DAYANANDA SAGAR ACADEMY OF TECHNOLOGY & MANAGEMENT

CURRICULUM

Scheme and Syllabus V & VI Semester

Outcome Based Education

(Academic Year 2025-2026)

Department of Computer Science and Engineering (Artificial Intelligence)

5th& 6thSemester 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 programs 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

Computer Science and Engineering (Artificial Intelligence) is a CSE allied branch. Artificial intelligence (AI) is intelligence—perceiving, synthesizing, and inferring information demonstrated by machines, as opposed to intelligence displayed by animals and humans. Example tasks in which this is done include speech recognition, computer vision, translation between (natural) languages, as well as other mappings of inputs.

The course covers a wide range of topics, including programming languages, data structures, algorithms, computer architecture, software engineering, machine learning, natural language processing, computer vision, robotics, and more.

The curriculum is designed to provide students with a strong foundation in computer science and engineering, while also exploring the latest advancements in artificial intelligence. Students will learn to design and develop intelligent systems and algorithms in Center of Excellence set-up by Microsoft in the Department of AI. The Students can analyze, understand, interact, participate in lab sessions, group projects, and carryout individual research work in the department. Upon completion of the course, students can pursue careers as software engineers, AI developers, data scientists, machine learning engineers, or AI researchers, among other roles.

VISION OF THE DEPARTMENT

To create an enriching learning environment that imparts creative, learning and research skills to students in the domain of artificial intelligence.

MISSION OF THE DEPARTMENT

M1: To Impart Strong foundation of statistics for understanding Artificial Intelligence.

M2: To develop skilled and knowledgeable professionals in the field of Artificial Intelligence.

M3: To contribute towards advanced AI technologies that provide increased and better performance.

M4: To collaborate with renowned companies for multidisciplinary research and development.

M5: To guide the students in learning and creative for developing intelligent technology based solutions to societal problems.

PROGRAM EDUCATION OBJECTIVES (PEO'S):

PEO1: The Graduates of CSE(AI) acquire a comprehensive understanding of the fundamentals of Artificial Intelligence (AI) and its applications.

PEO2: To apply AI techniques and tools to solve real-world problems and create innovative solutions.

PEO3: To develop skills in data analysis, Cloud Computing, Full Stack development and Machine learning for AI implementation.

PEO4: To develop the ability to design, analyse, and evaluate the CSE(AI) systems.

PEO5: To foster creativity, innovative thinking, entrepreneurial Skills and a commitment to lifelong learning in the field of CSE(AI) to contribute towards DIGIWORLD.

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: To Apply Analytical Skills for Problem Solving in Engineering, Business and Societal Applications using CSE (AI) Approaches safely and securely.

PSO 2: Ability to Enrich the Critical Thinking Skills and Decision making in Emerging Technologies such as Natural Language Processing, Machine Learning, Deep Learning, Data Analysis, Robotics and Computer Vision .

PROPOSED UG CREDIT STRUCTURE IN ALIGNMENT WITH VTU

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

PROPOSEDUG SCHEME

Sl. No	Course Category	BOS	TD	Teaching Hours/Week					Credits
				Lecture	Tutorial	Practical	Project	Total (Hrs/week)	
				L	T	P	S		
1	IPCC1	CSE(AI)	CSE(AI)	3	0	2	0	5	4
2	PCC	CSE(AI)	CSE(AI)	3	0	0	0	3	4
3	PCC	CSE(AI)	CSE(AI)	3	0	0	0	3	4
4	PEC-1	CSE(AI)	CSE(AI)	3	0	0	0	3	3
5	Min-Project	CSE(AI)	CSE(AI)	0	0	2	2	4	2
6	PCCL	CSE(AI)	CSE(AI)	0	0	2	0	2	2
7	HSMS	Conacred Dept	Conacred Dept	1	0	0	0	1	1
8	AEC	CSE(AI)	CSE(AI)	0	0	2	0	2	2
9	NCMC	NSS / YOGA / PED							
10	AICTE Activity Points								
								Total	**22**

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

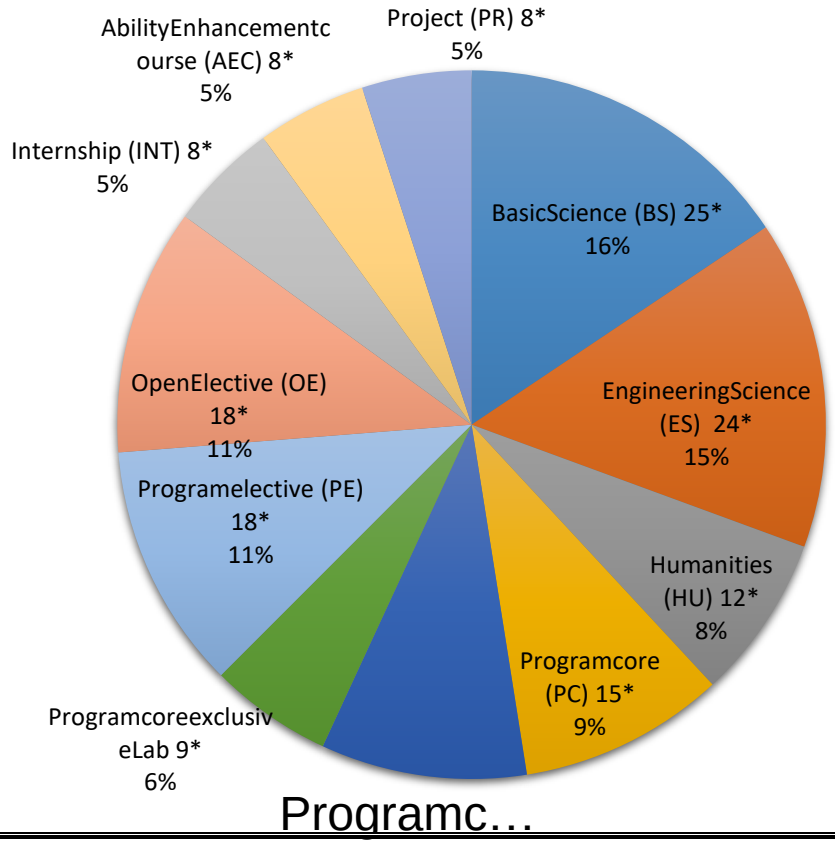
5thSem &6th Sem

Sl. No	CourseCategory	Component			
		Theory	Practical	Outreach	YOGA/SPORTS
1	IPCC1	40%	60%	--	--
2	PCC	60%	40%	--	--
3	PCC	60%	40%	--	--
4	PEC-1	100%	--	--	--
5	Min-Project	100%	--	--	--
6	PCCL	--	100%	--	--
7	HSMS	100%		--	--
8	AEC	--	100%	--	--
9	NCMC	--	--	--	100%
Total Percentage		53%	47%	--	13%

Scheme Distribution

Department of Computer Science and Engineering (Artificial Intelligence)

Course Component	Credits	%of Credits
Basic Science (BS)	25*	15.6
Engineering Science (ES)	24*	15
Humanities (HU)	12*	7.5
Program core (PC)	15*	9.4
Program core Integrated (PCI)	15*	9.4
Program core exclusive Lab	9*	5.6
Program elective (PE)	18*	11.25
Open Elective (OE)	18*	11.25
Internship (INT)	8*	5
Ability Enhancement course (AEC)	8*	5
Project (PR)	8*	5
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							16
Engineering Sciences (ESC)	3	6	3	3					15
Humanities, Social Sciences and Management (HSMC)	1	2							03
Ability Enhancement Course (AEC)	2	1	1	1	1	1	1	1	09
Universal Human Values (UHV)	0	0	1	1					02
Professional Core Courses (PCC)	6	3	6	6	6	6	3		36
Integrated Professional core Course (IPCC)	0	0	8	8	6	6	3		31
Professional Elective Course (PEC)	0	0			6	6	6	6	24
Institutional Open Elective Courses (IOE)	0	0					3		03
Internship (INT)	0	0			1	1	2	3	07
Mini Project / Project Work (PW)	0	0	2	2	2	2	2	4	14
Non-credit Mandatory Courses (NCMC)	0	0							
Total Credits	20	20	21	21	22	22	20	14	160

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

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

Scheme of Teaching and Examinations – 2025-26

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

5th SEMESTER: CSE(AI)

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	BCA501	Machine Learning with Python	IPCC1	CSE (AI)	CSE (AI)	3	0	2	0	5	4	03	50	50	100
2	BCA502	Database Management Systems	IPCC2	CSE (AI)	CSE (AI)	3	0	2	0	5	4	03	50	50	100
3	BCA503	Theory of Computation	PCC	CSE (AI)	CSE (AI)	3	0	0	0	3	3	03	50	50	100
4	BCA504A	Computer Networks	PEC	CSE (AI)	CSE (AI)	3	0	0	0	3	3	03	50	50	100
5	BCA505	Computer Vision	PBL	CSE (AI)	CSE (AI)	0	0	2	2	4	3	03	50	50	100
6	BCAL506	Web Technology	PCCL	CSE (AI)	CSE (AI)	0	0	2	0	2	2	03	50	50	100
7	BRM507A	Research Methodology and Intellectual Property Rights (RMIPR)	AEC	CSE (AI)	CSE (AI)	1	0	0	0	1	1	02	50	50	100
8	BESK508	Environmental Studies and E Waste Management	HSMS	Concern Dept	Concern Dept	2	0	0	0	2	2	02	50	50	100
9	BNSK509	National Service Scheme (NSS)	NCMC	CSE (AI)	CSE (AI)	0	0	2	0	2	0	-	100	-	100
	BPEK509	Physical Education (PE)													
	BYOK509	YOGA													
Total						**15**	**0**	**10**	**2**	**27**	**22**	**22**	**500**	**400**	**900**

Ability Enhancement Course / Skill Enhancement Course-V

BCA508B	**Project Management with GIT**

6th SEMESTER: CSE(AI)

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture	Tutorial	Practical	Project	Total		SEE Duration	CIE Marks	SEE Marks	Total Marks
						L	T	P	S						
1	BCA601	Natural Language Processing	IPCC1	CSE (AI)	CSE (AI)	3	0	2	0	5	4	03	50	50	100
2	BCA602	Full stack web development with Java	IPCC2	CSE (AI)	CSE (AI)	3	0	2	0	5	4	03	50	50	100
3	BCA603	Human Centered AI	PCC	CSE (AI)	CSE (AI)	3	0	0	0	3	3	03	50	50	100
4	BCA604A	Prompt Engineering for Large Language Models	PEC	CSE (AI)	CSE (AI)	3	0	0	0	3	3	03	50	50	100
5	BCA605	Institutional Open Elective Courses	IOE-1	on-dept	on-dept	3	0	0	0	3	3	03	50	50	100
6	BCA606	Project Evaluation Phase 1	Major Pro	CSE (AI)	CSE (AI)	0	0	0	2	2	2	03	50	50	100
7	BCAL607	Generative & Agentic AI	PCCL	CSE (AI)	CSE (AI)	0	0	2	0	2	2	03	50	50	100
8	BCA608	Data Visualization	AEC	CSE (AI)	CSE (AI)	0	0	2	0	2	1	03	50	50	100
9	BNSK609	National Service Scheme (NSS)	NCMC	CSE (AI)	CSE (AI)	0	0	2	0	2	0	0	100	0	100
	BPEK609	Physical Education (PE)													
	BYOK609	YOGA													
Total						**15**	**0**	**10**	**2**	**27**	**22**	**24**	**600**	**400**	**1000**
Ability Enhancement Course / Skill Enhancement Course-VI															
BCA608B						**UI&UX Design**									

IPCC: Integrated Professional Core Course,

PCC: Professional Core Course

PEC-1: Professional Elective Course

PCCL: Professional Core Course Laboratory

HSMC: Humanity and Social Science & Management Course

OEC- Open Elective Course

AEC: Ability Enhancement Course

NCMC: Non-Credit Mandatory Course

L: Lecture,

T: Tutorial,

P: Practical

S= SDA: Skill Development Activity,

CIE: Continuous Internal Evaluation,

SEE: Semester End Evaluation.

Integrated Professional Core Course (IPCC): Refers to Integrated Professional Core Course Theory Integrated with 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.

5th Semester

Sl. No	Course Code	Course Name	Topics Added	Topics Removed	Revised in %	Justification
1						
2						
3						
4						
5						
6						
7						
8						

6th Semester

Sl. No	Course Code	Course Name	Topics Added	Topics removed	Revised in %	Justification
1						
2						
3						
4						
5						
6						
7						
8						

Newly introduced subjects in the syllabus

		5th Semester	6th Semester
1.	List of Existing Elective Courses		
2.	List of New Existing Elective Courses		
3.	List of New Industry Aligned Courses		

Percentage of Change in the Syllabus

5th SEMESTER

INTEGRATED PROFESSIONAL CORE COURSE (IPCC-1)

IPCC Course– Integrated Professional Core Course

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

- The theory part of the IPCC shall be evaluated both by CIE and SEE.
- The practical part shall be evaluated by only CIE (no SEE).
- However, questions from the practical part of IPCC shall be included in the SEE question paper.

Integrated Professional Core Course (IPCC) - 4 Credit Course

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

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

Internal Assessment Test (IAT):

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are 25 marks and that for the practical component is 25 marks.

- 25 marks for the theory component are split into 15 marks for two Internal Assessment Tests(Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 15 marks) and 10 marks for Two Continuous Comprehensive Assessment(CCA) methods.
- The first Internal test at the end of 40-50% coverage of the syllabus
- The second Internal test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for 25 marks).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

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

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

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

CIE	**Total CIE Theory**						**25**	**10**	Scale down Marks of IAT and CCA to 25
	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
			Execution	25					
			Viva-voce	10					

		Open Ended Experiment	Write up	05	20	----	05	2	One experiment for 20marks. 20 marks reduced
			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

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Semester	:	5th				
Course Title	:	Machine Learning with Python				
Course Code	:	BCA501				
Course Type (Theory/ Practical/ Project/Integrated)	:	Integrated				
Category	:	IPCC1				
Stream	:	CSE(AI)		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	4:0:0:0		**SEE**	:	50
Total Hours	:	50 Hrs+ 20 Hrs		**SEE Duration**	:	03 Hrs
Credits	:	4				

Course Learning Objectives: Students will be able to:

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 real world applications.
3	To familiarize the machine learning algorithms such as regression, decision trees, Bayesian models, clustering, and neural networks
4	To explore advanced concept like reinforcement learning and provide practical insight into its applications
5	To enable students to model and evaluate machine learning solutions for different types of problems

Teaching-Learning Process

Pedagogical Initiatives:

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 of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
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, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply 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 up with 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 helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

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:** Need for Machine Learning, Machine Learning Explained, Machine Learning in Relation to other Fields, Types of Machine Learning, Challenges of Machine Learning, Machine Learning Process, Machine Learning Applications. **Understanding Data–1**: Introduction, Big Data Analysis Framework, Descriptive Statistics, Univariate Data Analysis and Visualization. **Chapter-1, 2 (2.1-2.5)**	**8Hours**
Pedagogy	**Quiz**	
2.	**Understanding Data – 2:** Bivariate Data and Multivariate Data, Multivariate Statistics, Essential Mathematics for Multivariate Data, Feature Engineering and Dimensionality Reduction Techniques. Basic Learning Theory: Design of Learning System, Introduction to Concept of Learning, Modelling in Machine Learning. **Chapter-2 (2.6-2.8, 2.10), Chapter-3 (3.3, 3.4, 3.6)**	**8Hours**
Pedagogy	**Demonstration**	
3.	**Similarity-based Learning:** Nearest-Neighbor Learning, Weighted K-Nearest-Neighbor Algorithm, Nearest Centroid Classifier, Locally Weighted Regression (LWR). **Regression Analysis:** Introduction to Regression, Introduction to Linear Regression, Multiple Linear Regression, Polynomial Regression, Logistic Regression. Decision Tree Learning: Introduction to Decision Tree Learning Model, Decision Tree Induction Algorithms. **Chapter-4 (4.2-4.5), Chapter-5 (5.1-5.3, 5.5-5.7), Chapter-6 (6.1, 6.2)**	**8Hours**
Pedagogy	**Presentation**	
4.	**Bayesian Learning:** Introduction to Probability-based Learning, Fundamentals of Bayes Theorem, Classification Using Bayes Model, Naïve Bayes Algorithm for Continuous Attributes. **Artificial Neural Networks:** Introduction, Biological Neurons, Artificial Neurons, Perceptron and Learning Theory, Types of Artificial Neural Networks, Popular Applications of Artificial Neural Networks, Advantages and Disadvantages of ANN, Challenges of ANN. **Chapter-8 (8.1-8.4),Chapter-10 (10.1-10.5, 10.9-10.11)**	**8Hours**
Pedagogy	**Case Study**	
5.	**Clustering Algorithms:** Introduction to Clustering Approaches, Proximity Measures, Hierarchical Clustering Algorithms, Partitional Clustering Algorithm, Density-based Methods, Grid-based Approach. Reinforcement Learning:	**8Hours**

	Overview of Reinforcement Learning, Scope of Reinforcement Learning, Reinforcement Learning as Machine Learning, Components of Reinforcement Learning, Markov Decision Process, Multi-Arm Bandit Problem and Reinforcement Problem Types, Model-based Learning, Model Free Methods, Q-Learning, SARSA Learning. **Chapter -13 (13.1-13.6), Chapter-14 (14-1-14.10)**	
	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	Develop a program to create histograms for all numerical features and analyze the distribution of each featureGenerate box plots for all numerical features and identify any outliers. Use California Housing dataset	CO1
2	Develop a program to Compute the correlation matrix to understand the relationships between pairs of features. Visualize the correlation matrix using a heatmap to know which variables have strong positive/negative correlations. Create a pair plot to visualize pairwise relationships between features. Use California Housing dataset.	CO1
3	Develop a program to implementPrincipal Component Analysis (PCA) for reducing the dimensionality of the Iris dataset from 4 features to 2.	CO2

4	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Find-Salgorithm to output a description of the set of all hypotheses consistent with the training examples.	CO2
5	Develop a program to implement k-Nearest Neighbour algorithm to classify the randomly generated 100 values of x in the range of [0,1]. Perform the following based on dataset generated. 1. Label the first 50 points {x1,……,x50} as follows: if (xi ≤ 0.5), then xi ∈ Class1, else xi ∈ Class1 2. Classify the remaining points, x51,……,x100 using KNN. Perform this for k=1,2,3,4,5,20,30	CO3
6	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs	CO3
7	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
8	Develop a program to demonstrate the working of the decision tree algorithm. Use Breast Cancer Data set for building the decision tree and apply this knowledge to classify a new sample.	CO3
9	Develop a program to implement the Naive Bayesian classifier considering Olivetti Face Data set for training. Compute the accuracy of the classifier, considering a few test data sets.	CO4
10	Develop a program to implement k-means clustering using Wisconsin Breast Cancer data set and visualize the clustering result.	CO5

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1.	S Sridhar, M Vijayalakshmi, "Machine Learning", OXFORD University Press 2021, First Edition.
Reference Books	

1.	Murty, M. N., and V. S. Ananthanarayana. Machine Learning: Theory and Practice, Universities Press, 2024
2.	T. M. Mitchell, “Machine Learning”, McGraw Hill, 1997
3.	Burkov, Andriy. The hundred-page machine learning book. Vol. 1. Quebec City, QC, Canada: Andriy Burkov, 2019

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning	
1.	Practical Assignment: Implementation of Practical Exercises Chapter 2: Q1-Q4, Chapter 3: Q1, Chapter-4: Q1, Chapter-7: Q1, Chapter-8: Q1 - 10 Marks.
(Note: Refer to Reference book 1 for programming assignments https://www.universitiespress.com/resources?id=9789393330697)	
2.	Course project: By considering suitable machine learning-based real-world application problem [15 Marks]

Web links and Video Lectures (e-Resources):	
1	https://www.universitiespress.com/resources?id=9789393330697
2	https://www.drssridhar.com/?page_id=1053
3	Machine Learning Tutorials: https://www.geeksforgeeks.org/machine-learning/
4	Machine Learning Tutorials: https://www.tutorialspoint.com/machine_learning/index.htm
5	Python for Machine Learning: https://www.w3schools.com/python/python_ml_getting_started.asp
6	Introduction to Machine Learning: https://onlinecourses.nptel.ac.in/noc22_cs29/preview

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Describe the machine learning techniques, their types and data	L2	Understand
CO2	Apply mathematical concepts for feature engineering and perform dimensionality reduction to enhance model performance network.	L3	Apply
CO3	Analyse similarity-based learning models and regression models for solving classification and prediction tasks	L4	Analyse
CO4	Evaluate probabilistic learning models and design neural network	L5	Create
CO5	Create clustering algorithms to identify patterns in data and	L6	Evaluate

Mapping of Course Outcomes to Program Outcomes:

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

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	10		10		

Understand	10		20		
Apply	20	10	20	5	
Analyse	10	20		20	
Evaluate		10		15	
Create		10		10	

CIE Course Assessment Plan

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

SEE- Semester End Examination (50 Marks)

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

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 t 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	10					20	20%
CO2	10	10					20	20%
CO3			10	10			20	20%
CO4					10	10	20	20%
CO5					10	10	20	20%
Total	20	20	10	10	20	20	100	100%

PROFESSIONAL CORE COURSE (IPCC-2)

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	5th				
Course Title	:	Database Management Systems				
Course Code	:	BCA502				
Course Type (Theory/ Practical/ Project/ Integrated)	:	Integrated				
Category	:	IPCC				
Stream	:	CSE(AI)		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	03:00:02:00		**SEE**	:	50
Total Hours	:	40 (T) + 20 (L)		**SEE Duration**	:	03 Hrs
Credits	:	4				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To Provide a strong foundation in database concepts, technology, and practice.
2	To Practice SQL programming through a variety of database problems.
3	To Understand the relational database design principles.
4	To Demonstrate the use of concurrency and transactions in database.
5	To Design and build database applications for real world problems.
6	To become familiar with database storage structures and access 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 -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 to Databases:** Introduction, Characteristics of database approach, Advantages of using the DBMS approach. **Overview of Database Languages and Architectures:** Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment. **Conceptual Data Modelling using Entities and Relationships:** Entity types, Entity sets and structural constraints, Weak entity types, ER diagrams, Specialization and Generalization.	**8Hrs**
Pedagogy	Presentation, Quiz	
2.	**Relational Model:** Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations. **Relational Algebra:** Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra. **Mapping Conceptual Design into a Logical Design:** Relational Database Design using ER-to-Relational mapping.	**8Hrs**
Pedagogy	Collaborative Learning, Presentation	
3.	**Normalization:** Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. **Transaction Processing:** Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, characterizing schedules based on recoverability, characterizing schedules based on Serializability, Transaction support in SQL.	**8Hrs**
Pedagogy	PBL (Project Based Learning), Practical Based Learning	

4.	**SQL:** SQL data definition and data types, Schema change statements in SQL, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL**.** **SQL: Advanced Queries:** More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL. **Web Database Programming Using PHP:** A Simple PHP Example, Overview of Basic Features of PHP, Overview of PHP Database Programming, Brief Overview of Java Technologies for Database Web Programming.	**8 Hrs**
Pedagogy	PBL (Project Based Learning), Practical Based Learning	
5.	**Concurrency Control in Databases:** Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking. **NOSQL Databases and Big Data Storage Systems:** Introduction to NOSQL Systems, The CAP Theorem, Document-Based NOSQL Systems and MongoDB, NOSQL Key-Value Stores, Column-Based or Wide Column NOSQL Systems, NOSQL Graph Databases and Neo4j	**8 Hrs**
	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	Create a table called Employee & execute the following. **Employee (EMPNO,ENAME,JOB, MANAGER_NO, SAL, COMMISSION)**	CO5

	1. Create a user and grant all permissions to theuser. 2. Insert the any three records in the employee table contains attributes EMPNO,ENAME JOB, MANAGER_NO, SAL, COMMISSION and use rollback. Check the result. 3. Add primary key constraint and not null constraint to the employee table. 4. Insert null values to the employee table and verify the result.	
2	Create a table called Employee that contain attributes EMPNO,ENAME,JOB, MGR,SAL & execute the following. 1. Add a column commission with domain to the Employeetable. 2. Insert any five records into the table. 3. Update the column details of job 4. Rename the column of Employ table using alter command. 5. Delete the employee whose Empno is 105.	CO5
3	Queries using aggregate functions(COUNT, AVG, MIN, MAX, SUM), Group by, Order by **Employee (Eid, Ename, Age, Salary)** 1. Create Employee table containing all Records E_id, E_name, Age, Salary. 2. Count number of employee names from employeetable 3. Find the Maximum age from employee table. 4. Find the Minimum age from employeetable. 5. Find salaries of employee in Ascending Order. 6. Find grouped salaries of employees.	CO5
4	Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old & new Salary. **CUSTOMERS(ID,NAME,AGE,ADDRESS,SALARY)**	CO5
5	Create cursor for Employee table & extract the values from the table. Declare the variables, Open the cursor & extract the values from the cursor. Close the cursor. **Employee(E_id, E_name, Age, Salary)**	CO5
6	Write a PL/SQL block of code using parameterized Cursor, that will merge the data available in the newly created table N Roll Call with the data available in the table O_RollCall. If the data in the first table already exist in the second table then that data should be skipped.	CO5

7	Develop a PHP program (with HTML/CSS) to keep track of the number of visitors visiting the web page and to display this count of visitors, with relevant headings. Develop a PHP program (with HTML/CSS) to sort the student records which are stored in the database using selection sort.	
8	Develop and demonstrate PHP Script for the following problems: a) Write a PHP Script to find out the Sum of the Individual Digits. b) Write a PHP Script to check whether the given number is Palindrome or not.	
9	Implement the following web applications using PHP. A web application that takes a name as input and on submit it shows a hello page where name is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You message with the duration of usage (hint: Use session to store name and time). Also write a PHP Program to display current Date, Time and Day.	
10	Install an Opensource NoSQL Data base Mongo DB & perform basic CRUD (Create, Read, Update & Delete) operations. Execute Mongo DB basic Queries using CRUD operations.	CO5
Open ended Programs		
1	Create a database for a university course registration system. Include tables for courses, students, and enrolments. Use views to simplify complex queries. Write queries using views to: • List all courses offered by a specific department with the number of enrolled students. • Find students enrolled in more than two courses this semester. Create a trigger to automatically update a "total credits" field for a student whenever they enroll in a new course.	CO5
2	Simulate a bank transaction system using SQL. Implement transactions with ACID properties (Atomicity, Consistency, Isolation, Durability) using appropriate SQL statements (BEGIN TRANSACTION, COMMIT, ROLLBACK). Develop functionalities for deposit, withdrawal, and fund transfer between accounts, ensuring data integrity across operations.	CO5

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2	Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill
Reference Books	
1	Database System Concepts by S. Sudarshan, Henry F. Korth and Abraham Silberschatz, 2019, McGraw Hill

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
1	Understand the basic elements of a relational database management	Understand	L2
2	Apply various Structured Query Language (SQL) statements for	Apply	L3
3	Analyse various normalization forms for the given application.	Analyze	L4
4	Design entity relationship for the given scenario.	Create	L6
5	Ability to implement a database application for a given real world problem.	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		2													
CO4			2							2	2				
CO5					2					2	2		2		

Web links and Video Lectures (e-Resources)	
1	https://www.youtube.com/@stanforddbclass4747
2	https://onlinecourses.nptel.ac.in/noc21_cs04/preview
3	https://youtube.com/playlist?list=PLxCzCOWd7aiFAN6I8CuViBuCdJgiOkT2Y&feature=shared
4	https://www.javatpoint.com/dbms-tutorial

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	20	10			
Understand	20	10	10		10
Apply	10	20	10		10
Analyse		10	10		10
Evaluate				10	10
Create				10	10

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	10	2.5	2.5	5	10	40	26.5%
CO2	10	10	2.5	2.5	5	10	40	26.5%
CO3	5	5	5	5	10	20	50	35%
CO4			2.5	2.5	5	10	20	14%
CO5								
Total	25	25	12.5	12.5	25	50		

SEE- Semester End Examination (50 Marks)

Bloom's Category	**SEE Marks** **(90% Theory+10% Practical Questions)**
Remember	10%+2%
Understand	20%+2%
Apply	40%+4%
Analyze	20%+2%

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	20	10	5	5			40	40%
CO2	-	10	5	5	10	10	40	40%
CO3					5	5	10	10%
CO4					5	5	10	10%
CO5								
Total	20	20	10	10	20	20	100	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
		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)

Semester	:	5th				
Course Title	:	Theory of Computation				
Course Code	:	BCA502				
CourseType(Theory/Practical /Project Integrated)	:	Theory				
Category	:	PCC				
Stream	:	CSE(AI)		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	(3:2:0:0)		**SEE**	:	50
Total Hours	:	50		**SEE Duration**	:	3 Hours
Credits	:	4				

Course Learning Objectives: Students will be able to:

Sl.No	Course Objectives
1	Introduce core concepts in Automata and Theory of Computation
2	Identify different Formal Language Classes and their Relationships.
3	Learn concepts of Grammars and Recognizers for different formal languages.
4	Prove or disprove theorems in automata theory using their properties.
5	Determine the decidability and intractability of Computational 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, implementing labprograms 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
Module 1	**Introduction:** to Finite Automata, Automata and Complexity. The Central Concepts of Automata Theory. Deterministic Finite Automata, Nondeterministic Finite Automata, An Application: Text Search, Finite Automata with Epsilon-Transitions. **TEXT BOOK: Sections 1.1, 1.5, 2.2,2.3,2.4,2.5**	**10 Hours**
Pedagogy		
Module 2	Regular Expressions, Finite Automata and Regular Expressions, Proving Languages not to be Regular. Closure Properties of Regular Languages, Equivalence and Minimization of Automata, Applications of Regular Expressions **TEXT BOOK: Sections 3.1, 3.2 (Except 3.2.1), 3.3, 4.1, 4.2, 4.4**	**10 Hours**
Pedagogy		
Module 3	Context-Free Grammars, Parse Trees, Ambiguity in Grammars and Languages, Ambiguity in Grammars and Languages, Definition of the Pushdown Automaton, The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata. **TEXT BOOK: Sections 5.1, 5.2, 5.4, 6.1,6.2,6.3.1,6.4**	**10 Hours**
Pedagogy		
Module 4	Normal Forms for Context-Free Grammars, The Pumping Lemma for Context-Free Languages, Closure Properties of Context-Free Languages. **TEXT BOOK: Sections 7.1, 7.2, 7.3**	**10 Hours**

Pedagogy		
Module 5	**Introduction to Turing Machines:** Problems That Computers Cannot Solve, The Turing Machine, Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Undecidability: A Language That Is Not Recursively Enumerable. **TEXT BOOKS:Sections 8.1,8.2,8.3,8.4,9.1.9.2**	**10 Hours**
	Pedagogical Initiatives (Not limited to): **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another **Problem Solving:** encourages cognitive thinking and enables creative problem solving **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. **Case studies:** maps different domains in real time applications **Demonstration**: exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	John E Hopcroft, Rajeev Motwani, Jeffrey D. Ullman," Introduction to Automata Theory, Languages and Computation", Second Edition, Pearson.
Reference Books	
1	Elain Rich, "Automata,Computability and complexity", 1st Edition, Pearson Education,2018.
2	K.L.P Mishra, N Chandrashekaran, 3rd Edition , 'Theory of Computer Science",PHI,2012.
3	Peter Linz, "An introduction to Formal Languages and Automata ", 3rd Edition, Narosa Publishers,1998.
4	Michael Sipser : Introduction to the Theory of Computation, 3rd edition, Cengage learning,2013.
5	John C Martin, Introduction to Languages and The Theory of Computation, 3rd Edition, Tata McGraw –Hill Publishing Company Limited, 2013.

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
1	Explain the fundamentals of automata theory to write DFA, NFA,	Understand	L2
2	Apply the properties of regular languages using regular	Apply	L3
3	Apply context-free grammars (CFGs) and pushdown automata (PDAs) for formal languages.	Apply	L3
4	Apply the Normal Forms for Context-Free Grammars, The Pumping Lemma for Context-Free Languages, and Closure	Apply	L3
5	Analyse Turing machines to solve the computational problems and concepts of decidability and undesirability.	Analyse	L4

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://archive.nptel.ac.in/courses/106/105/106105196/
2	https://archive.nptel.ac.in/courses/106/106/106106049/
3	https://nptelvideos.com/course.php?id=717

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**
Understand	10	5	10	
Apply	10	15	10	5
Apply	10	10	10	5
Apply	10	5	10	20
Analyse	10	15	10	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	10	10					20	20%
CO2	10	10					20	20%
CO3			10	10			20	20%
CO4					10	15	25	25%
CO5					10	5	15	15%
Total	20	20	10	10	20	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Understand	30
Apply	35
Analyses	35

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	20%
CO2	10	10					20	20%
CO3			10	10			20	20%
CO4					10	10	20	20%
CO5					10	10	20	20%
Total	20	20	10	10	10	10	100	100%

PROFESSIONAL ELECTIVE COURSE (PEC)

PEC 1 Course - Professional Elective Course

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

3 Credit Course – Professional Elective Course (PEC 1)

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to **25 marks**

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

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

Semester-End Examination:

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

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

Continuous and Comprehensive Assessment (CCA):

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

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

Total score for CCA is 10 Marks

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

Possible Continuous and Comprehensive Assessment (CCA):

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

Professional Elective Course (PEC 1) – 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
		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	:	5th				
Course Title	:	Computer Networks				
Course Code	:	BCA504				
Course Type (Theory/ Practical/ Project/ Integrated)	:	Theory				
Category	:	PEC				
Stream	:	CSE(AI)		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	3:0:0:0		**SEE**	:	50
Total Hours	:	40 Hrs		**SEE Duration**	:	03 Hrs
Credits	:	3				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Study the TCP/IP protocol suite, switching criteria and Medium Access Control protocols for reliable and noisy channels.
2	To apply concepts of protocol layering and media access techniques in real-time data transmission.
3	To analyze addressing, routing, and transport mechanisms in modern networks.
4	To evaluate application-layer protocols and real-world case studies in networking.
5	Demonstrate the working of different concepts of networking layers and protocols.

Teaching-Learning Process

Pedagogical Initiatives:

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 of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
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, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply 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 up with 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 helps improve 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 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. Textbook: Ch. 1.1 - 1.3, 2.1 - 2.3, 7.1 – 7.3	**8Hours**
Pedagogy	**Quiz**	
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, Media Access Control: Random Access, Controlled Access. Textbook: Ch. 10.1-10.3.5, 11.1 -11.3, 12.1-12.2.	**8Hours**
Pedagogy	**Demonstration**	
3.	Network Layer: Network layer Services, Packet Switching, IPv4 Address, IPv4 Datagram, IPv6 Datagram, Introduction to Routing Algorithms: DVR, LSR, PVR, Unicast Routing Protocols: RIP, OSPF, Multicast Link State (MOSPF) Textbook: Ch. 18.1, 18.2, 18.4, 22.2,20.1-20.3.3, 21.3.2	**8Hours**
Pedagogy	**Presentation**	
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	**8Hours**
Pedagogy	**Case Study**	

5.	Introduction to Application Layer: Introduction, Client-Server Programming, Standard Client Server Protocols: World Wide Web and HTTP, FTP, Electronic Mail, Domain Name System (DNS). Textbook: Ch. 25.1-25.2, 26.1-26.6	**8Hours**
	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**
2.	Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, Tata McGraw.
Reference Books	
4.	Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2019.
5.	Nader F. Mir: Computer and Communication Networks, 2nd Edition, Pearson Education, 2015.
6.	William Stallings, Data and Computer Communication 10th Edition, Pearson Education, Inc., 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** and explain the fundamentals of Computer	L2	Understand
CO2	**Apply** various concepts of physical components and demonstrate the working of layered protocols in the communication network.	L3	Apply
CO3	**Analyze** and organize the communication systems network components and principles of layered protocols	L4	Analyze
CO4	**Evaluate** the performance and reliability of communication protocols at various layers for specific network scenarios and	L5	Evaluate
CO5	**Design** and simulate simple network models incorporating application-layer protocols and end-to-end communication	L6	Create

Mapping of Course Outcomes to Program Outcomes:

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

CO4	-	-	**3**	-	-	-	-	-	-	-	**2**	-	-	**2**	-
CO5	-	-	-	-	**2**	-	-	-	**2**	-	**2**	-	-	-	-

Web links 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

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**	**10 Marks**	**15 Marks**
Remember				
Understand	20	10		
Apply	20	10		
Analyse	10	20		
Evaluate		10	10	
Create				15

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 3	Module-4	Module-5		
CO1	10	10	5	5	10	10	50	50%
CO2	10	10					20	20%
CO3			5	5			10	10%
CO4					10		10	10%
CO5						10	10	10%
Total	20	20	10	10	20	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	20
Understand	30
Apply	30
Analyze	20

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 t 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	10	5	5	10	10	50	50%
CO2	10	10					20	20%
CO3			5	5			10	10%
CO4					10		10	10%
CO5						10	10	10%
Total	20	20	10	10	20	20	100	100%

PROJECT BASED LEARNING (PBL)

PBL-Project Based Learning

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

	CIE		**SEE**	
	Project Weekly Assessment		Final Project Evaluation	
Project	Project Understanding	05Marks	Writeup	10Marks
	Technical Competence	10Marks	Presentation & Demonstration	50Marks
	Innovation	10Marks	Project report	25Marks
	Problem Solving	15Marks	Viva-Voce	15Marks
	Project Demonstration	10Marks	Total	100Marks
Total		50Marks	100MarksReducedto50Marks	

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 via project.

 During this process, students will be able to learn and understand the various stages of project development.

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 they will 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 endeavors.
- 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 3rd semester.
- 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 project execution.

Phase 2:

1. Phase 2 is for 11 Weeks

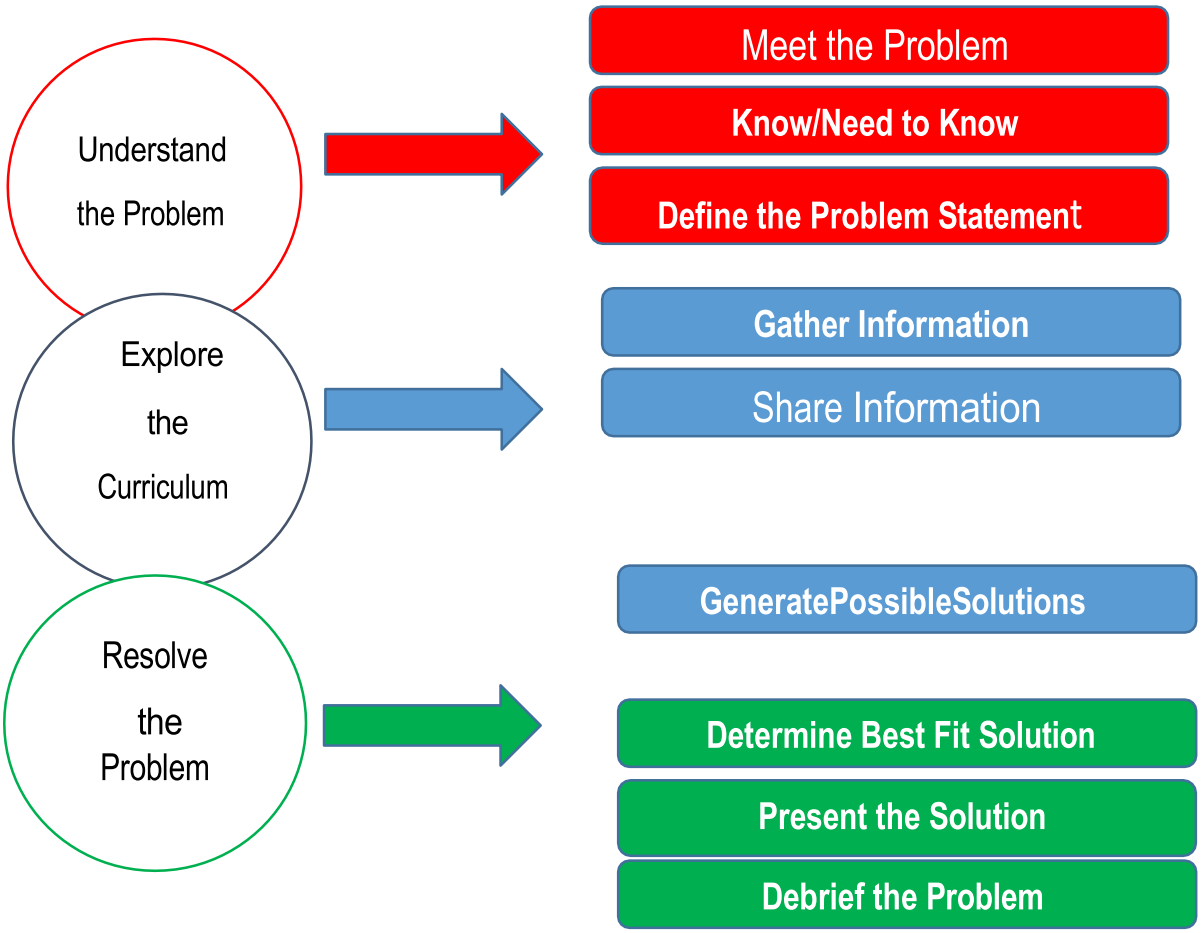
2. During this phase, the students shall carry out the project under regular supervision of the guide/subject expert, Implementation and give final presentation/demonstration with project documents.

The marks distribution for PBL Work:

Phase 1 – 25 Marks

Phase 2 – 25 Marks

1. PBLTeachingandLearningTemplate



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.

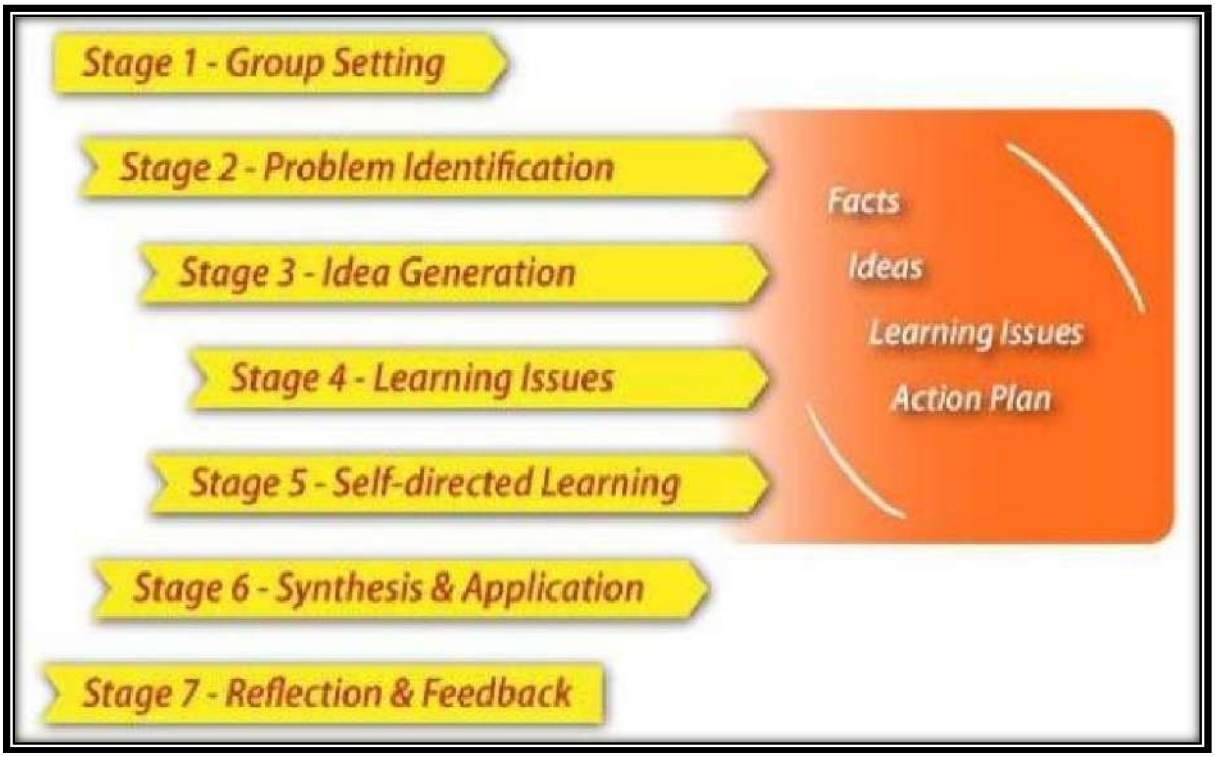
10. Obstacles/Gaps

- 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

6. **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.

2. **Block diagram of PBL**



13. Impact Analysis

- It encourages students to draw on their own creativity on problem
- solving and they learn the bridge gap between theory and practice.
- 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**.**

14. 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.

2.1 Main phases of the project

Sl. No	Topics	Duration
Phase-1		
1.	Understanding of the project and preparing a project plan	**3Weeks**
2.	Literature review	**1Week**
	Planning	**1Week**
Phase-2		
4.	Analysis and Design	**3Weeks**
5.	Implementation	**6Weeks**
6.	Testing	**1Week**
7.	Writing the project report	**1Week**
Total		**16Weeks**

14.2 Final Presentation Structure

1. Title of the project & Batch Information
2. Agenda / Topics
3. Problem Statement / Project Definition
4. Background / Literature Review
5. Methodology
6. Analysis and Design
7. Implementation
8. Testing
9. Conclusion and Scope for Future Works

14.3 Project Based Learning Report Structure

1. Cover Page
2. Certificate
3. Declaration
4. Acknowledgement
5. Table of Contents
6. List of Tables
7. List of Figures
8. Introduction
9. Background / Literature Review
10. Methodology / Solution
11. Analysis and Design
12. Implementation
13. Results
14. Conclusion and Future Works
15. Bibliography / References
16. Appendices

15. 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 297 mm).
- The margins should be: Left – 1.25", Right – 1", Top and Bottom – 0.75".
- The total number of reports to be prepared are
- One copy to the department.
- One copy to the concerned guide
- One copy to the candidate.
- Before taking the final printout, the approval of the concerned guide is
- mandatory and suggested corrections, if any, must be incorporated in the
- Final Report.
- For making copies dry tone Xerox is suggested.
- An abstract (synopsis) not exceeding 100 words, indicating salient
- features of the work.

16. 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-BasedLearningRubric

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	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 I 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 carried	Multimedia loosely illustrates the main points. Form at does not suit the content. Presentation does not capture audience.
2	Provides inconsistent information for solution Has no apparent application of critical thinking Has no clear go all pulled from few sources Has significant factual errors, misconceptions, or misinterpretations	Morethan5spelling, 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 content. Presentation has no clear organization.

Subject Identified for Project Based Learning

Semester	05
Subject Identified for PBL	Computer Vision
Prerequisite	
Justification for the selected subject	
List of possible projects	

Semester	:	05				
Course Title	:	Computer vision				
Course Code	:	BCA505				
Course Type Theory/Practical/Project Integrated)	:	Project Experiential Leaning				
Category	:	PBL				
Stream	:	CSE(AI)		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	0:0:2:0		**SEE**	:	50
Total Hours	:	40hrs		**SEE Duration**	:	Viva-voce
Credits	:	03				

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 -2024-25 Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

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COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction:** What is computer vision? A brief history. **Image Formation:** Photometric image formation, The digital camera. **Image processing**: Point operators, Linear filtering. **Textbook-1:** Chap-1 (1.1, 1.2), Chap-2 (2.2, 2.3), Chap-3 (3.1, 3.2)	5Hours
Pedagogy		
2	**Image processing**: More neighborhood operators, Fourier transforms, Pyramids and wavelets, and Geometric transformations. **Textbook-1:** Chap- 3 (3.3 - 3.6)	5Hours
Pedagogy		
3	**Image Restoration and Reconstruction:** A model of Image degradation/restoration process, restoration in the presence of noise only, periodic noise reduction by frequency domain filtering. **Image Segmentation:** Fundamentals, Point, Line and edge detection, thresholding (Foundation & Basic global thresholding only), Segmentation by region growing & region splitting & merging. **Textbook-2:** Chap-5 (5.1 to 5.4), Chap-10 (10.1 to 10.3.2, 10.4)	5Hours

Pedagogy		
4	**Color Image Processing:** Color fundamentals, color models, Pseudocolor image processing, full color image processing, color transformations, color image smoothing and sharpening, Using color in image segmentation, Noise in color images. **Textbook-2:** Chap-6 (6.1-6.8)	5Hours
Pedagogy		
5	**Morphological Image Processing:** Preliminaries, Erosion and Dilation, opening and closing, Hit-or- miss transform, some basic morphological algorithms. **Feature Extraction:** Background, Boundary preprocessing (Boundary following & Chain codes only). **Image pattern Classification:** Background, Patterns and classes, Pattern classification by prototype matching (Minimum distance classifier only). **Textbook-2:** Chap -9 (9.1-9.5), Chap-11(11.1-11.2.2), Chap-12 (12.1-12.3.1)	5Hours
	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	Richard Szeliski, Computer Vision: Algorithms and Applications (Texts in Comput Science), 2nd Edition, 2022, Springer.
2	Rafael C G., Woods R E. and Eddins S L, Digital Image Processing, Pearson, 4 edition, 2019.
Reference Books	
1	David Forsyth and Jean Ponce, Computer Vision: A Modern Approach, 2nd Edition Pearson, 2015.
2	Reinhard Klette, Concise Computer Vision - An Introduction into Theory and Algorithm Springer, 2014.

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 fundamentals of computer vision and its applications.	L2	Understand
CO2	Apply the image enhancement techniques for smoothing and sharpening of images.	L3	Apply
CO3	Compare the different image restoration and segmentation techniques.	L3	Apply
CO4	Demonstrate the smoothing and sharpening techniques for color images.	L4	Analyze

CO5	Explain morphological, feature extraction, and pattern classification techniques for object recognition	L4	Evaluate

Mapping of Course Outcomes to Program Outcomes:

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

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

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**
Understand				

Apply					
Analyse					
Create					

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module to 2.5	Module-2. to 3	Module-4	Module-5		
CO1	15	10	5	5	5	5	45	45%
CO2	10	5					15	15%
CO3			5	5	10		20	20%
CO4				5	5	10	20	20%
Total	25	15	10	15	20	15	100	100%

Project Based Learning – Continuous Evaluation

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

Project Based Learning – Review

CONTINIOUS INTERNAL ASSESSMNET

Batch No.	Name of the Student	USN	Phase I (25 Marks)		Phase II (25 Marks)		Final CIE Marks (Phase I & Phase II) (50 Marks)
			Abstract / Understanding of the Project (5 Marks)	Analysis & Design (20 Marks)	Implementation (20 Marks)	Demonstration (5 Marks)	

Professional Core Course laboratory (PCCL)

PCCL- Professional core Course Laboratory

Teaching Hours/Week (L: T:P: S)	0:0:2:0
Total Hours of Pedagogy	20 hours – Practical
Credits:	02
Modules	5
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Practical

2 Credit Course – Professional Core Course Laboratory (PCCL)

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):

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. 1. 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. 2. Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks. 3. Total marks scored by the students are scaled down to 30 marks (60% of maximum marks). 4. Weightage to be given for neatness and submission of record/write-up on time. 5. Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.

6. 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. 7. The suitable rubrics can be designed to evaluate each student's performance and learning ability. 8. The marks scored shall be scaled down to 20 marks (40% of the maximum marks).

Semester End Evaluation (SEE):

1. SEE marks for the practical course are 50 Marks.
2. SEE shall be conducted jointly by the two examiners of the same institute examiners are appointed by the Head of the Institute.
3. The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
4. All laboratory experiments are to be included for practical examination.
5. (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.
6. Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
7. 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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	5				
Course Title	:	Web Technology				
Course Code	:	BCA506				
Course Type Theory/Practical/Project Integrated)	:	Practical				
Category	:	PCCL				
Stream	:	CSE(AI)		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	0:0:2:0		**SEE**	:	50
Total Hours	:	25 hours		**SEE Duration**	:	3 Hours
Credits	:	1				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1.	Learn HTML 5 elements and their use.
2.	Use of CSS for enhanced user interface presentation.
3.	Gain knowledge of JavaScript, AJAX and jQuery for dynamic presentation.
4.	Use of Django to build Web applications.
5.	Design and develop Websites and Web 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).

List of Programs:

Sl. No.	**Experiments/Programs**	**COs**
	Practice Programs	
1	Develop the HTML page named as "Myfirstwebpage.html". Add the following tags with relevant content. 1. Set the title of the page as "My First Web Page" 2. Within the body use the following tags: a) Moving text = "Basic HTML Tags" b) Different heading tags (h1 to h6) c) Paragraph d) Horizontal line e) Line Break f) Block Quote g) Pre tag	CO1

	h) Different Logical Style (<b>, <u> , <sub>, <sup>, etc.)	
2	Develop the HTML page named as “Table.html” to display your class time table. a) Provide the title as Time Table with table header and table footer, row-span and col-span etc. b) Provide various colour options to the cells (Highlight the lab hours and elective hours with different colours.) c) Provide colour options for rows.	CO1
3	Develop an external style sheet named as “style.css” and provide different styles for h2, h3, hr, p, div, span, time, img & a tags. Apply different CSS selectors for tags and demonstrate the significance of each.	CO1
4	Develop HTML page named as “registration.html” having variety of HTML input elements with background colors, table for alignment & provide font colors & size using CSS styles.	CO2
	List of Programs:	
1	Develop HTML page named as “newpaper.html” having variety of HTML semantic elements with background colors, text-colors & size for figure, table, aside, section, article, header, footer… etc.	CO2
2	Apply HTML, CSS and JavaScript to design a simple calculator to perform the following operations: sum, product, difference, remainder, quotient, power, square-root and square.	CO2
3	Develop JavaScript program (with HTML/CSS) for: a) Converting JSON text to JavaScript Object b) Convert JSON results into a date c) Converting From JSON To CSV and CSV to JSON d) Create hash from string using crypto.createHash() method	CO2

4	Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems: a) Input: Click on Display Date button using onclick( ) function Output: Display date in the textbox b) Input: A number n obtained using prompt Output: Factorial of n number using alert c) Input: A number n obtained using prompt Output: A multiplication table of numbers from 1 to 10 of n using alert d) Input: A number n obtained using prompt and add another number using confirm Output: Sum of the entire n numbers using alert	
5	Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.	
6	Implement the following web applications using Django – Student details. Create a Django application with a frontend form to register student details and display the submitted data. Use Django's views to handle form submission (GET and POST methods). Display the submitted data on a success page using Django templates.	
7	Implement the following web applications using Django – To Do list. Build a basic to-do list can add and delete tasks in web app with a dynamic frontend using Django and HTML. Use Django templates to render tasks dynamically.	CO3
8	Development of a Django Web Application to Manage and Display Employee Details from the given 5 employees	
9	Develop jQuery script (with HTML/CSS) for: a. Appends the content at the end of the existing paragraph and list. b. Change the state of the element with CSS style using animate() method c. Change the color of any div that is animated.	CO3
10	Develop a JavaScript program with Ajax (with HTML/CSS) for: a. Use ajax() method (without Jquery) to add the text content from the text file by sending ajax request. b. Use ajax() method (with Jquery) to add the text content from the text file by sending ajax request. c. Illustrate the use of getJSON() method in jQuery d. Illustrate the use of parseJSON() method to display JSON values.	CO3

Open ended Programs		
Sl No	**Experiments/Programs**	**CO's**
1	Construct a Website (multiple Web pages) containing 'Resume' and Bio -data by using relevant HTML elements and appropriate styling for presentation with CSS/jQuery/JavaScript. Host the Website on a cloud platform.	CO2
2	Build a Web application with HTML, CSS, JavaScript, jQuery and PHP for online application/registration form. Form should accept the information and print/display on a browser with formatting/styling upon submission (Button click) on success. Host the application on a cloud platform.	CO2
3	Design and develop a dynamic event management portal using HTML, CSS, JavaScript, PHP, and jQuery that allows users to: • View a list of upcoming events • Register for events using a form • View a confirmation message upon registration • Admin can sort and display the registration list using selection sort (PHP) • Include a visitor counter on the homepage	CO3
4	Create an interactive Online Resume Builder where users can input their personal, academic, and professional information through a form and generate a styled resume in a new browser window using HTML, CSS, and JavaScript	CO3

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Randy Connolly and Ricardo Hoar, Fundamentals of Web Development, 3rd edition, Pearson, 2021
Reference Books	
1	Robert W Sebesta, Programming the World Wide Web, 8th Edition, Pearson Education, 2020.
2	Jeff Forcier, Paul Bissex, Wesley J. Chun, "Python Web Development with Django", Addison-Wesley Publisher, 2008, ISBN: 978-0132356138

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Apply** HTML5, CSS, and JavaScript to design interactive and well-	Apply	L3
CO2	**Analyze** the behavior and functionality of web applications using jQuery, AJAX, and PHP to handle client-side and server-side	Analyse	L4
CO3	**Design** and develop responsive websites and web applications integrating frontend and backend technologies, and deploy them on	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	3	2			2					2			2		
CO2	3	2			2								2		
CO3		3	2		3								3	1	
CO4		2	3		3				2			1	3	1	
CO5															

Weblinks and Video Lectures (e-Resources)	
1	https://www.w3schools.com/html/default.asp
2	https://www.w3schools.com/css/default.asp
3	https://www.w3schools.com/js/js_examples.asp.
4	https://www.geeksforgeeks.org/javascript-examples/
5	https://www.geeksforgeeks.org/jquery-tutorial/
6	https://www.w3schools.com/php/default.asp

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Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

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)

Semester	:	**5th Semester**				
Course Title	:	**Environmental Studies and E-Waste Management**				
Course Code	:	**BCV508**				
Course Type (Theory/ Practical/ Integrated)	:	**THEORY**				
Category	:	**MC**				
Stream	:	**Common to all Branches**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**2:0:0:0**		**SEE**	:	**50**
Total Hours	:	**30**		**SEE Duration**	:	**2 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 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)**.

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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)

COURSE CURRICULUM

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)	3

	Global Environmental Issues: Acid Rain, Ozone Depletion, Global warming and Ground water depletion. Self-Study Component (SSC): Case studies of air pollution episodes.	
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 Solid Waste Management Rules,2016, Biomedical Waste Management Rules, 2016. Self-Study Component (SSC): Case studies on waste management options	**3**
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	**Power Point 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** **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	**S M Prakash – Environmental Studies,3rd Edition 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 Geetha Balakrishna & 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, land, and water**	**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	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1													2		
CO2									2	2				2	1
CO3								3		3					

Weblinks and Video Lectures (e-Resources)	
1	https://youtu.be/l_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/l_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 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	10	5	5	10	10	50	100%
CO2								
CO3								
Total	10	10	5	5	10	10	50	

ABILITY ENHANCEMENT COURSE (AEC)

AEC Course – Ability Enhancement Course

Teaching Hours/Week (L: T:P: S)	0:0:2:0
Total Hours of Pedagogy	24 hours Practical
Credits:	01
Programs / Experiments	12
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Practical (Internal Examiners only)

1 Credit Course – Practical

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.

IContinuous 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. **Semester End Evaluation (SEE):** SEE marks for the practical course are 50 Marks. • SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the Head of the Institute. • The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University. 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 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.

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	5th				
Course Title	:	Research Methodology and Intellectual Property Rights (RMIPR)				
Course Code	:	BRM507x				
Course Type (Theory/Practical/Project Integrated)	:	Theory				
Category	:	AEC				
Stream	:	Common to all branches		**CIE**	:	50 Marks
Teaching hours/ week (L:T:P:S)	:	1:0:0:0		**SEE**	:	50 Marks
Total Hours	:	15 hrs		**SEE Duration**	:	1 Hours
Credits	:	1				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the knowledge on basics of research and its types.
2	Learn the concept of Literature Review, Technical Reading, Attributions and Citations.
3	Learn Ethics in Engineering Research.
4	Discuss the concepts of Intellectual Property Rights in engineering

Teaching-Learning Process

Pedagogy (General Instructions):

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

1. 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 SYLLABUS

Module No.	Contents of the Module	Hours
1.	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. Text book1: Chapter 1	3 hrs
Pedagogy	Think-Pair-Share	
2.	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 Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading. Tools: Google Scholar, IEEE Xplore, ACM Digital Library, PubMed, Scopus, Web of Science, arXiv, bioRxiv, Semantic Scholar, Connected Papers / Research Rabbit Text book1: Chapter 2	3 hrs
Pedagogy	Literature Review Paper Writing and Demo of the same	
3.	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.	3 hrs

	Text book1: Chapter 3	
pedagogy	Case study, Patent Proposal Writing	
4.	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, TrademarkNow Advisor, DesignSearch.ai, DesignShelf, Legal Robot Text book1: Chapter 4, 5, 6	3 hrs
Pedagogy	Chalk and board, Practical based learning, Higher order thinking	
5.	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 Text book1: Chapter 7,8	3 hrs
	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
	Dr. Santosh M Nejakar, Dr. Harish Bendigeri "Research Methodology and Intellectual Property Rights", ISBN 978-93-5987-928-4, Edition: 2023-24.
Reference Books	
	David V. Thiel "Research Methods for Engineers" Cambridge University Press, 978-1-107-03488- 4-
	Intellectual Property Rights by N.K. Acharya Asia Law House 6th Edition. ISBN: 978-93-81849-30-9
	Research Methodology – Methods and Techniques., C. R Kothari, Gourav Garg, New Age International 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	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	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
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)	
	https://onlinecourses.nptel.ac.in/noc24_ge21/preview
	https://archive.nptel.ac.in/content/syllabus_pdf/121106007.pdf
	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
Analyse	10	20	10	20
Evaluate	-	20	5	5
Create	-		5	5

CIE Course Assessment Plan

CO's	Marks Distribution						Total Mark s	Weightage
	Test-1(50)			Test-2(50)				
	Module -1	Module -2	Modul e 2 to 2.5	Module -2.5 to 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	
Tota l	20	20	10	10	20	20	100	

SEE- Semester End Examination (50 Marks)

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

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module -1	Module -2	Modul e 2 to 2.5	Module -2.5 to 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	
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

6thSEMESTER

INTEGRATED PROFESSIONAL CORE COURSE (IPCC1)

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

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

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

- On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report, **05 Marks**are for conducting the experiment, **05 Marks** for

preparation of the laboratory record, **5 Marks** for conducting Open Ended Experiments Each experiment. Marks of all experiments' write-ups are added to 15 marks.

- The Practical laboratory test **(duration 03 hours)**at the end of the 15th week of the semester/after completion of all the experiments (whichever is early) shall be conducted for **50 Marks** and scaled down to **5 Marks.**
- The open-ended experiment after completion of all the experiments shall be conducted for 20 marks with a split-up for 5 Marks for writeup, 10 Marks for Execution, and 5 Marks for Viva-Voce. Marks for writeup, Execution and Viva-Voce is added and scaled down to 05 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 25 marks.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

Semester End Examination (SEE) for IPCC Theory

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

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

Continuous and Comprehensive Assessment (CCA):

	Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for 50 Marks. Total Marks scored will be (CCA1+CCA2)/2 and scaled down to **10 Marks.**
	• CCA1 after 4th week and CCA2 after 9th week. The Assessment will be through rubrics.
	• CCA as project-based learning,
	  o 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.
	  o 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
		CCA-2- Pedagogical Initiatives/ Activity based learning		50				

								method may be adopted
	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					
			Write up	15					
			Execution	25					

		Practical Test	Viva-voce	10	50	----	05	4	One Internal Practical Test after conduction
		Open Ended Experiment	Write up	05	20	----	05	2	One experiment for 20marks. 20 marks reduced
			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	:	6				
Course Title	:	Natural Language Processing				
Course Code	:	BCA601				
Course Type (Theory/ Practical/ Project/ Integrated)	:	Integrated				
Category	:	IPCC1				
Stream	:	CSE(AI)		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	03:00:02:00		**SEE**	:	50
Total Hours	:	40 (T) + 20 (L)		**SEE Duration**	:	03 Hrs
Credits	:	4				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Learn the importance of natural language modelling
2	Understand the Applications of natural language processing
3	Study spelling, error detection and correction methods and parsing techniques in NLP
4	Illustrate the information retrieval models in natural language processing
5	To analyze machine translation techniques, including encoder-decoder models, evaluation methods, and ethical considerations."

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:** What is Natural Language Processing? Origins of NLP, Language and Knowledge, The Challenges of NLP, Language and Grammar, Processing Indian Languages, NLP Applications. Language Modeling: Statistical Language Model - N-gram model (unigram, bigram), Paninion Framework, Karaka theory. **Textbook 1: Ch. 1, Ch. 2.**	**8Hours**
Pedagogy		
2.	**Word Level Analysis:** Regular Expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection and Correction, Words and Word Classes, Part-of Speech Tagging. Syntactic Analysis: Context-Free Grammar, Constituency, Top-down and Bottom-up Parsing, CYK Parsing. **Textbook 1: Ch. 3, Ch. 4.**	**8Hours**
Pedagogy		
3.	**Naive Bayes, Text Classification and Sentiment:** Naive Bayes Classifiers, Training the Naive Bayes Classifier, Worked Example, Optimizing for Sentiment Analysis, Naive Bayes for Other Text Classification Tasks, Naive Bayes as a Language Model. **Textbook 2: Ch. 4.**	**8Hours**
Pedagogy		
4.	**Information Retrieval:** Design Features of Information Retrieval Systems, Information Retrieval Models - Classical, Non-classical, Alternative Models of Information Retrieval - Custer model, Fuzzy model, LSTM model, Major Issues in Information Retrieval. Lexical Resources: WordNet, FrameNet, Stemmers, Parts-of-Speech Tagger, Research Corpora. **Textbook 1: Ch. 9, Ch. 12.**	**8Hours**

Pedagogy		
5.	**Machine Translation:** Language Divergences and Typology, Machine Translation using Encoder Decoder, Details of the Encoder-Decoder Model, Translating in Low-Resource Situations, MT Evaluation, Bias and Ethical Issues. **Textbook 2: Ch. 13.**	**8Hours**
	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	Write a Python program for the following preprocessing of text in NLP: ● Tokenization ● Filtration ● Script Validation ● Stop Word Removal ● Stemming	CO2
2	Demonstrate the N-gram modeling to analyze and establish the probability distribution across sentences and explore the utilization of unigrams, bigrams, and trigrams in diverse English sentences to illustrate the impact of varying n-gram orders on the calculated probabilities.	CO2
3	Investigate the Minimum Edit Distance (MED) algorithm and its application in string comparison and the goal is to understand how the algorithm efficiently computes the minimum number of edit operations required to transform one string into another. ● Test the algorithm on strings with different type of variations (e.g., typos, substitutions, insertions, deletions) ● Evaluate its adaptability to different types of input variations	CO3
4	Write a program to implement top-down and bottom-up parser using appropriate context free grammar.	CO3
5	Given the following short movie reviews, each labeled with a genre, either comedy or action: ● fun, couple, love, love comedy ● fast, furious, shoot action ● couple, fly, fast, fun, fun comedy ● furious, shoot, shoot, fun action ● fly, fast, shoot, love action and A new document D: fast, couple, shoot, fly Compute the most likely class for D. Assume a Naive Bayes classifier and use add-1 smoothing for the likelihoods.	CO3

6	Demonstrate the following using appropriate programming tool which illustrates the use of information retrieval in NLP: ● Study the various Corpus – Brown, Inaugural, Reuters, udhr with various methods like filelds, raw, words, sents, categories ● Create and use your own corpora (plaintext, categorical) ● Study Conditional frequency distributions ● Study of tagged corpora with methods like tagged_sents, tagged_words ● Write a program to find the most frequent noun tags ● Map Words to Properties Using Python Dictionaries ● Study Rule based tagger, Unigram Tagger Find different words from a given plain text without any space by comparing this text with a given corpus of words. Also find the score of words.	CO4
7	Write a Python program to find synonyms and antonyms of the word "active" using WordNet.	CO4
8	Implement the machine translation application of NLP where it needs to train a machine translation model for a language with limited parallel corpora. Investigate and incorporate techniques to improve performance in low-resource scenarios.	CO4
Open ended Programs		
1	Text Classification Game ● Objective: Learn supervised learning and text classification. ● Activity: Provide students with a set of documents (e.g., movie reviews) labeled as positive or negative. Divide them into groups and have them create a simple classification model using keywords or phrases. They can then test their model on new reviews.	CO5
2	Grammar Check and Correction ● Objective: Learn about language structure and NLP tools. ● Activity: Provide sentences with grammatical errors. Students can use grammar checking tools (like Grammarly or LanguageTool) to identify errors and suggest corrections, discussing why each suggestion is made.	CO5

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press.
2	Daniel Jurafsky, James H. Martin, "Speech and Language Processing, An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education, 2023.
Reference Books	
1	Akshay Kulkarni, Adarsha Shivananda, "Natural Language Processing Recipes - Unlocking Text Data with Machine Learning and Deep Learning using Python", Apress, 2019.
2	T V Geetha, "Understanding Natural Language Processing – Machine Learning and Deep Learning Perspectives", Pearson, 2024.
3	Gerald J. Kowalski and Mark.T. Maybury, "Information Storage and Retrieval systems", Kluwer Academic Publishers.

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
1	Understand the fundamental concept of NLP, grammar-based language model and statistical-based language model.	Understand	L2
2	Apply the concepts of information retrieval, Naïve Bayes classifier and sentiment analysis for Natural language problems and text classifications.	Apply	L3
3	Analyse Model morphological using Finite State Transducers and parsing using context-free grammar and different parsing	Analyze	L4
4	Investigate Models of Information Retrieval and Major Issues in Information Retrieval.	Evaluate	L5
5	Implement machine Translation applications of NLP using Encode and Decoder	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													
CO2	2	3			2				2				2		
CO3	2	3							2	2			2	1	
CO4		2	2						2	2			2		
CO5					3				3	2		1	2	1	

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

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	10				
Understand	10	10			
Apply	20	20	20	20	
Analyse	10	20	20	20	
Evaluate			10	10	10
Create					15

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

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	20
Understand	30
Apply	30
Analyze	20

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 t 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	10	5	5	10	10	50	50%
CO2	10	10					20	20%
CO3			5	5			10	10%
CO4					10		10	10%
CO5						10	10	10%
Total	20	20	10	10	20	20	100	100%

INTEGRATED PROFESSIONAL CORE COURSE (IPCC2)

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	6th				
Course Title	:	FULL STACK WEB DEVELOPMENT WITH JAVA				
Course Code	:	BCA602				
Course Type (Theory/ Practical/ Project/ Integrated)	:	Integrated				
Category	:	IPCC2				
Stream	:	CSE(AI)		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	3:0:0:0		**SEE**	:	50
Total Hours	:	40 Hrs		**SEE Duration**	:	03 Hrs
Credits	:	4				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Apply core Java SE & J2EE principles—including OOP features, with Java Beans, reflection, and exception concepts
2	Analyze and implement Collections, XML, AWT/Swing components to model, manipulate structured data efficiently
3	Demonstrate and execute JDBC programming with driver configuration and also its batch processing skills
4	Develop and manage Servlets, JSP, and MVC design to manage session state, and process applications
5	Design and integrate enterprise solutions using Hibernate and Spring Boot for full-stack Java web development

Teaching-Learning Process

Pedagogical Initiatives:

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 of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
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, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply 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 up with 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 helps improve 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 CURRICULUM

Module No.	Topics	Hours
1.	**Introduction**: J2EE and J2SE, Why J2EE? Introduction - Client/Server - 3 tier and N tier Systems - Web Applications – Databases - Java Beans – String - upcasting – downcasting – reflection - MVC architecture **Language Principles**: Abstraction – Encapsulation - Inheritance – Polymorphism – Interfaces- Abstract class – Exception **Textbook** 1: Ch. 1, Ch. 2, Ch. 7, Ch. 8	**8Hours**
Pedagogy	**Quiz**	
2.	**UI Components**: AWT – Event Handling – Listener – Adapter classes - Swing components **Collections**: Collection Frameworks – ArrayList – LinkedList – HashSet – TreeSet – Queue – Map – HashMap – LinkedHashMap – TreeMap – Vector – Enum – Comparator **Textbook** 1: Ch. 18, Ch. 19 Textbook 2: Ch. 3, Ch. 4	**8Hours**
Pedagogy	**Demonstration**	
3.	**XML**: XML – Types – DTD – XML Schema – elements – simple – complex – types - XPath – Xquery **JDBC Concepts**: The Concept of JDBC; JDBC Driver Types - JDBC Drivers - JDBC Package - The JDBC process - MySQL - Database Connection - Associating the JDBC/ODBC Bridge with the Database - Statement Object - ResultSet Object – Prepared Statement – Callable statement – Batch Updates – Advanced RowSet – types - Transaction Processing **Textbook** 1: Ch. 26	**8Hours**

Pedagogy	**Presentation**	
4.	**Servlets:** Servlet – Servlet API – Generic Servlet – HttpServlet – Life cycle - How servlet works – Servlet example with HTML components - Session – Tracking mechanism – cookie – Hidden form field, URL rewriting – Request Dispatcher – sendRedirect – HttpSessionEvent - CRUD Application **JSP:** JSP –lifecycle – API – Scripting elements – implicit objects – Directive elements – Exception - Expression Language – Standard action tags – custom action tags - Core Tags – Function tags – formatting tags **Textbook 4:**Ch. 5, Ch. 6, Ch. 7, Ch. 8	**8Hours**
Pedagogy	**Case Study**	
5.	**Hibernate**: Hibernate architecture – JPA - with xml – annotation – generator – dialects – mapping - HQL – HCQL – Named query – caching **Spring**: Spring.io – spring initalizr - spring boot – Spring Modules- Dependency Injection - Spring AOP – Spring ORM – SPEL - Problem Solving Examples API - Rest - web - SOAP - Test API - postman, curl, httpie, jmeter, rest assured, swagger UI **Textbook** 5: Ch. 1, Ch. 3, Ch. 6 **Textbook** 6: Ch. 2, Ch. 4	**8Hours**
	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.	Implement core OOP concepts (Abstraction, Inheritance, Polymorphism, Interfaces) using a Banking application with its interest rate and balance with deposit and withdrawn functions - Get user account number - Account name - Branch Utilize functions – to access accounts	CO2
2.	Create a Java application demonstrating upcasting, downcasting, exception handling, and reflection API. - Banking application to raise exception if amount < 0 To analyze software by itself – variables, functions and classes	CO2
3.	Develop a student record management system using ArrayList, HashMap, and implement sorting using Comparator and Enum - Sorting techniques Listing techniques and others	CO2
4.	Create an XML based program to display the student details w.r.t its section. Utilize XML Schema to adapt and fetch student information	CO2
5.	Create a basic calculator that performs addition, subtraction, multiplication, and division. - Use AWT concepts using Events Use Listener and its functions	CO2
6.	Create a JDBC application to connect to a MySQL database, and perform basic CRUD operations using PreparedStatement - Updation of student mark details - Insertion of student records - Deletion of records Creating an aggregation of marks	CO3
7.	Develop a CRUD web application using Servlets and HTML forms, with session	CO3

	tracking using cookies and URL rewriting - Display the session ID - Access the html file and process the UI controls using servlets Update and access the data	
8.	Create a JSP-based web app using Expression Language, JSTL core tags, and formatting tags, including error handling and MVC structure. - Display the values using implicit objects - Use standard action tags command to include and forward the page Use JSTL core tags to display values using expression language	CO4
9.	Build a Hibernate-based application with XML and annotation-based mapping, and perform CRUD with HQL queries - Create a Pojo class file and annotate it - Create hibernate xml file for doing the mapping with database concepts Use server file to start the transaction	CO4
10.	Create a Spring Boot application using Spring Initializr, with Dependency Injection, Spring ORM, and AOP features - Develop a spring boot application by developing packages using spring initializr - Create a class to access dependency injection - Testing API's	CO5

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1.	Herbert Schildt, "Java: The Complete Reference", McGraw-Hill, 13 th ed., 2024 ch 1,2,7,8
2.	Maurice Naftalin & Philip Wadler, "Java Generics and Collections", O'Reilly, 2 nd ed., 2025
3.	Joe Fawcett, Danny Ayers & Liam Quin, "Beginning XML", Wrox/Wiley, 5 th ed., 2012
4.	Joel Murach & Michael Urban, "Murach's Java Servlets and JSP", Murach & Associates, 3rd ed., 2014 (full Servlet 3.1/JSP 2.3 coverage, JSTL, EL, MVC)
5.	Java Persistence with Hibernate – Christian Bauer, Gary Gregory & Gavin King, Manning, 2nd ed., 2015
6.	Craig Walls, "Spring in Action", Manning, 6 th ed., 2022
Reference Books	
7.	Cay S. Horstmann,"Core Java, Vol I – Fundamentals", Pearson/Oracle Press, vol 1, 12th ed., 2021
8.	Cay S. Horstmann, "Core Java, Vol II – Advanced Features", OraclePress, vol 2,12 th ed., 2022

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand core Java SE & J2EE concepts such as OOP, JavaBeans, reflection, and exception handling in	Understand	L2
CO2	Apply and use Collection package, XML, and GUI components for effective data handling and user	Apply	L3
CO3	Develop JDBC-based applications, including database	Apply	L3

CO4	Analyse dynamic web applications using Servlets, JSP, and MVC architecture, managing session and request	Analyse	L4
CO5	Evaluate enterprise-level full-stack applications by integrating Hibernate ORM and Spring Boot frameworks.	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	3	3	3	3	3	3	3	1	2	2	3	2	3	-
CO2	3	3	3	3	3	3	3	1	-	2	1	3	3	2	-
CO3	3	3	3	3	3	3	3	2	-	2	1	3	3	3	-
CO4	3	3	3	3	3	3	3	1	-	2	1	3	3	3	-
CO5	3	3	3	3	3	3	3	3	1	2	2	3	2	3	-

Web links and Video Lectures (e-Resources)	
1.	http://acl.digimat.in/nptel/courses/video/106105191/lec1.pdf
2.	http://acl.digimat.in/nptel/courses/video/106105225/L21.html
3.	https://archive.nptel.ac.in/courses/106/105/106105191/
4.	https://www.coursera.org/specializations/java-fullstack
5.	https://www.youtube.com/watch?v=WkKT5M-ABnY&list=PLlhM4lkb2sEiiEAP0uSFXiFY8KdXPnN0f
6.	https://www.coursera.org/specializations/object-oriented-programming
7.	https://www.youtube.com/watch?v=v5Q7TC5u5Co
8.	https://www.coursera.org/specializations/spring-framework

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	10				
Understand	10	10			
Apply	20	20	20	20	
Analyse	10	20	20	20	
Evaluate			10	10	10
Create					15

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	Module-4	Module-5		
CO1	10	10	5	5	10	10	50	50%
CO2	10	10					20	20%
CO3			5	5			10	10%
CO4					10		10	10%
CO5						10	10	10%
Total	20	20	10	10	20	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	**SEE Marks** **(90% Theory+10% Practical Questions)**
Remember	20
Understand	30
Apply	30
Analyze	20

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	5	5	10	10	50	50%
CO2	10	10					20	20%
CO3			5	5			10	10%
CO4					10		10	10%
CO5						10	10	10%
Total	20	20	10	10	20	20	100	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
		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	:	6				
Course Title	:	Human Centred AI				
Course Code	:	BCA603				
Course Type Theory/Practical/Project Integrated)	:	Theory				
Category	:	PCC				
Stream	:	CSE(AI)		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	3:0:0:0		**SEE**	:	50
Total Hours	:	40hrs		**SEE Duration**	:	3 hours
Credits	:	3				

Course Learning Objectives: Students will be able to:

Sl.No	Course Objectives
CO1	To understanding of the foundational principles of Human-Centred AI
CO2	To learn and evaluate reliable, safe, and trustworthy AI systems using the HC AI framework
CO3	To understand governance strategies that bridge the gap between ethical principles and practical steps
CO4	To learn how to create and assess safety cultures in organizations through management strategies, incident reporting, and trustworthy certification practices
CO5	To understand how AI can amplify human-to-human communication and cooperation

Teaching-Learning Process

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

1. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation/Demonstration to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) 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, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Use animations/videos to help the students to understand the concepts.

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, implementing lab programs 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)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**WHAT IS HUMAN-CENTERED ARTIFICIAL INTELLIGENCE:** Introduction, Are People and Computers in the Same Category? Will Automation, AI, and Robots Lead to Widespread Unemployment? **Textbook: Chapter 1, Chapter 3, Chapter 4**	8Hours
Pedagogy		
2	**HUMAN-CENTERED AI FRAMEWORK:** Introduction, Defining Reliable, Safe, and Trustworthy Systems, Two-Dimensional HCAI Framework, Design Guidelines and Examples **Textbook: Chapter 6, Chapter 7, Chapter 8, Chapter 9**	8Hours
Pedagogy		
3	**DESIGN METAPHORS:** Introduction, Science and Innovation Goals, Intelligent Agents and Super tools, Teammates and Tele-bots, Social Robots and Active Appliances **Textbook: Chapter 11, Chapter 12, Chapter 13, Chapter 14, Chapter 16**	8Hours
Pedagogy		
4	**GOVERNANCE STRUCTURES – 1:** Introduction, Reliable Systems Based on Sound Software Engineering Practice, Safety Culture through Business Management Strategies, Trustworthy Certification by Independent Oversight **Textbook: Chapter 18, Chapter 19, Chapter 20, Chapter 21**	8Hours
Pedagogy		
5	**GOVERNANCE STRUCTURES – 2:** Government Interventions and Regulations, Introduction: Driving HC AI Forward, Assessing Trustworthiness, Caring for and Learning from Older Adults **Textbook: Chapter 22, Chapter 24, Chapter 25, Chapter 26,**	8Hours

	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.	Shneiderman, Ben. Human-centered AI. Oxford University Press, 2022.
Reference Books	
1.	Nam, Chang S., Jae-Yoon Jung, and Sangwon Lee, eds. Human-Centered Artificial Intelligence:Research and Applications. Academic Press, 2022.
2.	Chetouani, Mohamed, et al., eds. Human-centered artificial intelligence: Advanced lectures. Vol.13500. Springer Nature, 2023.

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

CO	**Course Outcomes**	**RBT Level**	**RBT Level Indicator**
CO1	Demonstrate a foundational of Human-Centered AI with human values such as rights, dignity, and justice.	Understand, Remember	L1, L2
CO2	Apply the Human-Centered AI framework to design AI systems that achieve high levels of both human control and automation	Apply	L3
CO3	Utilize design metaphors (super tools and tele-bots) to innovate and develop AI applications that enhance human creativity	Apply	L3
CO4	Develop governance structures and ethical strategies to ensure the safe and responsible deployment of AI systems	Create	L6
CO5	Identify emerging trends and challenges in Human-Centered AI and Design strategies for enhancing trustworthiness and societal	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	2	-	-	-	2	1	3	-	-	-	-	2	-	-
CO2	3	1	3	-	-	2		3	-	-	-	2	3	-	-
CO3	2	-	3	-	-	-	-	-	-	-	-	3	-	3	-
CO4	2	3	2	-	-	3	1	3	-	-	-	-	3	-	-
CO5	1	3	-	-	-	2	3	3	-	-	-	3		-	-

Weblinks and Video Lectures (e-Resources)	
1.	https://www.youtube.com/playlist?app=desktop&list=PL2ovtN0KdWZiBkaQsHXMGFTEzok7YQkvt
2.	https://www.youtube.com/watch?v=HcCZSw-Rm-w

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	10	20		
Apply	25	20		
Evaluate	5			
Create			25	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		10	10	10	50	50%
CO2	10	10	5		10	10	45	45%
CO3								
CO4								
CO5			5				5	5%
Total	20	20	10	10	20	20	100	

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	25%
Understand	25%
Apply	45%
Evaluate	5%

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		10	10	10	50	50% (25%+25%)
CO2	10	10	5		10	10	45	45%
CO3								
CO4								
CO5			5				5	5%
Total	20	20	10	10	20	20	100	

PROFESSIONAL ELECTIVE COURSE (PEC-02)

PEC-02 Course - Professional Elective Course

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

3 Credit Course – Professional Elective Course (PEC 2)

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

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

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

Semester-End Examination:

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

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

Continuous and Comprehensive Assessment (CCA):

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

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

Total score for CCA is 10 Marks

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

Possible Continuous and Comprehensive Assessment (CCA):

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

Professional Elective Course (PEC 2) – 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
		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	:	6				
Course Title	:	Prompt Engineering for Large Language Models				
ourse Code	:	BCA604				
ourse Type **heory/Practical/Project Integrated)**	:	Theory				
ategory	:	PEC-02				
Stream	:	CSE(AI)		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	3:0:0:0		**SEE**	:	50
Total Hours	:	40 Hrs		**SEE**	:	03 Hours
Credits	:	03		**Duration**		

Course Learning Objectives: Students will be able to:

Sl.No	Course Objectives
1	Learn details on transformers and BERT models
2	Illustrate how pretrained models work
3	Explore the fundamentals of prompt engineering with GPT3 and optimizing LLMs
4	Learn about hugging face and hugging face library.
5	Investigate the case studies on LLMs

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, implementing lab programs 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 to Transformers:** Motivation behind transformers, Self-attention mechanism, Transformer architecture and components. BERT: Working of BERT, BERT pretrained model, input representation, Use cases of BERT **Textbook2: Chapter 2, Chapter 3**	**8Hours**
Pedagogy	**Quiz**	
2.	**Introduction to Large language models:** What are large language models, Popular modern LLMs, Domain specific LLMs, Applications of LLMs. Prompt Engineering with GPT3: Introduction, Prompt engineering, working with prompts across models, Building Q/A bot with GPT **Textbook1: Chapter1, Chapter3**	**8Hours**
Pedagogy	**Demonstration**	
3.	**Optimizing LLMs with Customized Fine Tuning:** Introduction, Transfer learning and fine tuning, OpenAI Fine tuning API, Amazon Review category classification. Advanced Prompt Engineering: Introduction, Prompt engineering, Introduction, Prompt injection attacks, Input/Output Validation, Batch Prompting, Prompt Chaining, chain of thought prompting, Testing and Iterative prompt development. **Textbook1: Chapter 4, Chapter5**	**8Hours**
Pedagogy	**Problem solving**	
4.	**Hugging Face:** Introduction, Features of hugging face platform, Components of hugging face, Pipelines **Tasks using hugging face library:** Introduction to Gradio, Creating a space on hugging face, Hugging face tasks, Q/A, Translation. **Textbook2: Chapter 4, Chapter 5**	**8Hours**

Pedagogy	Presentation	
5.	Case Study – Building a Recommendation System, Case Study—Visual Q/A, Case Study—Reinforcement Learning from Feedback. Deploying Custom LLMs to the Cloud Overview of Cloud Deployment, Best Practices for Cloud Deployment **Textbook1: Chapter 6,7,9**	**8Hours**
	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	"Quick Start Guide to Large Language Models: Strategies and Best Practices for using ChatGPT and Other LLMs" by Sinan Ozdemir, O'reilly publications, October 2023
2	"Introduction to Transformers for NLP: With the Hugging Face Library and Models to Solve Problems" by Shashak mohan Jain, O'reilly publications, October 2022.
Reference Books	
1	"The Art of Prompt Engineering with ChatGPT: A Hands-on Guide (learn AI Tools the Fun Way!)" by Nathan Hunter.
2	"Prompt Engineering: Unlocking Generative AI: Ethical Creative AI for All" by Navveen Balani.
3	"The Ultimate Guide to ChatGPT: A Beginner's Handbook to Understanding Prompt Engineering, the Future of Artificial Intelligence and How to Use It Effectively" by Percival C. Verena.

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 concept of transformers and BERT models and	Understand	L2
CO2	Apply prompt engineering with GPT3 and optimizing LLMs.	Apply	L3
CO3	Analyse hugging face platform, transformers for LLMs and	Analyse	L4
CO4	Investigate tasks using hugging face library.	Evaluate	L5
CO5	Building a Recommendation System, Visual Q/A, Reinforcement Learning from Feedback.	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		1	2							2			2		

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=vCra2J3-tak
2	https://www.youtube.com/watch?v=LWiMwhDZ9as

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**	**10 Marks**	**15 Marks**
Remember				
Understand	20	10		
Apply	20	10		
Analyse	10	20	10	
Evaluate		10		
Create				15

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			10	10	40	40%
CO2	10	10	10				30	30%
CO3				10			10	10%
CO4					10		10	10%
CO5						10	10	10%
Total	20	20	10	10	20	20	100	

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	20
Understand	30
Apply	30
Analyze/ Evaluate	20

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			10	10	40	40%
CO2	10	10	10				30	30%
CO3				10			10	10%
CO4					10		10	10%
CO5						10	10	10%
Total								

Professional Core Course laboratory(PCCL)

PCCL- Professional Core Course Laboratory

Teaching Hours/Week (L: T:P: S)	0:0:2:0
Total Hours of Pedagogy	20 hours – Practical
Credits:	02
Modules	5
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Practical

2 Credit Course – Professional Core Course Laboratory (PCCL)

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):

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. 1. 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. 2. Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks. 3. Total marks scored by the students are scaled down to 30 marks (60% of maximum marks). 4. Weightage to be given for neatness and submission of record/write-up on time. 5. Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus. 6. 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. 7. The suitable rubrics can be designed to evaluate each student's performance and learning ability. 8. The marks scored shall be scaled down to 20 marks (40% of the maximum marks).

Semester End Evaluation (SEE):

1. SEE marks for the practical course are 50 Marks.
2. SEE shall be conducted jointly by the two examiners of the same institute examiners are appointed by the Head of the Institute.
3. The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
4. All laboratory experiments are to be included for practical examination.
5. (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.
6. Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
7. 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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	6				
Course Title	:	Generative & Agentic AI				
Course Code	:	BCA606				
Course Type (Theory/Practical/Project Integrated)	:	Practical				
Category	:	PCCL				
Stream	:	CSE(AI)		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	0:0:2:0		**SEE**	:	50
Total Hours	:	25 Hrs		**SEE Duration**	:	03 Hrs
Credits	:	01				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the principles and concepts behind generative AI models
2	Explain the knowledge gained to implement generative models using Prompt design frameworks.
3	Apply various Generative AI applications for increasing productivity.
4	Develop Large Language Model-based Apps.

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 analysing 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

SL.No	List of Experiments	
1	Explore pre-trained word vectors. Explore word relationships using vector arithmetic. Perform arithmetic operations and analyze results.	CO1
2	Use dimensionality reduction (e.g., PCA or t-SNE) to visualize word embeddings for Q 1. Select 10 words from a specific domain (e.g., sports, technology) and visualize their embeddings. Analyze clusters and relationships. Generate contextually rich outputs using embeddings. Write a program to generate 5 semantically similar words for a given input.	CO2
3	Train a custom Word2Vec model on a small dataset. Train embeddings on a domain-specific corpus (e.g., legal, medical) and analyze how embeddings capture domain-specific semantics.	CO2
4	Use word embeddings to improve prompts for Generative AI model. Retrieve similar words using word embeddings. Use the similar words to enrich a GenAI prompt. Use the AI model to generate responses for the original and enriched prompts. Compare the outputs in terms of detail and relevance.	CO2
5	Use word embeddings to create meaningful sentences for creative tasks. Retrieve similar words for a seed word. Create a sentence or story using these words as a starting point. Write a program that: Takes a seed word. Generates similar words. Constructs a short paragraph using these words.	CO3
6	Use a pre-trained Hugging Face model to analyze sentiment in text. Assume a real-world application, Load the sentiment analysis pipeline. Analyze the sentiment by giving sentences to input.	CO3
7	Summarize long texts using a pre-trained summarization model using Hugging face model. Load the summarization pipeline. Take a passage as input and obtain the summarized text.	CO3
8	Install langchain, cohere (for key), langchain-community. Get the api key(By logging into Cohere and obtaining the cohere key). Load a text document from your google drive . Create a prompt template to display the output in a particular manner.	CO4

9	Take the Institution name as input. Use Pydantic to define the schema for the desired output and create a custom output parser. Invoke the Chain and Fetch Results. Extract the below Institution related details from Wikipedia: The founder of the Institution. When it was founded. The current branches in the institution . How many employees are working in it. A brief 4-line summary of the institution.	CO4
10	Build a chatbot for the Indian Penal Code. We'll start by downloading the official Indian Penal Code document, and then we'll create a chatbot that can interact with it. Users will be able to ask questions about the Indian Penal Code and have a conversation with it.	CO4
	Open Ended Programs	
1	AI Agent for Customer Complaint Resolution Scenario: A company receives customer complaints via email. The AI agent must read the message, categorize the complaint (e.g., billing, technical issue, product defect), suggest an appropriate action, and generate a reply. Objective: Design a reflection-capable agent that can: * Extract key details from input text * Classify the issue * Generate a response and revise it if flagged as inappropriate or incomplete Outcome: Students learn prompt refinement, classification tools, and reflective reasoning.	CO3
2	Smart Travel Planner Agent Scenario: A user provides a travel query like: “Plan a 3-day budget trip to Goa in October.” The AI agent breaks the task into subtasks: finding flights, booking hotels, and suggesting activities. Objective: Build a multi-agent system where each specialized agent contributes to an overall plan, coordinated by a supervising agent. Outcome: Students gain experience in agent collaboration, delegation, and real-time data/API integration.	CO4
3	Smart Travel Planner Agent Scenario: A user provides a travel query like: “Plan a 3-day budget trip to Goa in October.” The AI agent breaks the task into subtasks: finding flights, booking hotels, and suggesting activities. Objective: Build a multi-agent system where each specialized agent contributes to an overall plan, coordinated by a supervising agent.	CO4

	Outcome: Students gain experience in agent collaboration, delegation, and real-time data/API integration.	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Modern Generative AI with ChatGPT and OpenAI Models: Leverage the Capabilities of OpenAI's LLM for Productivity and Innovation with GPT3 and GPT4, by Valentina Alto, Packt Publishing Ltd, 2023.
2	Generative AI for Cloud Solutions: Architect modern AI LLMs in secure, scalable, and ethical cloud environments, by Paul Singh, Anurag Karuparti ,Packt Publishing Ltd, 2024.
Reference Books	
1	https://www.pwc.com/m1/en/publications/documents/2024/agentic-ai-the-new-frontier-in-genai-an-executive-playbook.pdf
2	A Practical Guide to Building AI Agents: From Concept to Deployment, Sanjay Kumar , Ph.D.

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

CO	**Course Outcomes**	**RBT Level**	**RBT Level Indicator**
CO1	Develop the ability to explore and analyze word embeddings, perform vector arithmetic to investigate word relationships, visualize embeddings using dimensionality reduction techniques	Apply	L3
CO2	Apply prompt engineering skills to real-world scenarios, such as information retrieval, text generation.	Apply	L3
CO3	Analyse pre-trained Hugging Face models for real-world applications, including sentiment analysis and text summarization.	Analyse	L4
CO4	Investigate different architectures used in large language models, such as transformers, and understand their advantages and limitations.	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			2					2			2		
CO2	3	2			2								2		
CO3		3	2		3								3	1	
CO4		2	3		3				2			1	3	1	

Weblinks and Video Lectures (e-Resources)	
1	https://www.w3schools.com/gen_ai/index.php
2	https://youtu.be/eTPiL3DF27U
3	https://youtu.be/seXp0VWWZV0
4	https://youtu.be/0SAKM7wiC-A
5	https://youtu.be/je6AlVeGOV0
6	https://youtu.be/0SAKM7wiC-A

ABILITY ENHANCEMENT COURSE (AEC)

AEC Course – Ability Enhancement Course

Teaching Hours/Week (L: T:P: S)	0:0:2:0
Total Hours of Pedagogy	24 hours Practical
Credits:	01
Programs / Experiments	12
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Practical (Internal Examiners only)

1 Credit Course – Practical

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.

IContinuous 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.

Semester End Evaluation (SEE):

SEE marks for the practical course are 50 Marks.

- SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University. 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 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.

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	6th				
Course Title	:	Data Visualization				
Course Code	:	BCA608				
Course Type (Theory/Practical/Project Integrated)	:	Practical				
Category	:	AEC				
Stream	:	CSE(AI)		**CIE**	:	50
Teaching hours/ week (L:T:P:S)	:	0:0:2:0		**SEE**	:	50
Total Hours	:	25 Hrs		**SEE Duration**	:	03 Hrs
Credits	:	01				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the principles and importance of PowerBI and Tableau
2	Familiarize with the PowerBI and Tableau interface and its components
3	Learn how to clean, transform, and model data using PowerBI and Tableau tools
4	Learn how to import data from various sources into PowerBI and Tableau
5	Understand the principles of dashboard design

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 analysing 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).

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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)

COURSE CURRICULUM

SL.No	List of Experiments	CO'S
1	Creating a View - Connecting to Database, Different types of Tableau Joins, formatting charts, adding filters, creating calculated fields and defining parameters.	CO1
2	Dashboard Design and Storytelling – Components of Dashboard, understanding how to place worksheets in Containers, Action filters and its types.	CO2
3	Creating Reports & Visualizations - Different types of charts, Formatting charts with Title, Colors, Filters in Power BI, Formatting dashboards.	CO1
4	Querying Data from CSV - Query Editor, Connecting the data from the Excel Source, Clean, Transform the data.	CO3
5	Analysis of revenue in sales dataset: i) Createachoroplethmap(fillthemap)tospotthespecialtrendstoshowthestatewhichhasthehighest revenue. ii) Create a line chart to show the revenue based on the month of the year. iii) Createabinofsize10fortheagemeasuretocreateanewdimensiontoshowtherevenue. iv) Createadonutchartviewtoshowthepercentageofrevenueperregionbycreatingzeroaccessinthe calculated field. v) Createabutterflychartbyreversingthebarcharttocomparefemale&malerevenuebasedonproduct category. vi) Createacalculatedfieldtoshowtheaveragerevenueperstate&displayprofitable&non-profitable state. vii) Build a dash board.	CO5
6	Analysis of GDP data set: i) Visualizethecountriesdatagiveninthedatasetwithrespecttolatitudeandlongitudealongwith country name using symbol maps. ii) CreateabargraphtocompareGDPofBelgiumbetween2006–2026. iii) Using pie chart, visualize the GDP of India, Nepal, Romania, South Asia,	CO5

	Singaporebytheyear2010. iv) Visualize the countries Bhutan & Cost a Ricacompe ting in term so GDP. iv) Create a scatter lotor circle view of GDP of Mexico, Algeria, Fiji, Estonia from 2004 to 2006. vi) Build an inter active as board.	
7	Design the Dashboard for Car Dataset Analysis using PowerBI (Use Car dataset) 1. Create a Clustered Column Chart for Car Price by Car Names 2. Create a Donut Chart for Horsepower 3. Create a Tree Map for High way mpg 4. Create a Stacked Bar Chart for Wheelbase by Car Name 5. Include slicer for various Car Names	CO4
8	Analysis of Amazon Prime Dataset: i) Create a Do nut chart to show the percentage of movie and tv shows ii) Create a are a chart to shows by release year and type iii) CreateahorizontalbarcharttoshowTop10genre iv) Create a map to display total shows by country v) Create a text sheet to show the description of any movie/movies. vi) Build anointer active Dash board.	CO5
9	vii) Design the Dashboard for Sales Analysis – Region and Segment-wise using Power BI (Use Global Superstore Sales dataset) viii) Create a clustered Column chart for Sum of Sales by Region and segment ix) Create a Clustered Column chart Sum of Profit and quantity by Region-wise x)Create a Donut chart for Sum of Discount by region-wise xi) Create a Treemap for Sum of Profit and sales by region-wise xii) Create an Area chart for Sum of sales by Region and segment-wise. xiii) Create a Piechart for Sum of sales by segment-wise. xiv) Add the slicer for the Region data.	CO4
10	xv) Design the Dashboard for TFL Bus Safety using Tableau(Use tfl-bus-incident Dataset) xvi) Create a Bar Chart on Boroughs Field to visualize the trend in the count. xvii) Create a line chart for date of incidents for each month in a 1 quarter, comment on possibilities and suitability of different charts for this timeline. xviii) In above question, apply formatting to display the first letter of the month on x-axis.	CO4

	xix) Create Tree Maps of all the data fields except date & year and comment on significance of tree map. xx) Create an interactive dashboard for the above data.	
11	xxi) Analysis of Customer Analysis dataset: xxii) Create a map (fill the map) to spot the special trends to show the state which has the highest revenue. xxiii) Create a line chart to show the revenue based on the month of the year. xxiv) Create a bin of size 10 for the age measure to create a new 3 dimension to show the revenue. xxv) Create a donut chart view to show the percentage of revenue per region by creating zero access in the calculated field. xxvi) Create a bar chart to compare female & male revenue based on product category. xxvii) Create a calculated field to show the average revenue per state & display profitable & non-profitable state. xxviii) Build a dashboard.	CO5
12	Analysis of HR Dataset: i) Create KPI to show employee count, attrition count, attrition rate, attrition count, active employees, and average age. ii) CreateaLollipopCharttoshowtheattritionratebasedongendercategory. iii) Createapiecharttoshowtheattritionpercentagebasedon DepartmentCategory-Dragdepartment into colour sand change automatic topie. Entireview, Dragattrition count toangle. Label attrition count, change to percent, add total also, edit label. iv) Create a barcha rttodis play thenum berof employees by Age group, v) Createahighlighttabletoshowthe JobSatisfactionRatingforeachjobrolebasedonemployeecount. vi) Createahorizontalbarcharttoshowtheattritioncountforeach EducationfieldEducationfieldwise attrition – drag education field to rows, sum attrition count to col, vii) CreatemultipledonutcharttoshowtheAttritionRatebyGenderfordifferentAgegroup.	CO5
	Open Ended Programs	
1	Implement an AR application that recognizes a printed marker and displays a 3D object using Unity	CO5

2	Create a navigable 3D environment (like a museum or park) using Unity and simulate movement via gaze or controllers.	
3	Create a desktop-based VR simulation in Unity where the user can walk inside a 3D room and interact with objects using keyboard and mouse inputs.	

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 principles of effective data visualization and the importance of visual storytelling in data analysis.	L1 , L2	U/R
CO2	Apply the concepts of Power BI's and Tableau to clean, transform, and model data	L3	Apply
CO3	Analyze between various data visualization techniques and choose the most appropriate one for a given dataset or business.	L4	Analyse
CO4	Evaluate the performance and efficiency of Power BI and Tableau dashboards and reports, identifying areas for optimization.	L3	Evaluate
CO5	Design and build customized, interactive dashboards that meet specific business needs also with AR application	L4	Create

Mapping of Course Outcomes to Program Outcomes:

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

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Data visualization with python: create an impact with meaningful data insights using interactive and engaging visuals, Mario Dobler, Tim Grobmann, Packt Publications, 2019
2	Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master, Ryan Sleeper, Oreilly Publications, 2018
Reference Books	
1	Jonathan Linowes, Unity Virtual Reality Projects", Packt Publishing, 2nd Edition, Unity 2020
2	Data Visualization with R: 111 Examples by Thomas Rahlf, Springer, 2020

Weblinks and Video Lectures (e-Resources)	
1	https://learn.unity.com/
2	https://docs.unity3d.com/Manual/AROverview.html
3	https://codelabs.developers.google.com/arcore-unity-ar-foundation
4	https://developers.google.com/ar/develop/unity
5	https://needle.tools/docs/intro