

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



4<sup>th</sup> BoS Meeting

*with effect from*  
27.05.2023

# B.Tech - Artificial Intelligence & Data Science

B.Tech (VTR UGE-21) - Curriculum

CBCS - Choice Based Credit System

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School of Computing

# **B.Tech - ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

## **CBCS CURRICULUM**

**Honors / Specialization / Minor  
(With effect from 2021-2022)**



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

### PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

After completion of degree graduate will

**PEO1:**Apply the fundamental skills to acquire, curate, manage, analyze and make inferences from data.

**PEO2:**Formulate and solve real world problems using cutting edge technologies in Artificial Intelligence and Data Science.

**PEO3:**Explore opportunities in the growing field of Artificial Intelligence and Data Science as trained professionals or pursue higher education at a reputed institution in India or abroad.

**PEO4:**Exhibit professional leadership skills to excel as committed engineers with high ethical values in interdisciplinary domains and engage in lifelong learning.

### 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:** Extract knowledge from the data using Artificial Intelligence and Data Science principles

**PSO2:** Develop essential proficiency in the areas related to Data Science and Artificial Intelligence in terms of underlying statistical and computational principles to solve real world problems.

### COURSE OUTCOMES (COs)

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

**B.TECH - ARTIFICIAL INTELLIGENCE AND DATA SCIENCE  
CURRICULUM  
(CBCS)  
(Specialization / Honors)  
(With effect from 2021-2022)**

**Credits required for regular students in various course categories for**

**B.Tech - Artificial Intelligence And Data Science**

**Preamble:**

Data Science is an interdisciplinary field with the ability to extract knowledge/insights from data-be it structure, unstructured, or semi-structured data. Twinned with Artificial Intelligence more efficient solutions to find meaningful information from huge pools of data are possible today, with data from multiple sources-sensors, images, streaming video, satellite, medical imagery and the cloud.

**Program Structure**

<b>Course Category</b>	<b>Minimum Credits Required</b>
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
<b>TOTAL</b>	<b>164</b>

**Minimum credits required for regular students in various course categories for B.Tech Artificial Intelligence and Data Science 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 Artificial Intelligence and Data Science with minor subject to the regulations.

**Minimum credits required for regular students in various course categories for B.Tech Artificial Intelligence and Data Science 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 Artificial Intelligence and Data Science 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-Credit)**

S.No	Course Code	Subject Title	Category	L	T	P	C
<b>Lecture Courses</b>							
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
4	10210MA110	Discrete Mathematical Structures	BSC	3	1	0	4
5	10210PH101	Semiconductor Physics	BSC	3	0	0	3
6	10210CH103 (2021-2022) admitted batch only	Environmental Science	BSC	3	0	0	3
	10210CH104 (2022-2023) admitted batch onwards	Environmental Science and Sustainability	BSC	3	0	0	3
7	10210CS101	Problem Solving using C	ESC	3	0	0	3
8	10210CS103 (2021-2022) admitted batch only	Object Oriented Programming using C++	ESC	3	0	0	3
	10210CS104 (2022-2023) admitted batch onwards	Python Programming	ESC	3	0	0	3
9	10210ME101	Design thinking	ESC	2	0	0	2
10	10210BM101	Biology for Engineers	ESC	2	0	0	2
11	10210ME103	Innovation & Entrepreneurship	ESC	2	0	0	2
12	10210ME102	Universal Human Values	HSC	3	0	0	3
13	10210ME104	Project Management & Finance	HSC	2	0	0	2
14	10210ME105	Engineers and Society	HSC	1	0	0	M
15	10210BL101	Constitution of India	HSC	1	0	0	M

Integrated Courses							
16	10210EN201	Professional Communication - I	HSC	1	0	2	2
17	10210EN202	Professional Communication - II	HSC	1	0	2	2
18	10210EC201	Basic Electronics & Digital Logic Design	ESC	2	0	2	3
19	10210EE204	Introduction to Engineering	ESC	1	0	4	3
20	10210ME201	Engineering Graphics	ESC	1	0	4	3
Laboratory Courses							
21	10210PH301	Modern Physics Laboratory	BSC	0	0	2	1
22	10210EE301	Engineering Products Lab	ESC	0	0	2	1
23	10210CS301	Problem Solving using C Lab	ESC	0	0	2	1
24	10210CS303 (2021-2022) admitted batch only	IT workshop	ESC	0	0	2	1
25	10210CS304 (2021-2022) admitted batch only	Object Oriented Programming using C++ Lab	ESC	0	0	2	1
	10210CS305 (2022-2023) admitted batch onwards	Python Programming Lab	ESC	0	0	2	1
<b>Total Credits</b>							<b>56</b>

\*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-Credit)**

S.No	Course Code	Course Name	L	T	P	C
		<b>Theory Courses</b>				
1	10211AD101	Data Structures	3	1	0	3
2	10211AD103	Operating Systems	3	0	0	3
3	10211AM104 (2021- 2022) admitted batch only	Computer Architecture and Organization	3	0	0	3
	10211AM129 (2022-2023) admitted batch onwards	Modern Computer Architecture	3	0	0	3
4	10211AD110	Optimization Techniques	3	1	0	3
5	10211AD108 (2021-2022) admitted batch only	Image Processing	2	0	0	2
	10211AD118 (2022-2023) admitted batch onwards	Image Processing Techniques	3	0	0	3
		<b>Integrated Courses</b>				
6	10211AD202	Design and Analysis of Algorithms	3	1	2	4
7	10211AD204	Programming using Java	2	1	2	3
8	10211AD207	Database Management Systems	3	1	2	4
9	10211AD209 (2021-2022) admitted batch only	Artificial Intelligence	2	0	2	3
	10211AD211 (2022-2023) admitted batch only	Artificial Intelligence Techniques	3	0	2	4
10	10211AD210	Big Data Analytics	3	0	2	4
11	10211AD213 (2021-2022) admitted batch only	Python Programming	1	1	2	2
12	10211AD214	Data Visualization	3	0	2	4
13	10211AD223	Machine Learning Techniques	3	0	2	4
14	10211AD217	Data Science	2	0	2	3
15	10211AD218	Modeling for Data Science	3	0	2	4
16	10211AD215	Deep Learning	3	1	2	4
		<b>Laboratory Courses</b>				
17	10211AD301	Data Structures Laboratory	0	0	2	1
18	10211AD304	Operating Systems Laboratory	0	0	2	1
19	10211AD306	Competitive Coding-I	0	0	2	1
20	10211AD307	Competitive Coding-II	0	0	2	1
21	10211AD309	Robotic Process Automation Laboratory	0	0	2	1
<b>Total Credits</b>						<b>58</b>

### Program Elective (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-Credit)

S.No	Course Code	Course Name	L	T	P	C
<b>General Elective</b>						
1	10212AD106	Formal Languages and Automata Theory	3	1	0	3
2	10212AD107	Compiler Design	3	1	0	3
3	10212AD208	Software Engineering	3	1	2	4
4	10212AD105	Fundamentals of Computer Networks	3	0	0	3
5	10212AD212	Web and Mobile Application Development	3	0	2	4
6	10212AD228	Blockchain Technology*	2	0	2	3
7	10212AD229	IoT and Cloud Computing	3	0	2	4
<b>AI-Data Science-Core Courses</b>						
8	10212AD216	Natural Language Processing	3	0	2	4
9	10212AD113	Reinforcement Learning	3	0	0	3
10	10212AD222	Cognitive Computing*	3	0	0	3
11	10212AD224	Computer Vision*	3	0	2	4
12	10212AD234	Time Series and Forecasting*	3	0	2	4
13	10212AD121	High Performance Computing*	3	0	0	3
14	10212AD123	Data Security and Privacy*	2	0	0	2
*The proposed course and the course content are subject to approval/ratification in the upcoming BOS meetings						

### 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-Credit)

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-3	3	0	0	3
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\*One of The Courses may be completed through MOOCs platform like NPTEL as described by the department.

These courses offered to the other departments/Schools by School of Computing under Open Elective category.

**(L-Lecture, T-Tutorial ,P-Practical,C-Credit)**

S.No	Course Code	Course Name	L	T	P	C
1	10213AD101	Object Oriented Programming using Java	3	0	0	3
2	10213AD102	Data Structures	3	0	0	3
3	10213AD103	Operating Systems	3	0	0	3
4	10213AD104	Database Management Systems	3	0	0	3
5	10213AD105	Computer Networks	3	0	0	3
6	10213AD106	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:

S.No	Course Code	Course Name	L	T	P	C
1	10214AD501	Community Service Project	-	-	-	1
2	10214AD601	Minor Project	0	0	4	2
3	10214AD602	Minor Project	0	0	4	2
4	10214AD701	Major Project	-	-	-	9
<b>Total</b>						<b>14</b>

### 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 (IIIC) 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 IIIC. The students shall choose either one two credits course or one one credit course or two one credit courses.

S.No	Course Code	Course Name	L	T	P	C
1	10215AD901	Internship	-	-	-	2
2	10215AD902	Industry Expert Lecture-1	-	-	-	1
3	10215AD903	Industry Expert Lecture-2	-	-	-	1
4	10215AD951	Higher Institute Learning Interaction-1	-	-	-	1
5	10215AD952	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.

S.No	Course Code	Course Name	L	T	P	C
1	10216GE901	Soft Skill-I	2	-	-	1
2	10216GE902	Soft Skill-II	2	-	-	1
3		Professional Proficiency Course-III	2	-	-	1
4		Professional Proficiency Course-IV	2	-	-	1