

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 - Computer Science & Design

B.Tech (VTR UGE-21 ) - Curriculum

CBCS - Choice Based Credit System

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School of Computing

# **B.Tech–COMPUTER SCIENCE AND DESIGN**

## **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:**Analyze computing approaches, use tools and technologies to design and implement software solutions.

**PEO2:**Formulate design approaches related to interactive design and design methods for user experience in web presence, animation and gaming.

**PEO3:**Explore in software industry as well as digital design & media industry and Pursue higher education in computer science or design at reputed institution in India or abroad and engage in lifelong learning.

**PEO4:**Demonstrate critical thinking, communication, teamwork, leadership skills, professional and ethical attitude to make positive impact on environment and society.

### 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 (PSOs)

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

**PSO1:** Apply the principles of Computer Science and Design to solve real world problem.

**PSO2:** Create innovative solutions from idea to product, applying scientific methods and tools for animation and gaming applications.

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

**Credits required for regular students in various course categories for  
B.Tech Computer Science and Design**

**Preamble:**

Computer Science and Design (CSD) aim to develop graduates that are not only well versed with computing approaches, tools, and technologies, but are also experienced with Design approaches. The program will prepare students to work in the software industry as well as gaming, animation and user experience design industry. The program will prepare students to take up higher studies in CS or in Design.

**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.TechComputer Science and Designwith 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 Design with minor subject to the regulations.

**Minimum credits required for regular students in various course categories for  
B.TechCompter Science and Designwith 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 Designwith 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	Programming Using Python	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
<b>Integrated Courses</b>							
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
<b>Laboratory Courses</b>							
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	Programming Using PythonLab	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	10211CD101	Data Structures	3	1	0	3
2	10211CD103	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	10211CD105	Computer Networks	3	0	0	3
5	10211CD130 (2022-2023) admitted batch onwards	Fundamentals of Computer Networks	3	0	0	3
6	10211CD106	Formal Languages and Automata Theory	3	1	0	3
7	10211CD107	Compiler Design	3	1	0	3
		<b>Integrated Courses</b>				
8	10211CD202	Design and Analysis of Algorithms	3	1	2	4
9	10211CD203	Programming using Java	2	1	2	3
10	10211CD205	Computer Graphics and Image Processing	2	1	2	3
11	10211CD206	Human Computer Interaction	2	0	2	3
12	10211CD207	Database Management Systems	3	1	2	4
13	10211CD208	Software Engineering	2	1	2	3
14	10211CD210	Big Data Analytics	3	0	2	4
15	10211CD220	Animation Engineering	3	0	2	4
16	10211CD221	Game Design	3	0	2	4
17	10211CD222	Virtual and Augmented Reality	2	0	2	3
		<b>Laboratory Courses</b>				
18	10211CD301	Data Structures Laboratory	0	0	2	1
19	10211CD303	Computer Networks Laboratory	0	0	2	1
20	10211CD312 (2022-2023) admitted batch onwards	Fundamentals of Computer Networks Laboratory	0	0	2	1
21	10211CD304	Operating Systems Laboratory	0	0	2	1
22	10211CD306	Competitive Coding- I	0	0	2	1
23	10211CD307	Competitive Coding –II	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 Electives</b>				
1	10211CS212	Web and Mobile Application Development	3	0	2	4
2	10212CD228	*Block Chain Technology	2	0	2	3
3	10212CD229	IoT and Cloud Computing	3	0	2	4
		<b>Track: Design and Animation</b>				
4	10212CD237	*Design Processes and Perspectives	2	0	2	3
5	10212CD238	*Design Drawing and Visualization	2	0	2	3
6	10212CD239	3D Character Modeling	3	0	2	4
7	10212CD240	Design and Prototyping of Interactive Systems	3	0	2	4
8	10212CD241	*User Interface Software and Technology	3	0	2	4
9	10212CD125	*Sound Design for Animation	3	0	0	3
10	10212CD243	*Mobile Game Development Tools	3	0	2	4
		<b>Track : Artificial Intelligence and Machine Learning</b>				
11	10212CD211	Artificial Intelligence Techniques	3	0	2	4
12	10212CD214	Data Visualization	3	0	2	4
13	10212CD215	Deep Learning	3	1	2	4
14	10212CD216	Natural Language Processing	3	0	2	4
15	10212CD113	Reinforcement Learning	3	1	0	3
16	10212CD122	*Cognitive Computing	3	0	0	3
17	10212CD223	Machine Learning Techniques	3	0	2	4
18	10212CD234	*Time series and Forecasting	3	0	2	4
* 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.

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/schools by school of computing under open elective category

S.No	Course Code	Course Name	L	T	P	C
1	10213CD101	Object Oriented Programming using Java	3	0	0	3
2	10213CD102	Operating Systems	3	0	0	3
3	10213CD103	Data Structures	3	0	0	3
4	10213CD104	Database Management System	3	0	0	3
5	10213CD105	Computer Networks	3	0	0	3
6	10213CD106	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	10214CD501	Community Service Project	-	-	-	1

2	10214CD601	Minor Project	0	0	4	2
3	10214CD602	Minor Project	0	0	4	2
4	10214CD701	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 (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 - Credit**

S.No	Course Code	Course Name	L	T	P	C
1	10215CD901	Internship	-	-	-	2
2	10215CD902	Industry Expert Lecture-1	-	-	-	1
3	10215CD903	Industry Expert Lecture-2	-	-	-	1
4	10215CD951	Higher Institute Learning Interaction-1	-	-	-	1
5	10215CD952	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 - Credit**

S.No	Course Code	Course Name	L	T	P	C
1	10216GE901	Soft Skill-I	2	0	0	1
2	10216GE902	Soft Skill-II	2	0	0	1
3		Professional Proficiency Course-III	2	0	0	1
4		Professional Proficiency Course-IV	2	0	0	1