

2023-24



Vel Tech
Rangarajan Dr. Sagunthala
R&D Institute of Science and Technology
(Deemed to be University Estd. u/s 3 of UGC Act, 1956)
Chennai, Tamil Nadu
India



B.Tech - Computer Science and Engineering (Artificial Intelligence and Machine Learning)

B.Tech (VTR UGE-21) - Curriculum

CBCS - Choice Based Credit System

School of Computing

**B.Tech - COMPUTER SCIENCE AND
ENGINEERING**
(Artificial Intelligence and Machine Learning)
CBCS CURRICULUM
Honors / Specialization / Minor
(With effect from 2022-2023)



**Vel Tech Rangarajan Dr. Sagunthala R&D Institute
of
Science and Technology**

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After completion of degree graduate will

PEO1: Formulate, solve and analyze Computer Science and Engineering problems using necessary mathematical, scientific and engineering fundamentals.

PEO2: Equip with strong theoretical and practical knowledge to solve computing problems by using Artificial Intelligence and Machine Learning techniques.

PEO3: Excel as software engineer in the domains of Artificial Intelligence and Machine Learning or continues higher education at a reputed institution in India or abroad.

PEO4: Demonstrate critical thinking, communication, teamwork, leadership skills and ethical behaviour necessary to function productively and professionally

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO)

On successful completion of the program, the graduates will be able to,

PSO1: Use appropriate algorithms and techniques to develop the solution for computer science and engineering problems.

PSO2: Develop intelligent systems using Artificial Intelligence and Machine Learning algorithms and techniques.

COURSE OUTCOMES (COs)

Abilities of the student defined in terms of Course Outcomes (COs) as per the Bloom's Taxonomy at the end of every course in the programme.

**B.Tech - COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)
CURRICULUM
(CBCS)
(Specialization / Honors)
(With effect from 2022-2023)**

Preamble:

Artificial Intelligence(AI) and Machine Learning(ML) in the field of Computer Science and Engineering aims to build intelligent machines that can impersonate human cognitive functions, such as seeing, learning, and problem-solving. The learners will comprehend the basic AI-related terms such as Machine Learning, Deep Learning, and Expert Systems which will play a key role in the future of technology and science. This program is designed along with the Computer Science Engineering core and more emphasis on AI and ML specialization.

Program Structure

Course Category	Minimum Credits Required
Foundation Courses (FC)	56
Program Core (PC)	58
Program Elective (PE)	18
Open Elective (OE)	12
Independent Learning(IL)	14
Industry / Higher Institute Learning Interaction(IHL)	2
Professional Proficiency Courses (PPC)	4
TOTAL	164

Minimum credits required for regular students in various course categories for B.Tech Computer Science and Engineering (Artificial Intelligence and Machine Learning) with minor

The students shall earn 164 credits in various course categories and additional 18 to 20 credits in the specialized tracks / areas from other branches/Schools by satisfying the prerequisite courses for the award of degree of B.Tech Computer Science and Engineering (Artificial Intelligence and Machine Learning) with minor subject to the regulations.

Minimum credits required for regular students in various course categories for B.Tech Computer Science and Engineering (Artificial Intelligence and Machine Learning) with Honors

The students shall earn 164 credits in various course categories and additional 18 to 20 credits in the specialized tracks / areas courses by satisfying the prerequisite courses for the award of degree of B.Tech Computer Science and Engineering (Artificial Intelligence and Machine Learning) with Honors subject to the regulations.

Foundation Core (56 Credits)

Foundation courses enhance the knowledge, skills and attitude of UG engineering graduates of all programmes to the expected level. The foundation courses shall have the courses related to basic sciences and mathematics, basic engineering sciences and humanities and social sciences.

L-Lecture T-Tutorial P-Practical C-Credits

S.No	Course Code	Subject Title	Category	L	T	P	C
Lecture Courses							
1	10210MA101	Linear Algebra for Computing	BSC	3	1	0	4
2	10210MA102	Calculus & Ordinary differential Equations	BSC	3	1	0	4
3	10210MA103	Probability, Statistics and Queuing theory	BSC	3	1	0	4
	10210MA110	Discrete Mathematical Structures	BSC	3	1	0	4
4	10210PH101	Semiconductor Physics	BSC	3	0	0	3
5	10210CH104	Environmental Science and Sustainability	BSC	3	0	0	3
6	10210CS101	Problem Solving using C	ESC	3	0	0	3
7	10210CS104	Programming Using Python	ESC	3	0	0	3
8	10210ME101	Design thinking	ESC	2	0	0	2
9	10210BM101	Biology for Engineers	ESC	2	0	0	2
10	10210ME103	Innovation & Entrepreneurship	ESC	2	0	0	2
11	10210ME102	Universal Human Values	HSC	3	0	0	3
12	10210ME104	Project Management & Finance	HSC	2	0	0	2
13	10210ME105	Engineers and Society	HSC	1	0	0	M
14	10210BL101	Constitution of India	HSC	1	0	0	M
Integrated Courses							
15	10210EN201	Professional Communication - I	HSC	1	0	2	2
16	10210EN202	Professional Communication - II	HSC	1	0	2	2
17	10210EC201	Basic Electronics & Digital Logic Design	ESC	2	0	2	3
18	10210EE204	Introduction to Engineering	ESC	1	0	4	3
19	10210ME201	Engineering Graphics	ESC	1	0	4	3
Laboratory Courses							
20	10210PH301	Modern Physics Laboratory	BSC	0	0	2	1
21	10210EE301	Engineering Products Lab	ESC	0	0	2	1
22	10210CS301	Problem Solving using C Lab	ESC	0	0	2	1
23	10210CS305	Programming Using Python Lab	ESC	0	0	2	1
Total Credits							56

*BSC – Basic Science Courses, ESC – Engineering Science Courses, HSC – Humanities & Social Science Courses, M – Mandatory course

Program Core (58 Credits)

L-Lecture T-Tutorial P-Practical C-Credits

S.No	Course Code	Course Name	L	T	P	C
Theory Courses						
1	10211CA101	Data Structures	3	1	0	3
2	10211CA103	Operating Systems	3	0	0	3
3	10211CA129	Modern Computer Architecture	3	0	0	3
4	10211CA130	Fundamentals of Computer Networks	3	0	0	3
5	10211CA106	Formal Languages and Automata Theory	3	1	0	3
6	10211CA107	Compiler Design	3	1	0	3
7	10211CA109	Microprocessors	2	1	0	2
Integrated Courses						
8	10211CA202	Design and Analysis of Algorithms	3	1	2	4
9	10211CA204	Programming Using Java	3	0	2	4
10	10211CA207	Database Management Systems	3	1	2	4
11	10211CA208	Software Engineering	2	1	2	3
12	10211CA210	Big Data Analytics	3	0	2	4
13	10211CA211	Artificial Intelligence Techniques	3	0	2	4
14	10211CA212	Web and Mobile Application Development	3	0	2	4
15	10211CA223	Machine Learning Techniques	3	0	2	4
Laboratory Courses						
16	10211CA301	Data Structures Laboratory	0	0	2	1
17	10211CA304	Operating Systems Laboratory	0	0	2	1
18	10211CA305	Microprocessor Laboratory	0	0	2	1
19	10211CA306	Competitive Coding-I	0	0	2	1
20	10211CA307	Competitive Coding-II	0	0	2	1
21	10211CA312	Fundamentals of Computer Networks Laboratory	0	0	2	1
22	10211CA313	Problem Solving Techniques	0	1	2	1
Total Credits						58

Tutorial hour is not considered for credit calculation of the course

Program Electives (18 Credits)

Program Electives are the courses offered in the programme which covers depth and breadth. The students may register for appropriate electives offered in the programme based on their area of interest. One course under this category shall be taken from the list of approved MOOCs.

L-Lecture T-Tutorial P-Practical C-Credits						
S. No	Course Code	Course Name	L	T	P	C
		Artificial Intelligence and Machine Learning Core				
1	10212CA110	Optimization Techniques	3	1	0	3
2	10212CA113	Reinforcement Learning*	3	0	0	3
3	10212CA121	High Performance Computing	3	0	0	3
4	10212CA214	Data Visualization	3	0	2	4
5	10212CA215	Deep Learning*	3	1	2	4
6	10212CA216	Natural Language Processing*	2	0	2	3
7	10212CA224	Computer Vision *	3	0	2	4
8	10212CA228	Blockchain Technology *	2	0	2	3
9	10212CA229	IoT and Cloud Computing *	3	0	2	4
* The proposed course and the course content are subject to approval/ratification in the upcoming BoS meetings						

Tutorial hour is not considered for credit calculation of the courses

Open Electives (12 Credits)

Open electives are the courses offered across the schools to enhance the knowledge breadth and professional competency of the students. The students shall register for appropriate electives offered in other schools based on their area of interest. The courses offered under this category cover the interdisciplinary knowledge.

L-Lecture T-Tutorial P-Practical C-Credits						
S.No	Course Code	Course Name	L	T	P	C
1	XXX1	Course Name – 1	3	0	0	3
2	XXX2	Course Name – 2	3	0	0	3
3	XXX3	Course Name – 3	3	0	0	3
4	XXX4	Course Name – 4	3	0	0	3

*One of the courses may be completed through MOOCs Platform like NPTEL as described by the department

These courses offered to the other departments by school of Computing under open elective category

L-Lecture T-Tutorial P-Practical C-Credits						
S.No	Course Code	Course Name	L	T	P	C
1	10213CA101	Object Oriented Programming using Java	3	0	0	3
2	10213CA102	Data Structures	3	0	0	3
3	10213CA103	Operating Systems	3	0	0	3
4	10213CA104	Database Management Systems	3	0	0	3
5	10213CA105	Computer Networks	3	0	0	3
6	10213CA106	Data warehousing and Data mining	3	0	0	3

The following courses are offered to the other departments/schools by School of Computing under Open Elective category. The students will solve the problems posted by Leet Code Platform, the grades will be offered based on the scores secured by the students by solving the problems posted in Leet Code Platform.

S.No	Course Code	Course Name	L	T	P	C
1	10213GE301	Programming Challenges	0	1	4	2

Independent Learning (14 Credits)

The students are expected to learn the courses offered under this category on their own. The courses offered under this category include:

L-Lecture T-Tutorial P-Practical C-Credits						
S.No	Course Code	Course Name	L	T	P	C
1	10214CA601	Community Service Project	-	-	-	1
2	10214CA701	Minor Project	0	0	4	2
3	10214CA702	Minor Project	0	0	4	2
4	10214CA801	Major Project	-	-	-	9

Industry / Higher Institute Learning Interaction (2 Credits)

The students shall earn a minimum of two credits by undergoing internship and/or specialized courses.

1. Internship:

The students shall undergo Internship in the industry/higher learning institute approved by Industry-Institute Interaction Cell (IIC) during any time after the second academic year.

2. Specialized Courses:

The students shall undergo the courses offered either by the industrial experts whose minimum academic qualification is Bachelor of Engineering or equivalent or faculty expert from higher learning institutions approved by IIC. The students shall choose either one two credits course or one one credit course or two one credit courses.

L-Lecture T-Tutorial P-Practical C-Credits

S.No	Course Code	Course Name	L	T	P	C
1	10215CA901	Internship	-	-	-	2
2	10215CA902	Industry Expert Lecture-1	-	-	-	1
3	10215CA903	Industry Expert Lecture-2	-	-	-	1
4	10215CA951	Higher Institute Learning Interaction-1	-	-	-	1
5	10215CA952	Higher Institute Learning Interaction-2	-	-	-	1

Professional Proficiency Courses (4 Credits)

The Professional Proficiency Courses which carry four credits, to be offered in four different semesters, starting from third semester. These courses offered in this category are relevant to professional proficiency.

L-Lecture T-Tutorial P-Practical C-Credits

S.No	Course Code	Course Name	L	T	P	C
1	10216GE901	Soft Skill-I	2	0	0	1
2		Professional Proficiency Course-II	2	0	0	1
3		Professional Proficiency Course-III	2	0	0	1
4		Professional Proficiency Course-IV	2	0	0	1