DAYANANDA SAGAR ACADEMY OF TECHNOLOGY & MANAGEMENT

CURRICULUM

Scheme and Syllabus VII to VIII Semester

Outcome Based Education

(Academic Year 2026-2027)

Department of Computer Science and Design

7th & 8th Semester B.E

ABOUT THE INSTITUTE

Dayananda Sagar Academy of Technology and Management- DSATM was established in 2011 with 5 UG Programmes and 1 PG Program, the programmes are approved by All India Council for Technical Education (AICTE) New Delhi, Affiliated to Visvesvaraya Technological University (VTU), Belagavi and DSATM is an autonomous institute from 2023-2024.

The Dayananda Sagar Institutions is one of pioneer institutions in India and abroad with six decades of excellence in Academic and Research. The newer campuses were necessary to accommodate the growing need of the technology and innovation.

DSATM nurtures the students in academic, research, sports, cultural and extracurricular activities.

- Creating an academic environment to nurture and develop competent entrepreneurs, leaders and professionals who are socially sensitive and environmentally conscious.
- Integration of Outcome Based Education and cognitive teaching and learning strategies to enhance learning effectiveness.
- Developing necessary infrastructure to cater to the changing needs of Business and Society.
- Optimum utilization of the infrastructure and resources to achieve excellence in all areas of relevance.
- Adopting learning beyond curriculum through outbound activities and creative assignments.
- Imparting contemporary and emerging techno-managerial skills to keep pace with the changing global trends.
- Facilitating greater Industry-Institute Interaction for skill development and employability enhancement.
- Establishing systems and processes to facilitate research, innovation and entrepreneurship for holistic development of students.
- Implementation of Quality Assurance System in all Institutional processes.

VISION OF THE INSTITUTE

To strive at creating the institution a centre of highest calibre of learning, so as to create an overall intellectual atmosphere with each deriving strength from the other to be the best of engineers, scientists with management & design skills.

MISSION OF THE INSTITUTE

- To serve its region, state, the nation and globally by preparing students to make meaningful contributions in an increasing complex global society challenges.
- To encourage, reflection on and evaluation of emerging needs and priorities with state-of-the-art infrastructure at institution.
- To support research and services establishing enhancements in technical, economic, human and cultural development.
- To establish interdisciplinary centre of excellence, supporting/ promoting student's implementation.
- To increase the number of Doctorate holders to promote research culture on campus.
- To establish IIPC, IPR, EDC, innovation cells with functional MOU's supporting student's quality growth**.**

QUALITY POLICY

Dayananda Sagar Academy of Technology and Management aims at achieving academic excellence through continuous improvement in all spheres of Technical and Management education. In pursuit of excellence cutting – edge and contemporary skills are imparted to the utmost satisfaction of the students and the concerned stakeholders.

ABOUT THE DEPARTMENT

The Computer Science and Design Department, established in 2021, is a dynamic and innovative centre of learning and research, dedicated to advancing the frontiers of technology and creative design. Our state-of-the-art facilities and experienced faculty provide students with a robust education in programming, algorithms, data structures, artificial intelligence, and user experience design. We emphasize critical thinking, problem-solving, and hands-on experience, ensuring our graduates are well- equipped for the challenges of the tech and design industries. Through industry partnerships, internships, and collaborative projects, students gain real-world experience and professional growth opportunities. The department is committed to fostering a supportive and inclusive environment, encouraging creativity, and inspiring future leaders in computer science and design.

VISION OF THE DEPARTMENT

Envisions to become a renowned faculty of engineering globally with a profound impact on the society through continual innovation in education and research in the field of Computer Science & Design

MISSION OF THE DEPARTMENT

To create technology enabled experiential learning environment for students focusing on development of problem solving and design thinking

• To collaborate with Industries, R & D organizations and Universities to solve socially relevant problems through joint research in the field of Computer Science keeping design as a focus

• To create a conducive environment for faculty to upskill and reskill themselves

• To attract talented faculty to the work force and talented students to the program

PROGRAM EDUCATION OBJECTIVES (PEO'S):

To create technology enabled experiential learning environment for students focusing on development of problem solving and design thinking

• To collaborate with Industries, R& D organizations and Universities to solve socially relevant problems through joint research in the field of Computer Science keeping design as a focus

• To create a conducive environment for faculty to upskill and reskill themselves

• To attract talented faculty to the work force and talented students to the program.

PROGRAM OUTCOMES (PO's)

Engineering Graduates will be able to:

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

2. 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.

3. 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.

4. 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.

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

6. 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.

7. 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.

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

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

10. 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.

11. 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.

12. 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's)

Students will have the knowledge of Computer hardware, system software, algorithms, networking and data bases 2. Students will be able to design, analyze and develop efficient and secure algorithms using appropriate data structures, databases for processing of data. 3. Students will be capable of developing stand alone, embedded and web-based solutions having easy to operate interface using software engineering practices and contemporary computer programming languages. 4. Students will be able to demonstrate ability to self-learn, write technical articles, project reports and research papers**.**

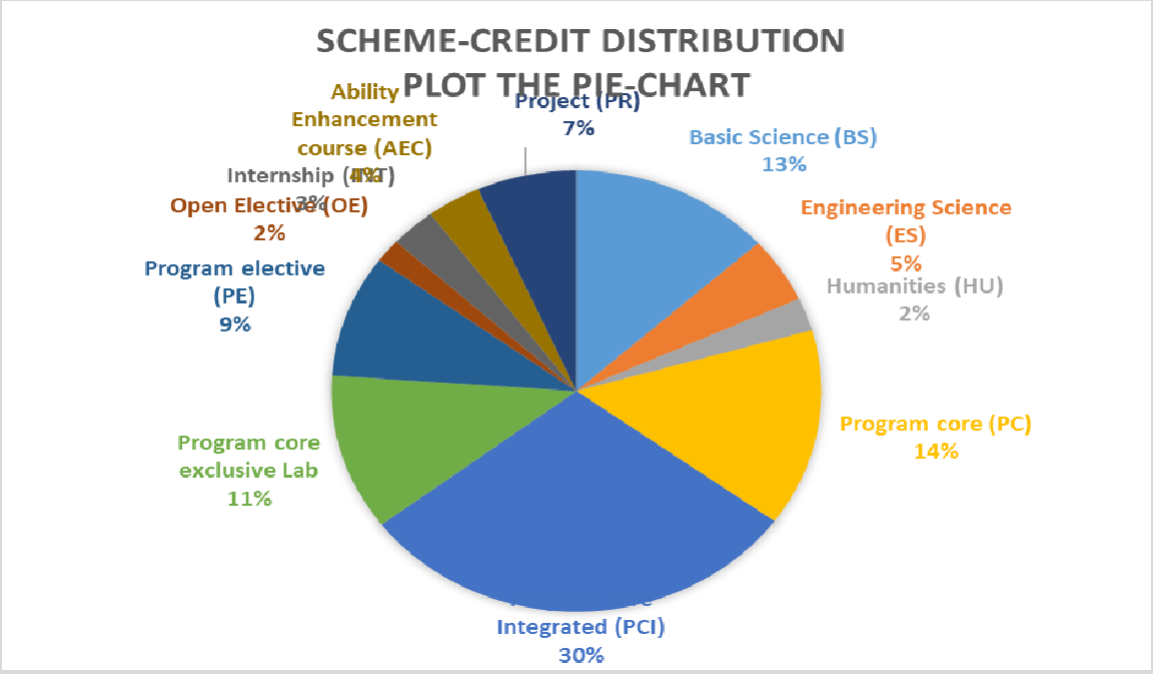
PROPOSED UG CREDIT STRUCTURE IN ALIGNMENT WITH VTU

Sl.No	Semester	No. of Credits
1	1st Semester	20
2	2nd Semester	20
3	3rd Semester	21
4	4th Semester	21
5	5th Semester	22
6	6th Semester	22
7	7th Semester	20
8	8th Semester	14
	Total	**160**

Scheme Distribution

Department of Computer Science and Design

Course Component	Credits	% of Credits
Basic Science (BS)	22	13.75
Engineering Science (ES)	09	5
Humanities (HU)	04	2.5
Program core (PC)	24	15
Program core Integrated (PCI)	49	30.62
Program core exclusive Lab	19	11.87
Program elective (PE)	15	9.3
Open Elective (OE)	03	1.8
Internship (INT)	05	3.1
Ability Enhancement course (AEC)	06	3.7
Project (PR)	11	6.8
Total	**160**	**100**



SEMESTER WISE CREDIT BREAKDOWN FOR B.E. DEGREE CURRICULUM

BATCH 2023-2027

Course Category	Semester								Total Credits
	1st	2nd	3rd	4th	5th	6th	7th	8th	
Basic Sciences (BSC)	8	8	3	3					22
Engineering Sciences (ESC)	3	6							9
Humanities, Social Sciences and Management (HSMC)	2	2							4
Ability Enhancement Course (AEC)	1	1	1	1	1	1			6
Universal Human Values (UHV)			1	1	1	1			4
Professional Core Courses (PCC)			6	6	6	3			24
Integrated Professional core Course (IPCC)	6	3	8	8	8	8	4		49
Professional Elective Course (PEC)					4	4	6		15
Institutional Open Elective Courses (IOE)						3	3		3
Internship (INT)								10	5
Mini Project / Project Work (PW)			2	2	2	2	7	4	19
Non-credit Mandatory Courses (NCMC)									
Total Credits	20	20	21	21	22	22	20	14	160

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Affiliated to VTU
Approved by AICTE
Accredited by NAAC with A+ Grade
6 Programs Accredited by NBA
(CSE, ISE, ECE, EEE, MECH, CIVIL)

Scheme of Teaching and Examinations – 2026
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from 2026-27)

7th SEMESTER: Computer Science & Design (CSD)

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture L	Tutorial T	Practical P	Project S	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
1	BCG701	Big Data Analytics	IPCC	CSD	CSD	3	0	2	0	5	4	3hrs	50	50	100
2	BCG702	Virtual and Augmented Reality	PCC	CSD	CSD	3	0	0	0	3	3	3hrs	50	50	100
3	BCG703X	Professional Elective Course-1	PEC	CSD	CSD	3	0	0	0	3	3	3hrs	50	50	100
4	BCG704X	Open Elective Course	OEC	CSD	CSD	3	0	0	0	3	3	3hrs	50	50	100
5	BCG705	Capstone Project – Phase-2	PROJ	CSD	CSD	0	0	0	2	2	7	3hrs	50	50	100
6	BCG706	Indian Knowledge System	NCMC	CSD	CSD	1	0	0	0	1	--	1hrs	100	-	100
7		AICTE Activity Points	Details of 80 AICTE Activity Points Earned												
					Total	13	0	2	2	17	20	16	350	250	600

8th SEMESTER: Computer Science & Design (CSD)

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture L	Tutorial T	Practical P	Project S	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
1	BCG801	Capstone Project – Phase-3 (Publications & Patents)	PROJ	CSD	CSD	0	0	2	0	2	4	3hrs	50	50	100
2	BCG802	Internship	INT	CSD	CSD	Two contact hours/week for interaction between faculty and students				12	10	3hrs	100	100	200
3		AICTE Activity Points	Details of 100 AICTE Activity Points Earned												
					Total	0	0	14	0	14	14		150	150	300

IPCC: Integrated Professional Core Course,

PEC: Professional Elective Course

OEC: Open Elective Course

PROJ: Project Work,

NCMC: Non-Credit Mandatory Course

L: Lecture,

T: Tutorial,

P: Practical

S= SDA: Skill Development Activity,

CIE: Continuous Internal Evaluation,

SEE: Semester End Evaluation.

Integrated Professional Core Course (IPCC): Refers to Integrated Professional Core Course Theory Integrated with practical's of the same course. Credit for IPCC can be 04 and its Teaching Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both 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.

Non Credit Mandatory Course (NCMC) - National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Newly introduced subjects in the syllabus

		7th Semester
1.	List of Existing Elective Courses	Deep Learning Embedded Systems Social Network Analysis Animation Principles and Design
2.	List of New Existing Elective Courses	Understanding Incubation and Entrepreneurship Virtual and Augmented Reality
3.	List of New Industry Aligned Courses	Understanding Incubation and Entrepreneurship

Percentage of **Change in the Syllabus**

7th Semester						
Sl. No	**Course Code**	**Course Name**	**Topics Added**	**Topics removed**	**Revised in %**	**Justification**
1	BCG7XX	Virtual And Augmented Reality	AR/VR fundamentals, immersive design, Unity/Unreal-based labs	None (new course)	25%	Introduced to align with industry demand for immersive technologies and design-centric applications.
2	BCG7XX	Big Data Analytics	Lab and case studies and its applications	None (new course)	25%	Data Science analysis and concepts to Applications
3	BCG7XX	Understanding Incubation and Entrepreneurship	Startup lifecycle, incubation models, funding strategies, case studies	None (new course)	20%	Introduced to foster entrepreneurial mindset, innovation, and industry-aligned skill development.

7th SEMESTER

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

IPCC Course – Integrated Professional Core Course

Teaching Hours/Week (L: T:P: S)	3:0:2:0
Total Hours of Pedagogy	40 hours Theory + 20 Hours of Practical Classes
Credits:	04
Theory - Each Module	8 Hrs
Practical's	8-10 Programs / Experiments
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

- The theory part of the IPCC shall be evaluated both 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.

Integrated Professional Core Course (IPCC) - 4 Credit Course

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE) for the Theory component of the IPCC (Maximum marks 50)

Internal Assessment Test (IAT):

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are 25 marks and that for the practical component is 25 marks.
- 25 marks for the theory component are split into 15 marks for two Internal Assessment Tests (Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 15 marks) and 10 marks for Two Continuous Comprehensive Assessment(CCA) methods.

- The first Internal test at the end of 40-50% coverage of the syllabus
- The second Internal test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for 25 marks).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Revised Blooms Taxonomy (RBT) Levels. Emphasis to be given for Higher order Thinking Skills(HOTS).

Continuous Internal Evaluation (CIE) for the practical component of the IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report, **05 Marks** are for conducting the experiment, **05 Marks for** preparation of the laboratory record, **5 Marks** for conducting Open Ended Experiments Each experiment. Marks of all experiments' write-ups are added to 15 marks.
- The Practical laboratory test **(duration 03 hours)** at the end of the 15th week of the semester/after completion of all the experiments (whichever is early) shall be conducted for **50 Marks** and scaled down to **5 Marks.**
- The open-ended experiment after completion of all the experiments shall be conducted for 20 marks with a split-up for 5 Marks for writeup, 10 Marks for Execution, and 5 Marks for Viva-Voce.
  Marks for writeup, Execution and Viva-Voce is added and scaled down to 05 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 25 marks.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

Semester End Examination (SEE) for IPCC Theory

SEE will be conducted as per the scheduled timetable, with common question papers for the course (duration 03 hours)

- The question paper will have ten questions. Each question is set for 20 marks.

- The question paper shall be set for 100 Marks. The medium of the question paper shall be English. **The duration of SEE is 03 hours.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. The two questions shall be of same course outcome, program outcome and Blooms RBT level. Emphasis to be given for higher order RBT levels.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored by the student shall be proportionally scaled down to 50 Marks.
- The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only.
- Questions mentioned in the SEE paper may include questions from the practical component.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be (CCA1+CCA2)/2 and scaled down to **10 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The Assessment will be through rubrics.
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **10 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **25 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

4 Credits Courses – Integrated Professional Core Course (IPCC)

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory + Practical				**50**	----	----	**20**	
CIE	**Theory**	Internal Assessment Test (IAT) - I	Module – 1 to 2.5	50	(50+50) / 2	**15**	6	Average of Two Internal test each of 50 Marks scale down the marks to 15 Marks
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity based learning	Considering all the Modules	50	(50+50) / 2	**10**	4	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives/ Activity based learning		50				
	Total CIE Theory					**25**	10	Scale down Marks of IAT and CCA to 25

CIE	**Practical**	Conduction of Experiments	Performance-Continuous Evaluation of each experiment	05	15	Average of all Experiments	15	4	Performance of the Experiment (On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. 20 marks are for conducting the experiment and calculations/observations/output)
			Record	05					
			Observation book	05					
		Practical Test	Write up	15	50	----	05	4	One Internal Practical Test after conduction of all Experiments for 50 Marks
			Execution	25					
			Viva-voce	10					
		Open Ended Experiment	Write up	05	20	----	05	2	One experiment for 20 marks. 20 marks reduced to 05 marks
			Execution	10					
			Viva-voce	05					
						Total CIE Practical	**25**	**10**	Scale down Marks of Experiments, Record, Observation, Practical Test and Open-Ended Experiment

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	40	

- The Minimum Marks to be secured in CIE to appear for SEE shall be 10 (40% of Maximum Marks – 25) in the Theory Component and 10 (40% of Maximum Marks – 25) in the Practical component.
- The Laboratory Component for the IPCC shall be for CIE only.
- However, in SEE, the Questions from the Laboratory Component shall be included in the respective Modules only.

Note: If few of the 3 Credit Courses are Integrated course type, for such courses the method suggested for 4 Credit IPCC Course shall be followed

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**VII**				
Course Title	:	**Big Data Analytics**				
Course Code	:	**BCG701**				
Course Type (Theory/ Practical/ Integrated)	:	**Integrated**				
Category	:	**IPCC**				
Stream	:	**2023**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:2:0**		**SEE**	:	**50**
Total Hours	:	**5**		**SEE Duration**	:	**100**
Credits	:	**4**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the fundamental concepts, architecture, and applications of Big Data Analytics in modern computing environments.
2	Develop skills to collect, store, process, and manage large-scale structured and unstructured data efficiently.
3	Apply analytical techniques, data mining, and machine learning methods to extract meaningful insights from big data.
4	Gain practical knowledge of big data tools and frameworks such as Hadoop, Spark, and NoSQL databases.
5	Analyze real-world business and research problems using big data technologies for informed decision-making.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2026-27

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2026-27)

COURSE CURRICULUM

Module No.	Topics	Hours
1	Introduction to Big Data and Analytics: Types of Digital Data, Definition of Big data and Analytics, Characteristics of Big Data, Domain Specific Examples of Big Data, Analytics Flow for Big Data, Big Data Stack, Mapping Analytics Flow to Big Data Stack, Case Study: Weather Data Analysis.	8
Pedagogy	Use visualization tools, videos, and industry datasets to illustrate data generation, storage, processing, and analysis techniques.	
2	CAP theorem, NoSQL: Types of NoSQL databases, MongoDB– Terms used in RDBMS and MongoDB, MongoDB Query Language: CRUD (Create, Read, Update and Delete) operations, Finding documents based on search criteria, Dealing with Null values , Count, Limit, Sort Skip, Aggregate Functions	8
Pedagogy	Conduct hands-on laboratory sessions using MongoDB to practice CRUD operations, querying, sorting, aggregation, and document handling.	
3	Cassandra –Features of Cassandra, Keyspaces, CRUD, Collection, Counters, Time to Live (TTL) operations, Practice Examples. Hadoop: Introducing Hadoop, RDBMS verses Hadoop, Distributed Computing Challenge	8
Pedagogy	Demonstrate distributed computing challenges and Hadoop concepts through real-time case studies, videos, and industry-oriented examples	
4	Hadoop Overview, Big Data Storge: HDFS, Batch Analysis: Hadoop and MapReduce, Wordcount Demonstration, Hadoop- MapReduce Examples.	8
Pedagogy	Use real-world case studies and visual demonstrations to illustrate distributed data storage, fault tolerance, and large-scale batch analytics	
5	Scala: The Basics, Control Structures and functions, Working with arrays, Maps and Tuples. Introduction to Data Analysis with Spark: Introduction to Apache Spark, A unified Spark, Users of Spark, Storage layers for Spark. Programming with RDDs: RDD Basics, Creating RDDs, RDD Operations, Passing functions to Spark, Common Transformations and Actions, Persistence. Spark SQL: Linking with Spark SQL, Using Spark SQL in Applications, Loading and Saving Data, JDBC/ODBC Server, User-defined functions, Spark SQL Performance.	8
Pedagogy	Demonstrate real-time data analysis workflows using Spark SQL, data loading/saving techniques, JDBC/ODBC connectivity, and user-defined functions.	

	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process

List of Programs:

Sl. No.	Experiments/Programs	COs
1	MongoDB- CRUD Operations Demonstration (Practice and Self Study)	CO5
2	Perform the following DB operations using Cassandra. a) Create a keyspace by name Employee b) Create a column family by name Employee-Info with attributes Emp_Id Primary Key, Emp_Name, Designation, Date_of_Joining, Salary, Dept_Name c) Insert the values into the table in batch d) Update Employee name and Department of Emp-Id 121 e) Sort the details of Employee records based on salary f) Alter the schema of the table Employee_Info to add a column Projects which stores a set of Projects done by the corresponding Employee. g) Update the altered table to add project names h) Create a TTL of 15 seconds to display the values of Employees	CO5
3	Perform the following DB operations using Cassandra. a) Create a keyspace by name Library b) Create a column family by name Library-Info with attributes Stud_Id Primary Key, Counter_value of type Counter, Stud_Name, Book-Name, Book-Id, Date_of_issue c) Insert the values into the table in batch d) Display the details of the table created and increase the value of the counter e) Write a query to show that a student with id 112 has taken a book "BDA" 2 times. f) Export the created column to a csv file g) Import a given csv dataset from local file system into Cassandra column family	CO5
4	Execution of HDFS Commands for interaction with Hadoop Environment. (Minimum 10 commands to be executed)	CO5
5	Implement Wordcount program on Hadoop framework	CO5
6	From the following link extract the weather data https://github.com/tomwhite/hadoopbook/tree/master/input/ncdc/all a) Create a MapReduce program to find average temperature for each year from NCDC data set. b) find the mean max temperature for every month.	CO5
7	For a given Text file, Create a Map Reduce program to sort the content in an alphabetic order listing only top 10 maximum occurrences of words	CO5

8	Scala program to print numbers from 1 to 100 using for loop	**CO5**
9	Using RDD and FlatMap count how many times each word appears in a file and write out a list of words whose count is strictly greater than 4 using Spark.	**CO5**
10	Write a simple streaming program in Spark to receive text data streams on a particular port, perform basic text cleaning (like white space removal, stop words removal, lemmatization, etc.), and print the cleaned text on the screen.	**CO5**
Open Ended Programs		
1	MongoDB- CRUD Operations -case study	**CO5**
2	Scala programs case study	**CO5**

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Big Data Science & Analytics – A Hands-on Approach, Arshdeep Bahga, Vijay Madisetti, 1st Edition, 2018
2	Big Data and Analytics, Seema Acharya, Subjashini Chellappan, 1st Edition, Wiley, 2010
Reference Books	
1	A Textbook on Big Data Analytics, Dr. V. Harsha Shastri Mrs. V Sreeprada Mr. T. Udhayakumar Dr. K. R. Ananth,1st Edition, Notion Press, 2023
2	Big Data Analytics, Introduction to Hadoop, Spark, and MachineLearning, Raj Kamal, Preeti Saxena,1st Edition, McGraw Hill, 2019

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

CO	**Course Outcomes**	**RBT Level**	**RBT Level Indicator**
CO1	Acquire and preprocess large datasets from diverse sources using suitable tools and frameworks..	**L1/ L2**	**UNDERSTAND**
CO2	Implement big data algorithms and distributed computing models (Hadoop, Spark) to analyze large-scale datasets.	**L3**	**APPLY**
CO3	Design and develop visualization techniques to represent big data insights for effective decision-making.	**L4**	**ANALYZE**

CO4	Apply big data analytics methods to solve real-world problems in domains such as business, healthcare, and IoT.	**L5**	**EVALUATE**
CO5	Demonstrate awareness of data privacy, security, and ethical issues while exploring emerging trends in big data technologies.	**L6**	**CREATE**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2		**3**													
CO3			**3**												
CO4				**3**											
CO5				**3**	**3**										

Weblinks and Video Lectures (e-Resources)	
1	E-book : https://www.ijae ast.com/Introduc tion%20to%20Big %20Data%20Anal ytics.pdf
2	https://www.udemy.com/course/hadoopstarterkit/

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Theory**				**Practical**
	Continuous Assessment Tests (IAT)		**Continuous Comprehensive Assessment (CCA)**		**Practical Test**
	IAT-1	**IAT-2**	**CCA-1**	**CCA-2**	
	50 Marks	**50 Marks**	**50 Marks**	**50 Marks**	
Remember	5	5	**-**	**-**	-
Understand	20	20	10	10	-
Apply	20	20	20	20	25
Analyze	5	2	20	20	25

Evaluate					
Create					

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	20						20	20%
CO2		20					20	20%
CO3			10	10			20	20%
CO4					20		20	20%
CO5						20	20	20%
Total	20	20	10	10	20	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	10
Understand	30
Apply	30

Analyse	30
Evaluate	
Create	

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	CO1	20					20	20%
CO2	CO2		20				20	20%
CO3	CO3			20			20	20%
CO4	CO4				20		20	20%
CO5	CO5					20	20	20%
Total	Total	20	20	20	20	20	100	100%

PROFESSIONAL CORE COURSE (PCC)

PEC Course - Professional Elective Course

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours
Credits:	03
Each Module	8 Hrs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Professional Elective Course (PEC)

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this condition shall not be applicable to cases where the admission to the program is less than 10.

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered

- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **10 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **10 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **25 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Professional Elective Course (PEC) – 3 Credit course – Theory

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory + Practical				**50**	----	----	**20**	
	Theory	Internal Assessment Test (IAT) - II	Module – 1 to 2.5	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	10	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE Theory					**50**	20	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	40	

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**VII**				
Course Title	:	**Virtual And Augmented Reality**				
Course Code	:	**BCG702**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PEC**				
Stream	:	**2023**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**03**		**SEE Duration**	:	**100**
Credits	:	**03**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To understand the fundamental concepts and components of Virtual and Augmented Reality systems.
2	To learn VR/AR hardware and development tools such as Unity and Unreal Engine.
3	To design and develop interactive and immersive VR/AR applications.
4	To apply tracking, rendering, and user interaction techniques in VR/AR environments.
5	To explore real-world applications and ethical considerations of VR/AR technologies.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2026-27

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2026-27)

COURSE CURRICULUM

Module No.	Topics	Hours
1	Fundamentals of Virtual Reality and Augmented Reality: General introduction, Application domains & system categories, Definitions, Historical evolution, Issues & challenges, Cybersickness, VR Hardware, AR Hardware, Understanding Tracking I, Understanding Tracking II, VR Software, AR Software, VR display types, Head Mounted Displays (HMD), Sensors and controllers	8
Pedagogy	Lecture and multimedia demonstrations to explain the fundamentals of Virtual Reality and Augmented Reality, including hardware, software, and application domains.	
2	Pose Estimation and Tracking Techniques: Pose Estimation and Tracking: Pose Estimation; Pose Tracking in AR, Mobile Sensor-Based Tracking, Optical Tracking, Hybrid Tracking, Marker-Based Tracking and AR, Diminished Reality, Marker-less Tracking and AR, SLAM basics, IMU sensors	8
Pedagogy	Case studies to understand pose estimation and tracking techniques used in AR systems.	
3	Augmented Reality Displays and Perception: Introduction to Augmented Reality What Is Augmented Reality - Defining augmented reality, History of augmented reality, Examples, Displays-Multimodal Displays, Visual Perception, Requirements and Characteristics, Spatial Display	8
Pedagogy	Interactive lectures supported by real-world examples to explain augmented reality concepts, displays, and visual perception.	
4	Computer Vision Techniques for AR: Computer Vision for Augmented Reality-Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Incremental Tracking, Simultaneous Localization and Mapping, Outdoor Tracking, Calibration and Registration-Camera Calibration, Display Calibration, Registration Visual Coherence: Registration, Photometric Registration, Common Illumination, Diminished Reality, Camera Simulation, Stylized Augmented Reality	8
Pedagogy	Teaching through demonstrations and problem-solving sessions to understand computer vision techniques used in augmented reality.	
5	AR Visualization and Interaction Techniques: Situated Visualization: Challenges, Visualization Registration, Annotations and Labelling, X-Ray Visualization, Spatial Manipulation, Information Filtering Interaction-Output Modalities, Input Modalities, Tangible Interfaces	8
Pedagogy	Activity-based learning and discussions to explore visualization methods and interaction techniques in augmented reality environments.	

	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Kai Hwang, Geoffrey C Fox, and Jack J Dongarra, Distributed and Cloud Computing, Morgan Kaufmann, Elsevier 2012
2	Dan C. Marinescu, Cloud Computing Theory and Practice, Morgan Kaufmann, 2nd Edition, Elsevier 2018
Reference Books	
1	Rajkumar Buyya, Christian Vecchiola, and Thamrai Selvi, Mastering Cloud Computing McGrawHill Education, 1st Edition, 2017
2	Toby Velte, Anthony Velte, Cloud Computing: A Practical Approach, McGraw-Hill Education, 2017.

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Explain the basic concepts, architecture, and components of VR/AR systems.	**L1**	**REMEMBER/UNDERSTAND**
CO2	Apply 3D modeling, rendering, and interaction techniques in VR/AR environments.	**L2**	**APPLY**
CO3	Analyze VR/AR hardware and software tools for application development.	**L3**	**ANALYZE**
CO4	Implement VR/AR applications using suitable devices and development platforms.	**L4**	**IMPLEMENT**
CO5	Evaluate VR/AR applications for usability, performance, and real-world impact.	**L5**	**EVALUATE**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	-	-	2	-	-	-	-	-	-	2			
CO2	2	2	3	1	3	-	-	-	1	-	-	2			
CO3	3	3	2	2	3	-	-	-	-	-	-	2			
CO4	2	3	3	2	3	-	-	-	2	-	-	2			
CO5	2	3	2	3	2	2	1	-	2	2	-	3			

Weblinks and Video Lectures (e-Resources)	
1	https://freevideolectures.com/course/4639/nptel-cloud-computing/1
2	https://www.youtube.com/playlist?list=PLShJJCRzJWxhz7SfG4hpaBD5bKOloWx9J
3	https://www.youtube.com/watch?v=EN4fEbcFZ_E
4	https://www.youtube.com/watch?v=RWgW-Cgdlk0
5	https://www.geeksforgeeks.org/virtualization-cloud-computing-types/

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	5	5		
Understand	10	10	5	
Apply	5	5	5	
Analyze				5
Evaluate				
Create				

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	5	5					10	10%
CO2	10	10	5				25	25%
CO3	5	5	5				15	15%
CO4				5	5	5	15	15%
CO5				5	10	10	25	25%
Total					5	5	10	10%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	
Understand	25
Apply	50
Analyze	25
Evaluate	
Create	

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	5	5					10	10%
CO2	10	10	5				25	25%
CO3	5	5	5				15	15%
CO4				5	5	5	15	15%
CO5				5	10	10	25	25%
Total					5	5	10	10%

PROFESSIONAL ELECTIVE COURSE (PEC)

PEC Course - Professional Elective Course

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours
Credits:	03
Each Module	8 Hrs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Professional Elective Course (PEC)

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this condition shall not be applicable to cases where the admission to the program is less than 10.

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered

- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **10 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **10 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **25 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Professional Elective Course (PEC) – 3 Credit course – Theory

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory + Practical				**50**	----	----	**20**	
	Theory	Internal Assessment Test (IAT) - II	Module – 1 to 2.5	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	10	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE Theory					**50**	20	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	40	

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**VII**				
Course Title	:	**Robotic Process Automation and Development**				
Course Code	:	**BCG703A**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**2023**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**03**		**SEE Duration**	:	**100**
Credits	:	**03**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To Understand basic concepts of RPA
2	To Describe RPA, where it can be applied and how its implemented
3	To Describe the different types of variables, Control Flow and data manipulation techniques
4	To Understand Image, Text and Data Tables Automation
5	To Describe various types of Exceptions and strategies to handle

Teaching-Learning Process

Pedagogical Initiatives

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2026-27

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2026-27)

COURSE CURRICULUM

Module No.	Topics	Hours
1	RPA Foundations- What is RPA – Flavors of RPA- History of RPA- The Benefits of RPA- The downsides of RPA- RPA Compared to BPO, BPM and BPA – Consumer Willingness for Automation- The Workforce of the Future- RPA Skills-On-Premise Vs. the Cloud- Web Technology- Programming Languages and Low Code- OCR-Databases-APIs- AI-Cognitive Automation-Agile, Scrum, Kanban and Waterfall0 DevOpsFlowcharts.	8
Pedagogy	Chalk and board, Active Learning, Problem based learning.	
2	RPA Platforms- Components of RPA- RPA Platforms-About Ui Path- About UiPath - The future of automation - Record and Play - Downloading and installing UiPath Studio -Learning Ui Path Studio- - Task recorder - Step-by-step examples using the recorder..	8
Pedagogy	Chalk and board, Active Learning, Demonstration.	
3	Sequence, Flowchart, and Control Flow-Sequencing the workflow-Activities-Control flow, various types of loops, and decision making-Step-by-step example using Sequence and Flowchart-Step-by-step example using Sequence and Control flow-Data Manipulation-Variables and Scope-Collections Arguments – Purpose and use-Data table usage with examples-Clipboard management-File operation with step-by-step example-CSV/Excel to data table and vice versa (with a step-by-step example)..	8
Pedagogy	Chalk and board, Problem based learning, Demonstration.	
4	Taking Control of the Controls- Finding and attaching windows- Finding the control- Techniques for waiting for a control- Act on controls – mouse and keyboard activities- Working with UiExplorerHandling events- Revisit recorder- Screen Scraping- When to use OCR- Types of OCR available- How to use OCR- Avoiding typical failure points..	8
Pedagogy	Chalk& board, Problem based learning.	
5	Exception Handling, Debugging, and Logging- Exception handling- Common exceptions and ways to handle them- Logging and taking screenshot- Debugging techniques- Collecting crash dumps- Error reporting- Future of RPA	8

Pedagogy	Chalk and board, MOOC.

	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Tom Taulli , The Robotic Process Automation Handbook : A Guide to Implementing RPA Systems, 2020, ISBN-13 (electronic): 978-1-4842-5729-6, Publisher : Apress
2	Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: Packt Publishing Release Date: March 2018 ISBN: 9781788470940
Reference Books	
1	Frank Casale, Rebecca Dilla, Heidi Jaynes, Lauren Livingston, "Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation
2	Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant
3	Srikanth Merianda, Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	To Understand the basic concepts of RPA	**L1**	**UNDERSTAND**
CO2	Apply and describe the concepts of intelligent process automation in robotic process automation.	**L3**	**APPLY**
CO3	Analyze the different types of variables, control flow and data manipulation techniques.	**L4**	**ANALYZE**
CO4	Evaluate various controls and handling events with user interface explorer.	**L5**	**EVALUATE**
CO5	Design the various types of exceptions and strategies to handle for robotic process automation.	**L5**	**CREATE**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	2														
CO3		2													
CO4			2						2	2		2	2	2	
CO5			2						2	2		2	2	2	

Weblinks and Video Lectures (e-Resources)	
1	https://www.uipath.com/rpa/robotic-process-automation
2	https://docs.uipath.com/studiox/standalone/2024.10/user-guide/automation-basics
3	https://docs.uipath.com/studiox/standalone/2024.10/user-guide/common-activities
4	https://docs.uipath.com/studiox/standalone/2024.10/user-guide/ui-automation
5	https://www.youtube.com/watch?v=R-QszWgB29A

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	10	10	**20**	**20**
Understand	20	20	**30**	**30**
Apply	20	20		
Analyse	10	10	**20**	**20**
Evaluate				
Create				

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	5	5					10	10%
CO2	10	10	5				25	25%
CO3	5	5	5				15	15%
CO4				5	5	5	15	15%
CO5				5	10	10	25	25%
Total	20	20	10	10	20	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	
Understand	25
Apply	50
Analyze	25
Evaluate	
Create	

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	5	5					10	10%
CO2	10	10	5				25	25%
CO3	5	5	5				15	15%
CO4				5	5	5	15	15%
CO5				5	10	10	25	25%
Total					5	5	10	10%

PROFESSIONAL ELECTIVE COURSE (PEC)

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**VII**				
Course Title	:	**Understanding Incubation and Entrepreneurship**				
Course Code	:	**BCG703B**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PEC**				
Stream	:	**2023**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**03**		**SEE Duration**	:	**100**
Credits	:	**03**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To understand the basic concepts and importance of incubation and entrepreneurship.
2	To develop entrepreneurial skills for identifying business opportunities.
3	To learn the process of starting and managing a startup venture.
4	To understand the role of incubators in supporting innovation and startups.
5	To encourage students to develop innovative ideas and entrepreneurial mindset.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.

- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2026-27

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2026-27)

COURSE CURRICULUM

Module No.	Topics	Hours
1	Definition and scope of entrepreneurship, Evolution of entrepreneurship in India and globally, Entrepreneurial mindset and traits, Role of entrepreneurs in socio-economic development, Types of entrepreneurs (innovators, social, corporate, technopreneurs), Entrepreneurial motivation and leadership styles, Challenges faced by first-generation entrepreneurs, Role of entrepreneurship in job creation and GDP growth, Entrepreneurial ethics and values	8
Pedagogy	Case study analysis of successful entrepreneurs to understand entrepreneurial mindset, traits, challenges, and their role in socio-economic development.	
2	Concept of creativity and innovation, Innovation process and design thinking, Types of incubators (technology, social, sectoral), Role of IIT incubators (SINE, BETIC, DSSE), National incubation initiatives (Startup India, AIM, MSME), International incubation models (Silicon Valley, Israel, Singapore), University-based incubation centers, Role of mentors and networks in incubation, Government policies supporting incubation, Case studies of successful incubated startups	8
Pedagogy	Design thinking workshop activity to practice idea generation and understand the innovation process and incubation ecosystem.	
3	Idea generation techniques, Customer discovery and validation, Lean startup methodology, Business Model Canvas (BMC), Market research and opportunity analysis, Competitive landscape and SWOT analysis, Basics of business plan preparation, Pitching techniques for incubators/investors, Role of accelerators vs incubators, Case studies of startup journeys	8
Pedagogy	Business Model Canvas (BMC) workshop to develop and present a startup idea by identifying value proposition, customer segments, and revenue mode	
4	Sources of startup funding (angel, VC, crowdfunding, grants), Stages of funding (seed, series A, B, C), Role of incubators in funding access, Intellectual Property Rights (patents, trademarks, copyrights),Legal compliance for startups (DPIIT recognition, MSME policies), Taxation and financial planning for startups, Risk management and contingency planning, Case studies of funded startups, Role of government schemes (SIDBI, DST, DBT)	8
Pedagogy	Startup funding simulation activity where students prepare and present a funding plan for a startup including funding sources, IPR considerations, and financial planning.	

5	Strategies for scaling startups, Challenges in scaling (HR, finance, operations), Sustainable entrepreneurship models, Social entrepreneurship and impact ventures, Technology-driven entrepreneurship (AI, AR/VR, IoT, blockchain), Global trends in incubation and entrepreneurship, Exit strategies: mergers, acquisitions, IPOs, Role of corporate incubators and accelerators, Case studies of global unicorns and Indian scale-ups	**8**
Pedagogy	Group activity on developing a scaling strategy for a startup, identifying challenges in HR, finance, operations, and exploring possible exit strategies	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Disciplined Entrepreneurship: 24 Steps to a Successful Startup by Bill Aulet
2	The Essence of Medical Device Innovation by B Ravi
3	The Fortune at Bottom of Pyramid: Eradicating Poverty Through Profits by C.K.Prahalad Stay Hungry
Reference Books	
1	The Entrepreneurial Connection: East Meets West in the Silicon Valley by Gurmeet Naroola

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Explain the basics of entrepreneurship, entrepreneur types, ethics, and their role in economic development.	**L1**	**REMEMBER/UNDERSTAND**
CO2	Apply creativity, innovation, and design thinking to generate startup ideas and use incubation support.	**L2**	**EXPLAIN**
CO3	Analyze business opportunities using market research, SWOT, and Business Model Canvas.	**L3**	**APPLY**
CO4	Develop startup funding plans, business pitches, and strategies using IPR and legal requirements.	**L4**	**ANALYZE**
CO5	Evaluate startup growth strategies, sustainable ventures, and emerging entrepreneurship trends.	**L5**	**EVALUATE**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2		2	3		2				2						
CO3		3	2	2											
CO4		2	3					2	2	3	2				
CO5			2	2	3	2	3		2		3	2			

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=pC5l5j2u9SQ
2	https://www.youtube.com/watch?v=q36nJSmY1s8
3	https://nptel.ac.in/courses/107101092

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	10	10	**20**	**20**
Understand	20	20	**30**	**30**
Apply	20	20		
Analyse	10	10	**20**	**20**
Evaluate				
Create				

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	5	5					10	10%
CO2	10	10	5				25	25%
CO3	5	5	5				15	15%
CO4				5	5	5	15	15%
CO5				5	10	10	25	25%
Total	20	20	10	10	20	20	100	100%

SEE- Semester End Examination (100 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	10
Understand	10
Apply	40
Analyze	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	5	5					10	10%
CO2	10	10	5				25	25%
CO3	5	5	5				15	15%
CO4				5	5	5	15	15%
CO5				5	10	10	25	25%
Total	20	20	10	10	20	20	100	100%

OPEN ELECTIVE COURSE

(OEC)

OEC – Open Elective Course

Open Elective Courses: Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator / Advisor / Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10. Project Phase – I: Students have to discuss with the mentor / guide and with their help he / she has to complete the literature survey and prepare the report and finally define the problem statement for the project work.

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours – Theory
Credits:	03
Modules	5
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Open Elective Course (OEC)

Open Elective Courses (OEC): A open elective course (OEC) is a course offered by departments other than a student's parent department. These interdepartmental /interdisciplinary courses allow students to explore disciplines beyond their core area of study. These courses are intended to promote interdisciplinary learning, broad-based education, thereby enhancing a student's overall knowledge, creativity, and employability. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor/Proctor.

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **10 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **10 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **25 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Open Elective Course (OEC) – 3 Credit course – Theory

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory + Practical				**50**	----	----	**20**	
	Theory	Internal Assessment Test (IAT) - II	Module – 1 to 2.5	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	10	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE Theory					**50**	20	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	40	

Dayananda Sagar Academy of Technology & Management

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Semester	**:**					
Course Title	**:**					
Course Code	**:**					
Course Type (Theory/ Practical/ Integrated)	**:**					
Category	**:**					
Stream	**:**			**CIE**	**:**	
Teaching hours/ week (L:T:P:S)	**:**			**SEE**	**:**	
Total Hours	**:**			**SEE Duration**	**:**	
Credits	**:**					

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	
2	
3	
4	
5	

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2026-27

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2026-27)

COURSE CURRICULUM

Module No.	Topics	Hours
1	.	
Pedagogy		
2	.	
Pedagogy		
3		
Pedagogy		
4		
Pedagogy		
5		
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Text Books	
Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	
2	
Reference Books	
1	
2	

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1			
CO2			
CO3			
CO4			
CO5			

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															
CO3															
CO4															
CO5															

Weblinks and Video Lectures (e-Resources)	
1	
2	
3	
4	

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember				
Understand				
Apply				
Analyse				
Evaluate				
Create				

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1								
CO2								
CO3								
CO4								
CO5								
Total								

CAPSTONE PROJECT

CAPSTONE PROJECT (Phase-1, 2 and 3):

Capstone Project – Guidelines & Implementation Framework (UG Engineering Programs)

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1. Introduction

The Capstone Project is a comprehensive, year-long project carried out in **two phases during the 6th and 7th semesters** of the undergraduate engineering/technology program. It integrates knowledge and skills acquired from multiple courses and disciplines to address a **complex, real-world problem**.

This project provides students with an opportunity to apply:

- Scientific principles
- Engineering methodologies
- Technological tools

to **conceive, design, implement, and evaluate an engineering solution**.

The Capstone Project serves as a **culminating academic experience** enabling students to demonstrate attainment of program outcomes including:

- Problem-solving ability
- Teamwork
- Communication skills
- Practical application of engineering principles

Students may undertake the project:

- Individually, OR
- In a group **not exceeding four students**

The group may include:

- Students from the same discipline
- Students drawn from different disciplines

2. Types of Capstone Projects

Capstone projects undertaken during the one-year duration may fall into one or more of the following categories:

a) Research-Oriented Projects

- Focus on investigating new concepts, theories, or technologies.

- Aim to generate new knowledge or contribute to academic research.

b) Experimental / Analytical Projects

- Based on laboratory or field experiments to validate a hypothesis or study a phenomenon.
- Include detailed data collection, analysis, and interpretation.

c) Simulation / Modelling Projects

- Use computational tools to model, simulate, and predict system behaviour.
- Reduce the need for physical prototyping in the initial stages.

d) Industrial / Industry-Sponsored Projects

- Carried out in collaboration with an industry partner.
- Address real-world engineering problems faced by the organization.

e) Interdisciplinary / Multidisciplinary Projects

- Combine knowledge and techniques from multiple engineering domains.
- May also involve other fields such as:
    - Management
    - Medicine
    - Environmental sciences

f) Entrepreneurial / Innovation Projects

- Focus on product or service innovation with potential for commercialization.
- Include:
    - Market analysis
    - Cost estimation
    - Business planning

3. Objectives of the Capstone Project

The objectives of the Project Work are:

1. To encourage independent learning and an innovative attitude among students.
2. To develop interactive attitude, communication skills, organization, time management, and presentation skills.
3. To impart flexibility and adaptability.
4. To inspire teamwork.
5. To expand intellectual capacity, credibility, judgment, and intuition.
6. To ensure adherence to punctuality and meeting deadlines.
7. To instill responsibility towards oneself and others.
8. To train students to present project work confidently in seminars, enhance communication skills, and participate in discussions to exchange ideas.

4. Capstone Project – Phase I Evaluation

Capstone Project Phase-I shall have **Continuous Internal Evaluation (CIE) only**.

4.1 Evaluation Committee – Single Discipline Project

The Departmental Project Review Committee shall consist of:

- One Senior Professor
- Project Guide
- One additional faculty member appointed by the Principal

4.2 Evaluation Committee – Interdisciplinary Project

The Project Review Committee shall consist of:

- One Senior Professor
- Department Project Guide
- Interdepartmental Project Guide(s)
- One faculty member from a related department

All members shall be appointed by the Principal.

4.3 Evaluation Criteria

Phase-I evaluation shall be based on:

- Rubrics designed to measure **NBA Graduate Attributes**

Successful completion of Phase-I allows the student to proceed to **Phase-II**.

5. Capstone Project – Phase II Evaluation

5.1 Continuous Internal Evaluation (CIE)

CIE for Phase-II shall be conducted similarly to Phase-I using the designated committee.

5.2 Semester End Examination (SEE)

The SEE shall be conducted by:

- **University-appointed examiners**

Assessment shall be based on:

- Rubrics designed to measure **NBA Graduate Attributes**

6. Continuous Internal Evaluation (CIE) Procedure

6.1 Single Discipline Project

The CIE marks shall be awarded by a committee consisting of:

- Head of the concerned Department
- Two senior faculty members of the Department
- One of the two faculty members shall be the Project Guide

6.2 Distribution of CIE Marks

The CIE marks for the project work shall be based on:

Component	Weightage
Project Report	50%
Project Presentation Skill	25%
Question & Answer Session	25%

Non-Credit Mandatory Courses (NCMC): are aimed at enhancing students' knowledge, skills, and awareness beyond the core curriculum. Successful completion of the NCMC is compulsory for fulfilling the requirements of the academic program. It shall not be considered for the computation of SGPA, CGPA and vertical progression. Each student shall register for the prescribed NCMC(s) in the prescribed semester. A student who fails to qualify in the prescribed NCMC shall not be eligible for the conferment of the degree.

AICTE Activity Points

Apart from technical knowledge and skills, to be successful as professionals, students should have excellent soft skills, leadership qualities and team spirit. They should have entrepreneurial capabilities and societal commitment. To match these requirements, AICTE has created a unique mechanism of awarding minimum 100 Activity Points for regular students and 75 Activity Points for Lateral Entry students over and above the academic grades.

The activities can be spread over the entire duration of the programme and will be reflected in the Student's VIII Semester Grade Card. It shall not be considered for computation of SGPA/CGPA and for vertical progression. The total duration of the activities for the entire programme is 320 hours for regular students and 240 hours for lateral entry students.

Break-up of CCE marks for activity points:

Evaluation by the Proctor/Coordinator 50 marks

Evaluation by the Dept. Committee

(i) Report 20 marks

(ii) Presentation 20 marks

(iii) Outcome 10 marks

Total 100 marks

1. No SEE for AICTE Activity Points.

2. Students will be awarded either NP or P grade based on marks obtained.

Students will be awarded 'Degree' only on earning P grade in the Activity Points.

8th SEMESTER

Projects

1. Community Project: A community is a social unit or group of people sharing socially-significant characteristics, such as place, set of norms, culture, religion, values, customs or identity. A community project involves addressing issues or needs within such a community or a network of entities working toward a common purpose. These projects may cover a wide range of areas, including welfare, sustainability, technology integration, and social development. Examples include establishing and maintaining an orphanage, implementing solar power generation and its maintenance, or developing environmental improvement solutions, etc. A community project is an experiential learning activity that encourages students to identify, analyse, and address real-life problems of the community using engineering knowledge. It aims to promote social responsibility and civic engagement, interdisciplinary thinking and collaboration and practical application of theoretical concepts, thereby enabling students to contribute meaningfully to community welfare and sustainable development. Students can take up project individually or in a group not exceeding 4 students.

The evaluation shall be done as per the following; CIE: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work shall be based on the rubrics. SEE: SEE will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the rubrics.

2. Environmental Science Project:

The Environmental Science Project is an applied learning component designed to develop students' awareness, understanding, and responsibility toward the environment. It provides an opportunity to study real-world environmental issues and apply scientific and engineering principles to design feasible and sustainable solutions. The topics under environment include, but not limited to, climate change, biodiversity, air and water pollution, land use, excess use of natural resources, earthquakes, rise in the earth's temperature, power generation, soil erosion, environment issues related programmme, etc. The project involves problem identification, field surveys, case studies, data collection, environmental audits, analysis, and proposal of remedial or preventive measures aimed at improving biodiversity, air quality, and thermal comfort, etc. Students can take up project individually or in a group not exceeding 4 students. Students can opt for Interdisciplinary Project based on their interest.

The evaluation shall be done as per the following; CIE: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work, shall be based on the rubrics. SEE: SEE will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the rubrics.

3. Hackathon Based Project (Academic):

The term hackathon is derived from the combination of hack (referring to clever problem-solving, not illegal activity) and marathon, which denotes an arduous (i.e., difficult) intellectual task requiring sustained effort, endurance, and mental resilience. The meaning of a hackathon varies depending on the specific context and intent. In an academic context, a hackathon can be considered to involve several concepts, ranging from resourceful, unconventional approaches to problem-solving. Though a hackathon is an event, typically lasting for a few days to address a specific challenge, for academic purposes, it is conducted as a noncompetitive semester-long activity. The evaluation is done as and when the project is completed, by a panel of industry experts. The hackathons not only help participants develop skills like problem-solving, critical thinking, creativity, teamwork, communication and time management, but also foster indigenous technology development, promote innovation and entrepreneurship, and contribute to non-formal learning and skill enhancement. Students can take up a hackathon project individually or in a group of not exceeding 4 students.

The respective BoS will announce the problem statements in the beginning of the 5th semester. The topic selected can be discipline specific, interdepartmental, industrial, social (refers to immediate human relations, interactions, and individual behaviour within a community), societal (describes larger, general issues, institutions, and structures that define society as a whole), environmental, health, financial, or innovative in nature, leading to development of a working prototype, application, or product. Hackathon projects are aligned with the principles of Outcome-Based Education (OBE) and support the objectives of innovation, skill development, and experiential learning in engineering education. Projects shall be evaluated by industry experts, based on creativity, problem-solving approach, teamwork, and possible implementation, as far as possible, as and when the project is completed. The evaluation shall be done as per the following; CIE: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work, shall be based on the rubrics. SEE: SEE will be conducted by the industry experts appointed

by the Head of the Institute/University. The SEE marks awarded for the project work shall be based on the rubrics.

4. Capstone Project :

The Capstone project is a comprehensive, year-long project carried out in two phases during 6th and 7th semesters of the undergraduate engineering/technology program. It integrates knowledge and skills acquired from multiple courses and disciplines to address a complex, real-world problem. This project provides students with an opportunity to apply scientific principles, engineering methodologies, and technological tools to conceive, design, implement and evaluate an engineering solution. It serves as a culminating academic experience to demonstrate program outcomes, including problem-solving ability, teamwork, communication skills, and practical application of engineering principles. Students can take up project individually or in a group not exceeding 4 students. The group may have students from the same discipline and drawn from different disciplines.

Types of Capstone Projects: Capstone projects undertaken for one year may fall into one or more of the following categories:

a) Research-Oriented Projects : • Focus on investigating new concepts, theories, or technologies. • Aim to generate new knowledge or contribute to academic research.

b) Experimental/Analytical Projects • Based on laboratory or field experiments to validate a hypothesis or study a phenomenon. • Including detailed data collection, analysis, and interpretation.

c) Simulation/Modelling Projects

• Use computational tools to model, simulate, and predict system behaviour.

• Reduce the need for physical prototyping in the initial stages.

d) Industrial/Industry-Sponsored Projects

• Carried out in collaboration with an industry partner.

• Address real-world engineering problems faced by the organization.

e) Interdisciplinary/Multidisciplinary Projects

• Combine knowledge and techniques from multiple engineering domains or other fields such as management, medicine, or environmental sciences.

f) Entrepreneurial/Innovation Projects

• Focus on product or service innovation with potential for commercialization.

• Include aspects of market analysis, cost estimation, and business planning.

Phase I Evaluation: Capstone Project Phase-I shall have only Continuous Internal Evaluation (CIE). In case disciplinary capstone project, the CIE shall be conducted by the Departmental Project Review Committee, which consists of a Senior Professor, the Project Guide, and one additional faculty member appointed by the principal for projects within the parent discipline. For Interdisciplinary Projects, the Project Review Committee will consist of one Senior Professor, the department and interdepartmental Project Guides and one faculty member from a department related to the interdisciplinary project. The committee members are appointed by the principal of the college.

Phase-I evaluation shall be based on rubrics designed to measure graduate attributes defined by NBA. Successful completion of Phase-I allows the student to proceed to Phase-II.

Phase II Evaluation: CIE of Phase shall be evaluated as indicated with phase -I evaluation. The SEE shall be conducted by university-appointed examiners. The assessment shall be based on rubrics designed to measure graduate attributes defined by NBA.

Note: One Publication indexed in Scopus or Web of Science is Mandatory from Students Projects

Internship

Internship refers to the position of a student as trainee or a temporary (or unconfirmed) employee, who works in an organization, with or without pay, in order to gain work experience or satisfy requirements for a qualification. It is a structured, supervised professional experience in an industry, research organization, or community setting. Students taking up internship may be with or without stipend. Internships play a vital role in bridging the gap between theoretical education and professional practice. In general, engineering internships serve as a crucial component of professional education by providing experiential learning, industry readiness, and holistic skill development, ultimately producing competent engineers or entrepreneurs. Apart from these, it develops professional ethics, work culture awareness and communication skills. Some of the common types of internships are as follows:

i. Industry Internship: Carried out in the engineering industry, companies, manufacturing units, startups, business, IT industry. The topic involved may be technical, managerial, production-related tasks, live projects, or innovative activities.
ii. Research Internship: Carried out at universities, research labs, or R and D departments or organisations. The internship may involve literature review, data analysis, and experimental work leading to publications, prototypes, technical reports or innovations. The research internship may induce students to plan for higher studies or academic careers.
iii. Academic or Teaching Internship: Carried out at educational institutions. The students assist in academic activities, laboratory sessions or content development, and prepare or present report, presentation and student evaluation. The internship encourages interest in academia and pedagogy, develops new skills, helps to gain a competitive edge on the job market or for post-baccalaureate studies.
iv. Community or Societal Internship: Carried out with government schemes, or rural development projects, Non-Governmental Organisations (NGOs). The internship focused on social and community development activities promotes social responsibility, sustainable development awareness, encourages civic responsibility and ethical engagement.
v. Entrepreneurship Internship: Undertaken in association with start-ups, or entrepreneurship cells or launching own idea in Preincubations/Incubation centres. The internship offers exposure to business planning, prototype product development, and promotes innovation, risk-taking, and entrepreneurial mindset.
vi. Virtual or Remote or Online Internship: Undertaken using online tools and digital collaboration platforms. Such internships are common in content writing, data science, marketing, and software development. It

offers flexible learning environments and access to global opportunities, and allows participation in real projects without being physically present, from anywhere and anytime.

vii. Government Internship: Ministries, public sector units, or civic bodies offer such internships in policy research, administrative tasks, or public service projects. This internship is for students interested in governance or public administration.

viii. Post-Placement Internship: Refers to the internship offered to students after they receive a confirmed job offer (placement) from a company, but before formally joining as full-time employees. This internship (on-site, virtual, or hybrid) ensures that students are groomed to be professionally ready, technically competent, and culturally aligned with the organization even before official induction.

ix. Skill Enhancement Internship: Carried out at reputed organisations in offline or online mode. The aim of the internship is to expose to real-world tools, technologies, and professional environments to improve a student's employability by offering hands-on experience, application of theoretical concepts, and skill development aligned with current industry and technical trends. Skill Enhancement Internships, depending on focus area and scope, can be carried out at various organisations such as, Academic and Research Institutions, Industry and Corporate Settings, Government and Public Sector, NGOs and Social Enterprises. For Skill Enhancement Internship topics refer to https://online.vtu.ac.in/category/courses/Skill-Enhancement-Course.

Note on Internship for the Attention of Students and Colleges

• Placement training conducted at the college level, whether by third-party agencies, training institutes, or internal faculty, shall not be considered as internship for either a 15 week or a 30-week period.

The official engagement period of 15-week or 30-week for students selected/recruited by the company/ organization only at their premises under the supervision of the company, shall only be considered as an internship.

• The period of training and working of students who have been recruited as employees by organisations at the beginning of the 4th year of the programme, shall also be treated as an internship.

• Students and colleges/institutions shall follow all the guidelines and procedures of the organization and the University's Internship Guidelines, and complete the internship within a period that matches with the VTU Calander and examination timetable.

• The assigned institution faculty mentor/ coordinator/guide should monitor the student's progress, and document offer letters, training reports, attendance, and evaluations for awarding academic credits.

• All students undergoing an internship, should adhere to all the guidelines, reporting protocols, and evaluation procedures prescribed by the University.

• Students must submit the certificate of completion of an internship with the period of internship clearly mentioned, from the respective company/organization.

• Colleges must submit details of students opting for internship during the odd and even semesters, along with a copy of the company selection letter, to the VTU when notified by the University.

Attention: In addition to the internship support provided by the college, students have the option to select internships through the AICTE and VTU Internship Portals. To ensure uniformity, quality, and transparency in the internship process, VTU has developed a dedicated web portal that serves as a single platform where colleges can also register companies offering internships. Every student is required to register on the portal before the commencement of their internship, and their progress will be monitored through the same platform.

As per VTU norms, the CIE shall be conducted based on the students' performance during the training program, assessed through rubrics from the company supervisor. The SEE evaluation shall be conducted by the college as per the examination timetable published by the VTU.

AICTE Activity Points

Apart from technical knowledge and skills, to be successful as professionals, students should have excellent soft skills, leadership qualities and team spirit. They should have entrepreneurial capabilities and societal commitment. To match these requirements, AICTE has created a unique mechanism of awarding minimum 100 Activity Points for regular students and 75 Activity Points for Lateral Entry students over and above the academic grades.

The activities can be spread over the entire duration of the programme and will be reflected in the Student's VIII Semester Grade Card. It shall not be considered for computation of SGPA/CGPA and for vertical progression. The total duration of the activities for the entire programme is 320 hours for regular students and 240 hours for lateral entry students.

Break-up of CCE marks for activity points:

Evaluation by the Proctor/Coordinator 50 marks

Evaluation by the Dept. Committee

(i) Report 20 marks

(ii) Presentation 20 marks

(iii) Outcome 10 marks

Total 100 marks

1. No SEE for AICTE Activity Points.

2. Students will be awarded either NP or P grade based on marks obtained.

Students will be awarded 'Degree' only on earning P grade in the Activity Points.