DAYANANDA SAGAR ACADEMY OF TECHNOLOGY & MANAGEMENT

CURRICULUM

Scheme and Syllabus V to VI Semester

Outcome Based Education

(Academic Year 2025-2026)

Department of Artificial Intelligence and Machine Learning

5th&6th 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 caliber 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

VISION OF THE DEPARTMENT

To develop high quality engineers with technical knowledge, skills and ethics in the area of Artificial Intelligence and Machine Learning to meet industrial and societal needs.

MISSION OF THE DEPARTMENT

M1: To provide high quality technical education with up-to-date infrastructure and trained human resources to deliver the curriculum effectively in order to impart technical knowledge and skills.

M2 : To collaborate with research institutions to elevate innovative research and development in AI & ML to serve as per society needs.

M3: To train the students with entrepreneurship qualities, multidisciplinary knowledge and latest skill sets as required for industry and research activities.

M4: To Produce creative and technically strong engineers and to research pioneering solutions to global challenges.

M5: To inculcate knowledge in lifelong learning.

PROGRAM EDUCATION OBJECTIVES (PEO'S):

PEO1: Graduates will have the ability to adapt, contribute and innovate new technologies and systems in the key domains of Artificial Intelligence and Machine Learning.

PEO2: Graduates will be able to successfully pursue higher education in reputed institutions with AI Specialization.

PEO3: Graduates will have the ability to explore research areas and produce outstanding contributions in various areas of Artificial Intelligence and Machine Learning.

PEO4: Graduates will be ethically and socially responsible solution providers and entrepreneurs in the field of Computer Science and Engineering with AI/ML Specialization.

PEO5: Engaged in successful professional practices in their chosen discipline

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: Mathematical Informatics Section: To clarify the process of intelligent activities based on rational reasoning by human beings and to create new methods of problem-solving by implementation with computers.

PSO 2: Architecture Section: To establish the techniques for designing hardware and software systems necessary for the development of the next-generation of intelligent information processing systems.

PSO 3: Application Section: To apply the developed techniques to address challenging problems in various real-life applications from biomedical signal and image analysis, systems biology, climate to social and communication networks .

PROPOSEDUGCREDITSTRUCTUREINALIGNMENTWITH 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**

PROPOSEDUG SCHEME

Sl. No	Course Category	BOS	TD	Teaching Hours/Week					Credits
				Lecture	Tutorial	Practical	Project	Total (Hrs/week)	
				L	T	P	S		
1	IPCC	AIML	AIML	3	-	2	-	5	4
2	IPCC	AIML	AIML	3	-	2	-	5	4
3	PCC	AIML	AIML	3	-	-	-	3	3
4	PEC-1	AIML	AIML	3	-	-	-	3	3
5	PBL	AIML	AIML	-	2	-	4	6	3
6	PCCL	AIML	AIML	-	2	2	-	4	2
7	HSMS	AIML	AIML	2	-	-	-	2	2
8	AEC	AIML	AIML	1	-	-	-	2	1
9	NCMC	NSS / YOGA / PED							
10	AICTE Activity Points								
								Total	**22**

Percentage of Mapping– Theory & Practical - Scheme & Syllabus- 5th Semester&6th Semester

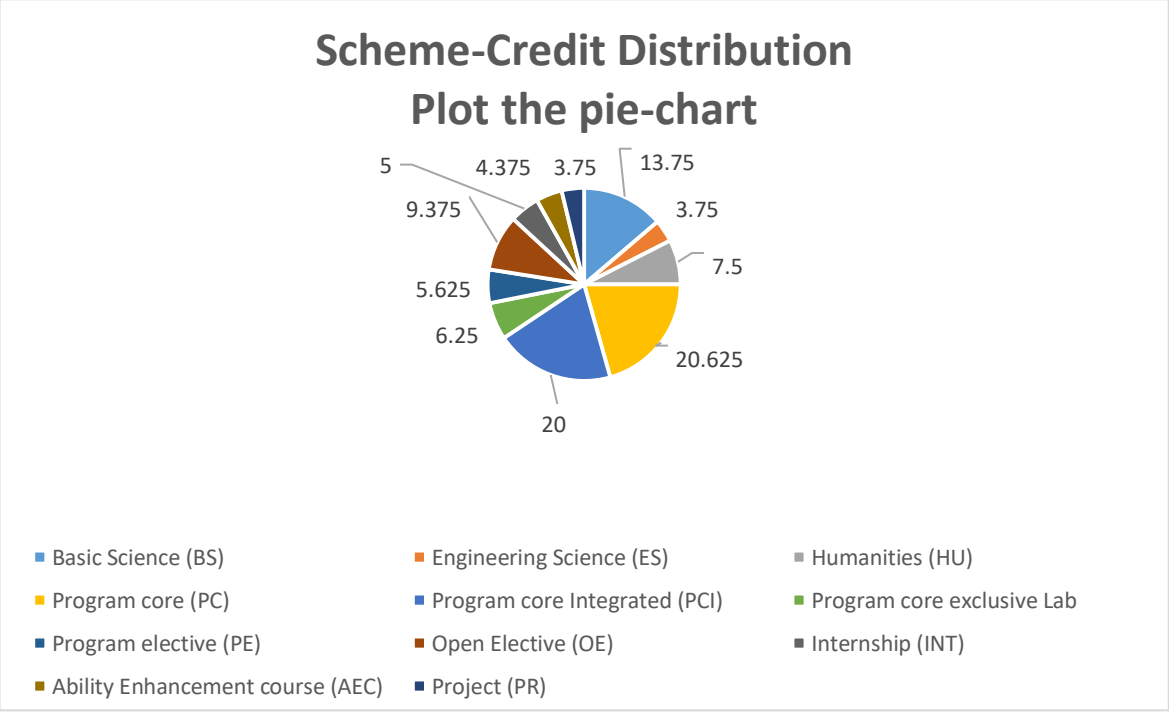
5th Semester&6th Semester

Sl. No	Course Category	Component			
		Theory	Practical	Outreach	YOGA/SPORTS
1	IPCC	60%	40%	--	--
2	IPCC	60%	40%	--	--
3	PCC	100%	--	--	--
4	PEC-1	100%	--	--	--
5	PBL	--	100%	--	--
6	PCCL	--	100%	--	--
7	HSMS	100%	--	--	--
8	AEC	100%	---	--	--
9	NCMC	--	--	100%	100%
Total Percentage		**58%**	**31%**	**11%**	**11%**

Scheme Distribution

Department of Artificial Intelligence and Machine Learning Engineering

Course Component	Credits	% of Credits
Basic Science (BS)	22	13.75
Engineering Science (ES)	06	3.75
Humanities (HU)	12	7.5
Program core (PC)	33	20.625
Program core Integrated (PCI)	32	20
Program core exclusive Lab	10	6.25
Program elective (PE)	09	5.625
Open Elective (OE)	15	9.375
Internship (INT)	08	5
Ability Enhancement course (AEC)	07	4.375
Project (PR)	06	3.75
Total	**160**	**100**



SEMESTER WISE CREDIT BREAKDOWN FOR B.E. DEGREE CURRICULUM

BATCH 2023-2027

Course Category	Semester								Total Credits
	1st	2nd	3rd	4th	5th	6th	7th	8th	
Basic Sciences (BSC)	8	8	3	3	-	-	-	-	22
Engineering Sciences (ESC)	3	3	-	-	-	-	-	-	06
Humanities, Social Sciences and Management (HSMC)	2	2	1	-	3	3	-	-	11
Ability Enhancement Course (AEC)	1	1	1	1	1	1	1	-	7
Universal Human Values (UHV)	-	-	-	1	-	-	-	-	1
Professional Core Courses (PCC)	3	3	6	6	6	6	3	-	33
Integrated Professional core Course (IPCC)	-	-	8	8	4	4	8	-	32
Professional Elective Course (PEC)	3	3	-	-	3	3	3	-	15
Institutional Open Elective Courses (IOE)	-	-	-	-	3	3	3	-	9
Internship (INT)	-	-	-	-	-	-	-	8	8
Mini Project / Project Work (PW)	-	-	2	2	2	2	2	6	16
Non-credit Mandatory Courses (NCMC)	-	-	-	-	-	-	-	-	-
Total Credits	20	20	21	21	22	22	20	14	160

Scheme of Teaching and Examinations – 2025
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from 2025-26)

5th SEMESTER: Artificial Intelligence and Machine Learning (AIML)

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	BAI501	Machine Learning using Python	IPCC	AIML	AIML	3	-	2	-	5	4	3	50	50	100
2	BAI502	Image processing and computer vision	IPCC	AIML	AIML	3	-	2	-	5	4	3	50	50	100
3	BAI503	Computer Network and Simulation	PCC	AIML	AIML	3	-	-	-	3	3	3	50	50	100
4	BAI504*	Professional Elective Course	PEC-1	AIML	AIML	3	-	-	-	3	3	3	50	50	100
5	BAI505	Generative AI applications	PBL	AIML	AIML	-	2	-	4	6	3	3	50	50	100
6	BAIL506	Mobile Application Development	PCCL	AIML	AIML	-	2	2	-	4	2	2	50	50	100
7	BAI507*	Ability Enhancement Course	AEC	AIML	AIML	1	-	-	-	1	1	2	50	50	100
8	BESK508	Environmental Studies and E-waste management	HSMS	AIML	AIML	2	-	-	-	2	2	1	50	50	100
9	B**K509	NSS /PE / YOGA	NCMC	AIML	AIML	-	-	2	-	2	0	-	100	-	100
** AICTE Activity points mandatory			Total			15	4	8	4	31	22	23	500	400	900

5th Semester Professional Elective Courses

BAI504A	Cloud Computing and security	BAI504B	Data Science and Big Data

5th Semester Ability Enhancement Course courses

BRM507A	Research Methodology and Intellectual Property Rights(RMIPR)	BAI507B	Block chain Technology

Scheme of Teaching and Examinations – 2025
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from 2025-26)

6thSEMESTER: Artificial Intelligence and Machine Learning (AIML)

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture L	Tutorial T	Practical P	Project S	Total		SEE Duration(Hrs)	CIE Marks	SEE Marks	Total Marks
1	BAI601	Deep Learning & Reinforcement Learning	IPCC	AIML	AIML	3	-	2	-	5	4	3	50	50	100
2	BAI602	Natural Language Processing and Generation	IPCC	AIML	AIML	3	-	2	-	5	4	3	50	50	100
3	BAI603	Software Engineering & Project Management	PCC	AIML	AIML	3	-	-	-	3	3	3	50	50	100
4	BAI604*	Professional Elective Course	PEC -2	AIML	AIML	3	-	-	-	3	3	3	50	50	100
5	BAI605*	Course Open Elective Course	OEC-1	AIML	AIML	3	-	-	-	3	3	3	50	50	100
6	BAI606	Capstone Project Phase - I	PROJ-I	AIML	AIML	-	-	-	4	4	2	-	100	-	100
7	BAIL607	DevSecOps Lab	PBL/PCCL	AIML	AIML	-	2	2	-	4	2	2	50	50	100
8	BAI608*	Ability Enhancement Course	AEC	AIML	AIML	1	-	-	-	1	1	2	50	50	100
9	B**K609	NSS /PE / YOGA	NCMC	AIML	AIML	-	-	2	-	2	0	-	100	-	100
** AICTE Activity points mandatory Total						**16**	2	**8**	4	**30**	**22**	**19**	**550**	**350**	**900**

6th Semester Professional Elective Course

BAI604A	Explainable AI	BAI604B	Full Stack Development

6th Semester AEC course

BAI608A	Agentic AI	BA6508B	Time Series Analysis

IPCC: Integrated Professional Core Course,

PCC: Professional Core Course

PEC: Professional Elective Course

OEC: Open Elective Course

PWP-1: Project Work Phase 1

PBL: Project Based Learning

PCCL: Professional Core Course Laboratory

AEC: Ability Enhancement Course,

NCMC: Non-Credit Mandatory Course

HSMS:Humanity and Social Science and management 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 practicals 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

		5TH Semester	6TH Semester
1.	**List of Existing Elective Courses**	Blockchain Technology	Devops Lab
2.	**List of New Existing Elective Courses**	Cloud Computing and security Data Science and Big Data	Explainable AI
3.	**List of New Industry Aligned Courses**	Generative AI for Images	Agentic AI

Percentage of Change in the Syllabus

5th Semester						
Sl.No	**Course Code**	**Course Name**	**Topics Added**	**Topics removed**	**Revised in %**	**Justification**
1	BAI501	Machine Learning using Python	SVM, Markov chain ,Bayesian Network	ANN, types of ANN	10	Most useful models in ML .Topics are vital for understanding time dependent patterns.
2	BAI502	Image processing and computer vision	Computer mini project and programs added	-	20	To introduce practical components with theory
3	BAI503	Computer Network and Simulation	NS2 simulator	DNS Server	5	To have practical analysis using NS2 simulator
4	BAI504A	Cloud Computing and security	Routing, Proximity and fault Tolerance, Trust, Reputation and Security Management	Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environment	10	To add security component to cloud computing
	BAI504B	Data Science and Big Data	Big Data	Machine Learning	20	To Promotes Real-World Data Visualization.
5	BAI505	Generative AI applications	Entire Syllabus is new	-	100	In line with industry requirements
6	BAIL506	Mobile Application Development	Open Ended Programs are included	-	10	To Promotes Real-World Problem Solving.
7	BRM507A	Research Methodology and Intellectual Property Right(RMIPR)	-	-	-	-
	BAI507B	Blockchain Technology	Basics of Blockchain ,ethereum .	Hyperledger and Enterprise Blockchain	10	To have an application level knowledge on blockchain
8	BESK508	Environmental Studies and E-waste	-	-	-	-

		management				
6th Semester						
Sl.No	**Course Code**	**Course Name**	**Topics Added**	**Topics removed**	**Revised in %**	**Justification**
1	BAI601	Deep Learning & Reinforcement Learning	Brief on Vision Transformers (ViT) – comparison with CNNs Pretrained Models and Transfer Learning Encoder-Decoder Structure | Applications in Text and Time Series Introduction to Deep Q Networks (DQN) and Policy Gradient Methods	-	**20**	Basic knowledge Required Practical Concepts required for laboratory
2	BAI602	Natural Language Processing and Generation	Module 1 – Deep learning for NLP Module 2 – WordNet Basics	Paninion,Framework, Karaka theory ,Syntactic analysis	20	Basic knowledge Required Practical Concepts required for laboratory
3	BAI603	Software Engineering & Project Management	Topics on Agile Development	-	10	In line with industry practice.
4	BAI604A	Explainable AI	Entire Syllabus is new	**-**	100	In line with industry requirements
	BAI604B	Full Stack Development	-	-	-	-
5	BAI606	Capstone Project Phase - I	-	-	-	-
6	BAIL607	DevSecOps Lab	-	-	-	-
7	BAI608A	Agentic AI	Entire Syllabus is new	**-**	100	In line with industry requirements
	BAI608B	Time Series Analysis	-	-	-	-

5TH SEMESTER

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

IPCCCourse–IntegratedProfessionalCoreCourse

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 secondInternal 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 ofIPCC (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 andViva-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 Assessmentwill be through rubrics.
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **10 Marks**

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

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,

	• The assessment of these techniques shall be in rubrics. • The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

4 Credits Courses – Integrated Professional Core Course (IPCC)

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

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

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

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

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th**				
Course Title	:	**Machine learning using Python**				
Course Code	:	**BAI501**				
Course Type (Theory/Practical/ Integrated)	:	**Integrated**				
Category	:	**IPCC**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:2:0**		**SEE**	:	**50**
Total Hours	:	**40T +20 P**		**SEE Duration**	:	**3 Hrs.**
Credits:	:	**4**				

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	To introduce the fundamental concepts and techniques of machine learning
2	To understanding of various types of machine learning and the challenges faced in realworld applications.
3	To enable students to evaluate machine learning models for different types of problems
4	To familiarize the machine learning algorithms such as regression, decision trees, Bayesian models,
5	To design, and apply machine learning techniques like Random Forest, Gradient Boosting, Hidden Markov Models, and Clustering to solve real-world problems

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type ofteaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in theprinciple.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, developthinking skills such as the ability to evaluate, generalize, and analyze information rather thansimply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come upwith their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helpsimprove the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for BE Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**The Machine Learning Landscape:**What is machine learning,why use machine learning,Examples of Applications, Types of Machine Learning Systems, Main challenges of machine learning, Testing and validating, **Introduction :**Well - posted learning problems, designing a learning system, Perspective and issues in machine learning, **Concept Learning and General to specific Ordering:** A concept learning task, Concept learning as search, FIND-S, Version spaced and candidate Elimination, Remarks on Version spaced and candidate Elimination, Inductive bias. **((T2: Chapter 1,T1: Chapter 1 and 2)**	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
2	**Classification:** MNIST, training a Binary classifier, performance measure, multiclass classification, error analysis, multi label classification, multi output classification, **Training Models:**Linear regression, gradient descent, polynomial regression, learning curves, Regularized linear models, logistic regression **(T2:3 and 4)**	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
3	**Support Vector Machine:** linear, Nonlinear, SVM regression, **Decision Trees:**Training and Visualizing DT, making prediction, estimating class, the CART training, computational complexity, GINI impurity, Entropy, regularization Hyper parameters, Regression **(T2: Chapter 5(153-162) and 6**	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	

4	**Ensemble learning and Random Forest:** Voting classifiers, Bagging and pasting, Random patches and Random subspaces, Random forests, Boosting, stacking. **Dimensionality Reduction:**The course of dimensionality, Main Approaches for Dimensionality Reduction, PCA,Kernel PCA, and LLE. **(T2: Chapter 7, 8)**	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
5	**Unsupervised Learning**: Clustering: Introduction to clustering -K Mean, Limits of K-Mean, Using Clustering for Image Segmentation,using clustering for preprocessing, Using clustering for semi supervised learning. Gaussian Mixtures: Anomaly Detection Using Gaussian Mixtures, Selecting the Number of Clusters, Bayesian Gaussian Mixture Models, **End to end Project:**Working with Real Data, Look at the Big Picture,Get the Data, Discover and Visualize the Data to Gain Insights, Prepare the Data for Machine Learning Algorithms, Select and Train a Model, Fine-Tune Your Model, Launch, Monitor, and Maintain Your System **(T2:Chapter 9(235-255and 260-270), Chapter 2)**	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	

List of Experiments or Programs

Sl.No	Experiments/Programs	COs
1	Develop a program to Load a dataset and select one numerical column. Compute mean, median, mode, standard deviation, variance, and range for a given numerical column in a dataset. Generate a histogram and boxplot to understand the distribution of the data. Identify any outliers in the data using IQR. Select a categorical variable from a dataset. Compute the frequency of each category and display it as a bar chart or pie chart.	CO1
2	Demonstrate Preprocessing (Data Cleaning, Integration and Transformation) activity on suitable data: For example: Identify and Delete Rows that Contain Duplicate Data by considering an appropriate dataset. Identify and Delete Columns That Contain a Single Value by considering an appropriate dataset.	CO1
3	Develop a program to Load a dataset with at least two numerical columns (e.g., Iris, Titanic). Plot a scatter plot of two variables and calculate their Pearson correlation coefficient. Write a program to compute the covariance and correlation matrix for a dataset. Visualize the correlation matrix using a heatmap to know which variables have strong positive/negative correlations.	CO2
4	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file and show the output for test cases.	CO2
5	For a given set of training data examples stored in a .CSV file, implement and demonstrate	CO2

	the Candidate-Elimination algorithm. Output a description of the set of all hypotheses consistent with the training examples.	
6	Develop a program to demonstrate the working of Linear Regression and Polynomial Regression. Use Boston Housing Dataset for Linear Regression and Auto MPG Dataset (for vehicle fuel efficiency prediction) for Polynomial Regression.	**CO3**
7	Develop a program to load the Titanic dataset. Split the data into training and test sets. Train a decision tree classifier. Visualize the tree structure. Evaluate accuracy, precision, recall, and F1-score.	**CO3**
8	Develop a program to implement k-means clustering using Wisconsin Breast Cancer data set and visualize the clustering result.	**CO3**
Open ended Programs		
1	Build a simple ML model to classify iris flowers into species (Setosa, Versicolor, Virginica) based on their petal and sepal measurements. Basic Task: • Load the Iris dataset (comes built-in with scikit-learn). • Train a basic classification model like K-Nearest Neighbors (KNN). • Predict flower species from input measurements.	**CO4**
2	Develop a program to implement Principal Component Analysis (PCA) for reducing the dimensionality of the Iris dataset from 4 features to 2	**CO5**

Text Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Tom M. Mitchell, Machine Learning, McGraw-Hill Education, 2013
2	Aurelien Geron, Hands-on Machine Learning with Scikit-Learn &Tensor Flow, O'Reilly, Shroff Publishers and Distributors pvt.Ltd 2019

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Ethem Alpaydin, Introduction to Machine Learning, PHI Learning Pvt. Ltd, 2nd Ed.
2	T. Hastie, R. Tibshirani, J. H. Friedman, The Elements of Statistical Learning, Springer, 1st edition, 2001
3	Machine Learning using Python ,Manaranjan Pradhan, U Dinesh kumar, Wiley, 2019 4. Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, Pearson,2020

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

CO	Course Outcomes	RBT Level	Level Indicator
CO1	**Define, Understand** and **Explain** the concepts of machine learning	**Understand**	**L1/L2**
CO2	**Apply** the concepts of Machine Learning and classification methods for a given problem.	**Apply**	**L3**
CO3	**Analyze** the given problem and use appropriate Machine Learning concepts and SVM algorithm.	**Analyze**	**L4**

CO4	**Design** solution for given problem using appropriate Machine Learning methods like decision tree, ensemble methods and random forest.	**Design**	**L5**
CO5	**Create** and implement various clustering and Bayesian techniques to solve classification problems in machine learning.	**Create**	**L5**

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.drssridhar.com/?page_id=1053
2	Machine Learning Tutorials: https://www.geeksforgeeks.org/machine-learning/
3	Python for Machine Learning: https://www.w3schools.com/python/python_ml_getting_started.asp

CIE- Continuous Internal Evaluation (50 Marks)

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module-2-2.5	Module-2.5-3	Module-4	Module-5		
CO1	6	4	--	--	--	--	10	20%
CO2	4	6	--	--	--	--	10	20%
CO3	--	--	5	5	6	--	10	20%
CO4	--	--	--	--	4	4	10	20%
CO5	--	--	--	--	--	6	10	20%
Total	10	10	5	5	10	10	50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	5
Understand	5
Apply	10
Analyse	10
Evaluate	10
Design	10

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module-2-2.5	Module-2.5-3	Module-4	Module-5		
CO1	10	-	-	-	-	-	10	20%
CO2	-	10	-	-	-	-	10	20%
CO3	-	-	5	5	-	-	10	20%
CO4	-	-	-	-	10	-	10	20%
CO5	-	-	-	-	-	10	10	20%
Total	10	10	5	5	10	10	50	100%

Semester	:	**5th**				
Course Title	:	**Image processing and Computer vision**				
Course Code	:	**BAI502**				
Course Type (Theory/Practical/ Integrated)	:	**Theory**				
Category	:	**IPCC**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:2:0**		**SEE**	:	**50**
Total Hours	:	**40T+20P**		**SEE Duration**	:	**3**
Credits	:	**4**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To understand the fundamentals of computer vision and digital image processing
2	To introduce the processes involved image enhancement and restoration.
3	To facilitate the students to gain understanding color image processing and morphology
4	To impart the knowledge of image segmentation and object recognition techniques

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 -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	Digital Image Fundamentals: What is Digital Image Processing? Origins of Digital ImageProcessing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception: Structure of the Human, Image Formation in the Eye. Image Sensingand Acquisition: Image Acquisition Using a Single Sensor, Image Sampling and Quantization: Basic Concepts in Sampling and Quantization, Representing Digital Image. Text book 1: Chapter 1 and Chapter 2: Sections 2.1,2.3, 2.4]	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
2	Image Restoration and Reconstruction: A model of Image degradation/restoration process.Restoration in the presence of noise only: Mean Filters, Order-Statistic Filters, Adaptive Filter. Image Segmentation: Fundamentals, Point, Line and edge detection: Detection of Isolated Points, Line Detection, Edge Models, Basic Edge Detection,Thresholding Foundation & Basic global thresholding only, Segmentation by region growing & region splitting & merging. Text book 1 : Chap-5 (5.1, 5.3), Chap-10 (10.1 to 10.3.2, 10.4)	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
3	Color Image Processing: Color fundamentals, Colormodels:The RGB ColorModel,The CMY and CMYK Color Models.Pseudocolor image processing: Intensity Slicing ,Full color image processing, Color transformations:ColorComplements,Color Slicing ,Color image smoothing and sharpening, Using color in image segmentation:Segmentation in HSI Color Space ,RGB Vector Space . Text book 1: Chap-6 (6.1-6.7)	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
4	Morphological Image Processing: Preliminaries, Erosion and Dilation, opening and closing, Hit-or-miss transform, some basic morphological algorithms (Boundary extraction, Convex Hull) Feature Extraction: Background, Boundary pre-processing (Boundary following & Chain codes only). Text book 1: Chap -9 (9.1-9.5), Chap-11(11.1-11.2.2)	8

Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
5	Introduction: What is computer vision? A brief history. Image processing: More neighbourhood operators: Non-linear filtering and bilateral filtering, Fourier transforms, Pyramids and wavelets, Object detection: Face detection, Pedestrian detection, General Object detection. Video object tracking. Text book 2: Chap-1 (1.1, 1.2) Chap- 3 (3.3 - 3.5) chap-6 (6.3.1,6.3.2,6.3.3) chap 9 (9.4.4)	**8**
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	

Sl.No	**Experiments/Programs**	**Cos**
1	Contrast stretching of a low contrast image, Histogram, and Histogram Equalization.	**CO4**
2	Write a program to show rotation, scaling, and translation on an image.	**CO4**
3	Read an image and extract and display low-level features such as edges, textures using filtering techniques.	**CO4**
4	Implementation of Image Thresholding Techniques in Digital Image Processing	**CO4**
5	Analysis of images with different color models.	**CO4**
6	Image Segmentation Using Region Growing and Splitting Techniques.	**CO4**
	Mini Project on Computer Vision	
	Develop mini-projects involving real-time computer vision applications, demonstrating problem-solving and critical thinking skills.Chooseimini**project ideas like**Face Detection Using OpenCV, Color Detection Tool, Hand Gesture Volume Controller, Face Recognition Attendance System etc.	**CO4, CO5**
Open ended Programs		
1	Simulation and Display of an Image, Negative of an Image (Binary &Gray Scale)	**CO4**
2	Computation of Mean, Standard Deviation, Correlation coefficient of the given Image.	**CO4**

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Rafael C G., Woods R E. and Eddins S L, Digital Image Processing, Pearson, 4th edition, 2019
2	Richard Szeliski, Computer Vision: Algorithms and Applications (Texts in Computer Science), 2nd Edition, 2022, Springer.

Reference books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	David Forsyth and Jean Ponce, Computer Vision: A Modern Approach, 2nd Edition, Pearson, 2015.
2	ReinhardKlette, Concise Computer Vision - An Introduction into Theory and Algorithms, Springer, 2014.

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

COs	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Ability to Explain the fundamentals of computer vision and its applications.	Understand	**L1/L2**
CO2	Ability to Apply the image enhancement techniques for smoothing and sharpening of images.	Apply	**L3**
CO3	Ability to Analyze the different image restoration and segmentation techniques.	Analyze	**L4**
CO4	Ability to Design the smoothing and sharpening techniques for color images	Design	**L5**
CO5	Ability to Implement fundamental image processing operations such as filtering, edge detection, and morphological transformations using Modern tools .	Evaluate	**L5**

Weblinks and Video Lectures (e-Resources)	
1	Virtual Labs: https://cse19-iiith.vlabs.ac.in/
2	https://onlinecourses.nptel.ac.in/noc21_ee78/preview
3	Introduction to Machine Vision: https://www.youtube.com/watch?v=tY2gczObpfU
4	https://coral.ise.lehigh.edu/optml/files/2019/10/OptML_CV_tutorial_1_compressed.pdf

Mapping of Course Outcomes to Program Outcomes:

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

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

Evaluation(50Marks)

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

Analyse	10	10	--	--	10
Evaluate	--	--	50	--	10
Create	--	--	--	50	20

CIECourseAssessmentPlan

CO's	MarksDistribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module2to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	**10**	--	**-**	**-**	--	--	**10**	**20%**
CO2	--	**10**	**-**	**-**	--	--	**10**	**20%**
CO3	--	--	**5**	**5**	--	--	**10**	**20%**
CO4	--	--	**-**	**-**	**10**	--	**10**	**20%**
CO5	--	--	**-**	**-**	--	**10**	**10**	**20%**
Total	**10**	**10**	**5**	**5**	**10**	**10**	**50**	**100%**

SEE-SemesterEndExamination(50Marks)

Bloom's Category	SEE Marks (90%Theory+10%PracticalQuestions)
Remember	**5**
Understand	**5**
Apply	**10**
Analyse	**10**
Evaluate	**10**
Create	**10**

SEE Course Plan

CO's	MarksDistribution						Total Marks	Weightage
	Module-1	Module-2	Module2to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	**10**	--	**-**	**-**	--	--	**10**	**20%**
CO2	--	**10**	**-**	**-**	--	--	**10**	**20%**
CO3	--	--	**5**	**5**	--	--	**10**	**20%**
CO4	--	--	**-**	**-**	**10**	--	**10**	**20%**
CO5	--	--	**-**	**-**	--	**10**	**10**	**20%**
Total	**10**	**10**	**5**	**5**	**10**	**10**	**50**	**100%**

Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module2to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	--	-	-	--	--	10	20%
CO2	--	10	-	-	--	--	10	20%
CO3	--	--	5	5	--	--	10	20%
CO4	--	--	-	-	10	--	10	20%
CO5	--	--	-	-	--	10	10	20%
Total	10	10	5	5	10	10	50	100%

SEE-Semester End Examination(50Marks)

Bloom's Category	SEE Marks (90%Theory+10%PracticalQuestions)
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	10
Create	10

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module2to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	--	-	-	--	--	10	20%
CO2	--	10	-	-	--	--	10	20%
CO3	--	--	5	5	--	--	10	20%
CO4	--	--	-	-	10	--	10	20%
CO5	--	--	-	-	--	10	10	20%
Total	10	10	5	5	10	10	50	100%

PROFESSIONAL CORE COURSE (PCC)

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)

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**	
	Theory	Internal Assessment Test (IAT) - II	Module – 1 to 2.5	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	10	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE Theory					**50**	20	Total Marks of IAT and CCA is50

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)

DSATM

Semester	:	**5th**				
Course Title	:	**Computer Network and Simulation**				
Course Code	:	**BAI503**				
Course Type (Theory/Practical/Integrated/Project)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40T**		**SEE Duration**	:	**3 Hrs.**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Explain the fundamentals of data systems
2	Applications of various physical components & protocols
3	Identify and organize the communication systems network components
4	Design communication network systems for user requirements
5	Investigate various communications challenges using modern tools

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 -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	Introduction: Data Communications, Networks, Network Types, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, Introduction to Physical Layer: Transmission media, Guided Media, Unguided Media: Wireless. Switching: Packet Switching and its types. Textbook: Ch. 1.1 - 1.3, 2.1 - 2.3, 7.1 – 7.3, 8.3.	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
2	Data Link Layer: Error Detection and Correction: Introduction, Block Coding, Cyclic Codes. Data link control: DLC Services: Framing, Flow Control, Error Control, Connectionless and Connection Oriented, Data link layer protocols, High Level Data Link Control. Media Access Control: Random Access, Controlled Access. Check Sum and Point to Point Protocol Textbook: Ch. 10.1-10.4, 11.1 -11.4, 12.1 - 12.2	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using simulation**	
3	**The Network Layer:** Network Layer: Network layer Services, Packet Switching, IPv4 Address, IPv4 Datagram, IPv6 Datagram, Introduction to Routing Algorithms, Unicast Routing Protocols: DVR, LSR, PVR, Unicast Routing protocols: RIP, OSPF, BGP, Multicasting Routing-MOSPF Textbook: Ch. 18.1, 18.2, 18.4, 22.2,20.1-20.3, 21.3.2	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Simulation experiments**	
4	Introduction to Transport Layer: Introduction, Transport-Layer Protocols: Introduction, User Datagram Protocol, Transmission Control Protocol: services, features, segments, TCP connections, flow control, Error control, Congestion control. Textbook: Ch. 23.1- 23.2, 24.1-24.3.4, 24.3.6-24.3.9	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	

5	Introduction to Application Layer: Introduction, Client-Server Programming, StandardClientServer Protocols: World Wide Web and HTTP, FTP, Electronic Mail, NS2 simulator- Ping Message, Client Sever communication, Three nodes point – to – point network with duplex links. Textbook: Ch. 25.1-25.2, 26.1-26.6	**8**
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
	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 thinkingandenables creative problemsolving • **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	Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill,Indian Edition
2	Computer Networking A Top-Down Approach -James F. Kurose and Keith W. RossPearson Education 7th Edition.
Reference Books	
1	Computer-Networks- Andrew S. Tanenbaum and David J. Wetherall, Pearson Education, 5th-Edition. (www.pearsonhighered.com/tanenbaum)
2	Larry L Peterson and Brusce S Davie, Computer Networks, fifth edition, ELSEVIER

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Ability to **Define, Understand** and **Explain** the fundamentals of communication systems	**Understand**	**L1/L2**
CO2	Ability to **Apply**various physical components and protocols for a given problem	**Apply**	**L2**

CO3	Ability to**Analyze**and organize the communication systems network components	**Analyze**	**L3**
CO4	Ability to**Design**communication networks for user requirements	**Design**	**L4**
CO5	Ability to **Investigate** communication challenges and its solution using modern tools.	**Investigate**	**L5**

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.digimat.in/nptel/courses/video/106105183/L01.html
2	http://www.digimat.in/nptel/courses/video/106105081/L25.html
3	https://nptel.ac.in/courses/106105081
4	VTU e-Shikshana Program

CIE- Continuous Internal Evaluation (50 Marks)

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

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	10	--	15	--	--	35	70%
CO2	--	--	5	--	5		10	20%
CO3	--	--	--	--		5	5	10%
CO4	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--
Total	10	10	5	15	5	5	50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	5
Understand	5
Apply	10
Analyse	10
Evaluate	10
Create	10

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	5	5	--	--	--	--	10	20
CO2	5	--	3	2	--	--	10	20
CO3	--	5	3	2	--	--	10	20
CO4	--	--	--	--	5	5	10	20
CO5	--	--	--	--	5	5	10	20
Total	10	10	5	5	10	10	50	20

PROFESSIONAL ELECTIVE COURSE (PEC-1)

Dayananda Sagar Academy of Technology & Management
(Autonomous Institute under VTU)

Semester	**:**	**5th**				
Course Title	**:**	**Cloud Computing and Security**				
Course Code	**:**	**BAI504**				
Course Type (Theory/Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PCC**				
Stream	**:**	**AIML**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:0:0**		**SEE**	**:**	**50**
Total Hours	**:**	**40**		**SEE Duration**	**:**	**3 Hrs.**
Credits	**:**	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Describe the different fundamental concepts of cloud computing, virtualization, and cloud services
2	Make them understand the programming features in cloud.
3	Demonstrating the various cloud-based platforms
4	Showing off the various cloud services and virtualization architectures.
5	Demonstrate and make them understand the platforms for development of cloud applications.

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 asevaluating, 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 -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	Distributed System Models and Enabling Technologies: Scalable Computing Over the Internet, Technologies for Network Based Systems, System Models for Distributed and Cloud Computing, Software Environments for Distributed Systems and Clouds, Performance, Security and Energy Efficiency. **Textbook 1: Chapter 1: 1.1 to 1.5**	8
Pedagogy	**ICT Learning**	
2	Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structure/Tools and Mechanisms, Virtualization of CPU/Memory and I/O devices, Virtual Clusters and Resource Management, Virtualization for Data Center Automation. **Textbook 1: Chapter 3: 3.1 to 3.5**	8
Pedagogy	**ICT Learning**	
3	Cloud Platform Architecture over Virtualized Data centers: Cloud Computing and Service Models, Data Center Design and Interconnection Networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms: GAE, AWS and Azure, Inter-Cloud Resource Management. **Textbook 1: Chapter 4: 4.1 to 4.5**	8
Pedagogy	**ICT Learning**	
4	**Cloud Security:**Cloud Security Risks,Security: The Top Concern for Cloud Users, Privacy Impact Assessment, Trust, OS security, VM Security, Security of VirtualizationSecurity Risks Posed by Shared Images and Management OS, XOAR, A Trusted Virtual Machine Monitor. **Cloud Security and Trust Management:** Cloud Security Defense Strategies, Distributed Intrusion/Anomaly Detection, Data and Software Protection Techniques, Reputation-Guided Protection of Data Centers. **Textbook 2: Chapter 9: 9.1 to 9.11** **Textbook 1: Chapter 4: 4.6**	8
Pedagogy	**ICT Learning**	

5	Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, Parallel and Distributed Computing Paradigms, Programming Support for Google App Engine, Peer-to-Peer computing and Overlay Networks:Routing, Proximity and Fault Tolerance, Trust, Reputation and Security Management. **Textbook 1: Chapter 6: 6.1 to 6.3** **Textbook 1: Chapter 8: 8.3 and 8.4**	**8**
Pedagogy	**ICT Learning**	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Kai Hwang, Geoffrey C Fox, and Jack J Dongarra, Distributed and Cloud Computing, Morgan Kaufmann, Elsevier 2012
2	Dan C. Marinescu, Cloud Computing Theory and Practice, Morgan Kaufmann, Elsevier 2018
Reference Books	
1	Toby Velte, Anthony Velte, Cloud Computing: A Practical Approach, McGraw-Hill Osborne Media.
2	George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly Publication.
3	John Rhoton, Cloud Computing Explained: Implementation Handbook for Enterprises, Recursive Press.

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 fundamental concepts of cloud computing and key security challenges associated with cloud environments	**Understand**	**L1/L2**
CO2	**Apply** virtualization and cloud service models to solve real-world computing problems	**Apply**	**L3**
CO3	To **Analyze** the role of security aspects in cloud computing.	**Analyze**	**L4**
CO4	To **Design** cloud services and virtualization architectures incorporating best practices for identity management, encryption, and compliance.	**Design**	**L5**
CO5	**To Develop** secure cloud applications using popular cloud platforms	**Create**	**L6**

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=1N3oqYhzHv4
2	https://www.youtube.com/watch?v=RWgW-CgdIk0

CIE- Continuous Internal Evaluation (50 Marks)

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weigh tage
	Test -1			Test -2				
	Module-1	Module-2	Module-2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	10		15			35	70%
CO2			5		5		10	20%
CO3						5	5	10%
CO4							--	--
CO5							--	--
Total	10	10	5	15	5	5	50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	5
Understand	5
Apply	10
Analyse	10
Evaluate	10
Design	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	20
CO2	5		5			10	20
CO3		5	5			10	20
CO4				5	5	10	20
CO5				5	5	10	20
Total	10	10	10	10	10	50	20

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th**				
Course Title	:	**Data Science and Big Data**				
Course Code	:	**BAI504B**				
Course Type (Theory/Practical/Integrated/Project)	:	**Theory**				
Category	:	**PEC-1**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40T**		**SEE Duration**	:	**3Hrs.**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To provide a foundation in data Science terminologies.
2	To familiarize data science process and steps.
3	To Demonstrate the data visualization tools.
4	To analyze the data science applicability in real time applications.

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 -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**PREPARING AND GATHERING DATA AND KNOWLEDGE**: Philosophies of data science - Data science in a big data world - Benefits and uses of data science and big data - facts of data: Structured data, Unstructured data, Natural Language, Machine generated data, Audio, Image and video streaming data - The Big data Eco system: Distributed file system, Distributed Programming framework, Data Integration frame work, Service programming and Security. **Textbook 1: Ch 1.1 to 1.4-1.4.1,1.4.2,1.4.3,1.4.9,1.4.10**	8
Pedagogy	**ICT Based Learning**	
2	**THE DATA SCIENCE PROCESS** : Overview of the data science process- defining research goals and creating project charter, retrieving data, cleansing, integrating and transforming data, exploratory data analysis, Build the models, presenting findings and building application on top of them. **MACHINE LEARNING:** Application for machine learning in data science- Tools used in machine learning. **Textbook 1: Ch 2-2.1,2.2,2.3,2.4,2.5,2.6,2.7 ,Ch 3.1**	8
Pedagogy	**ICT Based Learning**	
3	**Handling large data on a single computer :**The problems you face when handling large data, General techniques for handling large volumes of data, General techniques for handling large volumes of data, **Case study 1:** Predicting malicious URLs. **Case study 2:** Building a recommender system insidea database. **Textbook 1: Ch4-4.1,4.2,4.3,4.4,4.5**	8
Pedagogy	**ICT Based Learning**	

4	**Escalating Need for Strategic Information**, Failures Of Past Decision-Support Systems, Operational Versus Decision-Support Systems, Data warehousing—The Only Viable Solution, Data Warehouse Defined. The Data warehousing Movement, Evolution of Business Intelligence Data Warehouse: **The Building Blocks:** Defining Features, Data Warehouses and Data Marts, Architectural Types, Components: Source Data Component, Data Staging Component, Data Storage Component, Information Delivery Component, Metadata Component, Management and Control Component, Metadata In The Data Warehouse. **Text Book 2: Chapter 1 , 2 (Page No:4 – 42)**	**8**
Pedagogy	ICT Based Learning	
5	**Planning And Project Management:** Planning Your Data Warehouse, The Data Warehouse Project, The Development Phases, The Project Team, Project Management Considerations Defining **The Business Requirements:** Dimensional Analysis, Information Packages: Requirements Not Fully Determinate, Business Dimensions, Dimension Hierarchies and Categories, Key Business Metrics Or Facts, Requirements Gathering Methods, Data Sources, Data Transformation, Data Storage, Information Delivery, Information Package Diagrams. Requirements As The **Driving Force For Data warehousing:** Data Design , The Architectural Plan , Data Storage Specifications , Information Delivery Strategy **Text Book 2: Chapter 4, 5,6 (74-136)**	**8**
Pedagogy	**ICT Based Learning**	
	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	Introducing Data Science, Davy Cielen, Arno D. B. Meysman and Mohamed Ali,Manning Publications, 2016.
2	Data Warehousing Fundamentals for IT Professionals, Second Edition, PAULRAJ PONNIAH, Wiley 2010
Reference Books	
1	Doing Data Science, Straight Talk from the Frontline, Cathy O'Neil, Rachel Schutt, O' Reilly, 1st edition, 2013.
2	Mining of Massive Datasets, Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, Cambridge University Press, 2nd edition, 2014.

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Understand** various data science terminologies	Remember/ Understand	L1/L2
CO2	**Apply** the Data Science process on real time scenario.	Apply	L3
CO3	**Analyze** data visualization tools	Analyze	L4
CO4	**Design** a business intelligence report using data visualization tools	Design	L5
CO5	**Evaluate** Data storage and processing with frameworks.	Create/ Investigate	L6

Mapping of Course Outcomes to Program Outcomes:

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

CO5	-	-	-	**3**	-	-	-	-	**2**	**2**	-	-	**1**	**-**	**-**

Weblinks and Video Lectures (e-Resources)	
1	https://www.simplilearn.com/tutorials/data-science-tutorial/what-is-data-science
2	https://www.youtube.com/watch?v=N6BghzuFLIg
3	https://www.coursera.org/lecture/what-is-datascience/fundamentals-of-data-science-tPgFU

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	**-**	**-**
Apply	15	20	**-**	**-**
Analyze	15	20	20	10
Evaluate	-	-	15	20
Create	-	-	15	20

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	**4**	**3**	**3**	**-**	**-**	**-**	**10**	**20%**
CO2	**6**	**6**	**-**	**2**	**-**	**-**	**14**	**30%**
CO3	**-**	**-**	**3**	**2**	**4**	**4**	**13**	**24%**
CO4	**-**	**-**	**-**	**-**	**4**	**3**	**07**	**14%**
CO5	**-**	**-**	**-**	**-**	**3**	**3**	**06**	**12%**
Total	**10**	**9**	**6**	**4**	**11**	**10**	**50**	**100%**

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	12
Understand	13
Apply	15
Analyse	10
Evaluate	--
Create	--

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	3	2	3	-	2	2	12	24%
CO2	3	3	-	3	2	2	13	26%
CO3	--	--	5	-	5	5	15	30%
CO4	--	--	-	1	2	2	5	10%
CO5	--	--	-	-	2	3	5	10%
Total	6	5	8	4	13	14	50	100%

PROJECT BASED LEARNING (PBL)

PBL- Project Based Learning

Teaching Hours/Week (L: T:P:S)	0:0:2:4
Total Hours of Pedagogy	25 hours – Theory + Project
Credits:	03
Modules	5
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Project Evaluation

2 Credit Course – Project (PBL)	
	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). The minimum passing mark for the SEE is 35% of the maximum Marks (18 Marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 Marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together. **Continuous Internal Evaluation (CIE):** The CIE Marks for the internal assessment test shall be 50 **Marks**. **Internal Assessment test:** Continuous Internal Evaluation (CIE): CIE marks for the project are 50 Marks. • Students must complete a certification from Infosys Springboard. This will be evaluated for 25 marks. • Project weekly assessment in phase – 1 and phase – 2 will be evaluated for 50 marks which will be scaled down to 25 marks. • Each project will be evaluated weekly for 50 marks and the rubrics for the evaluation includes project understanding, technical competence, innovation, problem solving and project demonstration. • The marks scored in project weekly assessment shall be scaled down to 25 marks. • The Sum of final project weekly assessment and marks of the Infosys Springboard certification is the total CIE marks scored by the student **Semester End Examination (SEE):** • SEE will be evaluated for 100 marks and will be scaled down to 50 marks. • Write-up of the project will be evaluated for 10 marks. • Project demonstration and evaluation will be evaluated for 50 marks. • Project report will be evaluated for 25 marks. • Viva-voce will carry 15 marks. • The marks scored shall be scaled down to 50 marks

	CIE		SEE	
Certification	**Infosys Springboard Certification**	25 Marks		
Project Weekly Assessment				
Project	**Project Understanding**	05 Marks	**Writeup**	10 Marks
	Technical Competence	10 Marks	**Presentation& Demonstration**	50 Marks
	Innovation	10 Marks	**ProjectReport**	25 Marks
	Problem Solving	15 Marks	**Viva-Voce**	15 Marks
	Project Demonstration	10 Marks	**Total**	**100 Marks**
Project weekly assessment 50 Marks will be reduced to 25 Marks				
TotalCIE (Certification + Project Weekly Assessment)		**50 Marks**	**Total SEE : 100 Marks Reduced to 50 Marks**	

1. Introduction

Project Based Learning is a model for classroom activity that shifts away from the classroom practices of short, isolated, teacher-centered lessons and instead emphasizes learning activities that are long-term, interdisciplinary, and student-centered.

A systematic teaching method that engages students in learning essential knowledge and life-enhancing skills through an extended, student-influenced inquiry process structured around complex, authentic questions and carefully designed products and tasks.

Project learning, also known as project-based learning, is a dynamic approach to teaching, in which students explore real-world problems and challenges, simultaneously developing cross-curriculum skills while working in small collaborative groups.

2. Characteristics of Project-Based Learning:

- Students making decisions within a framework

• A problem or challenge to be solved;

• Students designing the process for reaching a solution

• Students gathering and managing information

• Continuous Evaluation

• Students regularly reflecting on the process

• A final product to be evaluated for quality

• An atmosphere that tolerates error and change

3. Purpose

- Introducing project-based learning on the curriculum.
- To help students to gain in-depth knowledge of the subject vivaproject.
- During this process, students will be able to learn and understand the various stages of projectdevelopment.

4. Objectives

- Introducing mini project based on the curriculum.
- Develop in depth knowledge of the topic and technology.
- Use critical thinking skills and make real world connections
- Demonstrate and understand through products.
- Industry and concept-oriented learning.

5. Why Incorporate PBL?

- Promotes collaboration and interaction
- Learners communicate meaningfully and for authentic purposes
- Allows students with a variety of learning styles to demonstrate their acquired knowledge
- Students learn language, content, and skills simultaneously

- Increases learner autonomy
- Provides opportunities for students to pursue their own interests and questions and make decisions about how theywill find answers and solve problems.
- Improves education for all students Facilitates student integration of the content of different subjects
- Teaches children to use their own minds well and applies what they learn in school to life-long endeavours.
- Helps students to become technologically literate
- Establishes connections to life outside the classroom, addressing real-world concerns, and developing real-world skills
- Skills learned through PBL are those desired by today's employers.

6. Benefits of PBL

- Offers multiple ways for students to participate and to demonstrate their knowledge.
- Accommodates different kinds of intelligences.
- Shifts students away from doing only what they typically do in a classroom Environment.
- Encourages the mastery of technological tools, thus preparing them for the workforce.
- Serves as a medium for students who don't usually participate.
- Prompts students to collaborate while at the same time support self-directed learning.
- Offers a learning experience that draws on the thinking and shared efforts of several individuals.
- Helps students develop a variety of social skills relating to group work and negotiation.
- Promotes the internalization of concepts, values, and modes of thought, especially those related to cooperation and conflict resolution.
- Establishes a supportive and non-competitive climate for students.
- Provides a means for transferring the responsibility for learning from teachers to students.
- Calls upon students to explain or defend their position to others in their project groups, so that learning is more apt to be personalized and valued.

7. Process

- Project batches will be formed after the commencement of 3rdsemester.
- The Students Batch Comprising of 4 members in a batch should be formed by the Project Based Learning co-ordinator.
- Each Semester consists of 16 Weeks of Project based Learning.
- The Level of the Projects to be identified.

  Level 1- 2nd Year – 3rd Semester & 4th Semester

  Level 2- 3rd year – 5th Semester & 6th Semester

  Level 3 – Final Year Project
- The Faculty handling the respective Theory Subject will be the PBL Coordinator and all the three Batches to be handled by the PBL Coordinator with additional faculty.
- The List of Project Batches to be identified by the faculty assigned in consultation with HOD.
- The batch can select any topic from the list circulated by the PBL Coordinator
- The details of students Interaction with the guide shall be maintained by the guide in the prescribed format.
- The Students Project should be continuously evaluated and PBL Coordinator should submit weekly report to the HOD.
- The Rubrics for the PBL should be followed.
- The Students batches shall give the presentation on understanding of the topic and plan for implementation.
- The Evaluation of the Projects is done in Two Phases

7.1 Two phases for Assessment

Phase 1:

1. Phase 1 is for 4 weeks

2**.** During this phase, the students shall discuss about the Objectives, Literature Survey and plan for projectexecution.

Phase 2:

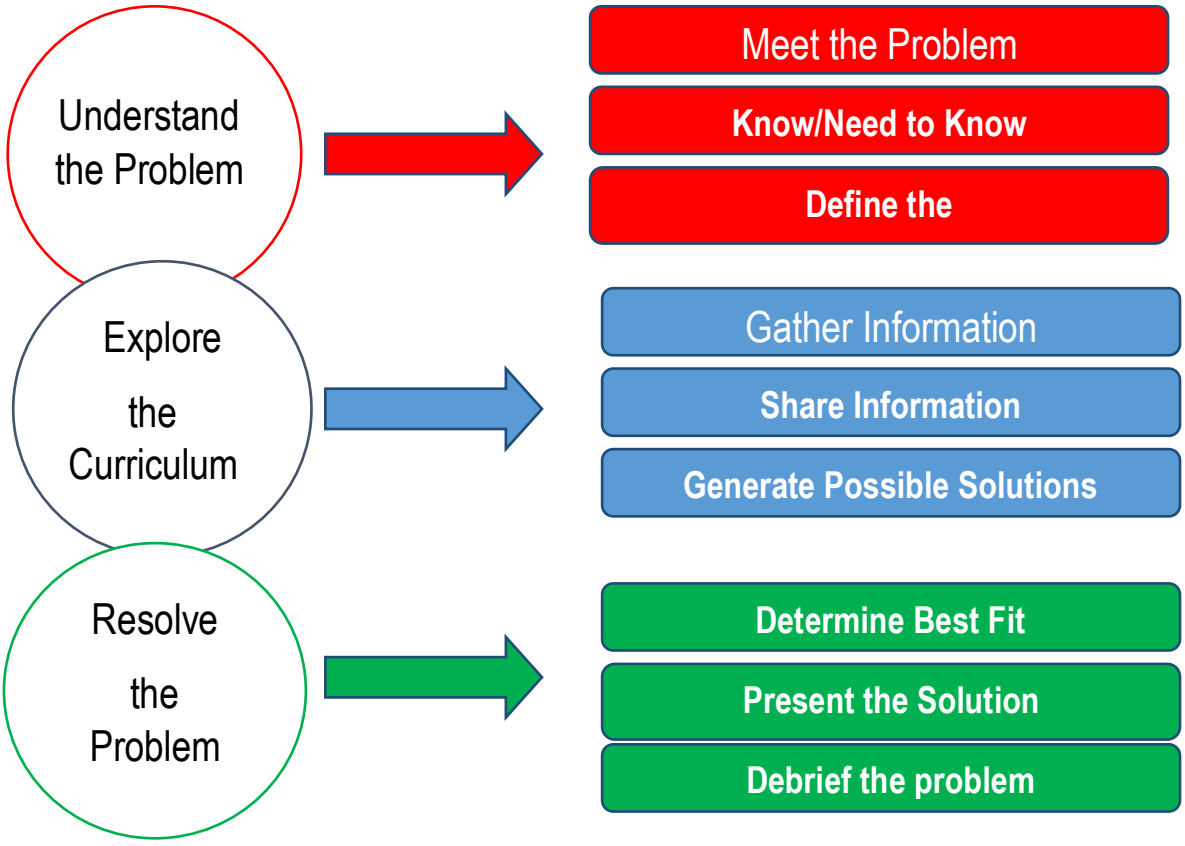
1. Phase 2 is for 6 Weeks

2**.** During this phase, the students shall carry out the project under regular supervision of the guide/subject expert, Implementation and give final presentation/demonstration with projectdocuments.

The marks distribution for PBLWork:

1. Phase 1 –25 Marks
2. Phase 2 – 25 Marks

8. PBL Teaching and Learning Template



9.Practice

- Every week 3 hour is exclusively dedicated to Project Based Learning.
- Assess their progress until they resolve the problem and summarise their learning.
- Provide opportunities for in-depth investigations of worthy topics.
- Allow learners to become more autonomous as they construct personally-meaningful artefacts that are representations of their learning.
- Motivate students by engaging them in their own learning. PBL affords students opportunities for development.
- Building communication, technical and management skills.

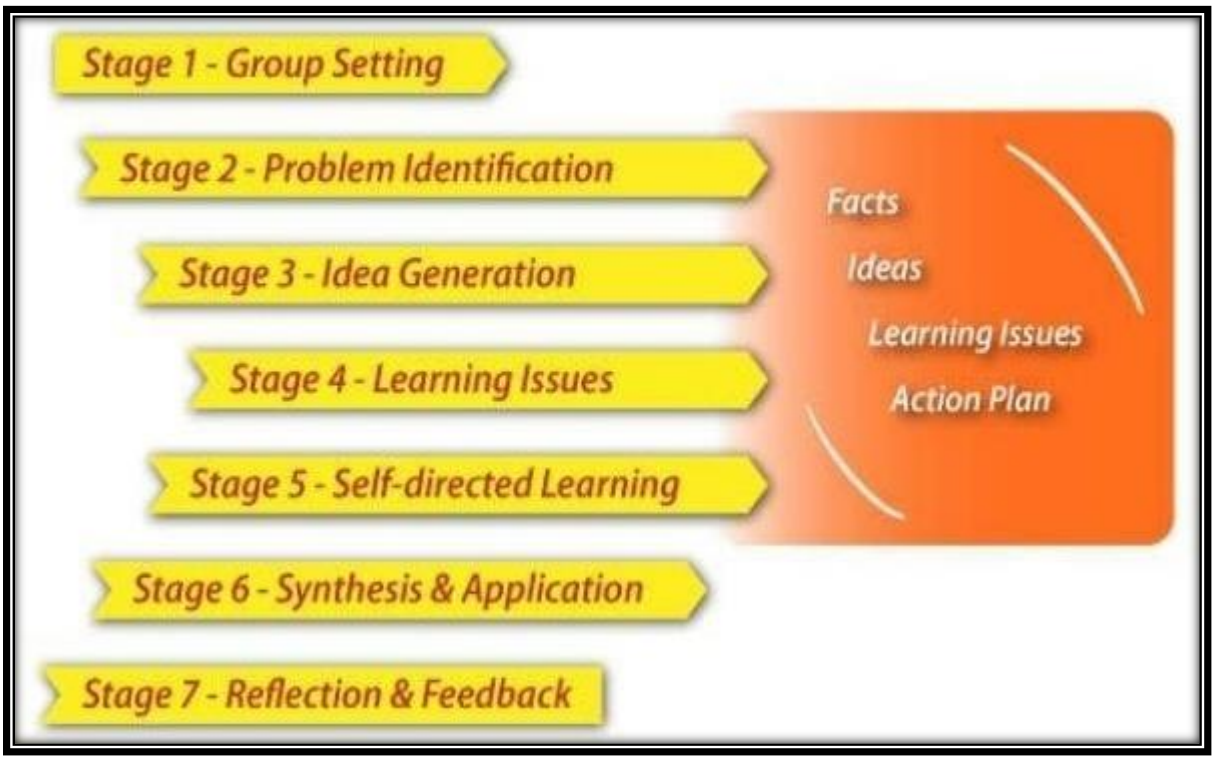
9. Obstacles/Gaps

- Lack of student's interest
- Lack of assessment
- Lack of Basic knowledge
- Lack of consistence attendance and monitoring.
- Lack of abundant time allotment and time management

10. How to Overcome?

- Periodic process – stage wise assessment has to be done.
- Basic Knowledge- A complete guidelines and videos will be provided by the faculty who is handling the respective subject and allotted guide.
- Regular evaluation and periodic monitoring is done by 2 stages.
- For Successful execution and demonstration of end-to-end system, exclusive 3hr/week project time is allotted.

11. Block diagram of PBL



12. Impact Analysis

- It encourages students to draw on their own creativity on problem solving and they learn the bridge gap between theory andpractice.
- Final products resulting from project-based learning can be shared with the department at large, thus fostering ownership and technically strong with the subject scenario.

13. PBL – Guidelines

The guidelines are for successful completion of the project and to facilitate effective and uniform conduction of projects by the students. It is expected that these guidelines will help in overall improvement in the quality of the project.

14.1 Main phases of the project

Sl.No	Topics	Duration
1.	**Theory & Practical**	**5 weeks**
Phase-1		
2.	Understanding of the project and preparing a project plan	**6thWeek**
3.	Literature review	**7th and 8thWeek**
4.	Planning	**9thWeek**
Phase-2		
5.	Analysis and Design	**10thWeek**
6.	Implementation	**11th, 12th, and13th Week**
7.	Testing	**14thWeek**
8.	Writing the project report	**15thWeek**
9.	Assessment	**16th Week**
	Total	**16 Weeks**

14.2 Final Presentation Structure

1. Title of the project &BatchInformation
2. Agenda /Topics
3. Problem Statement / ProjectDefinition
4. Background / LiteratureReview
5. Methodology
6. Analysis andDesign
7. Implementation
8. Testing
9. Conclusion and Scope for FutureWorks

14.3 Project Based Learning Report Structure

1. CoverPage
2. Certificate
3. Declaration
4. Acknowledgement
5. Table ofContents
6. List ofTables
7. List ofFigures
8. Introduction
9. Background / LiteratureReview
10. Methodology /Solution
11. Analysis andDesign
12. Implementation
13. Results
14. Conclusion and FutureWorks
15. Bibliography /References
16. Appendices

14. Guidelines to prepare the Project report

- Project reports should be typed neatly only on one side of the paper with 1.5 or double line

spacing on a A4 size bond paper (210 x 297mm).

- The margins should be: Left – 1.25", Right – 1", Top and Bottom –0.75".
- The total number of reports to be preparedare
    - One copy to thedepartment.
    - One copy to the concernedguide
    - One copy to thecandidate.
- Before taking the final printout, the approval of the concerned guide is mandatory and suggested corrections, if any, must beincorporated in the Final Report.
- For making copies dry tone Xerox issuggested.
- Anabstract(synopsis)notexceeding100words,indicatingsalientfeaturesofthework.

15. Outcome of the project

- Students will gain the knowledge and understand
- To think creatively, work collaboratively.
- Solve complex problems using digital technology.
- Students learn and desire to engage continuous gain about knowledge such as design, analysis, development, implementation and testing.
- Strong written communication skills and the ability to write technical documents that include specification, design, and implementation of a mini project.

Project-Based Learning Rubric

Score Levels	Content	Conventions	Organization	Presentation
5	▪ Is well thought out and supports the solution to the challenge or question ▪ Reflects application of critical thinking ▪ Has clear goal that is related to the topic ▪ Is pulled from a variety of sources ▪ Is accurate	▪ No spelling, grammatical, or punctuation errors ▪ High-level use of vocabulary and word choice	▪ Information is clearly focused in an organized and thoughtful manner. ▪ Information is constructed in a logical pattern to support the solution.	▪ Multimedia is used to clarify and illustrate the main points. ▪ Format enhances the content. ▪ Presentation captures audience attention. ▪ Presentation is organized and well laid out.
4	▪ Is well thought out and supports the solution ▪ Has application of critical thinking that is apparent ▪ Has clear goal that is related to the topic ▪ Is pulled from several sources ▪ Is accurate	▪ Few (1 to 3) spelling, grammatical, or punctuation errors ▪ Good use of vocabulary and word choice	▪ Information supports the solution to the challenge or question.	▪ Multimedia is used to illustrate the main points. ▪ Format is appropriate for the content. ▪ Presentation captures audience attention. ▪ Presentation is well organized.

3	▪ Supports the solution ▪ Has application of critical thinking that is apparent ▪ Has no clear goal ▪ Is pulled from a limited number of sources	▪ Minimal (3 to 5) spelling, grammatical, or punctuation errors ▪ Low-level use of vocabulary and word choice	▪ Project has a focus but might stray from it at times. ▪ Information appears to have a pattern, but the pattern is not consistently	▪ Multimedia loosely illustrates the main points. ▪ Format does not suit the content. ▪ Presentation does not capture audience attention.
2	▪ Provides inconsistent information for solution ▪ Has no apparent application of critical thinking ▪ Has no clear goal ▪ Is pulled from few sources ▪ Has significant factual errors, misconceptions, or misinterpretations	▪ More than 5 spelling, grammatical, or punctuation errors ▪ Poor use of vocabulary and word choice	▪ Content is unfocused and haphazard. ▪ Information does not support the solution to the challenge or question. ▪ Information has no apparent pattern.	▪ Presentation appears sloppy and/or unfinished. ▪ Multimedia is overused or underused. ▪ Format does not enhance e content. ▪ Presentation has no clear organization.

Subject Identified for Project Based Learning

Semester	5th
Subject Identified for PBL	Generative AI for Images
Prerequisite	Python Programming, Computer Vision and its Applications
Justification for the selected subject	Industry Oriented
List of possible projects	1. AI-Powered Art Generator 2. Style Transfer App 3. Image Upscaler

Signature of the Guide **Signature of HOD**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th**				
Course Title	:	**Generative AI applications**				
Course Code	:	**BAI505**				
Course Type (Theory/Practical/Integrated/Project)	:	**Project**				
Category	:	**PBL**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**0:2:0:4**		**SEE**	:	**50**
Total Hours	:	**10 Theory + 14 Project**		**SEE Duration**	:	**3 Hrs.**
Credits	:	**03**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand various methods for image generation using AI models.
2	Implement auto encoders, GANs, and diffusion models for image synthesis.
3	Build mini-projects demonstrating applications of image generation.
4	Utilize APIs and pre trained models for advanced image synthesis.
5	Train and develop deep learning models for generating and modifying images for real-world applications with Generative AI models.

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)**.

Scheme of Teaching and Examinations for BE Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

DSATM

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Basics of Image Processing** • Introduction to images as data: pixels, color spaces. • Image reading, displaying, writing using OpenCV. • Filters: smoothing, sharpening, noise removal. • Histogram analysis and contrast enhancement.	2
Pedagogy	**ICT Based Learning**	
2	**Deep Learning Foundations** • Basics of CNNs, convolution, pooling and activation functions for image processing. • Image classification using simple CNN models. • Regularization and dropout • Data augmentation for robust models -flipping, rotation, cropping, normalization	2
Pedagogy	ICT Based Learning	
3	**Introduction to Generative Models** • What are generative models? Applications in vision • Auto encoders: architecture, encoding-decoding • Denoising Auto encoders • Variational Auto encoders (VAEs): KL divergence, re parameterization trick • Implementing simple VAEs in Tensor Flow/PyTorch	2
Pedagogy	ICT Based Learning	
4	**Generative Adversarial Networks (GANs)** • GAN architecture: generator vs discriminator • Loss functions and training instability • Build a basic GAN to generate digits (MNIST) • Deep Convolutional GAN (DCGAN): convolutional generator and discriminator • Conditional GANs (cGANs): generating class-specific images	2

Pedagogy	ICT Based Learning	
5	**Diffusion Models** • Motivation and intuition behind diffusion models • Forward and reverse diffusion processes • Denoising Diffusion Probabilistic Models (DDPM) • Training a basic diffusion model for simple datasets • Overview of Stable Diffusion, DALL·E, Imagen	**2**
Pedagogy	**ICT Based Learning, Introduction to 1 framework**	
	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	

Sl. No.	Mini Projects(To be developed using MCP)	COs
1	• Apply Gaussian blur and edge detection • Enhance contrast using histogram equalization	**CO4**
2	Build and evaluate a robust classifier using augmented data	**CO4**
3	Image reconstruction using Auto encoder and VAE	**CO4**
4	Generate handwritten digits using GAN - Color image generation using DCGAN	**CO4**
5	Use pre trained diffusion models via Hugging Face or CompVis APIs	**CO4**
Open ended Programs		
1	Neural Style Transfer with VGG-based models	**CO4**
2	Image inpainting with GANs (e.g., partial occlusion filling)	**CO4**
3	Text-to-Image generation using Stability AI or OpenAI APIs	**CO4**
4	Text-to-image generation tool - Cartoonify faces using cGAN - Build your own diffusion-based image generator	**CO4**

Text Books

Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	**Deep Learning** by Ian Goodfellow, YoshuaBengio and Aaron Courville. MIT Press

2	**"Programming Computer Vision with Python"**byJan Erik Solem, O'Reilly Media
3	**"Hands-On Image Generation with TensorFlow"**by Soon Yau Cheong, Packt Publishing
Reference Books	
1	**"GANs in Action: Deep learning with Generative Adversarial Networks"**by Jakub Langr, Vladimir Bok, Manning Publications
2	**"Deep Learning with Python" (2nd Edition)**by François Chollet (creator of Keras), Manning Publications

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Understand** various methods for image generation using AI models.	Understand	L1/L2
CO2	**Apply** autoencoders, GANs, and diffusion models for image synthesis.	Apply	L3
CO3	Analyze mini-projects demonstrating applications of image generation.	Analyse	L4
CO4	**Design** APIs and pretrained models for advanced image synthesis.	Design	L5
CO5	Train and **evaluate**deep learning models for generating and modifying imagesfor real-world applications with Generative AI models.	Evaluate	L5

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	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	-	3	-	-	1	-	-	-	-	-	-	-	-	-	2
CO4	-	-	3	-	2	-	-	-	2	2	-	-	-	2	2

CO5	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**2**	**2**	**-**	**2**	**-**	**3**	**3**

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=8L11aMN5KY8
2	https://www.coursera.org/specializations/deep-learning
3	https://www.youtube.com/watch?v=0VH1Lim8gL8

Project Based Learning - Batch

From, **Date:**

Name: & USN:

Name: & USN:

Name: & USN:

Name: & USN:

Semester:

RespectedSir/Madam,

Sub: Regarding PBL Batch

With respect to the above subject, we are the students mentioned above would like to form the batch for carrying out the mini project on…….

Thanking you, Yours faithfully

Sl. No.	Name of the student	Signature
1.		
2.		
3.		
4.		

Signature of the Guide

Name of the Guide

Designation,Department

Dayananda Sagar Academy of Technology & Management
(Autonomous Institute under VTU)

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

Project Based Learning – Student(s) – Guide – Interaction

Date		
PBL Batch No.		
Title of the project		
Week No.		
Content of the Discussion		
Suggestion by the guide		
Name of Signature of students		

Signature of the Guide **Signature of PBL Coordinator** **Signature of HOD**

Project Based Learning – Continuous Evaluation

Batch No.	Name	USN	Marks assigned	Remarks by the guide on the progress of the project

Signature oftheGuide **SignatureofPBLCoordinator** **Signature ofHOD**

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(CSE, ISE, ECE, EEE, MECH, CV)

Project Based Learning –Review

Batch No.	Name of the Student	USN	Infosys Springboard Certification (25 Marks)	Phase I (25Marks)		Phase II (25 Marks)			Final CIE Marks (Certification (25Marks) + Phase I & Phase II (50 Marks reduced to 25 Marks)) (50 Marks)
				Project understanding (05 Marks)	Technical Competence (10 Marks)	Innovation (10 Marks)	Problem Solving (15 Marks)	Project Demonstration (10 Marks)	

Signature of the Guide **Signature of PBLCoordinator** **Signature of HOD**

Project Based Learning Outcomes

Sl.No	Batch No.	Name of Students	USN	Domain	Outcomes

PROFESSIONAL CORE COURSE LABORATORY (PCCL)

Dayananda Sagar Academy of Technology &Management

(Autonomous Institute under VTU)

Semester	:	**5th**				
Course Title	:	**Mobile application development**				
Course Code	:	**BAIL506**				
Course Type (Theory / Practical /Integrated /Project)	:	**Practical**				
Category	:	**PCCL**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours /week(L:T:P:S)	:	**0:0:2:0**		**SEE**	:	**50**
Total Hours	:	**28**		**SEE Duration**	:	**2 Hrs**
Credits	:	**02**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To introduce basics of Flutter platform for progressive app development
2	To gain knowledge on user interface support in Flutter.
3	To learn various programming elements required for app development.
4	To develop progressive applications with flutter.

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 **Project-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)**.

SI.NO	Experiments
1	Develop an application using Flutter to print “Hello world and Hello Flutter”.
2	Develop an application using Flutter to Increment and Decrement Numbers (Counter App).
3	Develop Login Screen Application.
4	Develop a “To-do List” Application.
5	Develop Calculator Application.
6	Develop an application to Check the Weather in Countries Across the world (Weather app)
7	Develop a “Stopwatch” application using Flutter
8	Develop an application that Navigate from one Screen to another (Seamless navigation).
9	Develop Basic E-commerce UI Application.
10	Develop an application to implement Animates Logo.
11	Develop an application that tracks our daily Expenses and get a report chart.
12	Develop an application to Play Quiz and get the Score Board.
	Open Ended Programs
1	Write a program to enter Medicine Name, Date and Time of the Day as input from the user and store it in the SQLite database. Input for Time of the Day should be either Morning or Afternoon or Eveningor Night. Trigger an alarm based on the Date and Time of the Day and display the Medicine Name.
2	Develop as implementation application with one EditText so that the user can write some text in it.Create a buttoncalled“ConvertTexttoSpeech”thatconvertstheuserinputtextinto voice.
	Text Books:
	1. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference”, Google Developer Training Team, 2017. https://www.gitbook.com/book/google-developer-training/android-developerfundamentals-course-concepts/details (Download pdf file from the above link)
	Weblinks and Video Lectures (e-Resources)
	• https://flutter.dev/ • https://developers.google.com/learn/pathways/intro-to-flutter • https://github.com/flutter/flutter

	• https://www.geeksforgeeks.org/flutter-tutorial/ • https://www.tutorialspoint.com/flutter/index.htm
	Conduct of Practical Examination:
	Continuous Internal Evaluation (CIE): CIE marks for the practical course are 50 Marks. The split-up of CIE marks for record/ journal and test are in the ratio 60:40. ● Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session. ● Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks. ● Total marks scored by the students are scaled down to 30 marks (60% of maximum marks). ● Weightage to be given for neatness and submission of record/write-up on time. ● Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus. ● In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce. ● The suitable rubrics can be designed to evaluate each student's performance and learning ability. ● The marks scored shall be scaled down to 20 marks (40% of the maximum marks). The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.
	SEE marks for the practical course are 50 Marks. ● All laboratory experiments are to be included for practical examination. ● (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. OR based on the course requirement evaluation rubrics shall be decided jointly by examiners. ● Students can pick one question (experiment) from the questions lot prepared by the examiners jointly. ● Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. ● General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in - 60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners) Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero. The minimum duration of SEE is 02 hours

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

CO's	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the fundamentals of mobile application development platforms, tools, and architecture.	Understand	L1/L2
CO2	Apply debugging, testing, and performance optimization techniques for mobile applications.	Apply	L3
CO3	Integrate mobile apps with cloud services and backend APIs for dynamic functionality.	Analyze	L4
CO4	Design user interfaces for mobile applications using modern UI/UX design principles.	Design	L5
CO5	Develop and deploy mobile applications using popular frameworks such as Android Studio/ React Native/ Flutter.	Evaluate	L5

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	3	3	3	2	2	--	--	--	2	2	--	--	1	1	1
CO5	2	3	2	3	2	--	--	--	2	2	--	--	1	1	1

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th Semester**				
Course Title	:	**Environmental Studies and E-Waste Management**				
Course Code	:	**BESK508**				
Course Type (Theory/Practical/Project/Integrated)	:	**Theory**				
Category	:	**HSMS**				
Stream	:	**All Branches**		**CIE**	:	**50**
Teaching hours/week(L:T:P:S)	:	**2:0:0:0**		**SEE**	:	**50**
Total Hours	:	**15**		**SEE Duration**	:	**1 Hrs.**
Credits	:	**2**				

Course Learning Objectives : Students will be able to:

Sl. No	Course Objectives
1	**To introduce** students to the fundamental concepts of the environment, ecosystems, and biodiversity, emphasizing their interdependence and significance in sustaining life.
2	To identify the causes, effects, control measures major challenges of pollution of environmental problems and e-waste management.
3	To provide guidance on developing skills, and demonstrate socio-economic skills for Environmental protection e-waste management.

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.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- 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)**.

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Scheme of Teaching and Examinations for BE Programme-2025 - 26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSECURRICULUM

Contents:

Module No.	Topics	Hours
1	**Environment and Sustainability**: **Environment &Ecosystem:** Components of the environment, Ecosystems: Structure and Function, Types: Forest, Wetlands, River, Oceanic and Lake ecosystem. **Sustainability**: 17SDG targets and possible actions. Self-Study Component (SSC): Biodiversity: Types, Values, and Conservation of biodiversity.	3
Pedagogy	Chalk and talk, PowerPoint presentation and animation tools	
2	**Natural resources and Energy:** Natural Resources: Water resources – Availability & Quality aspects, Water borne diseases & Fluoride problem in drinking water. Energy: Different types of energy, Wind Energy, Hydrogen as an alternative energy. Self-Study Component (SSC): Conventional sources &Non -Conventional sources of Energy, Solar energy	3
Pedagogy	Chalk and talk, PowerPoint presentation , Videos, Case studies	
3	**Environmental Pollution and Global Environmental Issues** Environmental Pollution: Water Pollution, Noise pollution, Air pollution (Sources, Impacts, Preventive measures, Case studies, Relevant Environmental Acts) Global Environmental Issues: Acid Rain, Ozone Depletion, Global warming and Ground water depletion. Self-Study Component (SSC): Case studies of air pollution episodes.	3
Pedagogy	PowerPoint presentation, Videos and Case studies.	
4	**Waste management & Environmental Legislation:** Waste management: Solid Waste Management, types and sources, Biomedical Waste Management - Sources, Characteristics, Environmental Legislation: Water Act 1974, Air Act 1981, Environmental Protection Act 1984	3

	Solid Waste Management Rules,2016, Biomedical Waste Management Rules, 2016. Self-Study Component (SSC): Case studies on waste management options	
Pedagogy	PowerPoint presentation, Seminar, Demonstration Videos	
5	**E - Waste Management** E- waste: Composition and generation, Global context in e- waste; E-waste pollutants, E waste hazardous properties, Effects of pollutant (E- waste) on human health and surrounding environment. Component of E waste management. E-waste (Management and Handling) Rules, 2011; and E-Waste (Management) Rules, 2022 - Salient Features and its implications. Self-Study Component (SSC): E-Waste (Management) Amendment Rules, 2023, 2024	**3**
Pedagogy	PowerPoint presentation, Demonstration videos and Poster presentation	
	Pedagogical Initiatives(Not limited to): • **Think Pair and Share(Blended Learning):** provides an opportunity for students to learn from one another • **ProblemSolving**:encouragescognitivethinkingandenablescreativeproblemsolving • **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	S M Prakash – Environmental Studies,3rdEdition Elite Publishers, Mangalore, 2018.
2	Hester R.E., and Harrison R.M, Electronic Waste Management. Science, 2009.
3	Benny Joseph- Environmental studies, Tata Mcgraw-Hill 2nd edition 2012.
Reference Books	
1	R GeethaBalakrishna& K G Lakasminarayana Bhatta- Environmental Studies, S M Publications, 2006-2007.
2	M.Ayi Reddy Textbook of environmental science and Technology, BS publications 2007
3	Johri R., E-waste: implications, regulations, and management in India and current global best practices, TERI Press, New Delhi.
4	Dr. B.S Chauhan- Environmental studies, university of science press 1st edition

5	M.Ayi Reddy Textbook of environmental science and Technology, BS publications 2007

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	To understand the principles of ecology and environmental issues that apply to air, landand water issues along with e-waste management on a global scale.	Understand/Remember	L1
CO2	To evaluate the societal complex issues related to environment and e-waste management.	Design	L4
CO3	To develop sustainable solution for environmental issues and e-waste management issues	Create	L5

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	--	--
CO2	--	--	--	--	--	--	--	--	2	2	--	--	--	2	1
CO3	--	--	--	--	--	--	--	3	--	3	--	--	--	--	--

Weblinks and Video Lectures (e-Resources)	
1	https://youtu.be/I_bnGkviWOUhttps://youtu.be/Ar04qG1P8Es
2	https://sdgs.un.org/goals
3	https://kspcb.karnataka.gov.in/waste-management/biomedical-waste
4	https://archive.nptel.ac.in/courses/109/105/109105190/
5	https://youtu.be/I_bnGkviWOUhttps://youtu.be/Ar04qG1P8Es

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	25	25		
Understand				
Apply				
Analyse				
Evaluate			25	
Create				25

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	10	5	10	10	5	25	100%
CO2								
CO3								
Total								

SEE- Semester End Examination (50 Marks):

Bloom's Category	SEE Marks (100% Theory Questions)
Remember	50 MCQ's -50 Marks
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	10	10	10	10	10	50	100%
CO2							
CO3							
Total	10	10	10	10	10	50	

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

ABILITY ENHAMCEMENT COURSE

EXPERIENTIAL LEARNING

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th**				
Course Title	:	**Research Methodology and Intellectual Property Rights(RMIPR)**				
Course Code	:	**BRM507A**				
Course Type (Theory/Practical/Integrated/Project)	:	**Theory**				
Category	:	**AEC**				
Stream	:	**Common to all branches**		**CIE**	:	**50**
Teaching hours/week(L:T:P:S)	:	**1:0:0:0**		**SEE**	:	**50**
Total Hours	:	**15**		**SEE Duration**	:	**2 Hrs.**
Credits	:	**1**				

1. *(a)Define Objectives*

Identify Goals: Determine what skills and knowledge you want students to acquire through Experiential Learning.	
Learning Goal(LG)-1	**Understand and apply fundamental research concepts** to design and execute structured investigations across academic and professional domains.
Learning Goal(LG)-2	**Develop and implement appropriate research methodologies**, including data collection, analysis, and interpretation, suited to various research problems.
Learning Goal(LG)-3	**Effectively communicate research findings** through structured reports, proper citation, and adherence to academic writing standards.
Learning Goal(LG)-4	**Demonstrate a comprehensive understanding of Intellectual Property Rights (IPR)**, including types, legal frameworks, and real-world applications.
Learning Goal(LG)-5	**Apply ethical principles in research and innovation**, and understand the processes of patent filing, technology transfer, and commercialization.

(b) Course Outcomes

Identify Goals: Determine what skills and knowledge you want students to acquire through Experiential Learning.	
Course Outcomes(CO)-1	**Explain** the fundamental concepts, types, and significance of research, and identify appropriate methodologies for various research problems.
Course Outcomes(CO)-2	**Apply** Design a research plan using suitable sampling techniques and data collection tools, and analyze data using basic statistical techniques.

Course Outcomes(CO)-3	**Prepare and present** research reports using proper structure, referencing styles, and academic writing conventions..
Course Outcomes(CO)-4	**Describe** the types of Intellectual Property Rights and evaluate their relevance in protecting creative and research-based outputs.
Course Outcomes(CO)-5	**Demonstrate** awareness of ethical standards in research, and illustrate the patent filing process and commercialization strategies for innovations.

(c) Alignment

Align with Curriculum: Ensure these goals align with the overall educational objectives of the engineering program.						
Sl. No	**Learning Goals**	**Course Outcomes**	**Assessment**	**In-Class Activity**	**Out-of-Class Activity**	**Weightage**
1.	**Understand and apply fundamental research concepts** to design and execute structured investigations across academic and professional domains.	**Explain** the fundamental concepts, types, and significance of research, and identify appropriate methodologies for various research problems.	CIE	Research Type Matching Game	**Identify and define a research problem** in your area of interest. Write a 1-page concept note including objectives, scope, and expected outcomes.	20%
2.	**Develop and implement appropriate research methodologies**, including data collection, analysis, and interpretation, suited to various research problems.	**Design** a research plan using suitable sampling techniques and data collection tools, and **analyze** data using basic statistical techniques.	CIE	Group Activity – Design a Mini Research Plan	**Design a simple survey or questionnaire** on a topic of your choice and collect data from at least 10 respondents.	20%

3.	**Effectively communicate research findings** through structured reports, proper citation, and adherence to academic writing standards.	**Prepare and present** research reports using proper structure, referencing styles, and academic writing conventions..	CIE	Hands-On Excel/Data Analysis Demo	**Analyze the collected data** from Module 2 using Excel or Google Sheets and write a short (2–3 page) research report including charts and references.	20%
4.	**Demonstrate a comprehensive understanding of Intellectual Property Rights (IPR)**, including types, legal frameworks, and real-world applications.	**Describe** the types of Intellectual Property Rights and **evaluate** their relevance in protecting creative and research-based outputs.	CIE	**IPR Case Discussion – Role Play**	**Select a recent case involving IPR (e.g., patent dispute, copyright issue)** and write a brief summary highlighting the key legal issue, the parties involved, and the outcome.	20%
5.	**Apply ethical principles in research and innovation**, and understand the processes of patent filing, technology transfer, and commercialization.	**Demonstrate** awareness of ethical standards in research, and **illustrate** the patent filing process and commercialization strategies for innovations.	CIE	**Patent Filing Simulation**	**Prepare a draft patent disclosure** (1–2 pages) for a hypothetical or real product idea, including the invention title, abstract, and key features.	20%

2. **Curriculum Design**

(a) Course integration

Course Integration : Identify which courses can incorporate experiential learning activities. This can include project-based courses, labs ,internships ,and workshops.			
Sl. No	**CourseName**	**CourseCode**	**Justification for selecting the Course for Experiential Learning**
1	**Entrepreneurship / Innovation Management**		Empowers students to transform research-based ideas into viable business solutions. Research skills help validate market needs, while ipr ensures innovations are protected legally. This combination fosters a startup mindset, encouraging students to develop, test, and safeguard their ideas, making them more prepared for entrepreneurial ventures or roles in innovation-driven industries.
2	**Technical Communication and Research Documentation**		Enables students to clearly present, ethically document, and protect their academic and innovative work. It enhances their ability to write research papers, proposals, and patent documents, ensuring professional communication of findings. This integration also promotes academic integrity, plagiarism-free writing, and readiness for publishing and ip filings.
3	**Design Thinking / Product Design Courses**		Combines creative problem-solving with structured research and innovation protection. It helps students identify real-world problems, develop solutions, validate them systematically, and learn how to protect their outcomes through patents or copyrights. This integration boosts creativity, research skills, and legal awareness—preparing students for careers in industry, startups, or academia.

Develop Modules : Create specific modules within these courses that focus on hands-on experiences.								
Module No	**Lecture No.**	**Session Topics**	**RBT Levels**	**Activities Planned**	**Course Outcome Mapping**	**Mode of Delivery**	**Planned Date**	**Actual Date**
1	1-2	**Introduction**: Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem. Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship. **Tools:**Undermind, Litmaps, Bohrium, Perplexity.	**L1/L2**	Research Type Matching Game	**CO1**	**Chalk&Talk/ Presentation**		
2	3-4	**Literature Review and Technical Reading**, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The WayForward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading. **Tools:** Google Scholar,IEEEXplore, ACM Digital Library,PubMed,Scopus, Web of Science,arXiv, bioRxiv,SemanticScholar,Connected Papers / Research Rabbit	**L1/L2**	Group Activity – Design a Mini Research Plan	**CO1**	**Chalk&Talk/ Presentation**		

3	5-7	**Paper Writing:** Identification of research problem, Paper writing as per IEEE format, Introduction to LaTeX, Plagiarism Checking **Attributions and Citations**: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations. **Tools:**Grammarly, QuillBot,LaTeX, Jenni.AI, Turnitin, Mendeley, Zotero, Scite.ai, PubMed, ResearchRabbit, Scispace, Speechify.	**L3**	Hands-On Excel/Data Analysis Demo	**CO2**	**Chalk&Talk/ Presentation**		
4	8-11	**Introduction to Intellectual Property:** IP as a Global Indicator of Innovation, Origin of IP History of IP in India. Major Amendments in IP Laws and Acts in India. **Patents:** Rights Associated with Patents, Enforcement of Patent Rights, Inventions Eligible for Patenting, Non-Patentable Matters, Patent Infringements, Avoid Public Disclosure of an Invention before Patenting. Process of Patenting, Prior Art Search. Choice of Application to be Filed. Patent Application Forms, Jurisdiction of Filing Patent Application, Publication, Pre-grant Opposition, Examination. Grant of a Patent, Validity of Patent Protection, Post-grant Opposition, Commercialization of a Patent, Need for a Patent Attorney/Agent.	**L4**	IPR Case Discussion – Role Play	**CO3**	**Chalk&Talk/ Presentation**		

		Tools: PatentPal, WIPO Lex/GPT-based querying, Google Patents, IPfolio/TurboPatent,WIPO, TrademarkNow Advisor, DesignSearch.ai, DesignShelf, Legal Robot						
5	12-15	**Copyrights and Related Rights**: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement **Trademarks**:Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India, Process for Trademarks Registration, Case Study: Coca-Cola Company vs. Bisleri International Pvt. Ltd. **Tools:**WIPO Lex, Google Scholar (Case Law), HeinOnline, LexisNexis / Westlaw, SCOPUS / Web of Science, Plagscan / Turnitin, WIPO Copyright Registration Tools, Scholarcy, Elicit	**L5**	Patent Filing Simulation	**CO4, CO5**	**Chalk&Talk/ Presentation**		

3. Mapping of Learning objectives with Learning Outcomes

Course/ Modules	Learning Objective	Learning Outcome	Assessment Method
Introduction: Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem. Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship. **Tools:**Undermind, Litmaps, Bohrium, Perplexity.	**Understand and apply fundamental research concepts** to design and execute structured investigations across academic and professional domains.	**Explain** the fundamental concepts, types, and significance of research, and identify appropriate methodologies for various research problems.	CIE
Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis ofPrior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The WayForward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading. **Tools:** Google Scholar,IEEEXplore, ACM Digital Library,PubMed,Scopus, Web of Science,arXiv, bioRxiv,Semantic Scholar,Connected Papers / Research Rabbit	**Develop and implement appropriate research methodologies**, including data collection, analysis, and interpretation, suited to various research problems.	**Design** a research plan using suitable sampling techniques and data collection tools, and **analyze** data using basic statistical techniques.	CIE
Paper Writing: Identification of research problem, Paper writing as per IEEE format, Introduction to LaTeX, Plagiarism Checking **Attributions and Citations**: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets,	**Effectively communicate research findings** through structured reports, proper citation, and adherence to academic writing standards.	**Prepare and present** research reports using proper structure, referencing styles, and academic writing conventions..	CIE

Styles for Citations. **Tools:**Grammarly, QuillBot,LaTeX, Jenni.AI, Turnitin, Mendeley, Zotero, Scite.ai, PubMed, ResearchRabbit, Scispace, Speechify.			
Introduction to Intellectual Property: IP as a Global Indicator of Innovation, Origin of IP History of IP in India. Major Amendments in IP Laws and Acts in India. **Patents:** Rights Associated with Patents, Enforcement of Patent Rights, Inventions Eligible for Patenting, Non-Patentable Matters, Patent Infringements, Avoid Public Disclosure of an Invention before Patenting. Process of Patenting, Prior Art Search. Choice of Application to be Filed. Patent Application Forms, Jurisdiction of Filing Patent Application, Publication, Pre-grant Opposition, Examination. Grant of a Patent, Validity of Patent Protection, Post-grant Opposition, Commercialization of a Patent, Need for a Patent Attorney/Agent. **Tools:** PatentPal, WIPO Lex/GPT-based querying, Google Patents, IPfolio/TurboPatent,WIPO, Trademark Now Advisor, DesignSearch.ai, DesignShelf, Legal Robot	**Demonstrate a comprehensive understanding of Intellectual Property Rights (IPR)**, including types, legal frameworks, and real-world applications.	**Describe** the types of Intellectual Property Rights and **evaluate** their relevance in protecting creative and research-based outputs.	CIE
Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement	**Apply ethical principles in research and innovation**, and understand the processes of patent filing, technology transfer, and commercialization.	**Demonstrate** awareness of ethical standards in research, and **illustrate** the patent filing process and commercialization strategies for innovations.	CIE

Trademarks: Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India, Process for Trademarks Registration, Case Study: Coca-Cola Company vs. Bisleri International Pvt. Ltd. **Tools:** WIPO Lex, Google Scholar (Case Law), HeinOnline, LexisNexis / Westlaw, SCOPUS / Web of Science, Plagscan / Turnitin, WIPO Copyright Registration Tools, Scholarcy, Elicit			

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1.	Research Methodology and Intellectual Property Rights , Dr. Santosh MNejakar, Dr. Harish Bendigeri, ISBN 978-93-5987-928-4, Edition: 2023-24.
Reference Books	
1.	Research Methods for Engineers, David V. Thiel, Cambridge University Press, 978-1-107-03488-4
2.	Intellectual Property Rights,N.K.Acharya Asia Law House 6th Edition. ISBN: 978-93-81849-30-9
3.	Research Methodology – Methods and Techniques.,C. R Kothari, Gourav Garg, New AgeInternational Publishers.

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Acquire the knowledge of research and conduct a literature review.	Understand	L2
CO2	Apply the knowledge of research design, Citations, and the concepts of research methodology to a problem.	Apply	L3
CO3	Write an effective research paper for a given problem statement and Analyze data collection methods.	Analyze	L4
CO4	Choose Indian patent applications, Patent laws,Gain the requirements about registration and infringements related to trademarks, & copyrights.	Evaluate	L5

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

Weblinks and Video Lectures(e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc24_ge21/preview
2	https://archive.nptel.ac.in/content/syllabus_pdf/121106007.pdf

3	https://onlinecourses.nptel.ac.in/noc21_hs08/preview

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	20	-	10	-
Apply	20	10	20	20
Analyze	10	20	10	20
Evaluate	-	20	5	5
Create	-		5	5

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1(50)			Test-2(50)				
	Module -1	Module -2	Module 2 to 2.5	Module -2.5to 3	Module -4	Module -5		
CO1	10	10	-	-	-	-	20	50 Marks
CO2	5	5	10	-	-	0	20	
CO3	5	5	-	10	10		30	
CO4	-	-	-	-	10	5	15	
CO5	-	-	-	-	-	15	15	
Total	20	20	10	10	20	20	100	

SEE-Semester End Examination(50 Marks)

Bloom's Category	SEE Marks
	(90%Theory+10%PracticalQuestions)
Remember	-
Understand	20
Understand	20
Understand	30
Understand	15
Understand	15

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module -1	Module -2	Module 2 to 2.5	Module -2.5to 3	Module -4	Module -5		
CO1	5	5	5	0	**0**	0	15	50 Marks
CO2	5	5	5	0	**5**	0	20	
CO3	5	5	0	5	**5**	5	25	
CO4	5	5	0	5	5	5	25	
CO5	**0**	0	0	0	5	10	15	
Total	20	20	10	10	20	20	100	

Cos Mapped with Pos and PSOs:

CO	PO	PSO
CO1	-	-
CO2	PO1,PO2,PO5	PSO1
CO3	PO1,PO2,PO5	-
CO4	PO1,PO3	PSO2
CO5	PO1,PO2,PO3,PO5,PO12	PSO1

4. Partnerships and Resources

Industry Collaboration: Establish partnerships with local industries and organizations to provide real-world projects,internships,and site visits.				
Sl. No	**Name of the Industry Collaboration**	**Projects undertaken/Industrial Visit**	**Domain**	**Project Outcomes**

Implement Experiential Activities

AEC Component	Details
Project Title	[Enter the project title]
Real-World Problem	[Describe the real-world problem the project addresses]
Learning Objectives	**Subject Areas:**[List subjects integrated] **Skills Developed:**[List skills]
Timeline	**Start Date:**[Enter start date] **Milestones/Checkpoints:**[List milestones] **End Date:**[Enter end date]
Resources Needed	**Materials:**[List materials] **Technology:**[List technology] **Guest Speakers/Experts:**[List experts]
Team Formation	**Group Size:**[Enter group size] **Team Roles:**[List roles such as Project Manager ,Researcher ,Presenter]

Background Information	[Describe the prior knowledge students need]
Research Methods	**Primary Sources:**[List methods such as interviews ,surveys] **Secondary Sources:**[List methods such as articles ,books ,videos]
Team Meetings	**Frequency:**[Enter frequency of meetings] **Structure:**[Describe the structure of the meetings]
Collaboration Tools	**Digital Platforms:**[List platforms such as GoogleDocs ,Trello] **CommunicationMethods:**[Listmethodssuchasin-person,virtualmeetings]
Project Deliverables	[Listwhatstudentswillproducesuchasreports,presentations,prototypes]
Presentation Format	**Options:**[List options such as PowerPoint ,video,lived demonstration] **Audience:**[List audience such as classmates ,community members] **Schedule:**[Enter presentation schedule]
Project Exhibition	[Describe how students' projects will be displayed or shared with a wider audience]

Experiential Learning-Batch

From, **Date:**

Name: &USN:

Name: &USN:

Name: &USN:

Name: &USN:

Semester:

Respected Sir/Madam,

Sub:Regarding Experiential Learning Batch

With respect to the above subject, we are the students mentioned above would like to form the batch for carrying out the mini project

on…….

Thanking you, Yoursfaithfully

Sl. No.	Name of the student	Signature
1.		
2.		
3.		
4.		

Signature of the Guide

Name of the Guide Designation

Department

Experiential Learning(EL)–Student(s)–Guide–Interaction

Date		
EL Batch No.		
Title of the project		
Week No.		
Content of the Discussion		
Suggestion by the guide		
Name of Signature of students		

SignatureoftheGuide **SignatureofHOD**

Assessment

RubricsforExperientialLearningAssessment

Sl. No	Nameofthe Student	USN	Criteria	Exemplary(4)	Proficient(3)	Developing(2)	Beginning(1)	Total
			ProjectUnderstanding	Demonstrates deep understanding of project goalsandrequirements ; identifies key issues and objectives.	Shows good understanding of project goals and requirements; recognizes most key issues and objectives.	Displays basic understanding of project goals and requirements; somekeyissuesand objectives are unclear.	Lacks clear understanding of projectgoalsandrequirements; key issues and objectives are misunderstood.	
			TechnicalCompetence	Mastery of technical skills requiredfortheproject; applies skillseffectively Andefficiently.	Good technical skills; applies skills competently with few errors.	Basic technical skills; occasionally makes errorsinapplication.	Limitedtechnical skills;frequentlymakeserrorsin application.	
				Highlycreative Andoriginalideas;	Somewhatcreative Andoriginalideas;	Limitedcreativityand Originality;shows	Lackscreativityand Originality;no	

			Innovation	Showssignificantinnovation and out-of-the-box thinking.	demonstratesinnovation in some aspects.	Minimalinnovation.	evidence of innovative thinking.	
			ProblemSolving	Identifies problems accurately and develops effective, comprehensive solutions.	Identifiesproblemscorrectly and develops good solutions.	Identifiesproblemsbutsolutions are somewhat effectiveorincomplete.	Struggles to identify problems and develop effective solutions.	
			ProjectManagement	Manages project timelines, resources, and tasks exceptionally well; meets all deadlines.	Manages project timelines,resources, and tasks effectively; meets most deadlines.	Manages project timelines,resources, andaskswithsomedifficulty; misses some deadlines.	Poormanagementof project timelines, resources, and tasks; frequently misses deadlines.	
			Documentation	Thorough, clear, and well-organized documentation;allnecessarydetails included.	Clearandorganizeddocumentation; most necessary details included.	Basicdocumentation; some necessary details aremissingorunclear.	Poor documentation; lacksnecessarydetails and organization.	
				Engagingand	Goodpresentation;	Basicpresentation;	Ineffective	

			PresentationSkills	well-organized presentation; communicates ideas clearly and effectively.	communicates ideas clearly but lacks some engagement or organization.	some ideas are unclear orpoorlyorganized.	presentation; ideas are unclear and poorlyorganized.	
			Collaboration	Works exceptionallywellwith team members;showsstrong teamworkand leadership skills.	Works well with team members; demonstratesgoodteam work.	Works with team members but has some difficulties in collaboration.	Strugglestoworkwith team members; lacks teamwork and collaborationskills.	
			FacultyAssessment	Meets or exceeds faculty expectationsin all areas; shows exceptional performance.	Meets faculty expectations in most areas;showsgood performance.	Meetssomefacultyexpectations;showsaverage performance.	Doesnotmeetfaculty expectations; shows poor performance.	
			Reflection	Providesdeep insights and critical analysis of	Providesgoodinsights and analysis of own work;demonstrates	Providesbasicinsights and analysis of own work; shows some	Providesminimalor Noinsightsandanal ysisofown	

				own work; demonstrates significantlearning andgrowth.	Learningandgrowth.	Learningandgrowth.	work; shows little to no learning and growth.	
			OverallAssessment	Exceptional overall performance; exceeds expectations in Mostorallareas.	Good overall performance;meetsexpectations in most areas.	Average overall performance; meets expectations in some areas.	Poor overall performance; does not meet expectations in Mostareas.	

SkillsAssessment

Student Name	USN	SkillAcquired	Skill Level Before (1-10)	Skill Level After (1-10)	Improvement(After-Before)	Syntax (1-10) Before	Syntax (1-10) After	Logic& Problem Solving (1-10) Before	Logic& Problem Solving (1-10) After	DataStructures(1-10) Before	DataStructures(1-10)After	Libraries& Frameworks (1-10) Before	Libraries& Frameworks (1-10)After	CodeOptimization(1-10)Before	CodeOptimization(1-10)After	Debugging (1-10)Before	Debugging(1-10)After

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th**				
Course Title	:	**Block Chain Technology**				
Course Code	:	**BAI507B**				
Course Type (Theory/Practical/Project/Integrated)	:	**Theory**				
Category	:	**AEC**				
Stream	:	**All Branches**		**CIE**	:	**50**
Teaching hours/week(L:T:P:S)	:	**1:0:0:0**		**SEE**	:	**50**
Credits	:	**1**		**SEE Duration**	:	**2 Hrs.**

5. *(a)Define Objectives*

Identify Goals: Determine what skills and knowledge you want students to acquire through Experiential Learning.	
Learning Goal(LG)-1	Elaborate the basics of Block chain concepts using modern tools/technologies
Learning Goal(LG)-2	Demonstrate the role of block chain applications in different domains including cybersecurity
Learning Goal(LG)-3	Understand the usage of Block chain implementation/features for the given problem
Learning Goal(LG)-4	Elucidate the usage of bitcoins and its impact on the economy.
Learning Goal(LG)-5	Analyze the application of specific block chain architecture for a given problem

(d) Course Outcomes

Identify Goals: Determine what skills and knowledge you want students to acquire through Experiential Learning.	
Course Outcomes(CO)-1	Demonstrate the basics of Block chain concepts using modern tools/technologies.
Course Outcomes(CO)-2	Apply the role of block chain applications in different domains including cybersecurity.

Course Outcomes(CO)-3	Analyze the usage of Block chain implementation/features for the given problem
Course Outcomes(CO)-4	Exemplify the usage of bitcoins and its impact on the economy.
Course Outcomes(CO)-5	Evaluate the application of specific block chain architecture for a given problem

(e) Alignment

Align with Curriculum: Ensure these goals align with the overall educational objectives of the engineering program.						
Sl.No	**Learning Goals**	**Course Outcomes**	**Assessment**	**In-Class Activity**	**Out-of-Class Activity**	**Weightage**
1.	Elaborate the basics of Block chain concepts using modern tools/technologies	**Explain** basics of Block chain concepts using modern tools/technologies.	CIE	Brain storming on different block chain technologies	Coding	20%
2.	**Demonstrate** role of block chain applications in different domains including cybersecurity	**Apply** the role of block chain applications in different domains including cybersecurity.	CIE	Discuss on different cyber threats	Case study	20%

3.	**Understand** the usage of Block chain implementation/features for the given problem	**Analyze** the usage of Block chain implementation/features for the given problem	CIE	Hands-On Demo	Design for real time problem	20%
4.	**Elucidate** the usage of bitcoins and its impact on the economy.	**Exemplify** the usage of bitcoins and its impact on the economy.	CIE	Discussion – Role Play	Compare different currency	20%
5.	**Evaluate** the application of specific block chain architecture for a given problem	**Evaluate** the application of specific block chain architecture for a given problem	CIE	Build small application using blockchain technology	Design a small POC	20%

6. Curriculum Design

(a) Course integration

Course Integration: Identify which courses can incorporate experiential learning activities.This can include project-based courses ,labs ,internships ,and workshops.			
Sl.No	**Course Name**	**Course Code**	**Justification for selecting the Course for Experiential Learning**
1	**Entrepreneurship / Innovation Management**		Blockchain is no longer limited to cryptocurrency. It is being adopted in industries such as finance, healthcare, supply chain, logistics, real estate, and government services. Engineering students equipped with blockchain skills are highly sought after in the job market. Experiential learning in this domain helps bridge the gap between academic knowledge and real-world application.
2	**Technical Communication and Research Documentation**		Blockchain is best understood by **doing**—developing smart contracts, building decentralized applications (DApps), and using platforms like Ethereum, Hyperledger, or Solidity. These practical components are ideal for experiential learning, promoting deeper understanding through real-world implementation.

3	**Design Thinking / Product Design Courses**		Blockchain encourages innovative thinking by introducing concepts such as decentralization, trustless systems, and tokenization. Students can work on projects like: • E-voting systems • Digital identity verification • Supply chain transparency • Decentralized finance (DeFi) tools These projects can potentially lead to startups or research papers.

DevelopModules: Createspecificmoduleswithinthesecoursesthatfocusonhands-onexperiences.								
ModuleNo	**LectureNo.**	**SessionTopics**	**RBT Levels**	**ActivitiesPlanned**	**CourseOutcomeMapping**	**ModeofDelivery**	**PlannedDate**	**ActualDate**
1	1-2	Introduction to Blockchain, How Blockchain works, Blockchain vs Bitcoin, Practical applications, public and private key basics, pros and cons of Blockchain, Myths about Bitcoin.	**L1/L2**	Brain storming on different block chain technologies	**CO1**	**Chalk&Talk/ Presentation**		
2	3-4	Blockchain :Architecture , versions ,variants , use cases, Life use cases of blockchain, Blockchain vs shared Database, Introduction to cryptocurrencies, Types, Applications.	**L1/L2**	Discuss on different cyber threats	**CO1**	**Chalk&Talk/ Presentation**		
3	5-7	Concept of Double Spending, Hashing, Mining, Proof of work. Introduction to Merkel tree, Privacy , payment verification , Resolving Conflicts , Creation of Blocks	**L3**	Hands-On Demo	**CO2**	**Chalk&Talk/ Presentation**		
4	8-11	Introduction to Bitcoin, key concepts of Bitcoin, Merits and De Merits Fork and Segwits, Sending and Receiving bitcoins, choosing bitcoin wallet, Converting Bitcoins to Fiat Currency.	**L4**	Discussion – Role Play	**CO3**	**Chalk &Talk/ Presentation**		
5	12-15	Introduction to Ethereum, Advantages and Disadvantages, Ethereum vs Bitcoin, Introduction to Smart contracts, usage, application, working principle , Law and Regulations. Case Study.	**L5**	Build small application using blockchain technology	**CO4, CO5**	**Chalk &Talk/ Presentation**		

7. Mapping of Learning objectives with Learning Outcomes

Course/Modules	Learning Objective	Learning Outcome	Assessment Method
Introduction to Blockchain, How Blockchain works, Blockchain vs Bitcoin, Practical applications, public and private key basics, pros and cons of Blockchain, Myths about Bitcoin.	Elaborate the basics of Block chain concepts using modern tools/technologies	**Explain** basics of Block chain concepts using modern tools/technologies.	CIE
Blockchain :Architecture , versions ,variants , use cases, Life use cases of blockchain, Blockchain vs shared Database, Introduction to cryptocurrencies, Types, Applications.	**Demonstrate** role of block chain applications in different domains including cybersecurity	**Apply** the role of block chain applications in different domains including cybersecurity.	CIE
Concept of Double Spending, Hashing, Mining, Proof of work. Introduction to Merkel tree, Privacy , payment verification , Resolving Conflicts , Creation of Blocks	**Understand** the usage of Block chain implementation/features for the given problem	**Analyze** the usage of Block chain implementation/features for the given problem	CIE
Introduction to Bitcoin, key concepts of Bitcoin, Merits and De Merits Fork and Segwits, Sending and Receiving bitcoins, choosing bitcoin wallet, Converting Bitcoins to Fiat Currency.	**Elucidate** the usage of bitcoins and its impact on the economy.	**Exemplify** the usage of bitcoins and its impact on the economy.	CIE
Introduction to Ethereum, Advantages and Disadvantages, Ethereum vs Bitcoin, Introduction to Smart contracts, usage, application, working principle , Law and Regulations. Case Study.	**Evaluate** the application of specific block chain architecture for a given problem	**Evaluate** the application of specific block chain architecture for a given problem	CIE

CIEandSEE:

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. 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).The student is declared as a pass in the course if he/she secures a minimum of 40%(40 marksoutof100) in the sum total of the CIE(Continuous Internal Evaluation) and SEE(Semester End Examination) taken together

Continuous Internal Evaluation(CIE):

- Forthe Assignment component tof the CIE, there are25 marks andfortheInternalAssessment Test component,thereare25marks.
- The firsttestwillbeadministeredafter40-50%ofthesyllabushasbeencovered,andthesecond Testwillbeadministeredafter85-90%ofthesyllabushasbeencovered
- Anytwoassignmentmethodsmentionedinthe22OB2.4,ifanassignmentisproject-basedthenonly oneassignmentforthecourseshallbeplanned.Theteachershouldnotconducttwoassignmentsat the end of the semester if two assignments are planned.
- Forthecourse,CIEmarkswillbebasedonascaled-downsumoftwotestsandothermethodsof assessment.

The sum of two tests ,twoassignments,will be out of 100 marks and will be scaled down to 50 marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations(SEE):

SEE paper shall be set for 50 questions,each of the 01 marks.The pattern of the question paper is MCQ (multiple choice questions).The time allotted for SEE is 01 hour.The student has to secure a minimum of 35% of the maximum marks meant for SEE.

Implement Experiential Activities

AEC Component	Details
Project Title	[Enter the project title]
Real-World Problem	[Describe the real-world problem the project addresses]
Learning Objectives	**Subject Areas:** [List subjects integrated] **Skills Developed:** [List skills]
Timeline	**Start Date:** [Enter start date] **Milestones/Checkpoints:** [List milestones] **End Date:** [Enter end date]
Resources Needed	**Materials:** [List materials] **Technology:** [List technology] **Guest Speakers/Experts:** [List experts]
Team Formation	**Group Size:** [Enter group size] **Team Roles:** [List roles such as Project Manager, Researcher, Presenter]
Background Information	[Describe the prior knowledge students need]

Research Methods	**Primary Sources:** [List methods such as interviews, surveys] **Secondary Sources:** [List methods such as articles, books, videos]
Team Meetings	**Frequency:** [Enter frequency of meetings] **Structure:** [Describe the structure of the meetings]
Collaboration Tools	**Digital Platforms:** [List platforms such as Google Docs, Trello] **Communication Methods:** [List methods such as in-person, virtual meetings]
Project Deliverables	[List what students will produce such as reports, presentations, prototypes]
Presentation Format	**Options:** [List options such as PowerPoint, video, live demonstration] **Audience:** [List audience such as classmates, community members] **Schedule:** [Enter presentation schedule]
Project Exhibition	[Describe how students' projects will be displayed or shared with a wider audience]

Experiential Learning - Batch

From, **Date:**

Name: & USN:

Name: & USN:

Name: & USN:

Name: & USN:

Semester:

RespectedSir/Madam,

Sub:Regarding Experiential Learning Batch

With respect to the above subject, we are the students mentioned above would like to form the batch for carrying out the mini project on…….

Thanking you, Yours faithfully

Sl. No.	Name of the student	Signature
1.		
2.		
3.		
4.		

Signature of the Guide

Name of the Guide Designation

Department of ……. Engineering

Experiential Learning (EL) – Student(s) – Guide – Interaction

Date		
EL Batch No.		
Title of the project		
Week No.		
Content of the Discussion		
Suggestion by the guide		
Name of Signature of students		

Signature of the Guide **Signature of HOD**

Assessment

Rubrics for Experiential Learning Assessment

Sl. No	Name of the Student	USN	Criteria	Exemplary (4)	Proficient (3)	Developing (2)	Beginning (1)	Total
			Project Understanding	Demonstrates deep understanding of project goals and requirements; identifies key issues and objectives.	Shows good understanding of project goals and requirements; recognizes most key issues and objectives.	Displays basic understanding of project goals and requirements; some key issues and objectives are unclear.	Lacks clear understanding of project goals and requirements; key issues and objectives are misunderstood.	
			Technical Competence	Mastery of technical skills required for the project; applies skills effectively and efficiently.	Good technical skills; applies skills competently with few errors.	Basic technical skills; occasionally makes errors in application.	Limited technical skills; frequently makes errors in application.	

			Innovation	Highly creative and original ideas; shows significant innovation and out-of-the-box thinking.	Somewhat creative and original ideas; demonstrates innovation in some aspects.	Limited creativity and originality; shows minimal innovation.	Lacks creativity and originality; no evidence of innovative thinking.	
			Problem Solving	Identifies problems accurately and develops effective, comprehensive solutions.	Identifies problems correctly and develops good solutions.	Identifies problems but solutions are somewhat effective or incomplete.	Struggles to identify problems and develop effective solutions.	
			Project Management	Manages project timelines, resources, and tasks exceptionally well; meets all	Manages project timelines, resources, and tasks effectively; meets most deadlines.	Manages project timelines, resources, and tasks with some difficulty; misses some deadlines.	Poor management of project timelines, resources, and tasks; frequently misses deadlines.	

				deadlines.				
			Documentation	Thorough, clear, and well-organized documentation; all necessary details included.	Clear and organized documentation; most necessary details included.	Basic documentation; some necessary details are missing or unclear.	Poor documentation; lacks necessary details and organization.	
			Presentation Skills	Engaging and well-organized presentation; communicates ideas clearly and effectively.	Good presentation; communicates ideas clearly but lacks some engagement or organization.	Basic presentation; some ideas are unclear or poorly organized.	Ineffective presentation; ideas are unclear and poorly organized.	
			Collaboration	Works exceptionally well with team members; shows strong teamwork and leadership skills.	Works well with team members; demonstrates good teamwork.	Works with team members but has some difficulties in collaboration.	Struggles to work with team members; lacks teamwork and collaboration skills.	

			Faculty Assessment	Meets or exceeds faculty expectations in all areas; shows exceptional performance.	Meets faculty expectations in most areas; shows good performance.	Meets some faculty expectations; shows average performance.	Does not meet faculty expectations; shows poor performance.	
			Reflection	Provides deep insights and critical analysis of own work; demonstrates significant learning and growth.	Provides good insights and analysis of own work; demonstrates learning and growth.	Provides basic insights and analysis of own work; shows some learning and growth.	Provides minimal or no insights and analysis of own work; shows little to no learning and growth.	
			Overall Assessment	Exceptional overall performance; exceeds expectations in most or all areas.	Good overall performance; meets expectations in most areas.	Average overall performance; meets expectations in some areas.	Poor overall performance; does not meet expectations in most areas.	

Skills Assessment

Student Name	USN	Skill Acquired	Skill Level Before (1-10)	Skill Level After (1-10)	Improvement (After-Before)	Syntax (1-10) Before	Syntax (1-10) After	Logic & Problem Solving (1-10) Before	Logic & Problem Solving (1-10) After	Data Structures (1-10) Before	Data Structures (1-10) After	Libraries & Frameworks (1-10) Before	Libraries & Frameworks (1-10) After	Code Optimization (1-10) Before	Code Optimization (1-10) After	Debugging (1-10) Before	Debugging (1-10) After

6thSEMESTER

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

IPCCCourse–IntegratedProfessionalCoreCourse

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 secondInternal 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 ofIPCC (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 andViva-Voce is added and scaled down to 05 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 25 marks.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

Semester End Examination (SEE) for IPCC Theory

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

- The question paper will have ten questions. Each question is set for 20 marks.
- The question paper shall be set for 100 Marks. The medium of the question paper shall be English. **The duration of SEE is 03 hours.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. The two questions shall be of same course outcome, program outcome and Blooms RBT level. Emphasis to be given for higher order RBT levels.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored by the student shall be proportionally scaled down to 50 Marks.
- The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only.
- Questions mentioned in the SEE paper may include questions from the practical component.

Continuous and Comprehensive Assessment (CCA):

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

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

Total score for CCA is **10 Marks**

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

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming

	Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom, • The assessment of these techniques shall be in rubrics. • The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

4 Credits Courses – Integrated Professional Core Course (IPCC)

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

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

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

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

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**6th**				
Course Title	**:**	**Deep Learning and Reinforcement Learning**				
Course Code	**:**	**BAI601**				
Course Type (Theory/Practical/Integrated/Project)	**:**	**Integrated**				
Category	**:**	**IPCC**				
Stream	**:**	**AIML**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:2:0**		**SEE**	**:**	**50**
Total Hours	**:**	**40 T + 20 P Hrs**		**SEE Duration**	**:**	**3 Hrs.**
Credits	**:**	**04**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the fundamentals of deep learning.
2	Know the theory behind Convolutional Neural Networks, RNN
3	Illustrate the strength and weaknesses of many popular deep learning approaches.
4	Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems

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.

Scheme of Teaching and Examinations for BE Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours

1	**Beyond the Essentials**:The bias variance tradeoff, K folds cross-validation, Grid searching, Ensembling techniques **Ensemble Learning and Random Forests:** Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking. **Introduction to Deep Learning:**Introduction, Shallow Learning, Deep Learning, Why to use Deep Learning, How Deep Learning Works, Deep Learning Challenges **Textbook 4:** Chapter 12 (Page No. 289 – 318) **Textbook 5:**Chapter 7 (Page No. 191 – 214) **Textbook 1:**Ch 1.1 – 1.6,	**8**
Pedagogy	Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools	
2	**Optimization for Training Deep Learning Models:** How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization **Basics of Supervised Deep Learning:** Introduction to CNNs, Evolution of CNN Models, Convolution Operation, Architecture of CNN, **Textbook 2:** 8.1,8.2 **Textbook 1:** Ch 2.1 – 2.5	**8**
Pedagogy	Chalk and talk, PPT, Discussion with real-time examples, Problem Solving	
3	**Training Supervised Deep Learning Networks:** Introduction, Training CNNs Gradient Descent-Based Optimization Techniques, Challenges in Training Deep Networks. **Supervised Deep Learning Architectures:**LeNet-5,AlexNet, ResNet **Text Book - 1:** Chapter 3: 3.2,3.4,3.5, Chapter 4: 4.2,4.3, 4.7	**8**
Pedagogy	Chalk and talk, PPT, Discussion with real-time examples, Problem Solving	

4	**Sequence Modeling: Recurrent and Recursive Nets:** Unfolding Computational Graphs, Recurrent Neural Network, Bidirectional RNNs, Deep Recurrent Networks, Recursive Neural Networks, The challenges of Long Short-Term Dependencies, The Long Short-Term Memory and other Gated RNNs. **Text Book – 2:** 10.1-10.7, 10.10	**8**
Pedagogy	Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools	
5	**Deep Reinforcement Learning:** Introduction, Stateless Algorithms: Multi-Armed Bandits, The Basic Framework of Reinforcement Learning, case studies. **Deep Q Networks (DQN)** and **Policy Gradient Methods** **Textbook – 3:** Chapter 11: 11.1, 11.2, 11.3, 11.8 **Textbook 6:** Chapter 4, Chapter 5 (Page no. 87 – 143)	**8**
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
	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	Design and implement a neural based network for generating word embedding for words in a document corpus	**CO4**
2	Write a program to demonstrate the working of a deep neural network for classification tasks.	**CO2**
3	Design and implement a Convolutional Neural Network(CNN) for classification of image dataset	**CO4**
4	Build and demonstrate an autoencoder network using neural layers for data compression on image dataset.	**CO4**
5	Design and implement a deep learning network for classification of textual documents using **LSTM or Transformer-based** models	**CO4**
6	Write a program to enable pre-train models to classify a given image dataset	**CO2**
7	Simple Grid World Problem: Design a custom 2D grid world where the agent navigates from a start position to a goal, avoiding obstacles. Environment: Custom grid (easily implemented in Python)	**CO2**
8	Write a program to demonstrate **Game Theory using Reinforcement Learning** via **Q-Learning** applied to a **Two-Player Iterated Prisoner's Dilemma**—a classic Game Theory problem.	**CO2**

Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	M. ArifWani Farooq Ahmad Bhat Saduf Afzal Asif Iqbal Khan, Advances in Deep Learning, Springer, 2020
2	Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
3	Charu C. Aggarwal, "Neural Networks and Deep Learning", Springer, 2018.
4	Principles of Data Science by Sinan Ozdemir, Packt Publishing
5	Hands-on Machine Learning with Scikit-Learn, Keras&Tensorflow, AurelienGeron, O'Reilly publications
6	Reinforcement Learning Industrial Applications of Intelligent Agents, Phil Winder,O'Reilly publications
References	
1	Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning, 2009
2	N.D. Lewis, "Deep Learning Made Easy with R: A Gentle Introduction for Data Science", January 2016
3	Nikhil Buduma, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly publications

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

CO	**Course Outcomes**	**RBT Level**	**RBT Level Indicator**

CO1	Demonstrate proficiency in implementing foundational deep learning architectures.	Understand	L1/L2
CO2	Analyze and compare various deep learning techniques	Apply	L3
CO3	Design and implement research-oriented projects	Analyze	L4
CO4	Apply transfer learning and fine-tuning of pre-trained models	Investigate	L5
CO5	Explore and implement reinforcement learning algorithms	Evaluate	L6

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

Weblinks and Video Lectures (e-Resources)	
1	https://cedar.buffalo.edu/~srihari/

CIE- Continuous Internal Evaluation (50 Marks)

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

Analyse	10	10	10	10	5
Evaluate	10	10	10	10	5
Create	10	10	10	10	5

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	-	-	-	-	-	10	20%
CO2	-	10	-	-	-	-	10	20%
CO3	-	-	5	5	-	-	10	20%
CO4	-	-	-	-	10	-	10	20%
CO5	-	-	-	-	-	10	10	20%
Total	10	10	5	5	10	10	50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	5
Understand	5
Apply	10
Analyse	10
Evaluate	10
Create	10

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	-	-	-	-	-	10	20%
CO2	-	10	-	-	-	-	10	20%
CO3	-	-	5	5	-	-	10	20%
CO4	-	-	-	-	10	-	10	20%
CO5	-	-	-	-	-	10	10	20%
Total	10	10	5	5	10	10	50	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**6th**				
Course Title	**:**	**Natural Language Processing and Generation**				
Course Code	**:**	**BAI602**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Integrated**				
Category	**:**	**IPCC**				
Stream	**:**	**AIML**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:2:0**		**SEE**	**:**	**50**
Total Hours	**:**	**40T + 20P**		**SEE Duration**	**:**	**3 Hrs.**
Credits	**:**	**4**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	**Understand** the fundamental concepts and challenges of Natural Language Processing (NLP), including language structures and its real-world applications.
2	**Apply** basic text processing techniques such as tokenization, stemming, lemmatization, and word sense disambiguation using tools like NLTK and WordNet.
3	**Analyze** various text representation models including One-Hot Encoding, Bag-of-Words, TF-IDF, and word embeddings for NLP task
4	**Design** NLP applications using Transformer-based architectures for text classification, generation, summarization, and question answering.
5	**Evaluate** the performance of advanced NLP systems such as Neural Machine Translation and Retrieval-Augmented Generation (RAG) in practical scenarios.

Teaching-Learning Process

Teaching-Learning Process These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Chalk and talk
2. Online videos

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 Python.
- 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.
- Topics will be introduced in multiple representations.
- 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)**.

Scheme of Teaching and Examinations for BE Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

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COURSE CURRICULUM

Module No.	Topics	Hours
1	**Module-1 –** **Introduction to NLP:** NLP in the Real-world, NLP Tasks, what is Language: Building Blocks of Language, Why NLP is Challenging?, Approaches to NLP **Text Representation** Vector Space Models, Basic Vectorization Approaches - One-Hot Encoding, Bag of Words, Bag of N-Grams, TF-IDF. Distributed Representations, Word Embeddings, Going Beyond Words, Distributed Representations Beyond Words and Characters, Universal Text Representations, Visualizing Embeddings **Textbook 1: Chapter 1 (Page no. 1 – 6)** **Textbook 1: Chapter 3(Page no. 81 – 118)**	**8**

Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools8**	
2	**Module-2-** **Tokenizing Text and WordNet Basics**: Introduction, Tokenizing text into sentences, Tokenizing sentences into words, Tokenizing sentences using regular expressions, training a sentence tokenizer, Filtering stop words in a tokenized sentence Looking up Synsets for a word in WordNet, looking up lemmas and synonyms in WordNet, Calculating WordNet Synset similarity, Discovering word collocations. **Replacing and Correcting Words:** Introduction, stemming words, Lemmatizing words with WordNet,replacing words matching regular expressions, removing repeating characters, Spelling correction with Enchant,replacing synonyms, Replacing negations with antonyms **Textbook 2: Chapter 1(Page no. 7 – 28), Chapter 2(Page no. 29 – 48)**	**8**
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
3	**Module-3 –** **Transformers Basics:** The Encoder-Decoder Framework, Attention Mechanisms, Transfer Learning in NLP, Hugging FaceTransformers: Bridging the Gap, A Tour of Transformer Applications: Text Classification, Named EntityRecognition, Question Answering, Summarization, Translation, Text Generation, The Hugging Face Ecosystem:The Hugging Face Hub, Hugging Face Tokenizers, Hugging Face Datasets, Hugging Face Accelerate, MainChallenges with Transformers. **Transformer Anatomy:** The Transformer Architecture, The Encoder: Self-Attention, The Feed-Forward Layer, Adding Layer,Normalization, Positional Embeddings, adding a Classification Head, The Decoder, Meet the Transformers: TheTransformer Tree of Life, The Encoder Branch, The Decoder Branch, The Encoder-Decoder Branch **Textbook 3:** Chapter 1**(Page no. 1 – 20)**, Chapter 3**(Page no. 57 – 86)**	**8**
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
4	**Module-4-** **Text Generation:** The Challenge with Generating Coherent Text, Greedy Search Decoding, Beam Search Decoding, SamplingMethods, Top-k and Nucleus Sampling **Summarization:** The CNN/Daily/Mail Dataset, Text Summarization Pipelines, Summarization Baseline: GPT-2, T5, BART, PEGASUS, Measuring the quality of Generated text – BLEU, ROUGE, Training a summarization model – Evaluating PEGASUS on SAMSum, Finetuning PEGASUS, Generating Dialogue Summaries	**8**

	Question Answering: Building a Review-Based QA system – The dataset, Extracting Answers from Text, Using Haystack to build a QA Pipeline, Improving our QA Pipeline – Evaluating the Retriever, Evaluating the Reader, Domain Adaptation, Evaluating the whole QA Pipeline **Textbook 3:** Chapter 5**(Page no. 123 – 140)**, Chapter 6**(Page no. 141 – 164)**, Chapter 7**(Page no. 165 – 204)**	
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
5	**Module-5 –** **A review of the approaches to Neural Machine Translation:** Introduction, Machine Translation Approaches, Formualtion of the NMT task, The encoder-decoder model, RNN's as encoder-decoder models, LSTM's dealing with long-term dependencies and vanishing gradients, NMT with attention, Recent developments in NMT, NMT in low resource languages, Vocabulary Coverage Problem, Datasets for MT, Challenges and future scope **Retrieval Augmented Generation:** What is RAG?, How does RAG help?, What are some popular RAG use cases?, RAG Architecture **Textbook 4:** Chapter 4**(Page no. 78 – 102)** **Textbook 5:** Sections 1, 2, 3, 4**(Page no. 1 – 45)**	**8**
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	

List of Programs:

Sl. No.	Experiments/Programs	COs
1	Write a program to Tokenize text into sentences and words; explore synonyms, antonyms, and semantic similarity using WordNet.	**CO2**
2	Write a program to Convert text into vectors using One-Hot Encoding, Bag-of-Words, N-Grams, and TF-IDF	**CO2**
3	Write a program to Visualize word relationships using Word2Vec, FastText, or GloVeembeddings.	**CO2**
4	Write a program to classify sentiments (positive/negative/neutral) in product or movie reviews using Hugging Face's BERT.	**CO2**
5	Write a program to Generate coherent text using sampling techniques like greedy search, top-k, and nucleus sampling.	**CO2**
6	Write a program to Build a pipeline that answers questions from a custom document (e.g.,	**CO4**

	college rules, syllabus) using Haystack	
7	Write a program to Implement an encoder-decoder model with attention for translating English sentences to Hindi.	**CO4**
8	Write a program to Summarize long news articles using a pre-trained model like T5 or PEGASUS.	**CO2**
Open ended Programs		
1	Generate Summaries for Classroom Lectures or Research Papers using T5, BART, or PEGASUS to summarize lengthy documents.	**CO4**
2	Use RAG (Retrieval-Augmented Generation) to build a QA system for student handbooks or curriculum files.	**CO5**

CIE for Natural Language Processing & Generation (Integrated Professional Core Course (IPCC)):

This Course refers to professional theory core course integrated with practical. Credit for this course can be 03 and its Teaching Learning hours (L : T : P: S) can be considered as (3 : 0 : 2 : 0).

15 marks for the conduction of practical experiment and preparation of the Laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.

On completion of every program in the laboratory, the student shall be evaluated including viva-voce and marks shall be awarded on the same day.

Each program report can be evaluated for **15 marks** (Write-up – 3 marks, Execution – 8 marks .and Viva – 4 marks)

The Laboratory test (duration 2 hours / 3 hours) after completion of all the programs shall be conducted for 50 marks and scaled down to **10 marks.**

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. This course is common to all branches of first year B.E/B.Tech. 2023-24 regulation.

Note: L- Theory Lecture, T- Tutorial, P-Practical, S-Project, IPCC: Integrated Professional Core Course, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

Text Books

Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems, SowmyaVajjala, Bodhisattwa Majumder, Anuj Gupta &HarshitSurana ,1st Edition, 2020, O'Reilly, ISBN: 978-1-492-05405-4
2	Python 3 Text Processing with NLTK 3 Cookbook, Jacob Perkins 2014, 1st Edition, Packt Publishing, ISBN 978-1-78216-785-3
3	Natural Language Processing with Transformers: Building Language Applications with HuggingFace,Lewis Tunstall, Leandro von Werra, and Thomas Wolf, 2022, 1st Edition, O'Reilly Media, ISBN:978-1-098-10324-8

4	Natural Language Processing and Information Retrieval Principles and Applications, Edited by Muskan Garg, Sandeep Kumar, and Abdul KhaderJilaniSaudagar
5	*A Simple Guide to Retrieval Augmented Generation* by AbhinavKimothi
Reference Books, Video Lectures (e-Resources)	
1	Daniel Jurafsky, James H. Martin, "Speech and Language Processing, An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education, 2023.
2	Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press.
3	Akshay Kulkarni, AdarshaShivananda, "Natural Language Processing Recipes - Unlocking Text Data with Machine Learning and Deep Learning using Python", Apress, 2019.

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 fundamental concepts and challenges of Natural Language Processing (NLP), including language structures and its real-world applications.	**Understand**	**L1/L2**
CO2	**Apply** basic text processing techniques such as tokenization, stemming, lemmatization, and word sense disambiguation using tools like NLTK and WordNet.	**Apply**	**L3**
CO3	**Analyze** various text representation models including One-Hot Encoding, Bag-of-Words, TF-IDF, and word embeddings for NLP task	**Analyze**	**L4**
CO4	**Design** NLP applications using Transformer-based architectures for text classification, generation, summarization, and question answering.	**Design**	**L5**
CO5	**Evaluate** the performance of advanced NLP systems such as Neural Machine Translation and Retrieval-Augmented Generation (RAG) in practical scenarios.	**Create/Investigate**	**L6**

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	--

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=M7SWr5xObkA
2	https://youtu.be/02QWRAhGc7g
3	https://archive.nptel.ac.in/courses/106/106/106106211/
4	https://onlinecourses.nptel.ac.in/noc23_cs45/preview
5	https://www.youtube.com/watch?v=CMrHM8a3hqw

CIE- Continuous Internal Evaluation (50 Marks)

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

Create	-	-	-	-	30

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	**1**	**1**	**1**	**-**	**1**		**40**	**40**
CO2	**-**	**1**	**1**	**-**	**1**	**1**	**40**	**40**
CO3	**-**	**-**	**-**	**-**	**1**	**1**	**20**	**20**
CO4	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

SEE- Semester End- Examination (50 Marks)

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

SEE Course Plan

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

CO5	**-**	**-**	**-**	**-**	**10**	**10**	**20%**
Total	**10**	**10**	**10**	**10**	**10**	**50**	**100%**

PROFESSIONAL CORE COURSE (PCC)

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)

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 Professor.

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

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**6th**				
Course Title	:	**Software Engineering and Project Management**				
Course Code	:	**BAI603**				
Course Type (Theory/Practical/Integrated/Project)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40Hrs**		**SEE Duration**	:	**3Hrs**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To discuss software engineering principles and activities involved in building small/large software programs.
2	To discuss concepts of Agile Development in building a software.
3	Interpret the importance of Project Management with its methods and methodologies along with quality standards.

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

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COURSE CURRICULUM

Module No.	Topics	Hours
1	**Software and Software Engineering :** The nature of Software, The unique nature of WebApps, Software Engineering, The software Process, The software Engineering practice, The software myths. **Process Models:** A generic process model, Process assessment and improvement, Prescriptive process models: Waterfall model, Incremental process models, Evolutionary process models, Concurrent models, Specialized process models. Unified Process **Textbook 1: Chapter 1: 1.1 to 1.6, Chapter 2: 2.1 to 2.5**	8
Pedagogy	**ICT Based Learning**	
2	**Understanding Requirements:** Requirements Engineering, Establishing the ground work, Eliciting Requirements, Developing use cases, Building the requirements model, Negotiating Requirements, Validating Requirements **Requirements Modeling Scenarios, Information and Analysis classes:** Requirement Analysis, Scenario based modeling, UML models that supplement the Use Case, Data modeling Concepts, Class Based Modeling **Requirement Modeling Strategies :** Flow oriented Modeling , Behavioral Modeling **Textbook 1: Chapter 5: 5.1 to 5.7, Chapter 6: 6.1 to 6.5, Chapter 7: 7.1 to 7.3**	8
Pedagogy	**ICT Based Learning**	
	Agile development: What is Agility?, Agility and the cost of change. What is an agile Process?, Extreme Programming (XP), Other Agile Process Models, A tool set for	8

3	Agile process. **Principles that guide practice:** Software Engineering Knowledge, Core principles, Principles that guide each framework activity **Textbook 1: Chapter 3: 3.1 to 3.6, Chapter 4: 4.1 to 4.3**	
Pedagogy	**ICT Based Learning**	
4	**Software Testing Strategies** : Verification and Validation ,Organizing for Software Testing Software Testing Strategy—The Big Picture ,Criteria for Completion of Testing,Strategic Issues Test Strategies for Conventional Software , Unit Testing ,Integration Testing ,Test Strategies for Object-Oriented Software ,Unit Testing in the OO Context ,Integration Testing in the OO Context ,Test Strategies for WebApps ,Validation Testing ,Validation-Test Criteria ,Configuration Review ,Alpha and Beta Testing ,System Testing ,Recovery Testing ,Security Testing ,Stress Testing ,Performance Testing ,Deployment Testing **Software Quality:** Introduction, The place of software quality in project planning, Importance of software quality, Defining software quality, Software quality models, product versus process quality management. **Textbook 1 : Chapter 17 : 17.1 to 17.7** **Textbook 2: Chapter 13: 13.1 to 13.5, 13.7, 13.8.**	**8**
Pedagogy	**ICT Based Learning**	
5	**Introduction to Project Management:** Introduction, Project and Importance of Project Management, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some ways of categorizing Software Projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle, Traditional versus Modern Project Management Practices. **Project Evaluation:** Evaluation of Individual projects, Cost–benefit Evaluation Techniques, Risk Evaluation. **Textbook 2: Chapter 1: 1.1 to 1.17 , Chapter 2: 2.4 to 2.6**	**8**
Pedagogy	**ICT Based Learning**	

	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 thinkingandenables creative problemsolving • **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	Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.
2	Bob Hughes, Mike Cotterell, Rajib Mall: Software Project Management, 6th Edition, McGraw Hill Education, 2018.
Reference Books	
1	Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India
2	"Software Engineering: Principles and Practice", Hans van Vliet, Wiley India, 3rd Edition, 2010

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Understand** software engineering principles and various process models.	**Remember/ Understand**	**L1/L2**
CO2	**Apply** the knowledge of software engineering and project management strategies in maintaining a software .	**Apply**	**L3**
CO3	**Analyze** the concepts ofagile methodology and project management in building a quality software .	**Analyze**	**L4**
CO4	**Design** a software engineering document for small projects.	**Design**	**L5**
CO5	**Evaluate** the importance of software engineering and software quality in enhancing their standards.	**Create/ Investigate**	**L6**

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

Weblinks and Video Lectures (e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc20_cs68/preview
2	https://onlinecourses.nptel.ac.in/noc24_mg01/preview

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	-	-
Apply	15	20	-	-
Analyze	15	20	20	10
Evaluate	-	-	15	20
Create	-	-	15	20

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	4	3	3	-	-	-	10	20%
CO2	6	6	-	2	-	-	14	30%
CO3	-	-	3	2	4	4	13	24%
CO4	-	-	-	-	4	3	07	14%
CO5	-	-	-	-	3	3	06	12%
Total	10	9	6	4	11	10	50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	12
Understand	13
Apply	15
Analyse	10
Evaluate	--
Create	--

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	3	2	3	-	2	2	12	24%
CO2	3	3	-	3	2	2	13	26%
CO3	--	--	5	-	5	5	15	30%
CO4	--	--	-	1	2	2	5	10%
CO5	--	--	-	-	2	3	5	10%
Total	6	5	8	4	13	14	50	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**6th**				
Course Title	**:**	**Explainable AI**				
Course Code	**:**	**BAI604A**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PEC -2**				
Stream	**:**	**AIML**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:0:0**		**SEE**	**:**	**50**
Total Hours	**:**	**40**		**SEE Duration**	**:**	**3 Hrs.**
Credits	**:**	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To understand the basic building block of Explainable AI and interpretable machine learning
2	To understand the inner workings of AI and consequent outcomes.
3	To bring transparency to AI systems by translating, simplifying, and visualizing its decisions.
4	To discover unknown correlations with causal relationships in data.

Teaching-Learning Process

Pedagogical Initiatives:

1. Adopt different teaching methods such as lectures, live coding sessions, and interactive

discussions to help students achieve the course outcomes.

2. Include video tutorials and demonstrations to explain different explainable software's for algorithm performance.
3. Encourage collaborative (group) learning through mini-projects, peer coding exercises, and GitHub collaboration to build teamwork and version control skills.
4. Ask at least three Higher-Order Thinking Skills (HOTS) questions module-wise to promote critical thinking in areas such as interpreting complex AI decisions, ensuring transparency in black-box models, and evaluating the ethical implications of explainability techniques.
5. Adopt Problem-Based Learning (PBL) by providing real-world AI challenges such as explaining credit scoring systems, medical image diagnoses, or autonomous vehicle decisions to develop analytical and ethical reasoning skills in AI applications.
6. Show different approaches to achieving explainability in AI systems, such as using SHAP, LIME, Grad-CAM, or integrated gradients, and encourage students to explore and compare their effectiveness across various model types and datasets.
7. Discuss various case studies from domains like healthcare, finance, and legal analytics where Explainable AI has been applied, to help students bridge theoretical concepts with real-world implementation and societal impact.
8. Devise innovative pedagogy like flipped classrooms (assign frontend/backend tutorials before class), live hands-on coding challenges during sessions, peer code reviews, and hackathons to enhance the Teaching-Learning Process (TLP)

DSATM

Scheme of Teaching and Examinations for BE Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
	Introduction to Interpretability and Explainability Black-Box problem, Goals, Porphyrian Tree, Expert Systems, Case-Based Reasoning, Bayesian Networks, Types of Explanations, Trade-offs, Taxonomy, Flowchart for Interpretable and Explainable Techniques	**8 Hours**

1	**Textbook 1: 1: 1.1 to 1.9**	
Pedagogy	**Demonstration, Presentation**	
2	**Pre-model Interpretability and Explainability** Data Science Process and EDA, Exploratory Data Analysis, Feature Engineering-Feature Engineering and Explainability, Feature Engineering Taxonomy and Tools. **Textbook 1: 1: 2.1 to 2.3**	**8 Hours**
Pedagogy	**Demonstration, Presentation**	
3	**Model Visualization Techniques and Traditional Interpretable Algorithms** Model Validation, Evaluation, and Hyperparameters, Model Selection and Visualization, Classification Model Visualization, Regression Model Visualization, Clustering Model Visualization, Interpretable Machine Learning Properties, Traditional Interpretable Algorithms-Linear Regression. **Textbook 1: 3.1 to 3.6, 3.7.2**	**8 Hours**
Pedagogy	**Demonstration, Presentation**	
4	**Model Interpretability: Advances in Interpretable Machine Learning** Interpretable vs. Explainable Algorithms, Ensemble-Based-Boosted Rulesets, Explainable Boosting Machines (EBM), Rule Fit, Skope-Rules, Iterative Random Forests (iRF), Decision Tree Based-Optimal Classification Trees, Optimal Decision Trees, Scoring System **Textbook 1: 1: 4.1-4.4,4.6**	**8 Hours**
Pedagogy	**Demonstration, Presentation**	
5	**Explainable Deep Learning** Applications, Tools and Libraries, Intrinsic, Perturbation- LIME, Occlusion, RISE, Prediction Difference Analysis, Meaningful Perturbation, Gradient/Backpropagation Activation Maximization, Class Model Visualization, Saliency Maps, DeepLIFT, Deep SHAP, Deconvolution, Guided Backpropagation, Integrated Gradients, Layer-Wise Relevance Propagation, Excitation Backpropagation, CAM	**8 Hours**

	Textbook 1: 6.1 to 6.4, 6.5.1 to 6.5.11	
Pedagogy	**Demonstration, Presentation**	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Mayuri Mehta, Vasile Palade ,Indranath Chatterjee, "Explainable AI: Foundations, Methodologies and Applications", Springer, 2023
2	John Liu, James Whitaker, James Whitaker, Uday Kamath, "Explainable Artificial Intelligence: An Introduction to Interpretable Machine Learning", Springer, 2021
Reference Books	
1	Christoph Molnar , "Interpretable Machine Learning: A Guide for Making Black Box Models Explainable", Second Edition Leonida Gianfagna, Antonio Di Cecco, "Explainable AI with Python" , 2021

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 concepts of interpretability and explainability in AI employing various explanation techniques and taxonomies.	**Understand**	**L1/L2**
CO2	Apply techniques like LIME, and SHAP to generate explanations from black-box machine learning models and utilize Feature Engineering for Explainability	**Apply**	**L3**
CO3	Implement explainable deep learning algorithms and solve real-world problems	**Analyze**	**L4**
CO4	Analyze challenges and limitations associated with Explainable AI methods, such as trade-offs between model complexity and interpretability	**Design**	**L5**
CO5	Identify novel methods, address open challenges in transparent and interpretable machine learning	**Create**	**L5**

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.udemy.com/course/xai-explain-ml-models/

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	-	-
Apply	15	20	-	-
Analyze	15	20	20	10
Evaluate	-	-	15	20
Create	-	-	15	20

CIE- Continuous Internal Evaluation (50 Marks)

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module-2-2.5	Module-2.5-3	Module-4	Module-5		
CO1	4	3	3	-	-	-	10	20%
CO2	6	6	-	2	-	-	14	30%
CO3	-	-	3	2	4	4	13	24%
CO4	-	-	-	-	4	3	07	14%
CO5	-	-	-	-	3	3	06	12%
Total	10	9	6	4	11	10	50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	12
Understand	13
Apply	15
Analyse	10
Evaluate	--
Design	--

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module-2-2.5	Module-2.5-3	Module-4	Module-5		
CO1	3	2	3	-	2	2	12	24%
CO2	3	3	-	3	2	2	13	26%
CO3	--	--	5	-	5	5	15	30%

CO4	**--**	**--**	**-**	**1**	**2**	**2**	**5**	**10%**
CO5	**--**	**--**	**-**	**-**	**2**	**3**	**5**	**10%**
Total	**6**	**5**	**8**	**4**	**13**	**14**	**50**	**100%**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**6th**				
Course Title	**:**	**Full Stack Development**				
Course Code	**:**	**BAI604B**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PEC-2**				
Stream	**:**	**AIML**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:0:0**		**SEE**	**:**	**50**
Total Hours	**:**	**40**		**SEE Duration**	**:**	**3 Hrs.**
Credits	**:**	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Explain the use of learning full stack web development.
2	Make use of rapid application development in the design of responsive web pages.
3	Illustrate Models, Views and Templates with their connectivity in Django for full stack web
4	development.
5	Demonstrate the use of state management and admin interfaces automation in Django.

Teaching-Learning Process

Pedagogical Initiatives:

9. Adopt different teaching methods such as lectures, live coding sessions, and interactive discussions to help students achieve the course outcomes.
10. Include video tutorials and demonstrations to explain Full Stack concepts like frontend

design, backend development, RESTful APIs, and database integration.

11. Encourage collaborative (group) learning through mini-projects, peer coding exercises, and GitHub collaboration to build teamwork and version control skills.
12. Ask at least three Higher-Order Thinking Skills (HOTS) questions module-wise to promote critical thinking in areas like optimizing web application performance, securing APIs, and designing scalable architectures.
13. Adopt Problem-Based Learning (PBL) by giving real-world Full Stack problems such as building an e-commerce website, a social media platform, or an online learning portal to develop analytical and problem-solving skills.
14. Show different approaches to solve Full Stack problems, such as using different frontend frameworks (React, Angular, Vue) or backend technologies (Node.js, Django, Flask), and encourage students to explore creative and optimized solutions.
15. Discuss various Full Stack development case studies from industries like education technology, fintech, and healthcare to connect theoretical knowledge with real-world practices.
16. Devise innovative pedagogy like flipped classrooms (assign frontend/backend tutorials before class), live hands-on coding challenges during sessions, peer code reviews, and hackathons to enhance the Teaching-Learning Process (TLP)

DSATM

Scheme of Teaching and Examinations for BE Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**MVC based web designing** Web framework, MVC Design Pattern, Django Evolution, Views, Mapping URL to Views, Working ofDjango URL Confs and Loose Coupling, Errors in Django, Wild Card patterns in URLS. **Textbook 1: Chapter 1 and Chapter 3**	**8 Hours**
Pedagogy	**Demonstration using visual studio code, Presentation**	
2	**Django templates and models** Template System Basics, Using Django Template System, Basic Template Tags and Filters, MVTDevelopment Pattern, Template Loading, Template Inheritance, MVT Development Pattern. Configuring Databases, Defining and Implementing Models, Basic Data Access, Adding Model StringRepresentations, Inserting/Updating data, Selecting and deleting objects, Schema Evolution **Textbook 1: Chapter 4 and Chapter 5**	**8 Hours**
Pedagogy	**Demonstration using visual studio code, Presentation**	
3	**Django Admin Interfaces and Model Forms** Activating Admin Interfaces, Using Admin Interfaces, Customizing Admin Interfaces, Reasons to useAdmin Interfaces. Form Processing, Creating Feedback forms, Form submissions, custom validation, creating Model Forms,URLConf Ticks, Including Other URLConfs. **Textbook 1: Chapters 6, 7 and 8**	**8 Hours**
Pedagogy	**Demonstration using visual studio code, Presentation**	
	Generic Views and Django State Persistence Using Generic Views, Generic Views of Objects, Extending Generic Views of objects,	**8**

4	Extending Generic Views.MIME Types, Generating Non-HTML contents like CSV and PDF, Syndication Feed Framework, Sitemap framework, Cookies, Sessions, Users and Authentication. **Textbook 1: Chapters 9, 11 and 12**	**Hours**
Pedagogy	**Demonstration using visual studio code, Presentation**	
5	**Caching:** Setting up the cache, the per site cache, The per view cache. **jQuery and AJAX Integration in Django** Ajax Solution, Java Script, XHTMLHttpRequest and Response, JSON, iFrames, Settings of JavaScript in Django, jQuery and Basic AJAX. **Textbook 1: Chapters 13** **Textbook 2: Chapters 1, 2 and 7.**	**8 Hours**

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Adrian Holovaty, Jacob Kaplan Moss, The Definitive Guide to Django: Web Development Done Right, Second Edition, Springer-Verlag Berlin and Heidelberg GmbH & Co. KG Publishers, 2009
2	Jonathan Hayward, Django Java Script Integration: AJAX and jQuery, First Edition, Pack Publishing, 2011
Reference Books	
1	AidasBendroraitis, Jake Kronika, Django 3 Web Development Cookbook, Fourth Edition, Packt Publishing, 2020
2	William Vincent, Django for Beginners: Build websites with Python and Django, First Edition, Amazon Digital Services, 2018
3	.Antonio Mele, Django3 by Example, 3rd Edition, Pack Publishers, 2020
4	ArunRavindran, Django Design Patterns and Best Practices, 2nd Edition, Pack Publishers, 2020.
5	Julia Elman, Mark Lavin, Light weight Django, David A. Bell, 1st Edition, Oreily Publications, 2014

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 working of MVT based full stack web development with Django.	Understand	L1/L2
CO2	Apply the Django framework libraries to render non-HTML contents like CSV and PDF.	Apply	L3
CO3	Analyze the role of Template Inheritance and Generic views for developing full stack webapplications.	Analyze	L4
CO4	Designing of Models and Forms for rapid development of web pages.	Design	L5
CO5	Create interactive Django applications using caching, jQuery, AJAX, JavaScript, and JSON	Create	L5

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

Weblinks and Video Lectures (e-Resources)	
1	MVT architecture with Django: https://freevideolectures.com/course/3700/django-tutorials
2	Model Forms with Django: https://www.youtube.com/watch?v=gMM1rtTwKxE

3	Real time Interactions in Django: https://www.youtube.com/watch?v=3gHmfoeZ45k
4	AJAX with Django for beginners: https://www.youtube.com/watch?v=3VaKNyjlxAU

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	-	-
Apply	15	20	-	-
Analyze	15	20	20	10
Evaluate	-	-	15	20
Create	-	-	15	20

CIE- Continuous Internal Evaluation (50 Marks)

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module-2-2.5	Module-2.5-3	Module-4	Module-5		
CO1	4	3	3	-	-	-	10	20%
CO2	6	6	-	2	-	-	14	30%
CO3	-	-	3	2	4	4	13	24%
CO4	-	-	-	-	4	3	07	14%
CO5	-	-	-	-	3	3	06	12%
Total	10	9	6	4	11	10	50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	12
Understand	13
Apply	15
Analyse	10
Evaluate	--
Design	--

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module-2-2.5	Module-2.5-3	Module-4	Module-5		
CO1	3	2	3	-	2	2	12	24%
CO2	3	3	-	3	2	2	13	26%
CO3	--	--	5	-	5	5	15	30%
CO4	--	--	-	1	2	2	5	10%
CO5	--	--	-	-	2	3	5	10%
Total	6	5	8	4	13	14	50	100%

PROJECT BASED LEARNING (PBL)

PBL- Project Based Learning

Teaching Hours/Week (L: T:P:S)	0:2:0:2
Total Hours of Pedagogy	24 hours – 10 Theory + 14 Project
Credits:	02
Modules	5
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Project Evaluation

Subject Identified for Project Based Learning

Semester	6th
Subject Identified for PBL	Project Work Phase 1
Prerequisite	Project Domain Finalization Identification of Problem Statement
Justification for the selected subject	Designed to bridge the gap between theoretical knowledge and practical application. Necessary for producing industry-ready graduates with critical thinking, technical expertise, and real-world problem-solving skills.
List of possible projects	1.House Price Prediction 2.Handwritten Digit Recognition 3.Image Fraud Detection

Signature of the Guide **Signature of HOD**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**6th**				
Course Title	:	**Capstone Project Phase - I**				
Course Code	:	**BAI606**				
Course Type (Theory/Practical/Integrated/Project)	:	**Project**				
Category	:	**PROJ-1**				
Stream	:	**AIML**		**CIE**	:	**100**
Teaching hours/ week (L:T:P:S)	:	**0:0:0:4**		**SEE**	:	**--**
Total Hours	:	**14 Project**		**SEE Duration**	:	**--.**
Credits	:	**2**				

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)**

COURSE CURRICULUM

Course objectives: • To understand the main themes and recurring ideas found in the literature related to the project. • Apply literature findings to define the scope and objectives of the project. • Critically analyze and compare different perspectives presented in the literature. • Critically evaluate the reliability and credibility of sources used in the literature survey. • Synthesize information from the literature to propose a conceptual framework for the project.	
Course outcomes: At the end of the course the student will be able to: • Demonstrate an **understanding** of the major themes and trends in the literature related to the project. • **Apply** literature findings to define the scope and boundaries of the project. • Critically **analyze** and compare different perspectives presented in the literature. • Critically **evaluate** the reliability and credibility of sources used in the literature survey. • **Develop**a framework for the project from the information acquired during literature survey and submit a report.	**2**
CIE procedure for Project Work Phase - 1: **(i)Single discipline:**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 phase -1, shall be based on the evaluation of project work phase -1 Report, project presentation skill and question and answer session in.The marks awarded for the project report shall be the same for all the batch mates. **(ii) Interdisciplinary:**Continuous Internal Evaluation shall be group wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work phase -1, shall be based on the evaluation of project work phase -1 Report, project presentation skill and question and answer session.The marks awarded for the project report shall be the same for all the batch mates. ■	

Dayananda Sagar Academy of Technology & Management
(Autonomous Institute under VTU)

Affiliated to VTU

Approved by AICTE
Accredited by NAAC with A+ Grade
6 Programs Accredited by NBA
(CSE, ISE, ECE, EEE, MEC

Project Based Learning - Batch

From, **Date:**

Name: & USN:

Name: & USN:

Name: & USN:

Name: & USN:

Semester:

RespectedSir/Madam,

Sub: Regarding PBL Batch

With respect to the above subject, we are the students mentioned above would like to form the batch for carrying out the mini project on……

Thanking you, Yours faithfully

Sl. No.	Name of the student	Signature
1.		
2.		
3.		
4.		

Signature of the Guide

Name of the Guide Designation

Dayananda Sagar Academy of Technology & Management
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Approved by AICTE
Accredited by NAAC with A+ Grade
6 Programs Accredited by NBA
(CSE, ISE, ECE, EEE, MEC

Project Based Learning – Student(s) – Guide – Interaction

Date		
PBL Batch No.		
Title of the project		
Week No.		
Content of the Discussion		
Suggestion by the guide		
Name of Signature of students		

Signature of the Guide **Signature of PBL Coordinator** **Signature of HOD**

Dayananda Sagar Academy of Technology & Management
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Project Based Learning – Continuous Evaluation

Batch No.	Name	USN	Marks assigned	Remarks by the guide on the progress of the project

Signature oftheGuide **SignatureofPBLCoordinator** **Signature ofHOD**

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Project Based Learning –Review

Batch No.	Name of the Student	USN	Infosys Springboard Certification (25 Marks)	Phase I (25Marks)		Phase II (25 Marks)			Final CIE Marks (Certification (25Marks) + Phase I & Phase II (50 Marks reduced to 25 Marks)) (50 Marks)
				Project understanding (05 Marks)	Technical Competence (10 Marks)	Innovation (10 Marks)	Problem Solving (15 Marks)	Project Demonstration (10 Marks)	

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Project Based Learning Outcomes

Sl.No	Batch No.	Name of Students	USN	Domain	Outcomes

Professional Core Course Laboratory

PCCL COURSE : Professional Core Course Laboratory

Teaching Hours/Week (L: T:P:S)	0:2:2:0
Total Hours of Pedagogy	28 hours Practical
Credits:	02
Programs / Experiments	12 Programs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Practical

Dayananda Sagar Academy of Technology &Management

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Semester	:	**6th**				
Course Title	:	**DevSecOps Lab**				
Course Code	:	**BAIL607**				
Course Type (Theory/Practical/Integrated/Project)	:	**Practical**				
Category	:	**PBL/PCCL**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours / week(L:T:P:S)	:	**0:2:2:0**		**SEE**	:	**50**
Total Hours	:	**28P**		**SEE Duration**	:	**3 Hrs**
Credits	:	**02**				

Course Learning Objectives: Students will be able to:

Sl .No	Course Objectives
1	To introduce DevOps terminology, definition & concepts
2	To understand the different Version control tools like Git, Mercurial
3	To understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment).
4	To understand Configuration management using Ansible
5	Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems

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 **Project-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)**.

SL.NO.	PROGRAMS
1	Introduction to Maven and Gradle: Overview of Build Automation Tools, Key Differences Between Maven and Gradle, Installation and Setup
2	Working with Maven: Creating a Maven Project, Understanding the POM File, Dependency Management and Plugins
3	Working with Gradle: Setting Up a Gradle Project, Understanding Build Scripts (Groovy and Kotlin DSL), Dependency Management and Task Automation
4	Practical Exercise: Build and Run a Java Application with Maven, Migrate the Same Application to Gradle
5	Introduction to Jenkins: What is Jenkins?, Installing Jenkins on Local or Cloud Environment, Configuring Jenkins for First Use
6	Continuous Integration with Jenkins: Setting Up a CI Pipeline, Integrating Jenkins with Maven/Gradle, Running Automated Builds and Tests
7	Configuration Management with Ansible: Basics of Ansible: Inventory, Playbooks, and Modules, Automating Server Configurations with Playbooks, Hands-On: Writing and Running a Basic Playbook
8	Practical Exercise: Set Up a Jenkins CI Pipeline for a Maven Project, Use Ansible to Deploy Artifacts Generated by Jenkins
9	Introduction to Azure DevOps: Overview of Azure DevOps Services, Setting Up an Azure DevOps Account and Project
10	Creating Build Pipelines: Building a Maven/Gradle Project with Azure Pipelines, Integrating Code Repositories (e.g., GitHub, Azure Repos), Running Unit Tests and Generating Reports
11	Creating Release Pipelines: Deploying Applications to Azure App Services, Managing Secrets and Configuration with Azure Key Vault, Hands-On: Continuous Deployment with Azure Pipelines
12	Practical Exercise and Wrap-Up: Build and Deploy a Complete DevOps Pipeline, Discussion on Best Practices and Q&A Deploy the project on cloud platform.
	Weblinks and Video Lectures (e-Resources)
	https://www.geeksforgeeks.org/devops-tutorial/ ● https://www.javatpoint.com/devops

	● https://www.youtube.com/watch?v=2N-59wUIPVI ● https://www.youtube.com/watch?v=87ZqwoFeO88
	Conduct of Practical Examination:
	Experiment distribution • For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity. • For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity. ● Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only. ● Marks Distribution (Need to change in accordance with university regulations) a) For laboratories having PART A and PART B i. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks ii. Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks

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

CO's	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Demonstrate different actions performed through Version control tools like Git	Understand	L1/L2
CO2	Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven	Apply	L3
CO3	Experiment with configuration management using Ansible	Analyze	L4
CO4	Demonstrate Cloud-based DevOps tools using Azure DevOps.	Design	L5
CO5	Develop and deploy a project in Devops	Evaluate	L5

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	3	3	3	2	2	--	--	--	2	2	--	--	1	1	1
CO5	2	3	2	3	2	--	--	--	2	2	--	--	1	1	1

ABILITY ENHANCEMENT COURSE

AEC Course – Ability Enhancement Course

Teaching Hours/Week (L: T:P:S)	1:0:0:0
Total Hours of Pedagogy	24 hours Theory
Credits:	01
Programs / Experiments	5 modules
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	1
Examination nature (SEE)	Theory

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ABILITY ENHANCEMENT COURSE

EXPERIENTIAL LEARNING

Dayananda Sagar Academy of Technology & Management

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Semester	:	6th				
Course Title	:	Agentic AI				
Course Code	:	BAI608A				
Course Type (Theory/Practical/Integrated/Project)	:	Theory				
Category	:	AEC				
Stream	:	AIML		CIE	:	50
Teaching hours/week(L:T:P:S)	:	1:0:0:0		SEE	:	50
Total Hours	:	15 Hrs.		SEE Duration	:	2 Hrs
Credits	:	1				

:

8. (a)DefineObjectives

IdentifyGoals:Determinewhatskillsandknowledgeyouwantstudentstoacquirethrough ExperientialLearning.	
LearningGoal(LG)-1	Understand the fundamentals of Agentic AI, including agency, autonomy, planning, and tool use
LearningGoal(LG)-2	Build intelligent agents using modern frameworks like LangChain and OpenAI function-calling
LearningGoal(LG)-3	Implement memory and planning components in agents, including both short-term and long-term memory
LearningGoal(LG)-4	Evaluate agent performance and ensure safety, addressing issues like prompt injection and misuse of tools
LearningGoal(LG)-5	Explore future trends and ethical impacts of self-improving and multi-agent systems

(f) CourseOutcomes

Identify Goals: Determine what skills and knowledge you want students to acquire through Experiential Learning.	
Course Outcomes (CO)-1	Understand the fundamentals of Agentic AI, including agency, autonomy, planning, and tool use.
Course Outcomes (CO)-2	Build intelligent agents using modern frameworks like LangChain and OpenAI function-calling.

Course Outcomes (CO)-3	Implement memory and planning components in agents, including both short-term and long-term memory.
Course Outcomes (CO)-4	Evaluate agent performance and ensure safety, addressing issues like prompt injection and misuse of tools.
Course Outcomes (CO)-5	Explore future trends and ethical impacts of self-improving and multi-agent systems.

(g) Alignment

AlignwithCurriculum:Ensurethesegoalsalignwiththeoveralleducationalobjectivesoftheengineeringprogram.						
Sl.No	**LearningGoals**	**CourseOutcomes**	**Assessment**	**In-ClassActivity**	**Out-of-Class Activity**	**Weightage**
1.	Understand the fundamentals of Agentic AI, including agency, autonomy, planning, and tool use	Understand the fundamentals of Agentic AI, including agency, autonomy, planning, and tool use.	Concept Quiz (Formative) Short Reflective Assignment	Small groups create digital or paper-based concept maps and present them.	Agent Journal / Learning Log, Industry Webinars & AI Conferences	**20%**
2.	Build intelligent agents using modern frameworks like LangChain and OpenAI function-calling	Build intelligent agents using modern frameworks like LangChain and OpenAI function-calling.	Lab Assignments Mini Project	Weekly lab tasks (e.g., build a retrieval-based agent, a tool-using agent). Run different agents on predefined tasks and log behaviors, response quality, and tool usage.	GitHub Open-Source Contribution, Build-a-Bot Weekend	**20%**

3.	Implement memory and planning components in agents, including both short-term and long-term memory	Implement memory and planning components in agents, including both short-term and long-term memory.	Project with Memory Component Code Review	Implement memory and planning components	Agent Book/Article Club, Industry Webinars & AI Conferences	**20%**
4.	Evaluate agent performance and ensure safety, addressing issues like prompt injection and misuse of tools	Evaluate agent performance and ensure safety, addressing issues like prompt injection and misuse of tools.	Case Study Analysis Red Team Simulation Report	Groups debate topics like "Should agents have autonomy in decision-making?", or "The risks of self-improving agents". Students pick a paper or case (e.g., AutoGPT, Devin AI, Amazon hiring bias) and present its structure, success, and pitfalls.	"AI Agents in the Wild" Field Study, Industry Webinars & AI Conferences	**20%**
5.	Explore future trends and ethical impacts of self-improving and multi-agent systems	Explore future trends and ethical impacts of self-improving and multi-agent systems.	Debate / Panel Presentation Ethical Analysis Essay	Students build a multi-component agent (e.g., travel planner, academic tutor, accessibility assistant) and document its performance, memory use, and ethical design.	"AI Agents in the Wild" Field Study	**20%**

9. Curriculum Design

(a) Course integration

CourseIntegration: Identifywhichcoursescanincorporateexperientiallearningactivities.Thiscan include project-basedcourses,labs,internships,and workshops.			
Sl.No	**Course Name**	**Course Code**	**Justification for selecting the Course for Experiential Learning**
1	**Cognitive Computing / Human-Centered AI**		These courses focus on simulating human reasoning, memory, and behavior—core to Agentic AI. Experiential activities like user testing or designing agents that mimic human planning enhance students' understanding of how agents can interact with people naturally and ethically.
2	**Natural Language Processing (NLP)**		NLP is a backbone of most agentic systems today. Function-calling, prompt design, and language understanding are crucial for building capable, safe agents. Hands-on activities like chatbot creation or prompt injection defense give students practical skills aligned with industry needs.
3	**Data Science / Applied Data Analytics**		Data-driven agents require real-time access and reasoning over large datasets. In this course, experiential learning through agent-assisted querying and analysis trains students to automate and optimize data workflows with AI tools—boosting both their technical and analytical skills.
4	**Technology & Society / AI Ethics**		Agentic AI raises complex ethical, legal, and social questions. Experiential learning through debates, role-playing, and policy simulations helps students think critically about agent behavior, responsibility, and regulation—equipping them to design ethically responsible systems.

(a) Develop Modules

DevelopModules:Createspecificmoduleswithinthesecoursesthatfocusonhands-onexperiences.								
ModuleNo	LectureNo.	SessionTopics	RBT Levels	ActivitiesPlanned	CourseOutcome Mapping	ModeofDelivery	PlannedDate	ActualDate
1	1-2	Foundations of Agentic AI: Definition and scope of Agentic AI Key concepts: agency, autonomy, planning, tool use History and motivation: from symbolic agents to LLM agents Key applications: task automation, search, problem solving	L1/L2	Small groups create digital or paper-based concept maps and present them.	CO1	Lectures / Concept Sessions		
2	3-4	Architectures and Frameworks, Cognitive loops: ReAct, Plan-and-Execute, Chain-of-Thought. Tool-use via LLMs: LangChain, OpenAI function-calling. Multi-agent and recursive agents (e.g., CrewAI, CAMEL)	L3	Weekly lab tasks (e.g., build a retrieval-based agent, a tool-using agent).Run different agents on predefined tasks and log behaviors, response quality, and tool usage.	CO2	Hands-on Labs / Workshops		
3	5-7	Agent Components: Memory, Planning, Tools Long-term vs short-term memory (vector DBs, scratchpads) Planners: deterministic, probabilistic, LLM-based Tool integration: search APIs, calculators, code interpreters	L4	Implement memory and planning components	CO3	Hands-on Labs / Workshops		
4	8-11	Evaluation, Safety, and Alignment Evaluating agent performance: correctness, efficiency, alignment Safety and control: prompt injection, tool misuse, feedback loops Human-in-the-loop and alignment strategies	L5	Groups debate topics like “Should agents have autonomy in decision-making?”, or "The risks of self-improving agents". Students pick a paper or case (e.g., AutoGPT, Devin AI, Amazon hiring bias) and present its structure, success, and pitfalls.	CO4	Hands-on Labs / Workshops, Case Studies & Ethical Debates		

5	12-15	Project Lab & Future Trends Emerging directions: Open-ended agents, Auto-evolution, Self-improving agents Project showcase & discussion Ethical implications and societal impact	L6	Students build a multi-component agent (e.g., travel planner, academic tutor, accessibility assistant) and document its performance, memory use, and ethical design.	C05, CO6	Hands-on Labs / Workshops. Assignments & Mini Projects. Case Studies & Ethical Debates		

10. Mapping of Learning objectives with Learning Outcomes

Course/Modules	LearningObjective	LearningOutcome	AssessmentMethod
Foundations of Agentic AI: Definition and scope of Agentic AI Key concepts: agency, autonomy, planning, tool use History and motivation: from symbolic agents to LLM agents Key applications: task automation, search, problem solving	Understand the fundamentals of Agentic AI, including agency, autonomy, planning, and tool use	Understand the fundamentals of Agentic AI, including agency, autonomy, planning, and tool use.	CIE
Architectures and Frameworks, Cognitive loops: ReAct, Plan-and-Execute, Chain-of-Thought. Tool-use via LLMs: LangChain, OpenAI function-calling. Multi-agent and recursive agents (e.g., CrewAI, CAMEL)	Build intelligent agents using modern frameworks like LangChain and OpenAI function-calling	Build intelligent agents using modern frameworks like LangChain and OpenAI function-calling.	CIE
Agent Components: Memory, Planning, Tools Long-term vs short-term memory (vector DBs, scratchpads) Planners: deterministic, probabilistic, LLM-based Tool integration: search APIs, calculators, code interpreters	Implement memory and planning components in agents, including both short-term and long-term memory	Implement memory and planning components in agents, including both short-term and long-term memory.	CIE
Evaluation, Safety, and Alignment Evaluating agent performance: correctness, efficiency, alignment Safety and control: prompt injection, tool misuse, feedback loops Human-in-the-loop and alignment strategies	Evaluate agent performance and ensure safety, addressing issues like prompt injection and misuse of tools	Evaluate agent performance and ensure safety, addressing issues like prompt injection and misuse of tools.	CIE

Project Lab & Future Trends Emerging directions: Open-ended agents, Auto-evolution, Self-improving agents Project showcase & discussion Ethical implications and societal impact	Explore future trends and ethical impacts of self-improving and multi-agent systems	Explore future trends and ethical impacts of self-improving and multi-agent systems.	CIE

CIEandSEE:

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. 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).The student is declared as a pass in the course if he/she secures a minimum of 40%(40 marksoutof100) in the sum total of the CIE(Continuous Internal Evaluation) and SEE(Semester End Examination) taken together

Continuous Internal Evaluation(CIE):

- Forthe Assignment component tothe CIE, there are25 marks andforthe InternalAssessment Test component,thereare25marks.
- The firsttestwillbeadministeredafter40-50%ofthesyllabushasbeencovered,andthesecond Testwillbeadministeredafter85-90%ofthesyllabushasbeencovered
- Anytwoassignmentmethodsmentionedinthe22OB2.4,ifanassignmentisproject-basedthenonly oneassignmentforthecourseshallbeplanned.Theteacher shouldnotconducttwoassignments at the end of the semester if two assignments are planned.
- Forthecourse,CIEmarkswillbebasedonascaled-downsumoftwotestsandothermethodsof assessment.

The sum of two tests,twoassignments,will be out of 100 marks and will be scaled down to 50 marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations(SEE):

SEE paper shall be set for 50 questions,each of the 01 marks.The pattern of the question paper is MCQ (multiple choice questions).The time allotted for SEE is 02 hour.The student has to secure a minimum of 35% of the maximum marks meant for SEE.

Implement Experiential Activities

AEC Component	Details
Project Title	[Enter the project title]
Real-World Problem	[Describe the real-world problem the project addresses]
Learning Objectives	**Subject Areas:** [List subjects integrated] **Skills Developed:** [List skills]
Timeline	**Start Date:** [Enter start date] **Milestones/Checkpoints:** [List milestones] **End Date:** [Enter end date]
Resources Needed	**Materials:** [List materials] **Technology:** [List technology] **Guest Speakers/Experts:** [List experts]
Team Formation	**Group Size:** [Enter group size] **Team Roles:** [List roles such as Project Manager, Researcher, Presenter]
Background Information	[Describe the prior knowledge students need]

Research Methods	**Primary Sources:** [List methods such as interviews, surveys] **Secondary Sources:** [List methods such as articles, books, videos]
Team Meetings	**Frequency:** [Enter frequency of meetings] **Structure:** [Describe the structure of the meetings]
Collaboration Tools	**Digital Platforms:** [List platforms such as Google Docs, Trello] **Communication Methods:** [List methods such as in-person, virtual meetings]
Project Deliverables	[List what students will produce such as reports, presentations, prototypes]
Presentation Format	**Options:** [List options such as PowerPoint, video, live demonstration] **Audience:** [List audience such as classmates, community members] **Schedule:** [Enter presentation schedule]
Project Exhibition	[Describe how students' projects will be displayed or shared with a wider audience]

Experiential Learning - Batch

From, **Date:**

Name: & USN:

Name: & USN:

Name: & USN:

Name: & USN:

Semester:

RespectedSir/Madam,

Sub:Regarding Experiential Learning Batch

With respect to the above subject, we are the students mentioned above would like to form the batch for carrying out the mini project on…….

Thanking you, Yours faithfully

Sl. No.	Name of the student	Signature
1.		
2.		
3.		
4.		

Signature of the Guide

Name of the Guide Designation

Department of ……. Engineering

Experiential Learning (EL) – Student(s) – Guide – Interaction

Date		
EL Batch No.		
Title of the project		
Week No.		
Content of the Discussion		
Suggestion by the guide		
Name of Signature of students		

Signature of the Guide **Signature of HOD**

Assessment

Rubrics for Experiential Learning Assessment

Sl. No	Name of the Student	USN	Criteria	Exemplary (4)	Proficient (3)	Developing (2)	Beginning (1)	Total
			Project Understanding	Demonstrates deep understanding of project goals and requirements; identifies key issues and objectives.	Shows good understanding of project goals and requirements; recognizes most key issues and objectives.	Displays basic understanding of project goals and requirements; some key issues and objectives are unclear.	Lacks clear understanding of project goals and requirements; key issues and objectives are misunderstood.	
			Technical Competence	Mastery of technical skills required for the project; applies skills effectively and efficiently.	Good technical skills; applies skills competently with few errors.	Basic technical skills; occasionally makes errors in application.	Limited technical skills; frequently makes errors in application.	
				Highly creative	Somewhat creative	Limited creativity	Lacks creativity	

			Innovation	and original ideas; shows significant innovation and out-of-the-box thinking.	and original ideas; demonstrates innovation in some aspects.	and originality; shows minimal innovation.	and originality; no evidence of innovative thinking.	
			Problem Solving	Identifies problems accurately and develops effective, comprehensive solutions.	Identifies problems correctly and develops good solutions.	Identifies problems but solutions are somewhat effective or incomplete.	Struggles to identify problems and develop effective solutions.	
			Project Management	Manages project timelines, resources, and tasks exceptionally well; meets all deadlines.	Manages project timelines, resources, and tasks effectively; meets most deadlines.	Manages project timelines, resources, and tasks with some difficulty; misses some deadlines.	Poor management of project timelines, resources, and tasks; frequently misses deadlines.	
				Thorough, clear,	Clear and	Basic	Poor	

			Documentation	and well-organized documentation; all necessary details included.	organized documentation; most necessary details included.	documentation; some necessary details are missing or unclear.	documentation; lacks necessary details and organization.	
			Presentation Skills	Engaging and well-organized presentation; communicates ideas clearly and effectively.	Good presentation; communicates ideas clearly but lacks some engagement or organization.	Basic presentation; some ideas are unclear or poorly organized.	Ineffective presentation; ideas are unclear and poorly organized.	
			Collaboration	Works exceptionally well with team members; shows strong teamwork and leadership skills.	Works well with team members; demonstrates good teamwork.	Works with team members but has some difficulties in collaboration.	Struggles to work with team members; lacks teamwork and collaboration skills.	
			Faculty Assessment	Meets or exceeds faculty expectations in	Meets faculty expectations in most areas; shows	Meets some faculty expectations; shows average	Does not meet faculty expectations;	

				all areas; shows exceptional performance.	good performance.	performance.	shows poor performance.	
			Reflection	Provides deep insights and critical analysis of own work; demonstrates significant learning and growth.	Provides good insights and analysis of own work; demonstrates learning and growth.	Provides basic insights and analysis of own work; shows some learning and growth.	Provides minimal or no insights and analysis of own work; shows little to no learning and growth.	
			Overall Assessment	Exceptional overall performance; exceeds expectations in most or all areas.	Good overall performance; meets expectations in most areas.	Average overall performance; meets expectations in some areas.	Poor overall performance; does not meet expectations in most areas.	

Skills Assessment

Student Name	USN	Skill Acquired	Skill Level Before (1-10)	Skill Level After (1-10)	Improvement (After-Before)	Syntax (1-10) Before	Syntax (1-10) After	Logic & Problem Solving (1-10) Before	Logic & Problem Solving (1-10) After	Data Structures (1-10) Before	Data Structures (1-10) After	Libraries & Frameworks (1-10) Before	Libraries & Frameworks (1-10) After	Code Optimization (1-10) Before	Code Optimization (1-10) After	Debugging (1-10) Before	Debugging (1-10) After

Dayananda Sagar Academy of Technology & Management

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Semester	:	6th				
Course Title	:	Time Series Analysis				
Course Code	:	BAI608B				
Course Type (Theory/Practical/Integrated/Project)	:	Theory				
Category	:	AEC				
Stream	:	AIML		**CIE**	:	**50**
Teaching hours/week(L:T:P:S)	:	1:0:0:0		**SEE**	:	**50**
Total Hours	:	15 Hrs.		**SEE Duration**	:	**2 Hrs**
Credits	:	1				

11. (a)DefineObjectives

IdentifyGoals:DeterminewhatskillsandknowledgeyouwantstudentstoacquirethroughExperientialLearning.	
LearningGoal(LG)-1	Understanding of Time Series Models
LearningGoal(LG)-2	Apply Forecasting Techniques and Applications
LearningGoal(LG)-3	Analyze seasonal time series using Seasonal ARIMA, structural components, and deterministic seasonality.
LearningGoal(LG)-4	Evaluate identifiability and uniqueness issues in time series model selection.
LearningGoal(LG)-5	Build and estimate multivariate models including Vector Autoregressive (VAR), Vector MA, and VARMA processes.

(h) CourseOutcomes

Identify Goals: Determine what skills and knowledge you want students to acquire through Experiential Learning.	
Course Outcomes (CO)-1	**Understand** the concepts and mathematical foundation of time series models
Course Outcomes (CO)-2	**Apply appropriate forecasting techniques**, such as minimum mean square error forecasts and state-space models, to real-world time series data.
Course Outcomes (CO)-3	**Analyze and model seasonal time series data** using Seasonal ARIMA models, structural components, and deterministic seasonality methods.
Course Outcomes (CO)-4	**Evaluate model identification techniques** with a focus on the identifiability and uniqueness of time series models, including issues related to model multiplicity.
Course Outcomes (CO)-5	**Design and estimate multivariate time series models**, such as Vector Autoregressive (VAR), Vector Moving Average (VMA), and Vector Autoregressive–Moving Average (VARMA) models, and use them for forecasting.

(i) Alignment

AlignwithCurriculum:Ensurethesegoalsalignwiththeoveralleducationalobjectivesoftheengineeringprogram.						
Sl.No	**LearningGoals**	**CourseOutcomes**	**Assessment**	**In-ClassActivity**	**Out-of-Class Activity**	**Weightage**
1.	Understanding of Time Series Models	**Understand** the concepts and mathematical foundation of time series models	Quiz	Time Series Diagnosis Lab	A hand-drawn or digital time series plot	**20%**
2.	Apply Forecasting Techniques and Applications	**Apply appropriate forecasting techniques**, such as minimum mean square error forecasts and state-space models, to real-world time series data	Programming Assignment	Gamified forecasting task : Apply forecasting models and evaluate their accuracy	Observing Time Series in Action	**20%**

3.	Analyze seasonal time series using Seasonal ARIMA, structural components, and deterministic seasonality.	**Analyze and model seasonal time series data** using Seasonal ARIMA models, structural components, and deterministic seasonality methods.	Project	Worksheet-based puzzle: Understand Seasonal ARIMA model structure	ACF & PACF Detective	**20%**
4.	Evaluate identifiability and uniqueness issues in time series model selection.	**Evaluate model identification techniques** with a focus on the identifiability and uniqueness of time series models, including issues related to model multiplicity.	Case Study	Group activity: Parameter Estimation Relay	Build Your First ARIMA Model	**20%**
5.	Build and estimate multivariate models including Vector Autoregressive (VAR), Vector MA, and VARMA processes.	**Design and estimate multivariate time series models**, such as Vector Autoregressive (VAR), Vector Moving Average (VMA), and Vector Autoregressive–Moving Average (VARMA) models, and use them for forecasting.	Presentation	Peer review-based activity: Model Diagnostic Clinic	Each group builds a time series model, presents residuals and diagnostics, and receives feedback from peers on over fitting, residual patterns, etc.	**20%**

Curriculum Design

(a) Course integration

Course Integration: Identify which courses can incorporate experiential learning activities. This can include project-based courses, labs, internships , and workshops.

Sl.No	Course Name	Course Code	Justification for selecting the Course for Experiential Learning
1	**Time Series Analysis**	**BA1608B**	The course content aligns with current industry trends and research domains. Through experiential learning, students gain hands-on experience with tools, platforms, and problem-solving approaches that are directly applicable in professional settings.

(b) Develop Modules

DevelopModules:Createspecificmoduleswithinthesecoursesthatfocusonhands-onexperiences.								
ModuleNo	LectureNo.	SessionTopics	RBT Levels	ActivitiesPlanned	CourseOutcome Mapping	ModeofDelivery	PlannedDate	ActualDate
1	1-2	Foundations of Agentic AI: Definition and scope of Agentic AI Key concepts: agency, autonomy, planning, tool use History and motivation: from symbolic agents to LLM agents Key applications: task automation, search, problem solving	L1/L2	Small groups create digital or paper-based concept maps and present them.	CO1	Lectures / Concept Sessions		
2	3-4	Architectures and Frameworks, Cognitive loops: ReAct, Plan-and-Execute, Chain-of-Thought. Tool-use via LLMs: LangChain, OpenAI function-calling. Multi-agent and recursive agents (e.g., CrewAI, CAMEL)	L3	Weekly lab tasks (e.g., build a retrieval-based agent, a tool-using agent).Run different agents on predefined tasks and log behaviors, response quality, and tool usage.	CO2	Hands-on Labs / Workshops		
3	5-7	Agent Components: Memory, Planning, Tools Long-term vs short-term memory (vector DBs, scratchpads) Planners: deterministic, probabilistic, LLM-based Tool integration: search APIs, calculators, code interpreters	L4	Implement memory and planning components	CO3	Hands-on Labs / Workshops		
4	8-11	Evaluation, Safety, and Alignment Evaluating agent performance: correctness, efficiency, alignment Safety and control: prompt injection, tool misuse, feedback loops Human-in-the-loop and alignment strategies	L5	Groups debate topics like “Should agents have autonomy in decision-making?”, or "The risks of self-improving agents". Students pick a paper or case (e.g., AutoGPT, Devin AI, Amazon hiring bias) and present its structure, success, and pitfalls.	CO4	Hands-on Labs / Workshops, Case Studies & Ethical Debates		

5	12-15	Project Lab & Future Trends Emerging directions: Open-ended agents, Auto-evolution, Self-improving agents Project showcase & discussion Ethical implications and societal impact	L6	Students build a multi-component agent (e.g., travel planner, academic tutor, accessibility assistant) and document its performance, memory use, and ethical design.	C05, CO6	Hands-on Labs / Workshops. Assignments & Mini Projects. Case Studies & Ethical Debates		

12. Mapping of Learning objectives with Learning Outcomes

Course/Modules	LearningObjective	LearningOutcome	AssessmentMethod
Understand the concepts and mathematical foundation of time series models	Understanding of Time Series Models	Understanding of Time Series Models	CIE
Apply appropriate forecasting techniques, such as minimum mean square error forecasts and state-space models, to real-world time series data	Apply Forecasting Techniques and Applications	Apply Forecasting Techniques and Applications	CIE
Analyze and model seasonal time series data using Seasonal ARIMA models, structural components, and deterministic seasonality methods.	Analyze seasonal time series using Seasonal ARIMA, structural components, and deterministic seasonality.	Analyze seasonal time series using Seasonal ARIMA, structural components, and deterministic seasonality.	CIE
Evaluate model identification techniques with a focus on the identifiability and uniqueness of time series models, including issues related to model multiplicity.	Evaluate identifiability and uniqueness issues in time series model selection.	Evaluate identifiability and uniqueness issues in time series model selection.	CIE
Design and estimate multivariate time series models, such as Vector Autoregressive (VAR), Vector Moving Average (VMA), and Vector Autoregressive–Moving Average (VARMA) models, and use them for forecasting.	Build and estimate multivariate models including Vector Autoregressive (VAR), Vector MA, and VARMA processes.	Build and estimate multivariate models including Vector Autoregressive (VAR), Vector MA, and VARMA processes.	CIE

CIEandSEE:

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. 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).The student is declared as a pass in the course if he/she secures a minimum of 40%(40 marksoutof100) in the sum total of the CIE(Continuous Internal Evaluation) and SEE(Semester End Examination) taken together

Continuous Internal Evaluation(CIE):

- Forthe Assignment component to the CIE, there are25 marks andforthe InternalAssessment Test componentthereare25marks.
- The firsttestwillbeadministeredafter40-50%ofthesyllabushasbeencovered,andthesecond Testwillbeadministeredafter85-90%ofthesyllabushasbeencovered
- Anytwoassignmentmethodsmentionedinthe22OB2.4,ifanassignmentisproject-basedthenonly oneassignmentforthecourseshallbeplanned.Theteacher shouldnotconducttwoassignments at the end of the semester if two assignments are planned.
- Forthecourse,CIEmarkswillbebasedonascaled-downsumoftwotestsandothermethodsof assessment.

The sum of two tests,twoassignments,will be out of 100 marks and will be scaled down to 50 marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations(SEE):

SEE paper shall be set for 50 questions,each of the 01 marks.The pattern of the question paper is MCQ (multiple choice questions).The time allotted for SEE is 01 hour.The student has to secure a minimum of 35% of the maximum marks meant for SEE.

Implement Experiential Activities

AEC Component	Details
Project Title	[Enter the project title]
Real-World Problem	[Describe the real-world problem the project addresses]
Learning Objectives	**Subject Areas:** [List subjects integrated] **Skills Developed:** [List skills]
Timeline	**Start Date:** [Enter start date] **Milestones/Checkpoints:** [List milestones] **End Date:** [Enter end date]
Resources Needed	**Materials:** [List materials] **Technology:** [List technology] **Guest Speakers/Experts:** [List experts]
Team Formation	**Group Size:** [Enter group size] **Team Roles:** [List roles such as Project Manager, Researcher, Presenter]
Background Information	[Describe the prior knowledge students need]

Research Methods	**Primary Sources:** [List methods such as interviews, surveys] **Secondary Sources:** [List methods such as articles, books, videos]
Team Meetings	**Frequency:** [Enter frequency of meetings] **Structure:** [Describe the structure of the meetings]
Collaboration Tools	**Digital Platforms:** [List platforms such as Google Docs, Trello] **Communication Methods:** [List methods such as in-person, virtual meetings]
Project Deliverables	[List what students will produce such as reports, presentations, prototypes]
Presentation Format	**Options:** [List options such as PowerPoint, video, live demonstration] **Audience:** [List audience such as classmates, community members] **Schedule:** [Enter presentation schedule]
Project Exhibition	[Describe how students' projects will be displayed or shared with a wider audience]

Experiential Learning - Batch

From, **Date:**

Name: & USN:

Name: & USN:

Name: & USN:

Name: & USN:

Semester:

RespectedSir/Madam,

Sub:Regarding Experiential Learning Batch

With respect to the above subject, we are the students mentioned above would like to form the batch for carrying out the mini project on…….

Thanking you, Yours faithfully

Sl. No.	Name of the student	Signature
1.		
2.		
3.		
4.		

Signature of the Guide

Name of the Guide Designation

Department of ……. Engineering

Experiential Learning (EL) – Student(s) – Guide – Interaction

Date		
EL Batch No.		
Title of the project		
Week No.		
Content of the Discussion		
Suggestion by the guide		
Name of Signature of students		

Signature of the Guide **Signature of HOD**

Assessment

Rubrics for Experiential Learning Assessment

Sl. No	Name of the Student	USN	Criteria	Exemplary (4)	Proficient (3)	Developing (2)	Beginning (1)	Total
			Project Understanding	Demonstrates deep understanding of project goals and requirements; identifies key issues and objectives.	Shows good understanding of project goals and requirements; recognizes most key issues and objectives.	Displays basic understanding of project goals and requirements; some key issues and objectives are unclear.	Lacks clear understanding of project goals and requirements; key issues and objectives are misunderstood.	
			Technical Competence	Mastery of technical skills required for the project; applies skills effectively and efficiently.	Good technical skills; applies skills competently with few errors.	Basic technical skills; occasionally makes errors in application.	Limited technical skills; frequently makes errors in application.	
				Highly creative and original	Somewhat creative and original ideas;	Limited creativity and originality;	Lacks creativity and originality;	

			Innovation	ideas; shows significant innovation and out-of-the-box thinking.	demonstrates innovation in some aspects.	shows minimal innovation.	no evidence of innovative thinking.		
			Problem Solving	Identifies problems accurately and develops effective, comprehensive solutions.	Identifies problems correctly and develops good solutions.	Identifies problems but solutions are somewhat effective or incomplete.	Struggles to identify problems and develop effective solutions.		
			Project Management	Manages project timelines, resources, and tasks exceptionally well; meets all deadlines.	Manages project timelines, resources, and tasks effectively; meets most deadlines.	Manages project timelines, resources, and tasks with some difficulty; misses some deadlines.	Poor management of project timelines, resources, and tasks; frequently misses deadlines.		
			Documentation	Thorough, clear, and well-organized	Clear and organized documentation;	Basic documentation; some necessary	Poor documentation; lacks necessary		

				documentation; all necessary details included.	most necessary details included.	details are missing or unclear.	details and organization.	
			Presentation Skills	Engaging and well-organized presentation; communicates ideas clearly and effectively.	Good presentation; communicates ideas clearly but lacks some engagement or organization.	Basic presentation; some ideas are unclear or poorly organized.	Ineffective presentation; ideas are unclear and poorly organized.	
			Collaboration	Works exceptionally well with team members; shows strong teamwork and leadership skills.	Works well with team members; demonstrates good teamwork.	Works with team members but has some difficulties in collaboration.	Struggles to work with team members; lacks teamwork and collaboration skills.	
			Faculty Assessment	Meets or exceeds faculty expectations in all areas; shows exceptional performance.	Meets faculty expectations in most areas; shows good performance.	Meets some faculty expectations; shows average performance.	Does not meet faculty expectations; shows poor performance.	

			Reflection	Provides deep insights and critical analysis of own work; demonstrates significant learning and growth.	Provides good insights and analysis of own work; demonstrates learning and growth.	Provides basic insights and analysis of own work; shows some learning and growth.	Provides minimal or no insights and analysis of own work; shows little to no learning and growth.	
			Overall Assessment	Exceptional overall performance; exceeds expectations in most or all areas.	Good overall performance; meets expectations in most areas.	Average overall performance; meets expectations in some areas.	Poor overall performance; does not meet expectations in most areas.	

Skills Assessment

Student Name	USN	Skill Acquired	Skill Level Before (1-10)	Skill Level After (1-10)	Improvement (After-Before)	Syntax (1-10) Before	Syntax (1-10) After	Logic & Problem Solving (1-10) Before	Logic & Problem Solving (1-10) After	Data Structures (1-10) Before	Data Structures (1-10) After	Libraries & Frameworks (1-10) Before	Libraries & Frameworks (1-10) After	Code Optimization (1-10) Before	Code Optimization (1-10) After	Debugging (1-10) Before	Debugging (1-10) After