DAYANANDA SAGAR ACADEMY OF TECHNOLOGY & MANAGEMENT

CURRICULUM

Scheme and Syllabus VII to VIII Semester

Outcome Based Education

(Academic Year 2026-2027)

Department of CSE in Data Science

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

Year of Establishment: 2022
Intake of the Department = 120
Brief Details about CSE in Data Science:

- Data Science is the extraction of actionable Information from raw data
- Data science is the practice of designing and building systems for collecting, Storing and analyzing data at scale.
- Data engineering is a Vital aspect of company growth, Network interactions and predicting future trends.
- Data Science is the field of study that combines domain expertise, programming skills and knowledge of mathematics and statics to exact meaningful insights from data.

VISION OF THE DEPARTMENT

"To create an academic environment which trains the students as next generation data scientist solving grand challenges innovating through global research opportunities."

MISSION OF THE DEPARTMENT

- To ensure the responsible use of data to benefit society.
- To ensure broader community in the translation of data into information to support and improve decision making.
- To develop skilled professionals in data science field.
- To establish industry conducive environment with State-of-Art data driven infrastructure
- To facilitate high quality data science education, industry collaboration with research orientation.
- To maximize the power of data benefiting the social needs through science and engineering. PEO's

PROGRAM EDUCATION OBJECTIVES (PEO'S):

- PEO1: Graduates shall have robust knowledge of data handling, analytics platform.
- PEO2: Graduates will be skilled professionals with global competence.
- PEO3: Graduates shall have successful carrier as data science engineers with leadership and management skills.

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)

- PSO 1: Produce quality data science professionals with robust development knowledge
- PSO 2: Develop global competency student quality to meet data science changes

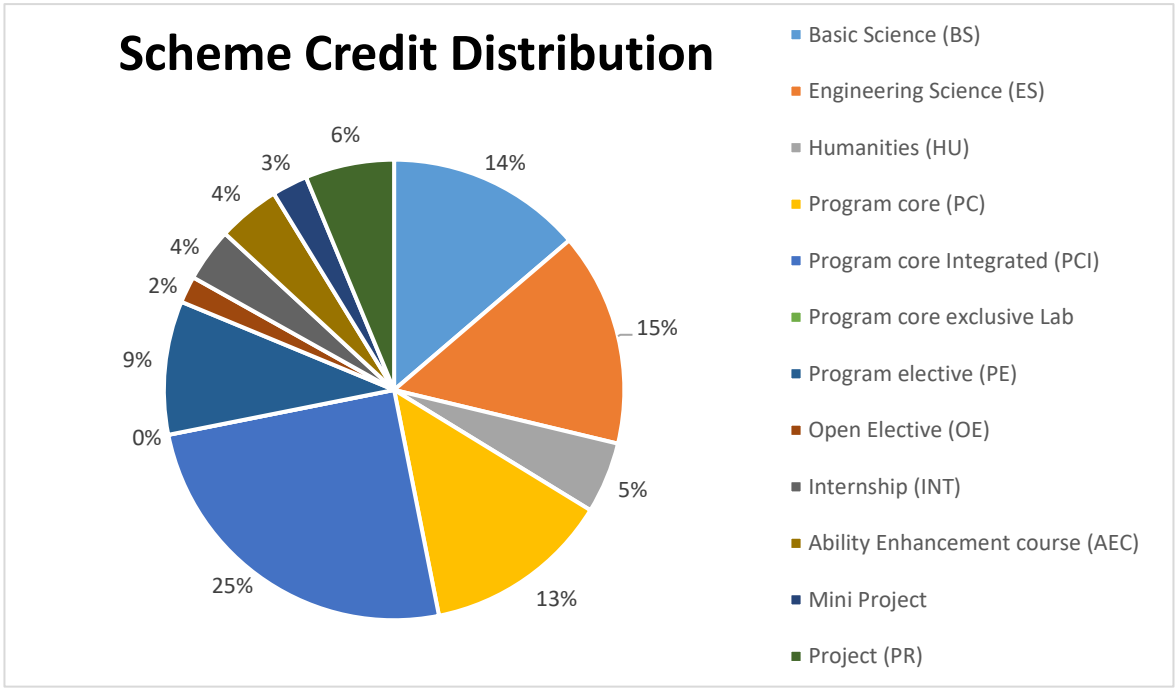
PROPOSED UG CREDIT STRUCTURE IN ALIGNMENT WITH VTU

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 CSE in Data Science

Course Component	Credits	% of Credits
Basic Science (BS)	22	14
Engineering Science (ES)	24	15
Humanities (HU)	8	5
Program core (PC)	21	13
Program core Integrated (PCI)	40	25
Program core exclusive Lab	0	0
Program elective (PE)	15	9
Open Elective (OE)	3	2
Internship (INT)	6	4
Ability Enhancement course (AEC)	7	4
Mini Project (MPR)	4	3
Project (PR)	10	6
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)			3	3	---	---	---	---	6
Engineering Sciences (ESC)			---	---	---	---	---	---	---
Humanities, Social Sciences and Management (HSMC)			---	---	2	---	---	---	2
Ability Enhancement Course (AEC)			1	1	1	1	---	---	4
Universal Human Values (UHV)			---	1	---	---	---	---	1
Professional Core Courses (PCC)			6	6	3	3	---	---	18
Professional Core Courses Lab (PCCL)			---	---	2	---	---	---	2
Integrated Professional core Course (IPCC)			8	8	8	8	4	---	36
Professional Elective Course (PEC)			---	---	3	3	6	---	12
Institutional Open Elective Courses (IOE)			---	---	---	3	3	---	6
Internship (INT)			---	---	---	---		10	10
Mini Project / Project Work (PW)			2	2	3	4	7	4	24
Social Connect & Responsibility (SCR)			1	---	---	---	---	---	1
Non-credit Mandatory Courses (NCMC)			---	---	---	---	---	---	---
Total Credits			**21**	**21**	**22**	**22**	**20**	**14**	**120**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Affiliated to VTU
Approved by AICTE
Accredited by NAAC with A+ Grade
4 Programs Accredited by NBA
(CSE, ISE, ECE, ME)

Scheme of Teaching and Examinations – 2024
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from 2026-27)

7th SEMESTER: Computer Science & Engineering (CSE in Data Science)

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture	Tutorial	Practical	Project	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
						L	T	P	S						
1	BCD701	Cloud Data Management	IPCC	CSE-DS	CSE-DS	3	-	2	-	5	4	3	50	50	100
2	BCD702	MLops & AI System Design	PCC	CSE-DS	CSE-DS	3	-	-	-	3	3	3	50	50	100
3	BCD703X	Professional Elective Course – 3	PEC-3	CSE-DS	CSE-DS	3	-	-	-	3	3	3	50	50	100
4	BXX704X	Open Elective Course -2	OEC-2	CSE-DS	CSE-DS	3	-	2	-	3	3	3	50	50	100
5	BCD705	Capstone Project Phase-2	PWP-2	CSE-DS	CSE-DS	2	-	-	5	7	7	3	50	50	100
6		Indian Knowledge System	IKS	CSE-DS	CSE-DS	1	-	-	-	1	0	-	100	-	100
7		AICTE Activity Points	Details of 80 AICTE Activity Points Earned												
					Total	**15**	**-**	**4**	**5**	**22**	**20**	**15**	**350**	**250**	**600**

Professional Elective Course – 3

BCD703A	Game Theory & Mechanism Design	BCD703C	Responsible AI & Ethics
BCD703B	Enterprise Data Warehouse		

8th SEMESTER: Computer Science & Engineering (CSE in Data Science)

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture	Tutorial	Practical	Project	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
						L	T	P	S						
1	BCD801	Capstone Project Phase – 3 (Publication & Patent)	PWP-3	CSE-DS	CSE-DS	0	0	8	0		4	--	100	--	100
2	BCD802	Internship	INT	CSE-DS	CSE-DS	Two contact hours/week for interaction between faculty and students					10	3	100	100	200
3		AICTE Activity Points	Details of 100 AICTE Activity Points Earned												
					Total						**14**		**200**	**100**	**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	
2.	List of New Existing Elective Courses	NA
3.	List of New Industry Aligned Courses	

Percentage of Change in the Syllabus

7th Semester						
Sl.No	**Course Code**	**Course Name**	**Topics Added**	**Topics removed**	**Revised in %**	**Justification**
			NA			

8th Semester						
Sl.No	**Course Code**	**Course Name**	**Topics Added**	**Topics removed**	**Revised in %**	**Justification**
			NA			

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
	Practical	Conduction of Experiments	Performance- Continuous Evaluation of each Experiment (5m)	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 (5m)					
			Observation Book (5m)					
		Practical Test	Write up (5m)	50				One Internal Practical Test after

			Execution (25m) Viva-voce (10m)		----	05	4	conduction of all Experiments for 50 Marks
		Open Ended Experiment	Write up (5m) Execution (10m) Viva-voce (5m)	20	----	05	2	One experiment for 20 marks. 20 marks reduced to 05 marks
					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	:	**7th Semester**				
Course Title	:	**Cloud Data Management**				
Course Code	:	**BCD701**				
Course Type (Theory/ Practical/ Integrated)	:	**Integrated**				
Category	:	**IPCC**				
Stream	:	**CSE-DS**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:2:0**		**SEE**	:	**50**
Total Hours	:	**40 Hours of Theory + 20 Hours of Practical**		**SEE Duration**	:	**3 Hours**
Credits	:	**4**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand fundamentals of cloud computing and cloud platforms.
2	Explain cloud storage systems and distributed data architectures.
3	Implement containerized data applications using Docker.
4	Deploy scalable cloud applications using Kubernetes.
5	Develop simple cloud-based data pipelines and streaming applications.

Teaching-Learning Process

Pedagogical Initiatives:

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

1. Adopt different teaching methods to attain course outcomes.
2. Use video demonstrations to explain cloud architectures.
3. Encourage collaborative learning and group discussions.
4. Ask higher order thinking questions module-wise.
5. Use problem based learning and real-world cloud case studies.
6. Conduct demonstrations of container and cloud deployment tools.

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 Cloud Computing:** Evolution of cloud computing, Cloud service models (IaaS, PaaS, SaaS), Cloud deployment models, Virtualization concepts, Containers vs Virtual machines	**8 Hours**
Pedagogy	**Quiz**	
2	**Cloud Storage Systems:** Cloud storage architecture, Object storage and block storage, Distributed storage systems, Data replication and availability, Introduction to data lakes.	**8 Hours**
Pedagogy	**Demonstration**	
3	**Containerized Data Platforms:** Docker architecture, Container lifecycle, Building containerized applications, Container networking and volumes, Docker for data applications	**8 Hours**
Pedagogy	**Demonstration**	
4	**Cloud Orchestration:** Kubernetes architecture, Pods, nodes and clusters, Kubernetes services and deployments, Resource management in cloud, Application scaling	**8 Hours**
Pedagogy	**Demonstration**	
5	**Cloud Data Pipelines:** Data pipeline architecture, Batch vs streaming processing, Introduction to Apache Kafka, Monitoring and logging in cloud systems, Cloud data platform overview	**8 Hours**
	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	**Lab 1: Docker Installation and Container Execution** **Scenario: A software team wants to standardize application deployment using containers.** **Tasks:** 1. Install Docker on the system. 2. Pull an Ubuntu image from Docker Hub. 3. Run a container and execute basic Linux commands. 4. List running and stopped containers.	**CO3**
2	**Creating and Managing Docker Images** **Scenario: A data engineer wants to package a Python application into a container.** **Tasks:** 1. Create a simple Python program. 2. Write a Docker file for the application. 3. Build a Docker image. Run the containerized application.	**CO3**
3	**Deploying Database Containers** **Scenario: A cloud application requires a portable database system.** **Tasks:** 1. Pull MySQL/PostgreSQL Docker image. 2. Run the database container. 3. Connect using command line client. 4. Create tables and insert sample data.	**CO3**
4	**Object Storage using MinIO** **Scenario:** A company wants to store large datasets in an object storage system. **Tasks:** 1. Install MinIO server. 2. Create a storage bucket. 3. Upload dataset files. 4. Retrieve files using MinIO client.	**CO2**
5	**Apache Kafka Streaming Setup** **Scenario:** An analytics platform needs real-time data streaming. **Tasks:** 1. Install Apache Kafka. 2. Start Zookeeper and Kafka server. 3. Create a Kafka topic. 4. Implement producer and consumer programs.	**CO5**
6	**Kubernetes Cluster Setup** **Scenario:** A cloud team wants to deploy scalable applications. **Tasks:** 1. Install Minikube. 2. Start Kubernetes cluster. 3. Verify cluster nodes. 4. Deploy a sample container application.	**CO4**
7	**Deploying Applications in Kubernetes** **Scenario:** A microservice application needs orchestration. **Tasks:** 1. Create Kubernetes deployment file. 2. Deploy container application. 3. Expose service using Node Port. 4. Verify running pods.	**CO4**

8	**Building a Data Processing Pipeline** **Scenario:** A company processes logs using containerized services. **Tasks:** 1. Create two containers: data generator and data processor. 2. Connect containers using Docker network. 3. Process sample data streams. 4. Display processed output.	**CO5**
Open ended Programs		
1	**Real-Time Data Streaming using Kafka** **Scenario: A smart city project streams sensor data in real time.** **Tasks:** 1. Simulate sensor data using Python producer. 2. Send data to Kafka topic. 3. Build consumer to analyse data stream. 4. Display real-time output.	**CO5**
2	**Log Monitoring using Kafka Streaming** **Scenario:** A cloud operations team wants to monitor application logs in real time to quickly detect system failures and abnormal behavior. **Tasks:** 1. Create a Python program to simulate application log messages. 2. Send log messages (INFO, WARNING, ERROR) to a **Kafka topic** using a producer program. 3. Develop a **Kafka consumer program** to read log messages from the topic. Filter and display only **ERROR messages** in real time for monitoring purposes.	**CO5**

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Thomas Erl – Cloud Computing: Concepts, Technology & Architecture.
2	Nigel Poulton – Docker Deep Dive.
Reference Books	
1	Brendan Burns – Kubernetes: Up and Running.
2	Kief Morris – Infrastructure as Code.

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Explain fundamentals of cloud computing and data platforms.	Understand	L2
CO2	Describe cloud storage and distributed data systems.	Understand	L2
CO3	Implement containerized applications using Docker.	Apply	L3
CO4	Deploy scalable applications using Kubernetes.	Apply	L3
CO5	Develop simple cloud data pipelines and streaming applications.	Analyze	L4

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	3	2													
CO2	3	2		1	2										
CO3			3	2	3								3		
CO4			3	2	3								3		
CO5		2	3	2	3								3	2	

Weblinks and Video Lectures (e-Resources)	
1	https://docs.docker.com/ - Docker official documentation
2	https://kubernetes.io/docs/home/ - Kubernetes documentation
3	https://kafka.apache.org/42/getting-started/introduction/ - Apache Kafka documentation

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					
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	20	20	10	10	20	20	100	50%

SEE- Semester End Examination (50 Marks)

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

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1							
CO2							
CO3							
CO4							
CO5							
Total	20	20	20	20	20	100	50%

PROFESSIONAL ELECTIVE COURSE (PEC)

PCC Course - Professional Core 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 Core Course (PCC)

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 Core Course (PCC) – 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**	
CIE	**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 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	**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	:	7				
Course Title	:	MLOps & AI Systems Engineering				
Course Code	:	BCD702				
Course Type (Theory/ Practical/ Integrated)	:	Theory				
Category	:	PCC				
Stream	:	CSE-DS		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	3:0:0:0		**SEE**	:	50
Total Hours	:	40		**SEE Duration**	:	3 Hours
Credits	:	3				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the ML System Lifecycle
2	Design Scalable Data & Feature Pipelines And Implement Experiment Tracking & Model Versioning
3	Build CI/CD Pipelines for Machine Learning and Deploy ML Models as Scalable Production Services
4	Monitor Models & Detect Data/Concept Drift
5	Leverage Cloud AI Platforms & Infrastructure as Code and Ensure Model Governance, Fairness & Responsible MLOps

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 DevOps**: SDLC, Virtualization: Containers, Container Orchestration Systems, Cloud platforms, **CI/CD**: Data Versioning and Automated CI/CD/Continuous Training Pipelines, Deployment and Delivery phases, Continuous monitoring, Continuous Testing. Optimization of ML Models for Production efficiency, Agentic Workflows, Autonomous Agent Loops, – Quantization, Pruning, distillation.	8
Pedagogy	***Live Demonstration*** *– Setting up MLflow experiment tracking and DVC versioning on a sample ML project*	
2	**Basic Concepts: MLOps Foundations**: Evolution of MLOps, Data-centric AI, ML Development Lifecycle, MLOps Approach. Types of Deployments - Canary, Blue-Green, and Shadow deployments and Comparing the mechanics **Features of MLOps**, ML Data Lifecycle in Production, MLOps maturity levels, ML artifacts, MLOps workflows. Model serving protocols (gRPC, REST, WebSocket, Messaging)	8
Pedagogy	***Case Study*** *– Distributed training architectures: lessons from Uber Michelangelo and LinkedIn Pro-ML*	
3	**Machine Learning Pipelines and Automation**: CI/CD for Machine Learning, ML model serving, Data pipelines, Data drift, **ML pipelines**: Data ingestion, Feature engineering, Hyperparameter optimization, testing and packaging.	8
Pedagogy	***Live Demonstration*** *– Deploying a REST API model server with FastAPI + Docker + BentoML end-to-end*	
4	**Model in MLOps**: Model management: Model deployment and monitoring, feedback, **orchestration pipelines for ML workflows**, ML security, Real-time Streaming ML models, Deployment on edge devices, Automated ML.	8
Pedagogy	***Group Discussion*** *– Detecting data drift and concept drift in production ML using Evidently AI*	
5	**Case Studies on MLOps Best Practices**: Netflix: Enhancing Content Recommendations with MLOps, **Uber: Demand Forecasting with MLOps**, Airbnb: Search Ranking Models, **Intuit: Fraud Detection and Prevention**, NASA: Satellite Image Analysis.	8
	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	Alla, Sridhar, and Suman Kalyan Adari. Beginning MLOps with MLFlow. Apress, 2021.
2	Rao, Dattaraj. *Keras to Kubernetes: The Journey of a Machine Learning Model to Production.* John Wiley & Sons, 2019.
3	Treveil, Mark et al. Introducing MLOps. O'Reilly Media, 2020.
Reference Books	
1	Burkov, Andriy. Machine Learning Engineering. True Positive Inc., 2020.
2	Ameisen, Emmanuel. *Building Machine Learning Powered Applications. O'Reilly Media, 2020.*
3	Humble, Jez and David Farley. Continuous Delivery. Addison-Wesley, 2011.

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Elucidate and assess the effectiveness and scalability of an end-to-end machine learning system in a real-world scenario.	**L2**	**U**
CO2	Recall various metrics used to evaluate machine learning model performance and the key activities of the ML development lifecycle.	**L2**	**U**
CO3	Design and integrate comprehensive automated systems that encompass ML pipelines, CI/CD, data processing, model serving, and drift detection.	**L3, L4**	**Ap**
CO4	Analyse the challenges and benefits of implementing MLOps in an organisation, including model management, security, and deployment strategies.	**L4**	**An**
CO5	Evaluate the applicability and effectiveness of MLOps best practices from real-world case studies and apply insights to organisational contexts.	**L5**	**E**

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	2		2			2	1		2	2	2	
CO2	2	2	2	2		2			2	1		2	2	2	
CO3	2	2	2	2		2			2	1		2	2	2	
CO4	2	2	2	2		2			2	1		2	2	2	
CO5	2	1		2				2		1			2	2	

Weblinks and Video Lectures (e-Resources)	
1	MLOps Course – NPTEL: https://nptel.ac.in/courses/106106184
2	https://ml-ops.org/
3	Full Stack Deep Learning: https://fullstackdeeplearning.com/course/
4	https://www.coursera.org/specializations/machine-learning-engineering-for-production-mlops

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	5		
Understand	10	5	10	
Apply	20	10	10	10
Analyse	10	20	20	20
Evaluate		10	10	20
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	10			5			15	15%
CO2	10			5			15	15%
CO3		10	10		10		30	30%
CO4		10			10	10	30	30%
CO5						10	10	10%
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	**20**
Apply	**20**
Analyse	**20**
Evaluate	**20**
Create	**10**

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module 3	Module-4	Module-5		
CO1	5			5		10	10%
CO2	10			10		20	20%
CO3		10	10		10	30	30%
CO4		10	10	10		30	30%
CO5		5			5	10	10%
Total	**15**	**25**		**25**	**15**	**100**	**100%**

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**	
CIE	**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 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	**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	:	7				
Course Title	:	Game Theory and Mechanism Design				
Course Code	:	BCD702A				
Course Type (Theory/ Practical/ Integrated)	:	Theory				
Category	:	PEC-3				
Stream	:	CSE-DS		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	3:0:0:0		**SEE**	:	50
Total Hours	:	40		**SEE Duration**	:	3 Hours
Credits	:	3				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Develop a strong theoretical foundation in classical and modern game theory, including Nash equilibrium, Bayesian games, and cooperative solution concepts.
2	Understand the principles of mechanism design and apply them to engineer incentive-compatible and efficient systems.
3	Analyse strategic behaviour and efficiency of multi-agent systems using computational techniques.
4	Connect game-theoretic ideas to real-world data science contexts such as explainability (SHAP), auction design, and multi-agent RL through curated reference case studies.
5	Appreciate the role of fairness, optimality, and computational tractability in algorithmic 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 Game Theory**: History, Scope & Applications in Data Science **Types of Games**: Cooperative vs Non-Cooperative, Static vs Dynamic **Strategic Form Games**: Players, Strategies & Payoffs, Dominant Strategies & Iterated Elimination of Dominated Strategies (IEDS) **Nash Equilibrium**: Existence, Computation & Interpretations, Mixed Strategy Nash Equilibrium & Support Theorem, Best Response Correspondences & Fixed-Point Theorems	8
Pedagogy	**Quiz**	
2	**Extensive Form Games**: Game Trees, Histories & Strategies, Backward Induction & Subgame Perfect Equilibrium (SPE), Games of Perfect vs Imperfect Information **Bayesian Games**: Incomplete Information & Type Spaces **Bayesian Nash Equilibrium**: Computation & Applications, Signaling Games & Separating/Pooling Equilibria, Repeated Games: Finite & Infinite Horizons, Folk Theorem	8
Pedagogy	**Problem Solving**	
3	**Cooperative Games**: Characteristic Function Form & Coalitions **Core, Shapley Value**: Definition, Axioms & Computation, Nucleolus, Bargaining Sets & Stability Concepts, Nash Bargaining Solution & Axiomatic Bargaining Theory **Social Choice Theory**: Arrow's Impossibility Theorem **Voting Rules**: Plurality, Borda, Condorcet & Comparison **Fairness & Envy-Free Allocations**: Cake-Cutting Algorithms	8
Pedagogy	**Voting Simulation**	
4	**Mechanism Design**: Inverse Game Theory, Goals & Taxonomy, Direct Mechanisms, Revelation Principle & Incentive Compatibility, Dominant Strategy Incentive Compatibility (DSIC) & Strategy-Proofness **VCG Mechanisms**: Groves & Clarke Taxes, Efficiency **Revenue-Maximizing Mechanisms**: Myerson's Optimal Auction, Bayesian Incentive Compatible (BIC) Mechanisms, Budget Balance, Individual Rationality & Impossibility Results (Myerson-Satterthwaite)	8
Pedagogy	**Live Auction Simulation**	
5	**Complexity of Computing Nash Equilibria**: PPAD-Completeness, Linear Programming Duality & Zero-Sum Games (Minimax Theorem) **Algorithmic Mechanism Design**: Approximation & Computability **Price of Anarchy & Price of Stability**: Quantifying Inefficiency **Online Learning in Games**: Regret Minimization & No-Regret Dynamics, Multi-Agent Reinforcement Learning (MARL) & Game-Theoretic Foundations **Algorithmic Fairness**: Fairness Constraints in Optimisation	8

	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	Martin J. Osborne & Ariel Rubinstein - A Course in Game Theory - MIT Press (Free Online)
2	Mechanism Design: A Linear Programming Approach - *Rakesh V. Vohra* Cambridge University Press, 2011
3	Noam Nisan, Tim Roughgarden, Eva Tardos, Vijay V. Vazirani - Algorithmic Game Theory - Cambridge University Press, 2007
Reference Books	
1	Roger Myerson - Game Theory: Analysis of Conflict - Harvard University Press
2	Putting Auction Theory to Work - *Paul Milgrom* Cambridge University Press, 2004
3	Tim Roughgarden - Twenty Lectures on Algorithmic Game Theory - Cambridge University Press

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Formulate and solve strategic-form and extensive-form games including Nash and Bayesian equilibria.	**An**	**L4**
CO2	Apply cooperative game theory and social choice mechanisms to collective decision problems.	**A**	**L3**
CO3	Design incentive-compatible mechanisms using the revelation principle, VCG, and Myerson's framework.	**C**	**L6**
CO4	Assess computational complexity of game-theoretic problems and apply LP-based solution methods.	**An**	**L4**
CO5	Relate game-theoretic methods to data science workflows including SHAP, MARL, and market design via reference case studies.	**U**	**L2**

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	3	3	1	2	1							2	2	1	
CO2	2	3	2	2		2			2			1	2	2	
CO3	2	2	3	2	2			1				1	2	3	1
CO4	2	3	1	2	3							2	2	3	2
CO5	2	2	2	1	3	2				1		3	3	2	2

Weblinks and Video Lectures (e-Resources)	
1	Game Theory and Mechanism Design Video Lectures: https://nptel.ac.in/courses/106101237
2	https://oyc.yale.edu/economics/econ-159
3	Algometric Game Theory: https://timroughgarden.org/videos.html
4	https://gtl.csa.iisc.ac.in/gametheory/

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	5	0
Understand	10	8	10	5
Apply	15	12	15	10
Analyse	15	15	10	15

Evaluate	5	8	5	10
Create	0	2	5	10

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	10					30	30%
CO2		10	5	10			25	25%
CO3					15		15	15%
CO4					5	10	15	15%
CO5			5	5		5	15	15%
Total	**20**	**20**	**15**	**15**	**20**	**15**	**100**	**100%**

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	**5**
Understand	**8**
Apply	**14**
Analyse	**13**
Evaluate	**7**
Create	**3**

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module 3	Module-4	Module-5		
CO1	10	5				15	30%
CO2		5	8			13	26%
CO3				10		10	20%
CO4				5	10	15	30%
CO5			2			2	4%
Total	**10**	**10**	**10**	**15**	**5**	**50**	**100%**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	7				
Course Title	:	Enterprise Data Warehouse				
Course Code	:	BCD703B				
Course Type (Theory/ Practical/ Integrated)	:	Theory				
Category	:	PEC-3				
Stream	:	CSE-DS		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	3:0:0:0		**SEE**	:	50
Total Hours	:	40		**SEE Duration**	:	3 Hours
Credits	:	3				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Gain a comprehensive understanding of the core principles and components of traditional data warehouses.
2	Understand how to structure and organize large datasets using dimensional modelling techniques.
3	Learn how cloud-based data warehousing platforms like Snowflake operate and manage data efficiently.
4	Explore mechanisms to manage, transform, and monitor data workflows within the Snowflake ecosystem.
5	Understand how to connect Snowflake to downstream tools for business intelligence and enable collaborative data usage across teams.

Teaching-Learning Process

Pedagogical Initiatives:

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

- ***Lecture method*** means it includes not only traditional lecture method, but different *type of teaching methods* may be adopted to develop the course outcomes.
- ***Interactive Teaching:*** *Adopt the* ***Active learning*** that includes brainstorming, discussing, group work, focused listening, formulating questions, notetaking, annotating, and roleplaying.
- Show ***Video/animation*** films to explain functioning of various concepts.
- Encourage ***Collaborative*** (Group Learning) Learning in the class.
- To make ***Critical thinking***, ask at least three Higher order Thinking questions in the class.
- Adopt ***Problem Based Learning***, which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Show the ***different ways to solve*** the same problem and encourage the students tocome up with their
- Discuss how every ***concept can be applied to the real world*** - and when that's possible, it helps improve the students' understanding.own creative ways to solve them.

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 DATA WAREHOUSING:** Data Warehousing Concepts and Architecture-Definition and purpose of data warehousing, Differences between OLTP and OLAP system, Components of a data warehouse: operational source systems, data staging area, data presentation area, data access tools, ETL Processes- Extract, Transform, Load processes, Importance in data warehousing, Data Marts and Business Intelligence-Role of data marts in data warehousing, Introduction to business intelligence tools	8
Pedagogy	**Presentation**	
2	**DATA MODELLING AND SCHEMA DESIGN:** Dimensional Modelling Techniques-Importance of dimensional modelling, Fact and dimension tables, Dimensional modelling vocabulary, Schema Design-Star schema design, Snowflake schema design, Comparison between star and snowflake schemas, Slowly Changing Dimensions (SCD) - Types 1, 2, and 3 SCDs, Implementation strategies	8
Pedagogy	**Group Discussion**	
3	**INTRODUCTION TO SNOWFLAKE:** Snowflake Architecture and Key Features-Overview of Snowflake's architecture, Unique features of Snowflake Setting up Snowflake Environment-Creating accounts and virtual warehouses, Understanding Snowflake's web interface, Database Objects in Snowflake, creating databases, schemas, and table, Data types and constraints in Snowflake, Data Loading and Unloading-Methods for loading data into Snowflake, Exporting data from Snowflake.	8
Pedagogy	**Problem Solving**	
4	**ADVANCED SNOWFLAKE FEATURES:** Time Travel and Data Cloning-Understanding Time Travel feature ,Creating zero-copy clones, Streams and Tasks-Implementing data pipelines with Streams, Automating tasks in Snowflake, Materialized Views and Result Caching-Creating and managing materialized views, Utilizing result caching for performance, Performance Tuning and Query Optimization-Techniques for optimizing queries, Monitoring and tuning performance, Security Features-Role-Based Access Control (RBAC),Data masking and encryption.	8
Pedagogy	**Case Study**	
5	**DATA SHARING AND INTEGRATION IN SNOWFLAKE:** Data Sharing and Marketplace, Sharing data securely within and outside the organization, Exploring Snowflake Marketplace, Integration with BI Tools-Connecting Snowflake to Tableau, Power BI, etc, Best practices for data visualization, Handling Semi-Structured Data-Working with JSON, Avro, Parquet formats, Parsing and querying semi-structured data, Continuous Data Ingestion with Snowpipe-Setting up Snowpipe for real-time data ingestion, Monitoring and managing data streams, Real-Time Analytics and Use Case, Implementing real-time analytics solutions, Case studies and industry applications.	8
	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	Jason Brownlee, The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling, Ralph Kimball and Margy Ross,Wiley,2nd Edition, ISBN: 978-0471200246
2	Snowflake: The Definitive Guide, Joyce Kay Avila, O'Reilly Media,1st Edition, *ISBN:* 978-1098103828
Reference Books	
1	Building the Data Warehouse, W.H. Inmon,Wiley
2	Cloud Data Management, Divesh Srivastava, Amol Deshpande, et al.,Morgan & Claypool Publishers

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 architecture, components, and processes involved in traditional data warehousing systems.	**L2**	**U**
CO2	Design dimensional models using star and snowflake schemas by applying best practices in data modelling.	**L3**	**A**
CO3	Utilize Snowflake's cloud-native features for structured and semi structured data storage and querying.	**L3**	**A**
CO4	Analyse and optimize Snowflake queries and data pipelines using built-in features like Time Travel, Streams, and Tasks.	**L4**	**An**
CO5	Develop secure and scalable data warehousing solutions integrating Snowflake with external BI tools for real-time analytics and sharing.	**L4**	**An**

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	3	2	2										3	3	
CO2	3	2	2										3	3	
CO3	3	2	2		3								3	3	
CO4	3	2	2		3								3	3	
CO5	3	2	2		3								3	3	

Weblinks and Video Lectures (e-Resources)	
1	Snowflake Official Documentation https://docs.snowflake.com/
2	Kimball Group Resources https://www.kimballgroup.com/

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	5		
Understand	10	5	10	
Apply	20	10	10	10
Analyse	10	20	20	20
Evaluate		10	10	20
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	10			5			15	15%
CO2	10			5			15	15%
CO3		10	10		10		30	30%
CO4		10			10	10	30	30%
CO5						10	10	10%
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	**20**
Apply	**20**
Analyse	**20**
Evaluate	**20**
Create	**10**

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module 3	Module-4	Module-5		
CO1	5			5		10	10%
CO2	10			10		20	20%
CO3		10	10		10	30	30%
CO4		10	10	10		30	30%
CO5		5			5	10	10%
Total	**15**	**25**		**25**	**15**	**100**	**100%**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	7				
Course Title	:	**Responsible AI With Ethics**				
Course Code	:	**BCD703C**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PEC-3**				
Stream	:	**CSE-DS**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40**		**SEE Duration**	:	**3 Hours**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the principles of Responsible Artificial Intelligence (RAI) and the ethical challenges associated with AI technologies.
2	Analyze bias, fairness, transparency, and explainability issues in AI systems and understand methods to mitigate them.
3	Apply responsible AI frameworks and ethical guidelines in the design and development of AI models.
4	Explore generative AI technologies, including large language models and prompt engineering techniques.
5	Evaluate real-world AI applications from a responsible AI perspective considering privacy, security, and societal impact.

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:** Introduction to Responsible AI, Robustness, Need for Ethics in AI. AI for Society and Humanity, Stages of AI model development and how RAI is relevant to these stages, Responsible AI Frameworks, Importance of Responsible AI. Ethics in the Age of AI: The call for responsibility – mitigating bias and discrimination – Ethics in AI governances – Bias and Fairness.	8
Pedagogy	**Poster Presentation**	
2	**Responsible AI:** Understanding Bias in Data and Models – Techniques to Detect and Mitigate Bias – Implementing bias detection and fairness - transparency and explainability – Importance of Transparency and Explainability in AI Models – Methods for Achieving Explainable AI – Tools, Frameworks and Implementation of Transparency and Explainability – Challenges and Solutions in Achieving Transparency and Explainability.	8
Pedagogy	**Problem Solving**	
3	**Ethical Aspects of AI:** Ethical Considerations in AI, Ethics, and Accountability - Auditing AI models, fairness assessment, Principles for ethical practices, Privacy-preserving ML. Privacy and security- Privacy concerns in AI – Security Concerns in AI - robustness and reliability – Challenges in Achieving Robustness – Challenges in Achieving Reliability.	8
Pedagogy	**Case study Assignment**	
4	**Generative AI:** Introduction to Generative AI – Responsible use of generative AI - Machine learning for Language models – Exploring ChatGPT – Art of Prompt engineering – Designing Effective Prompts – Programming LLMs – Introduction to RAG	8
Pedagogy	**Demonstration**	
5	**Applications:** Recommendation systems, Computer Vision, Natural Language Processing; Responsible Generative AI and Large Language Models.	8
	Case studies	
	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	Hua Chao, "Decoding AI - A Deep Dive into the Principles and Applications of Artificial Intelligence: Unveiling the Secrets of AI: Making Artificial Intelligence Accessible to Everyone", kindle Edition, 2024.
2	Virginia Dignum, "Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way" Springer Nature, 2019.
3	Avinash Manure, shaleen Bengani, Saravanan S, "Introduction to Responsible AI: Implement Ethical AI using Python", First Edition, A press, 2023.
4	Christoph Molnar "Interpretable Machine Learning". Lulu, 1st Edition, 2019.
Reference Books	
1	Altaf Rehmani, "Generative AI for everyone: Understanding the essentials and applications of this breakthrough technology", Kindle Edition, 2024
2	Melanny Castilla, "The principles of AI – A comprehensive Guide to Understanding, AI", Kindle Edition, 2024

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the basic principles of Responsible Artificial Intelligence including ethics, bias, fairness, transparency, explainability, governance, and generative AI concepts used in modern AI applications.	**L1 & L2**	**R & U**
CO2	Apply responsible AI techniques such as bias detection, fairness evaluation, explainable AI methods, and privacy-preserving mechanisms in the development of AI models and generative AI systems.	**L3**	**A**
CO3	Analyze AI systems to identify ethical issues, bias, security risks, privacy concerns, and robustness challenges while considering societal and regulatory implications.	**L4**	**An**
CO4	Analyze and implement AI solutions using responsible AI frameworks, generative AI models, and prompt engineering techniques ensuring fairness, transparency, and reliability.	**L4**	**An**
CO5	Evaluate real-world AI applications and case studies using responsible AI principles including accountability, ethical governance, privacy protection, and societal impact.	**L5**	**E**

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	3	2	-	-	-	-	-	2	-	-	-	2			
CO2	3	2	-	2	3	2	-	2	2	-	-	2			
CO3		3	-	-	-	2	-	2	-	-	-	2			
CO4		3	3	2	3	2	-	2	2	-	-	3			
CO5	2	3	3	2	2	-	2	2	2	2	-	3			

Weblinks and Video Lectures (e-Resources)	
1	Introduction to Responsible AI : https://www.youtube.com/watch?v=w_3L1Bf2P_g&msockid=2b1c224b1d3011f1a8174dbee500bda7
2	Introduction to Generative AI: https://www.youtube.com/watch?v=cZaNf2rA30k&list=PLBgogxgQVM9sl-KnKywVEhkb3QtLHU4OK&index=1

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	5		
Understand	10	5	10	
Apply	20	10	10	10
Analyse	10	20	20	20
Evaluate		10	10	20
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	10			5			15	15%
CO2	10			5			15	15%
CO3		10	10		10		30	30%
CO4		10			10	10	30	30%
CO5						10	10	10%
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	**20**
Apply	**20**
Analyse	**20**
Evaluate	**20**
Create	**10**

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module 3	Module-4	Module-5		
CO1	5			5		10	10%
CO2	10			10		20	20%
CO3		10	10		10	30	30%
CO4		10	10	10		30	30%
CO5		5			5	10	10%
Total	**15**	**25**		**25**	**15**	**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**	
CIE	**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 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	**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	:	7th				
Course Title	:	AI & IoT Enabled Smart Structure (CSE-ICB) AI for Power System and Power Transmission (EEE) AI for Entrepreneurship and Innovation (AIML) AI for Sustainability (AIML) AI for Wireless Communication (ECE) Drone Technology with AI (ECE) Supply Chain Management with AI (ME) Green AI & Sustainable Innovation (CE) AI for Conservation of Natural Resources-Smart Way (CE) Intelligent Environmental Protection and Management (CE) Disaster mitigation through AI (CE)				
Course Code	:	BXX704X				
Course Type (Theory/ Practical/ Integrated)	:	Theory				
Category	:	OEC-2				
Stream	:			**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	3:0:0:0		**SEE**	:	50
Total Hours	:	40		**SEE Duration**	:	3 hours
Credits	:	3				

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

(Phase-1)

CAPSTONE PROJECT (Phase-1 & 2):

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.

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