fullstack development bootcamp	3	0	0	https://online.vtu.ac.in/course-details/Credits- 03-Full-Stack-We Development-Bootcamp
MVJSAD28C	cloud architecture or cyber security, ethical and risk assessment.	3	0	0	https://online.vtu.ac.in/course-details/Credits- 03-Cyber-Securi Ethical-Hacking-and-Risk- Assessment
MVJSAD28D	Programming Combo Skill Program or Master Excel Data Analysis and Visualization	3	0	0	

Ability Enhancement Courses (AEC):.These courses are designed to help students enhance their skills in communication, language, and personality developm also promote a deeper understanding of subjects like social sciences and ethics, culture and human behavior, human rights, and the law. **Skill Enhanceme (SEC):** Skill Enhancement Course means a course designed to provide value-based or skill-based knowledge and should contain both theory and on/training/fieldwork. The main purpose of these courses is to provide students with life skills in the hands-on mode to increase their employability.

If AEC/SEC courses are ONLINE (MOOCs) courses suggested by the concerned board of studies. These courses will be made available on **www. online.vtu.ac.in**, however, online courses are not considered for vertical progression, but qualifying in online courses is mandatory for the award of the Degree.

For Professional Elective Course

Code	Title of the Course	Code	Title of the Course
MVJSAD241	Decision Support System	MVJSAD251	Business Intelligence And Analytics
MVJSAD242	Predictive Analysis	MVJSAD252	Advanced Database Management System
MVJSAD243	Computer Vision	MVJSAD253	Cloud Computing
MVJSAD244	Database Security	MVJSAD254	Health Care Data Analytics

Note: Mini Project with Seminar: This may be hands-on practice, survey report, data collection and analysis, coding, mobile app development, field visit and report preparation, modelling of system, simulation, analyzing and authenticating, case studies, etc. CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide, if any, and a senior faculty of the department. Students can present the seminar based on the completed mini project. Participation in the seminar by all postgraduate students of the program shall be mandatory. The CIE marks awarded for Mini- Project work and Seminar, shall be based on the evaluation of Mini Project work and

Report, Presentation skill and performance in Question-and-Answer session in the ratio 50:25:25. Mini-Project with Seminar shall be considered as a head of passing and shall be considered for vertical progression as well as for the award of degree. Those, who do not take-up/complete the Mini Project and Seminar shall be declared as fail in that course and must complete the same during the subsequent semester. There is no SEE for this course.

Internship: All the students shall have to undergo a mandatory internship of 06 weeks during the vacation of II and Ill semesters. A University examination shall be conducted during III semester and the prescribed internship credit shall be counted in the same semester. The internship shall be considered as a head of passing and shall be considered for vertical progression as well as for the award of degree. Those, who do not take- up/complete the internship shall be declared as fail in the internship course and have to complete the same during the subsequent University examination after satisfying the internship requirements.

III SEMESTER (A)

For the students who are willing to take up a two-semester duration Industry/Research Internship Leading to Project work /start-up

Sl. No.	Course		Course Title	Teaching Department	Teaching Hours/Week				Examination				Credits
					Theory	Tutorials/skill Development Activities	Practical/ mini project/Internship	Self-Study Components	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
	Type	Code			L	T	P	S					
1	PEC/MDC	MVJSAD31x	(Online Courses) 12 weeks duration	-	-	-	2	Y	-	-	-	100	3
2	PEC/MDC	MVJSAD 32x	(Online Courses)12 weeks duration	-	-	-	2	Y	-	-	-	100	3
3	PEC/MDC	MVJSAD 33x	(Online Courses)12 weeks duration	-	-	-	2	Y	-	-	-	100	3
4	INT	MVJSAD**MINT34**	Research Internship /Industry-Internship leading to project work/ Startup	Two-semester duration, SEE in the IV semester which leads to project work /start-up					03	100	-	100	3
				Total								**400**	**12**

IV SEMESTER (A)

Sl. No.	Course		Course Title	Teaching Department	Teaching Hours/Week				Examination				Credits
					Theory lecture	Tutorials	Practical/ field Work	Self-Study Components	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
	Type	Code			L	T	P	S					
1	INT	MVJSADINT41	Research Internship / Industry Internship Leading to Project Work/Start-up	-	Two Semester Duration				03	100	100	200	12
2	PRJ	MVJSADPRJ42	Project	-					03	100	100	200	16
Total									**06**	**200**	**200**	**400**	**28**

INT: Industry/ Research Internship leading to the project work /startup **PRJ**: Project work outcome of Internship (Project Phase-II is Viva voce SEE)

Taking up a two-semester Industry/Research Internship that leads to project work or a start-up can be a highly rewarding experience for students. It allows them to apply theoretical knowledge in practical settings, gain valuable industry or research experience, and potentially develop innovative solutions or business ideas. Here are some key steps and considerations for students pursuing such an internship:

Industry Internship: The main objective of the industry internship is to ensure that the intern is exposed to a real-world environment and gain practical experience. Often, it may be a practical exposure to the theory that has been learned during the academic period. The industry internship helps students understand of analytical concepts and tools, hone their skills in real-life situations, and build confidence in applying the skills learned.

Research Internship: A research internship is an opportunity for students or early career professionals to gain hands-on experience in conducting research under the guidance of a mentor or within a research team. These internships can take place in academic institutions, research organizations, government agencies, or private companies

Research /Industry Internship: In the third-semester Students have to be in touch with a guide/mentor/coordinator and regularly submit the report referred to the progress internship. Based on the progress report the Guide/Mentor/coordinator has to enter the CIE marks at the end of the 3rd semester. At the beginning of the 4th semester, students have to define the project topic out of the learning due to the Internship, upon completion of the project work he/she has to attend the SEE at the parent Institute.

Internship Leading to Start-up: An internship that leads to a startup is an exciting pathway, blending real-world experience with entrepreneurial ambition. Here's a comprehensive guide to transitioning an internship experience into launching your startup: 1) Maximize your internship experience, 2) Identifying Viable Business Ideas, 3) Research and Validation 4) Building a Business Plan 5) Networking and Mentorship 6) Securing Funding 7) Establishing Startup 8) Launching and Marketing. By following these steps, you can effectively transition from an internship to launching a successful startup. This journey requires dedication, resilience, and a willingness to learn and adapt.

MVJSAD31 to 33: MOOC courses of 12 weeks duration are the courses suggested by the Board of Studies of the University and will be displayed on www.online.vtu.ac.in. The online courses selected should not be the same as those studied in the first and second semesters of the program. The student will not be eligible to get their degree if they unintentionally select online courses that match previously finished courses. These courses are not considered for the vertical progression; however, qualifying for these courses and earning the credits is a must for the award of the degree. It is permitted to complete these online MOOC courses either in 3rd semester or in 4th semester.

For the students who are willing to take an Industry Internship for one-semester duration and independent project work next semester

III SEMESTER (B)

Sl. No.	Course		Course Title	Teaching Department	Teaching Hours/Week				Examination				Credits
					Theory	Tutorials/skill Development Activities	Practical/ mini project/Internship	Self-Study Components	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
	Type	Code			L	T	P	S					
1	PEC/MDC	MVJSAD31x	(Online Courses) 12 weeks duration	-	-	-	-	Y	-	-	-	100	3
2	PEC/MDC	MVJSAD 32x	(Online Courses)12 weeks duration	-	-	-	-	Y	-	-	-	100	3
3	PEC/MDC	MVJSAD 33x	(Online Courses)12 weeks duration	-	-	-	-	Y	-	-	-	100	3
4	INT	MVJSAD**MINT 34**	Industry Internship	One-semester duration					03	100	100	200	11
				Total	06	0						500	20

IV SEMESTER (B)

Sl. No.	Course		Course Title	Teaching Department	Teaching Hours/Week				Examination				Credits
					Theory lecture	Tutorials	Practical/ field Work	Self-Study Components	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
	Type	Code			L	T	P	S					
	PRJ	MVJSADPRJ42	Project				08		03	100	100	200	20
Total					04		08		**03**	**100**	**100**	**200**	**20**

Industry Internship: The main objective of the industry internship is to ensure that the intern is exposed to a real-world environment and gains practical experience. Often, it may be a practical exposure to the theory that has been learned during the academic period. The industry internship helps students understand of analytical concepts and tools, hone their skills in real-life situations, and build confidence in applying the skills learned. The students who take up a one-semester Internship in the Industry have to appear SEE at the institute at the end of the semester as per the examination calendar.

Project Work: Students in consultation with the guide shall carry out literature survey/ visit industries to finalize the topic of the Project. Subsequently, the students shall collect the material required for the selected project, prepare a synopsis, and narrate the methodology to carry out the project work. Each student, under the guidance of a Faculty, is required to

- Present the seminar on the selected project orally and/or through Power Point slides.
- Answer the queries and be involved in debate/discussion.
- Submit two copies of the typed report with a list of references.
- The participants shall take part in discussions to foster a friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident

CIE marks for the project report (20 marks), seminar (20 marks) and question and answer (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Principal. The committee shall consist of internal guide and a faculty from the department with the senior most acting as the Chairperson.

Semester End Examination SEE marks for the project report (30 marks), seminar (10 marks) and question and answer session (10 marks) shall be awarded (based on the quality of the report and presentation skill, participation in the question and answer session) by the examiners appointed by the University.

MVJSAD31 to 33:MOOC courses of 12 weeks duration are the courses suggested by the Board of Studies of the University and will be displayed on www.online.vtu.ac.in. The online courses selected should not be the same as those studied in the first and second semesters of the program. The student will not be eligible to get their degree if they unintentionally select online courses that match previously finished courses. These courses are not considered for the vertical progression; however, qualifying for these courses and earning the credits is a must for the award of the degree. It is permitted to complete these online MOOC courses either in 3rd semester or in 4th semester.

For the students who are willing to take a research-leading paper publication in Q1/Q2/Q3 Journals and to a PhD Registration

III SEMESTER (C)

Sl. No.	Course		Course Title	Teaching Department	Teaching Hours/Week				Examination				Credits
					Theory	Tutorials/skill Development Activities	Practical/ mini project/Internship	Self-Study Components	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
	Type	Code			L	T	P	S					
1	PEC/MDC	MVJSAD31x	(Online Courses) 12 weeks duration	-	-	-	2	Y	-	-	-	100	3
2	PEC/MDC	MVJSAD 32x	(Online Courses)12 weeks duration	-	-	-	2	Y	-	-	-	100	3
3	PEC/MDC	MVJSAD 33x	(Online Courses)12 weeks duration	-	-	-	2	Y	-	-	-	100	3
4	PEC/MDC	MVJSAD 33x	(Online Courses)12 weeks duration	-	-	-	2	Y	-	-	-	100	3
5	PRJ	MVJSAD**34**	Project Phase-1	One-semester duration					03	100		100	6
Total												**500**	**18**

IV SEMESTER (C)

Sl. No.	Course		Course Title	Teaching Department	Teaching Hours/Week				Examination				Credits
					Theory lecture	Tutorials	Practical/ Drawing	Self-Study Components	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
	Type	Code			L	T	P	S					
1	PRJ	MVJSADPRJ41	Project work		00	00	08	-	03	100	100	200	22
Total					04		08		**03**	**100**	**100**	**200**	**22**

The research section of the university has to announce the number of seats for M.Tech. students who are seeking PhD (research study) admission through a project leading to the publication of the paper in Q1/Q2/Q3 journals. Only full-time research work will be permitted in the university department or approved research centers of the affiliated colleges of the university (guidelines need to be set up). Based on seat availability, the students are permitted to register for project work leading to the publication of papers in Q1/Q2/Q3 journals and admission to research (PhD) in their 3rd semester of the M.Tech., program Project Phase-1

• **Project Phase-I,** typically the initial phase in any project, is crucial as it lays the foundation for the entire project. This phase involves defining the

project's scope, objectives, and initial planning. Here's a structured approach to effectively carry out Project Phase-I:

- **Project Charter: O**utlines the project's purpose, objectives, and stakeholders.
- **Scope Statement:** Defines the project boundaries and deliverables.
- **Requirements Document:** Captures all project requirements.
- **Project Plan:** Details the approach, timeline, and resource allocation.
- **Risk Management Plan:** Identifies and plans for potential risks.
- **Feasibility Study Report:** Assesses technical, economic, and operational feasibility.

Students in consultation with the guide shall carry out literature survey/visit industries to finalize the topic of the Project. Subsequently, the students shall collect the material required for the selected project, prepare a synopsis, and narrate the methodology to carry out the project work. Each student, under the guidance of a faculty, is required to

- Present the seminar on the selected project orally and/or through power point slides.
- Answer the queries and be involved in debate/discussion.
- Submit two copies of the typed report with a list of references.
- The participants shall take part in discussions to foster a friendly and stimulating environment in which the students are motivated to reach the highest and become self-confident.

Continuous Internal Evaluation (100 Marks).

CIE marks for the project report (60 marks), seminar (20 marks) and question and answer (20marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Principal. The committee shall consist of an internal guide and a faculty from the department with the seniormost acting as the Chairperson.

Project Work Phase-II: Each student shall be involved in carrying out the project work jointly in constant consultation with internal guide and external guide and prepare the project report as per the norms of the university to avoid plagiarism. Phase II of a project typically involves the detailed execution of the planned activities, continuous monitoring and control of the project's progress, and making necessary adjustments to ensure the project stays on track. Keep detailed records of all project activities, decisions, and changes. Ensure all project documentation is organized and accessible. Conduct a final project review to evaluate overall performance, achievements, and lessons learned. Document best practices and areas for improvement for future projects.

Paper Publication Process: Publishing a research paper based on your project in a Q1/Q2/Q3 journal involves several key steps, from writing the manuscript to navigating the peer review process. Here's a comprehensive guide:

Writing the Manuscript: Choose a clear and concise title that accurately reflects the content. Write an abstract summarizing the research question, methods, results, and conclusions.

Literature Review: Review relevant existing research to establish the foundation of your study.Identify gaps that your research aims to fill. Methodology: Describe the research design, methods, and procedures in detail. Include information on data collection, analysis, and any tools or software used.

Results: Present the findings of your research clearly and logically. Use tables, figures, and charts to illustrate key results.

Discussion: Interpret the results and explain their implications. Compare your findings with existing research and discuss any discrepancies or new insights.

Conclusion: Summarize the main findings and their significance. Suggest potential future research directions.

References: Cite all sources used in your research following the journal's citation style.

Journal Selection: Choose a journal that aligns with the scope and focus of your research. Consider the journal's impact factor (Q1, Q2, Q3) and audience.

Review Journal Guidelines: Carefully read the journal's submission guidelines and ensure your manuscript adheres to them.
Prepare Your Manuscript: Format your manuscript according to the journal's guidelines. Include all required sections and supplementary materials.
Cover Letter: Write a cover letter to the journal editor highlighting the significance of your research and why it fits the journal.
Submit the Manuscript: Use the journal's online submission system to submit your manuscript. Ensure all required information and documents are included.
Semester End Examination SEE marks for the project report (60 marks), seminar (20marks) and question and answer session (20 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) by the examiners appointed by the University.

Online courses (online.vtu.ac.in) Online courses like

Artificial Intelligence and Machine Learning
Artificial Intelligence: Knowledge Representation And Reasoning
Introduction to Machine Learning
Machine Learning for Engineering and Science Applications
Deep Learning
Reinforcement Learning
Optimization for Machine Learning: Theory and Implementation
Natural Language Processing
Introduction to Large Language Models (LLMs)
Introduction To Soft Computing
AI: Constraint Satisfaction etc

Data Science and Analytics
Data Science for Engineers
Python for Data Science
Business Intelligence & Analytics
The Joy of Computing using Python
Programming, Data Structures And Algorithms Using Python
Data Analytics with Python etc

AI/Data Science Adjacent Topics (Security, Cloud, Systems)
Cloud Computing
Cloud Computing and Distributed Systems
Foundation of Cloud IoT Edge ML
Block-chain and its Applications
Information Security - 5 - Secure Systems Engineering
Privacy and Security in Online Social Media
Secure Computation: Part I
Systems and Usable Security etc

HOD

Dean Academics