DAYANANDA SAGAR ACADEMY OF TECHNOLOGY & MANAGEMENT

CURRICULUM

Scheme and Syllabus III to IV Semester

Outcome Based Education

(Academic Year 2024-2025)

Department of Artificial Intelligence and Machine Learning

3rd & 4th Semester B.E

ABOUT THE INSTITUTE

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

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

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

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

VISION OF THE INSTITUTE

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

MISSION OF THE INSTITUTE

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

QUALITY POLICY

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

ABOUT THE DEPARTMENT

VISION OF THE DEPARTMENT

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

MISSION OF THE DEPARTMENT

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

M2: To collaborate with research institutions to elevate innovative research.

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

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

M5: To inculcate knowledge in lifelong learning.

PROGRAM EDUCATION OBJECTIVES (PEO'S):

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

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

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

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

PEO5: Engaged in successful professional practices in their chosen discipline

PROGRAM OUTCOMES (PO's)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO 1: Mathematical Informatics Section: To clarify the process of intelligent activities based on rational reasoning by human beings and to create new methods of problem-solving by implementation with computers.

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

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

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**

PROPOSED UG SCHEME

Sl. No	Course Category	BOS	TD	Teaching Hours/Week					Credits
				Lecture	Tutorial	Practical	Project	Total (Hrs/week)	
				L	T	P	S		
1	BSC	MAT	MAT	3	0	0	0	3	3
2	IPCC-1	AIML	AIML	3	0	2	0	5	4
3	IPCC-2	AIML	AIML	3	0	2	0	5	4
4	PCC-1	AIML	AIML	3	0	0	0	3	3
5	PCC-2	AIML	AIML	3	0	0	0	3	3
6	PBL	AIML	AIML	0	0	2	2	4	2
7	AEC	AIML	AIML	0	0	2	0	2	1
8	SCR	AIML	AIML	0	0	2	0	2	1
9	NCMC	NSS / YOGA / PED							
10	AICTE Activity Points								
								Total	**21**

Percentage of Mapping– Theory & Practical - Scheme & Syllabus- 3rd & 4th Sem

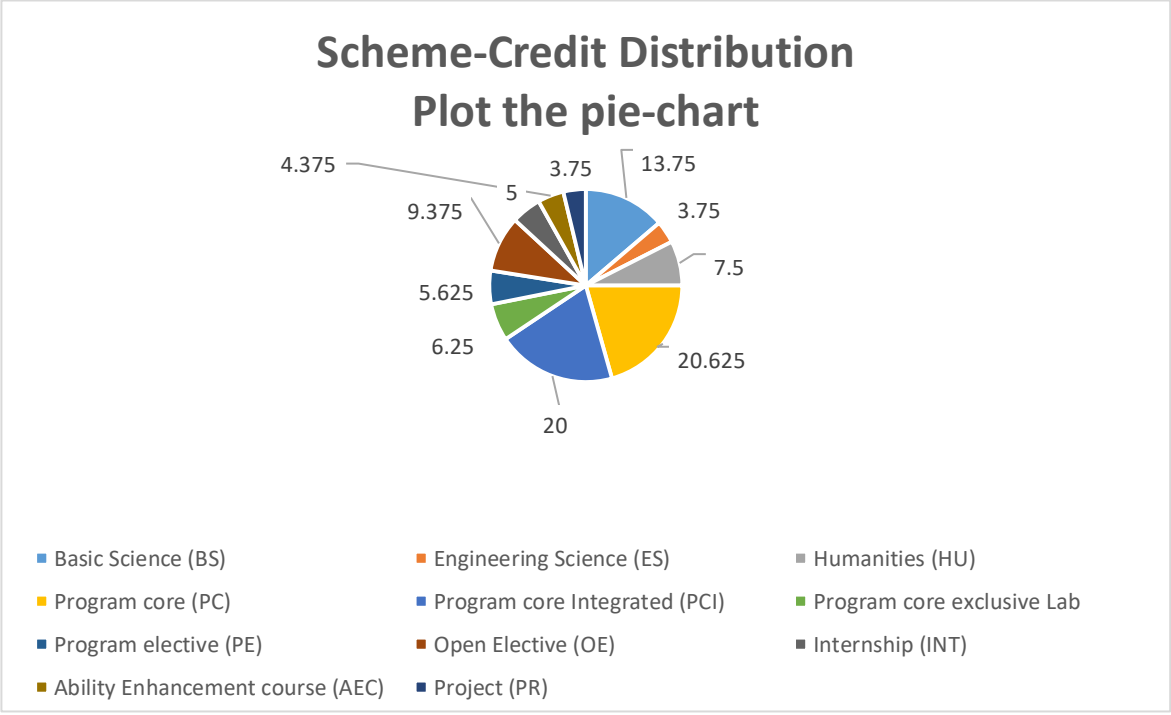
3rd Sem & 4th Sem

Sl. No	Course Category	Component			
		Theory	Practical	Outreach	YOGA/SPORTS
1	BSC	100%	--	--	--
2	IPCC-1	60%	40%	--	--
3	IPCC-2	60%	40%	--	--
4	PCC-1	100%	--	--	--
5	PCC-2	100%	--	--	--
6	PBL	--	100%	--	--
7	AEC	--	100%	--	--
8	SCR	--	--	100%	--
9	NCMC	--	--	--	100%
Total Percentage		**53%**	**47%**	**13%**	**13%**

Scheme Distribution

Department of Artificial Intelligence and Machine Learning Engineering

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



SEMESTER WISE CREDIT BREAKDOWN FOR B.E. DEGREE CURRICULUM

BATCH 2023-2027

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

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 – 2024
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from 2024-25)

3rd SEMESTER: Artificial Intelligence and Machine Learning (AIML)

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture L	Tutorial T	Practical P	Project S	Total		SEE Duration(Hrs)	CIE Marks	SEE Marks	Total Marks
1	BMATE301	Linear algebra, discrete mathematics and optimization techniques	BSC	MAT	MAT	3	-	-	-	3	3	3	50	50	100
2	BAI302	Data Structures and its applications	IPCC	AIML	AIML	3	-	2	-	5	4	3	50	50	100
3	BAI303	Python Programming	IPCC	AIML	AIML	3	-	2	-	5	4	3	50	50	100
4	BAI304	Operating System	PCC	AIML	AIML	3	-	-	-	3	3	3	50	50	100
5	BAI305	Digital Logic and Computer Organization	PCC	AIML	AIML	3	-	-	-	3	3	3	50	50	100
6	BAI306	Applications of JAVA Programming	PBL	AIML	AIML	-	2	-	2	4	2	3	50	50	100
7	BAI307	Project Management with Git	AEC	AIML	AIML	-	-	2	-	2	1	3	50	50	100
8	BSCK308	Social Connect and Responsibility	SCR	AIML	AIML	-	-	2	-	2	1	-	100	-	100
9	B**K309	NSS/PE/Yoga	HSMC	AIML	AIML	-	-	2	-	2	0	-	100	-	100
					Total	**15**	**2**	**10**	**2**	**29**	**21**	**21**	**550**	**350**	**900**

4th SEMESTER: Artificial Intelligence and Machine Learning (AIML)

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture L	Tutorial T	Practical P	Project S	Total		SEE Duration(Hrs)	CIE Marks	SEE Marks	Total Marks
1	BMATA401	Statistics and Probability	BSC	MAT	MAT	3	-	-	-	3	3	3	50	50	100
2	BAI402	Design and Analysis of Algorithms	IPCC	AIML	AIML	3	-	2	-	5	4	3	50	50	100
3	BAI403	Database Management System	IPCC	AIML	AIML	3	-	2	-	5	4	3	50	50	100
4	BAI404	Introduction to Artificial Intelligence	PCC	AIML	AIML	3	-	-	-	3	3	3	50	50	100
5	BAI405	Web Programming	PCC	AIML	AIML	3	-	-	-	3	3	3	50	50	100
6	BAI406	Engineering AI Solutions: Integrating Prompts and Language Models	PBL	AIML	AIML	-	2	-	2	4	2	3	50	50	100
7	BAI407	Mongo DB	AEC	AIML	AIML	-	-	2	-	2	1	3	50	50	100
8	BUHV408	Universal Human Values	UHV	AIML	AIML	-	-	2	-	2	1	1	50	50	100
9	B**K409	NSS/PE/Yoga	HSMC	AIML	AIML	-	-	2	-	2	0	-	100	-	100
					Total	**15**	**2**	**10**	**2**	**29**	**21**	**22**	**500**	**400**	**900**

IPCC: Integrated Professional Core Course,

PCC: Professional Core Course

PBL: Project Based Learning

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 practical's of the same course. Credit for IPCC can be 04 and its Teaching Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

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

Newly introduced subjects in the syllabus

		3rd Semester	4th Semester
1.	**List of Existing Elective Courses**	Project Management with Git Data Analytics with Excel Ethics and Public Policy for AI PHP Programming	Scala MongoDB MERN Julia
2.	**List of New Existing Elective Courses**	-	-
3.	**List of New Industry Aligned Courses**	Applications of JAVA Programming	Engineering AI Solutions: Integrating Prompts and Language Models

Percentage of Change in the Syllabus

3rd Semester						
Sl.No	**Course Code**	**Course Name**	**Topics Added**	**Topics removed**	**Revised in %**	**Justification**
1	BMATE301	Linear algebra, discrete mathematics and optimization techniques	--	--	--	--
2	BAI302	Data Structures and applications	Recursion , GCD , Fibonacci Series , Tress-AVL and Red Black Tree	Strings	10	Trees are used in representing content in NLP
3	BAI303	Python Programming	Numpy and Pandas	Classes and Objects	100	Strongly recommended to include as it becomes basic building block for machine learning in coming years.
4	BAI304	Operating System	Mobile Operating Systems	Secondary storage structure and protection , Disk Management	20	As its necessary for them to explore real time use of concepts
5	BAI305	Digital Logic and Computer Organization	Introduction to VHDL , Flip Flop , Latches	Input / Output Organization	45	To have an idea onhow Logic Design simulators can be used to verify the concept before actual implementation
6	BAI306	Applications of JAVA programming	Entire Syllabus is new	-	100	In line with industry requirements
7	BAI307	Project Management with Git	Basics of Git repositories ,collaboration and project management with Git	-	20	Theoretical concepts to be taught to implement projects
8	BSCK308	Social Connect and Responsibility	-	-	-	-

4th Semester						
Sl.No	**Course Code**	**Course Name**	**Topics Added**	**Topics removed**	**Revised in %**	**Justification**
1	BMATA401	Statistics and Probability	-	-	-	-
2	BAI402	Design and Analysis of Algorithm	Branch and Bound , Assignment Problems , Vertex cover , Set Cover , TSP using Approximation Algorithm	String Matching , Insertion Sort	10	As its necessary to learn how NP Hard Problems can be solved .
3	BAI403	Database Management System	Concurrency Control DB All Programs are modified	Mongo DB , Programs	20	In line with industry
4	BAI404	Introduction to Artificial Intelligence	Contemporary Issues	Expert System	10	Industry Exposure
5	BAI405	Web Programming	Entire Syllabus is new	-	100	To meet the industry demands in terms of UI development for any projects .
6	BAI406	Engineering AI Solutions: Integrating Prompts and Language Models	Entire Syllabus is new	-	100	In line with industry
7	BAI407	Mongo DB	NoSql theory	-	20	As its pre-requisites for Mongo DB
8	BUHV408	Universal Human Values	-	-	-	-

3rd SEMESTER

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

Semester	:	**3rd**				
Course Title	:	**Linear Algebra, Discrete Mathematics & Optimization Techniques**				
Course Code	:	**BMATE301**				
Course Type (Theory/Practical/Integrated)	:	**Theory**				
Course Category	:	**ASC**				
Stream	:	**AIML**		**CIE**	:	**50 Marks**
Teaching hour/week(L:T:P:S)	:	**2:2:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs**		**SEE Duration**	:	**3 Hours**
Credits:	:	**3**				

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Acquire basic knowledge of mathematical concepts for understanding engineering problems
2	Use concepts of linear algebra, Markov chain, relations, functions and optimization techniques in solving problems
3	Analyze problems using concepts of linear algebra, Markov chain, relations, functions and optimization techniques
4	Use MATLAB to obtain solutions of various mathematical problems.

Teaching-Learning Process

Pedagogy (General Instructions):

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

1. Lecture method (L) does not mean only the traditional lecture method, but a different type ofteaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in theprinciple.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes criticalthinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, developthinking skills such as the ability to evaluate, generalize, and analyze information rather thansimply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come upwith their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helpsimprove the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for BE Programme -2023-24
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2023-24)

COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Linear Algebra** Elementary transformations on a matrix, echelon form & rank of a matrix, consistency of system of linear equations, Gauss elimination, Gauss – Seidel method. eigen values and eigen vectors of a matrix, Rayleigh power method to determine the dominant eigen value of a matrix, diagonalization of matrices.	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
2	**Fundamentals of logic** Basic connectives and truth tables, logical equivalence-laws of logic, predicates, quantifiers,logical equivalence involving quantifiers, logical implication-rules of inference, proofs of theorems.	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
3	**Relations and functions** Cartesian products and relations, properties, computer recognitions-zero-one matrices, partial orders, equivalence relations, partitions, Hasse diagrams. Functions:one-one and onto functions,composition of functions and invertible functions.	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
4	**Introduction to Optimization Techniques** Gradients of vector valued functions, gradients of matrices, linearization and multivariate Taylor series, backpropagation and automatic differentiation, gradients in a deep network, gradient of quadratic cost, descending the gradient of cost, gradient of mean squared error.	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
5	**Advanced Optimization Techniques** Local and global optima, application of Hessian matrix in optimization, optimization using gradient descent, sequential search 3-point search and Fibonacci search, NR method, mini batch gradient descent, stochastic gradient descent.	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	

List of Experiments or Programs

Sl.No	Experiments/Programs	COs
	NIL	

Text Books
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1	Theoryandproblemsoflinearalgebra, SeymourLipschutz,MarcLipso, Schaum'soutlineseries, McGraw-HillEducation, 6thedition,2017.
2	Discrete Mathematics and its Applications, Kenneth H Rosen, McGraw Hill publications, 7th edition.
3	Convex Optimization: Algorithms and Complexity, S. Bubeck ,Foundations and Trends in Optimization, 2015

Reference Books	
Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Discrete and Combinatorial Mathematics, Ralph P. Grimaldi, Pearson Education, 5th Edition, 2004.
2	LinearAlgebra:AnIntroduction,RichardBronson&GabrielB.Costa, Academic Press, 2ndedition, 2014.
3	Distributed optimization and statistical learning via the alternating direction method of multipliers, S. Boyd, N. Parikh, and E. Chu , Foundations and Trends in Machine Learning, Now Publishers Inc

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

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Understand the basic concepts of linear algebra, Markov chain, relations, functions and optimization techniques	**Remember, Understand**	**L1, L2**
CO2	Apply techniques of linear algebra, Markov chain, relations, functions and optimization techniquesto solve Engineering Problems	**Apply**	**L3**
CO3	Analyze Engineering problems using linear algebra, Markov chain, relations, functions and optimization techniques	**Analyse**	**L4**
CO4	Develop mathematical solutions to various real time problems using MATLAB	**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
CO1													--	--
CO2	3												--	--
CO3		2											--	--
CO4			2		2				1	1			--	--

Weblinks and Video Lectures (e-Resources)	
3	https://youtu.be/9MCjyQSRmR8?si=qCydIg3dBT6kl-By
4	https://youtu.be/Lj9Awpd5ltc?si=4OFQYkUKdAhezhBX
5	https://youtu.be/0tqAEn7O0hY?si=K7OhG40mskphsaja – Fibonacci Search Method
6	https://youtu.be/tUoUdOdTkRw?si=eH9RqKFa3dW3IGXu - Backpropagation
7	https://youtu.be/U0NIon3C3jM?si=5x_msO-kNpcsZuZc-Gradient of vector valued functions & Matrices
8	https://youtu.be/0e0z28wAWfg?si=VjLE392RoFvhHE8d – Neural Networks
9	https://youtu.be/ZGSUrfJcXmA?si=UsH4joHH8h3VA5Zs – Automatic Differentiation

Assessment Pattern (both CIE and SEE)

Applied Science Courses								
3 credits - Theory								
Assessment Method	**Component**	**Type of Assessments**	**Syllabus Coverage**	**Maximum Marks**	**Average**	**Reduced Marks**	**Minimum Passing Marks**	**Evaluation Details**
Total CIE Theory + Practical				**50**			**20**	
CIE	**Theory**	Internal Assessment Test (IAT) -I	Module – 1, 2& 3(half module)	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25 Marks
		Internal Assessment Test (IAT) -II	Module- 3(half module), 4& 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives	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		50				
	Total CIE Theory					**50**	20	Scale down Marks of IAT and CCA to 50

SEE		Theory exam	Entire theory syllabus including questions from labcomponent	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.				

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 of the IPCC shall be for CIE only. However, in SEE the questions from the Laboratory Component shall be included in the respective Modules only.

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).
Astudent 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.

Possible continuous and comprehensive assessment:

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, storytelling. The assessment of these techniques can be either based on Quiz or rubrics.
The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Continuous Internal Evaluation (CIE):

The CIE Marks for the theory component of the IC shall be **25 Marks** and for the laboratory component **25 Marks**.

CIE for the theory component of the IC
Internal Assessment test:

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

Two Tests each of **50 Marks** scaled down to **25 Marks**

- First test after 7th week of the semester (syllabus completion of 50%)
- Second test after 14th week of semester (syllabus completion of 100%)

The average score of two tests is taken and scaled down to **25 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 25 **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 25 **Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **50 Marks**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day. The **10 Marks** are for conducting the experiment and preparation of the laboratory record, the other **10 Marks shall be for the test** conducted at the end of the semester and **5 Marks** for conducting Open Ended Experiments.
- The CIE Marks awarded in the case of the practical component shall be based on the continuous evaluation of the laboratory report and the conduction. Each experiment report can be evaluated for 05 Marks conduction(Observation Book) and 5 Marks for Record Book. Marks of all experiments' write-ups and conduction are added and scaled to **10 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 **10 Marks.**
- Open Ended Experiments are conducted after the completion of regular Experiments/Programs for 20 Marks and scaled down to **5 Marks**
- Scaled-down Marks of write-up, evaluations and tests, will be added as CIE Marks for the laboratory component of IC/IPCC for **25 Marks**.
- The minimum Marks to be secured in CIE to appear for SEE shall be 10 (40% of maximum Marks) in the theory component and 10 (40% of maximum Marks) in the practical component.
- The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 05 questions is to be set from the practical component of IC/IPCC, the total Marks of all questions should not be more than 25 Marks.

The theory component of the IC shall be for both CIE and SEE.

Semester End Examination (SEE):

- Theory SEE will be conducted as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**
- 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.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 Marks. The student has to answer 5 full questions, selecting one full question from each module summing up to maximum score of 100 Marks. Marks **scored out of 100 shall proportionally be reduced to 50 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 two questions should be of same course outcome, program outcome and Blooms RBT level. Emphasis to be given for higher order RBT levels

CIE- Continuous Internal Evaluation (50 Marks)

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

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module-3	Module-3	Module-4	Module-5		
CO1	5	5	5		5	5	25	25%
CO2	10	10	5	5	10	10	50	50%
CO3	5	5		5	5	5	25	25%
CO4								
CO5								
CO6								
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	--
Understand	5
Apply	35
Analyse	10
Evaluate	--
Create	--

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	5	--	--	--	--	5	10%
CO2	5	5	10	5	10	35	70%
CO3	--	5	--	5	--	10	20%
CO4	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--
CO6	--	--	--	--	--	--	--
Total	10	10	10	10	10	50	100%

Course Contents and Lecture Schedule

Module No.	Topics	No. of Lectures
1	Linear Algebra-I: Introduction, Elementary transformations on a matrix	1
1	Echelon form of a Matrix, Rank of a matrix	1
1	Consistency of system of linear equations	1
1	Gauss elimination	1
1	Gauss – Seidel method to solve system of linear equations	1
1	Eigen values and eigen vectors of a matrix	1
1	Rayleigh power method to determine the dominant eigen value of a matrix	1
1	Diagonalization of matrices	1
2	Basic connectives and truth tables	1
2	logical equivalence-laws of logic	1
2	predicates, quantifiers	1
2	logical equivalence involving quantifiers	1
2	logical implication-rules of inference	1
2	logical implication-rules of inference	1
2	proofs of theorems	1
2	proofs of theorems continued	1
3	Relations and functions: Introduction	1
3	Cartesian products and relations	1
3	Computer Recognitions-Zero-One Matrices	1
3	Partial Orders	1
3	Equivalence relations and Partitions	1
3	Hasse Diagrams	1
3	Functions:one-one and onto Functions	1
3	Composition of functions and Invertible functions	1

4	Gradients of vector valued functions	**1**
4	Gradients of matrices	**1**
4	Linearization and multivariate Taylor series	**1**
4	Continuation of above topic, Backpropagation	**1**
4	Continuation of above topic	**1**
4	Automatic differentiation	**1**
4	Gradients in a deep network, Gradient of Quadratic Cost	**1**
4	Descending the Gradient of Cost, Gradient of Mean Squared Error.	**1**
5	Local and global optima	**1**
5	Application of Hessian matrix in optimization	**1**
5	Continuation of above topic	**1**
5	Optimization using gradient descent,	**1**
5	Sequential search 3-point search	**1**
5	Fibonacci search	**1**
5	NR method	**1**
5	Mini batch gradient descent, Stochastic gradient descent.	**1**
	Total	**40 Hrs**

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

IPCC Course–Integrated Professional Core Course

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

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

Integrated Professional Core Course (IPCC) - 4 Credit Course

Assessment Details (both CIE and SEE)

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

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

Internal Assessment Test (IAT):

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

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

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

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

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

Semester End Examination (SEE) for IPCC Theory

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

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

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

Continuous and Comprehensive Assessment (CCA):

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

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

Total score for CCA is **10 Marks**

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

Possible Continuous and Comprehensive Assessment (CCA):

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

4 Credits Courses – Integrated Professional Core Course (IPCC)

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

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

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

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

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**3**				
Course Title	:	**Data Structures and its Applications**				
Course Code	:	**BAI302**				
Course Type (Theory/Practical/Integrated/Project)	:	**Integrated**				
Category	:	**IPCC**				
Stream	:	**AIML**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**3:0:2:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 T + 20 P Hrs**		**SEE Duration**	:	**3 hours**
Credits	:	**04**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the fundamentals of data structures and their applications essential for implementing solutions to problems.
2	Design and develop solutions to problems using Arrays, Stack, Queues and linked list.
3	Explore Usage of Trees and Graph for application development.
4	Apply the Hashing Techniques in mapping key value pairs.
5	Create the problem specific domain for practical experiments.

Teaching-Learning Process

Pedagogical Initiatives:

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

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

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

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	INTRODUCTION TO DATA STRUCTURES: Data Structures, Classifications (Primitive & Non-Primitive), Data structure Operations Review of pointers and dynamic Memory Allocation, **ARRAYS and STRUCTURES**: Arrays, Dynamic Allocated Arrays, Structures and Unions. **Array Operations:** Traversing, inserting, deleting, searching, and sorting. Multidimensional Arrays, Polynomials Chapter-1:1.2,1.2,1.3 Chapter-2 : 2.1- 2.4	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
2	**STACKS**: Stacks, Stacks Using Dynamic Arrays, Evaluation and conversion of Expressions **Recursion** - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi Chapter-3: 3.1-3.3	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Problem Solving**	
3	**QUEUES**: Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Priority Queues, Multiple Stacks and Queues. Programming Examples Chapter-3:3.4	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Problem Solving**	
4	**LINKED LISTS:** Definition, Representation of linked lists in Memory, Singly Linked List **Linked list operations:** Traversing, Searching, Insertion, and Deletion Doubly Linked list, Linked Stacks and Queues, Additional List Operations.	8

	Chapter-4 :4.1-4.4 ,4.8	
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
5	**TREES**: Introduction, Binary Trees, Binary Tree Traversals, Binary Search trees. Application of Trees-Evaluation of Expression. Trees 2: AVL tree, Red-black tree. **Graphs:** Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Traversal methods: Breadth First Search and Depth First Search. **Hashing:** Hash Table organizations, Hashing Functions, Static and Dynamic Hashing Chapter-5 : 5.1-5.8 Chapter-6 :6.1,6.2 Chapter 9: 9.1 – 9.3	**8**
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

List of Programs:

Sl. No.	Experiments/Programs	Cos
1	Design, Develop and Implement a menu driven Program in C for the following array operations. a. Creating an array of N Integer Elements b. Display of array Elements with Suitable Headings c. Inserting an Element (ELEM) at a given valid Position (POS) d. Deleting an Element at a given valid Position(POS) e. Exit.	CO1
2	Develop a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations	CO2
3	Develop a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the	CO2

	operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands.	
4	Develop a Program in C for the following Stack Applications a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^	**CO2**
5	Develop a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations	**CO3**
6	Develop a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue. f. Exi	**CO3**
7	Develop a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers . a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 b. Traverse the BST in Inorder, Preorder and Post Order c. Search the BST for a given element (KEY) and report the appropriate message d. Exi	**CO4**
8	Develop a Program in C for the following operations on Graph(G) of Cities a. Create a Graph of N cities using Adjacency Matrix. b. Print all the nodes reachable from a given starting node in a digraph using DFS/BFS method	**CO4**
Open ended Programs		
1	Develop a Program in Java for converting a prefix expression into postfix expression	**CO4**
2	Solving Tower of Hanoi problem with n disks	**CO4**

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Ellis Horowitz, SartajSahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014
Reference Books	
1	Seymour Lipschutz, Data Structures Schaum'sOutlines, Revised 1 st Ed, McGraw Hill, 2014.
2	A M Tenenbaum, Data Structures using C, PHI, 1989

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Understand** the concepts of Data Structures and its Application.	Understand	L1/L2
CO2	**Apply** Concepts of basic Data Structures like Stacks & Queues for solving Problem.	Apply	L3
CO3	**Analyze** various operations on linear and non-linear data structures.	Analyze	L4
CO4	**Design** the concepts of Advanced Data Structures like Trees, Graphs and Hashing techniques to perform various operations.	Investigate	L5
CO5	**Create or Investigate** the experiments to implement operations like searching, insertion,deletion, traversal mechanisms on various data structures.	Evaluate	L6

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://nptel.ac.in/courses/106/105/106105171/
2	https://ds2-iiith.vlabs.ac.in/exp/selection-sort/index.html

3	https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/depth-first-traversal/dft-practice.html
4	https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html
5	https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html

CIE- Continuous Internal Evaluation (50 Marks)

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

CIE Course Assessment Plan

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

SEE- Semester End Examination (50 Marks)

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

SEE Course Plan

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**3**				
Course Title	**:**	**Python Programming**				
Course Code	**:**	**BAI303**				
Course Type (Theory/Practical/Integrated/Project)	**:**	**Integrated**				
Category	**:**	**IPCC**				
Stream	**:**	**AIML**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:2:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40 T+20 P**		**SEE Duration**	**:**	**3 hours**
Credits	**:**	**4**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Develop a strong foundation in Python programming, covering basic concepts like data types, variables, input/output operations, flow control, and functions.
2	Use Python data structures (lists, dictionaries, strings, and tuples) to store and manipulate data.
3	Perform file operations in Python, including reading, writing, and managing files, while handling errors and debugging.
4	Use NumPy and Pandas for numerical computations and data analysis, handling and analyzing large datasets.
5	Create and customize data visualizations with Matplotlib to interpret and present data insights.

Teaching-Learning Process

Pedagogical Initiatives:

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

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.

- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Module-1 – Python Basics, Flow Control & Functions** Python Basics: The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Flow control: Boolean Values, Comparison Operators, Boolean Operators,Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules,Ending a Program Early with sys.exit(), Functions: def Statements with Parameters, Return Values and return Statements,The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number Practice Program: Create a basic calculator that can perform addition, subtraction, multiplication, and division. Extend it to handle more complex operations like square roots, exponents, and trigonometric functions. Textbook 1: Chapters 1 – 3	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
2	**Module-2- Lists, Dictionaries & Structuring Data** Lists: The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples, References,	8

	Dictionaries and Structuring Data: The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things, Textbook 1: Chapters 4 – 5	
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
3	**Module-3 – Manipulating String, Reading & Writing Files** Manipulating Strings: Working with Strings, Useful String Methods, Project: Password Locker, Project: Adding Bullets to Wiki Markup Reading and Writing Files: Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module,Saving Variables with the print.format() Function, Project: Generating Random Quiz Files, Project: Multiclipboard Textbook 1: Chapters 6 , 8	**8**
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
4	**Module-4- Debugging & Exception Handling** Organizing Files: The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module, Project: Renaming Files with American-Style Dates to European-Style Dates,Project: Backing Up a Folder into a ZIP File, Debugging: Raising Exceptions, Getting the Traceback as a String, Assertions, Logging, IDLE‟s Debugger. Textbook 1: Chapters 9-10	**8**
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
5	**Module-5 – NumPy, Pandas and Matplotlib** **NumPy (3 hours):** Introduction to NumPy, Creation and manipulation of arrays, multidimensional arrays in handling large datasets efficiently, Array operations, including reshaping, flattening, and appending data, both vertically and horizontally. Besides, indexing and slicing to access data subsets & statistical functions like min, max, mean, median, and standard deviation, illustrating their utility in data analysis. **Pandas (3 hours):** Basics of DataFrames and Series, detailing their creation and manipulation. Load data from CSV files, DataFrame operations, including computing basic statistics such as shape, number of columns, and	**8**

	mean values **Matplotlib (2 hours):** Role in data visualization. Creating plots, such as line plots, scatter plots, and bar plots. Visualizing data to uncover patterns and insights. Customization of plots by adding titles, labels, and legends. **Seaborn:** Introduction, comparison with matplotlib, getting built-in datasets in seaborn, Advanced plotting techniques, such as histograms, distribution plots, box plots, heatmaps, pair plot, customizing seaborn plts and saving visualizations. Textbook 2: Chapter 4, 5 & 9	
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

List of Programs:

Sl. No.	Experiments/Programs	COs
1	a. Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages. b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.	CO1
2	a. Develop a program to generate Fibonacci sequence of length (N). Read N from the console. b. Write a function to calculate factorial of a number. Develop a program to compute binomial coefficient (Given N and R).	CO1
3	a. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages. b. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.	CO2
4	a. Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display dictionary slice of first 10 items]	CO2

	b. Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(), readlines(), and write()].	
5	Develop a program to back Up a given Folder (Folder in a current working directory) into a ZIP File by using relevant modules and suitable methods.	**CO2**
6	a. Develop a program to generate a NumPy array of random integers. Perform basic array operations such as finding the mean, median, variance, and standard deviation. Visualize the array values using a histogram plot. b. Develop a program to read a CSV file containing daily temperature data with columns like 'Date' and 'Temperature'. Perform exploratory data analysis to compute the average temperature for each month. Visualize the average monthly temperatures using a line chart.	**CO3**
7	Develop a program to read a CSV file containing sales data with columns like 'Date', 'Product', 'Quantity', and 'Sales'. Perform exploratory data analysis to compute total sales, total quantity sold, and average sales per product.Create various visualizations to uncover the insights using matplotlib	**CO3**
8	Develop a program to read a built-in dataset from seaborn and perform exploratory data analysis by creating various visualizations to cover the insights.	**CO3**
	Open ended Programs	
1	Develop a hangman game where users try to guess a hidden word by suggesting letters within a certain number of attempts.	**CO4**
2	Create a personal diary application where users can write, save, and view diary entries. Add features like searching entries by date or keyword and exporting entries to a file.	**CO5**
3	Perform exploratory data analysis by creating statistical plots using Seaborn (Distribution plots, box plot, violin plots) for a sample dataset. Also create plots for categorical data (bar plot, count plot, point plot)	**CO5**
4	Build a program to visualize election results and voting patterns.	**CO4**

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Text Books 1. Al Sweigart,"Automate the Boring Stuff with Python",1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/) (Chapters 1 to 18, except 12) for lambda functions use this link: https://www.learnbyexample.org/python-lambda-function/
2	Text Books 2. Python for Data Analysis" by Wes McKinney. https://wesmckinney.com/book/

Reference Books, Video Lectures (e-Resources)	
1	https://www.learnbyexample.org/python/
2	https://www.learnpython.org/
3	https://pythontutor.com/visualize.html#mode=edit

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 remember the fundamental concepts of Python programming, including data types, variables, input/output operations, flow control, and functions.	Understand	L1/L2
CO2	Apply Python data structures such as lists, dictionaries, strings, and tuples to efficiently store and manipulate data for practical tasks and	Apply	L3
CO3	Analyze and manage data files using Python by performing file operations, including reading, writing, and organizing files, and incorporating robust error handling and debugging practices.	Analyse	L4
CO4	Evaluate and utilize advanced Python libraries, specifically NumPy for numerical computations and array manipulations, and Pandas for comprehensive data analysis	Design	L5
CO5	Investigate, Create, interpret, and present data insights through customized data visualizations using Matplotlib, effectively integrating these visualizations into data analysis workflows.	Create/Investigate	L6

Mapping of Course Outcomes to Program Outcomes:

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

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

SEE- Semester End Examination (50 Marks)

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

SEE Course Plan

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

PROFESSIONAL CORE COURSE (PCC)

PCC Course - Professional Core Course

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

3 Credit Course – Professional Core Course (PCC)

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

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

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

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

Semester-End Examination:

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

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

Continuous and Comprehensive Assessment (CCA):

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

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

Total score for CCA is **10 Marks**

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

Possible Continuous and Comprehensive Assessment (CCA):

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

Professional Core Course (PCC) – 3 Credit course – Theory

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

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**Third**				
Course Title	:	**Operating System**				
Course Code	:	**BAI304**				
Course Type (Theory/Practical/Integrated/Project)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40Hrs**		**SEE Duration**	:	**3Hrs**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To Demonstrate the need for OS and different types of OS
2	To discuss suitable techniques for management of different resources.
3	To demonstrate different APIs/Commands related to processor, memory, storage and file system 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)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

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COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction to operating systems** System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Operating System Services: User - Operating System interface; System calls: Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines. **Textbook 1: Chapter – 1 (1.1-1.5), 2 (2.2-2.8)** **Practical Based learning -**implement the Process system calls (fork(), exec(), wait(), create process, terminate process)	8
Pedagogy	ICT Based Learning	
2	**Process Management:** Process concept; Process scheduling; Operations on processes; Inter process communication Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Thread scheduling; Multiple-processor scheduling **Textbook 1: Chapter – 3 (3.1-3.4), 4 (4.1-4.4), 5 (5.1 -5.5)** **Practical Based learning -**Simulate the CPU scheduling algorithms to find turn around time and waiting time a)FCFS b)SJF c)Round Robin d)Priority.	8
Pedagogy	ICT Based Learning	
3	**Process Synchronization**: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. **Textbook 1: Chapter – 6 (6.1-6.6), 7 (7.1 -7.7)** **Practical Based learning** - demonstrate inter process communication between a reader process and a writer process .Use mkfifo, open, read, write and close APIs in	8

	the program.	
Pedagogy	ICT Based Learning	
4	**Memory Management**: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. **Textbook 1: Chapter -8 (8.1-8.6), 9 (9.1-9.6)** **Practical Based learning** - Develop a C program to simulate page replacement algorithms: a) FIFO b) LRU	**8**
Pedagogy	ICT Based Learning	
5	**File System, Implementation of File System**: File concept; Access methods; Directory and Disk structure; File system mounting; File sharing; Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management **Mobile Operating Systems**: Introduction, Objectives, Basic Functions of an Operating System Peripheral Device Management, Data File Management, Memory Management, Process Management,Mobile Operating Systems, Architecture of Android, Knowing the Operating System of a Mobile Phone, Discontinued Mobile Operating Systems, Existing Mobile Operating Systems,Types of Mobile Operating Systems. **Textbook 1: Chapter –10(10.1.-10.4) 11(11.1 – 11.5) 12 (12.1-12.5), TextBook 2: Chapter 4.1 to 4.8** **Practical Based learning** - Simulate following File Organization Techniques a) a) Single level directory b) Two level directory a)	**8**
Pedagogy	ICT Based Learning	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinkingand enables creative problemsolving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications	

	• **Demonstration:** exhibits the implementation process

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Operating System Principles Abraham Silberschatz, Peter Baer Galvin,Greg Gagne, 8th edition,Wiley-India,2015
2	Mobile Phone Operating Systems: Symbian OS, Android, Mobile Operating System, Webos, S60, Cyanogenmod, Symbian Platform, Blackberry OS by Books LLC, Publisher: General Books LLC, 2010, ISBN:1157464408, 9781157464402
Reference Books	
1	AnnMcHoesIdaMFylnn,UnderstandingOperatingSystem,CengageLearning,6thEdition
2	D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rdEd, McGraw-Hill, 2013.
3	P.C.P.Bhatt,An Introduction to Operating Systems: Concepts and Practice 4th Edition,PHI(EEE),2014.
4	William Stallings Operating Systems:Internals and Design Principles,6thEdition,Pearson

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 structure and functionality of operating system	**Remember/ Understand**	**L1/L2**
CO2	Apply appropriate techniques to manage the resources for the given problem.	**Apply**	**L3**
CO3	Analyze the case studies and provide solutions with appropriate techniques	**Analyze**	**L4**
CO4	Design the various techniques for managing files, process and memory	**Design**	**L5**
CO5	Create/Investigate the file management strategies and present the insights through types and applications of mobile operating systems	**Create/ Investigate**	**L6**

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://infyspringboard.onwingspan.com/web/en/app/search/learning?lang=en&q=operating%20systems
2	https://skillsforall.com/course/operating-systems-basics?courseLang=en-US
3	https://www.coursera.org/learn/os-power-user

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	10	5	-	-
Understand	10	5	-	-
Apply	15	20	-	-
Analyze	15	20	20	10
Evaluate	-	-	15	20
Create	-	-	15	20

CIE Course Assessment Plan

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

SEE- Semester End Examination (50 Marks)

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

SEE Course Plan

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

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Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**Third**				
Course Title	:	**Digital Logic and Computer Organization**				
Course Code	:	**BAI305**				
Course Type (Theory/Practical/Integrated/Project)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40 Hrs.**		**SEE Duration**	:	**3 Hrs.**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Explain The fundamentals of machine instructions, addressing modes and Processor performance
2	Apply the knowledge of functionalities of binary logic system and demonstrate the same using Verilog HDL simulation.
3	Analyze internal Organization of Memory and Impact of cache/Pipelining on Processor Performance.
4	Design the approaches involved in achieving communication between processor and I/O devices.

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 -2024-25

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COURSE CURRICULUM

Module No.	Topics	Hours
1	Introduction to Digital Design: Binary Logic, Basic Theorems And Properties Of Boolean Algebra, Boolean Functions, Digital Logic Gates, Introduction, The Map Method, Four-Variable Map, Don't-Care Conditions, NAND and NOR Implementation, Exclusive -OR Function. Text book 1: 1.9, 2.4, 2.5, 2.8, 3.1, 3.2, 3.3, 3.5, 3.6, 3.8 **Practical Based learning –**Given a 4-variable logic expression, simplify it using appropriate technique and simulate the same using basic gates	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
2	Combinational Logic: Introduction, Combinational Circuits, Design Procedure, Binary Adder- Subtractor, Decoders, Encoders, Multiplexers. HDL Models of Combinational Circuits – Adder, Multiplexer, Encoder. Programmable Logic devices, Programmable Logic Arrays, Programmable Array Logic. Text book 1: 4.1, 4.2, 4.4, 4.5, 4.9, 4.10, 4.11, 4.12 Text book 2: 9.4,9.5,9.6 **Practical Based learning –**Design a 4-bit full adder and subtractor and simulate the same using basic gates.	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using simulation**	
3	Introduction to VHDL: VHDL description of combinational circuits, VHDL Models for multiplexers, VHDL Modules. Latches and Flip-Flops: Set Reset Latch, Gated Latches, Edge-Triggered D Flip Flop 3,SR Flip Flop, J K Flip Flop, T Flip Flop, Flip Flop with additional inputs. Text book 2 : 10.1,10.2,10.3 and 11.1 to11.9 **Practical Based learning**–Design Verilog HDL to implement simple circuits using structural, Data flow and Behavioural model.Design Verilog HDL to implement Binary Adder-Subtractor – Half and Full Adder, Half and Full Subtractor.	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Simulation experiments**	
	Basic Structure of Computers: Functional Units, Basic Operational Concepts, Bus structure, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. Machine Instructions and Programs: Memory Location and Addresses, Memory Operations, Instruction and Instruction sequencing,	8

4	Addressing Modes. Text book 3: 1.2, 1.3, 1.4, 1.6, 2.2, 2.3, 2.4, 2.5	
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
5	Basic Processing Unit: Some Fundamental Concepts: Register Transfers, Performing ALU operations, fetching a word from Memory, Storing a word in memory. Execution of a Complete Instruction. Pipelining: Basic concepts, Role of Cache memory, Pipeline Performance. Text book 3: 7.1, 7.2, 8.1	**8**
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	M. Morris Mano & Michael D. Ciletti, Digital Design With an Introduction to Verilog Design, 5e, Pearson Education.
2	Charles H Roth and Larry L Kinney, Raghunandan G H, Analog and Digital Electronics, Cengage Learning,2019
3	Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5th Edition, Tata McGraw Hill.

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Ability to **Explain** The fundamentals of machine instructions, addressing modes and Processor performance	Understand	L1/L2
CO2	Ability to **Apply** the knowledge of functionalities of binary logic system and demonstrate the same using Verilog HDL simulation.	Apply	L3
CO3	Ability to **Analyze** internal Organization of Memory and Impact of cache/Pipelining on Processor Performance.	Analyse	L4
CO4	Ability to **Design** the approaches involved in achieving communication between processor and I/O devices.	Design	L5
CO5	Ability to **Illustrate** different combinational and sequential logic circuits using HDL	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://cse11-iiith.vlabs.ac.in/
2	https://www.youtube.com/watch?v=FPrcIhqNPVo

CIE- Continuous Internal Evaluation (50 Marks)

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

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	4	4	2	--	--	--	10	20%
CO2	6	6	3	3	--	--	15	30%
CO3	--	--	2	2	4	4	12	24%
CO4	--	--	--	--	4	3	07	14%
CO5	--	--	--	--	3	3	06	12%
Total	10	10	7	5	11	10	50	100%

SEE- Semester End Examination (50 Marks)

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

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	3	3	3	--	3	3	15	24%
CO2	4	3	--	3	3	2	15	26%
CO3	--	--	--	5	5	5	15	30%
CO4	--	--	--	--	1	2	3	10%
CO5	--	--	--	--	1	1	2	10%
Total	7	6	3	8	13	13	50	100%

PROJECT BASED LEARNING (PBL)

PBL- Project Based Learning

Teaching Hours/Week (L: T:P:S)	0:0:2:2
Total Hours of Pedagogy	25 hours – Theory + Project
Credits:	02
Modules	5
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Project Evaluation

2 Credit Course – Project (PBL)	
	Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum Marks (20 Marks out of 50). The minimum passing mark for the SEE is 35% of the maximum Marks (18 Marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 Marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together. **Continuous Internal Evaluation (CIE):** The CIE Marks for the internal assessment test shall be 50 **Marks**. **Internal Assessment test:** Continuous Internal Evaluation (CIE): CIE marks for the project are 50 Marks. • Students must complete a certification from Infosys Springboard. This will be evaluated for 25 marks. • Project weekly assessment in phase – 1 and phase – 2 will be evaluated for 50 marks which will be scaled down to 25 marks. • Each project will be evaluated weekly for 50 marks and the rubrics for the evaluation includes project understanding, technical competence, innovation, problem solving and project demonstration. • The marks scored in project weekly assessment shall be scaled down to 25 marks. • The Sum of final project weekly assessment and marks of the Infosys Springboard certification is the total CIE marks scored by the student **Semester End Examination (SEE):** • SEE will be evaluated for 100 marks and will be scaled down to 50 marks. • Write-up of the project will be evaluated for 10 marks. • Project demonstration and evaluation will be evaluated for 50 marks. • Project report will be evaluated for 25 marks. • Viva-voce will carry 15 marks. • The marks scored shall be scaled down to 50 marks

<table>
<tr><td></td><td colspan="2">CIE</td><td colspan="2">SEE</td></tr>
<tr><td>Certfication</td><td>Infosys Springboard Certification</td><td>25 Marks</td><td colspan="2" rowspan="2"></td></tr>
<tr><td colspan="2">Project Weekly Assessment</td></tr>
<tr><td rowspan="5">Project</td><td>Project Understanding</td><td>05 Marks</td><td>Writeup</td><td>10 Marks</td></tr>
<tr><td>Technical Competence</td><td>10 Marks</td><td>Presentation& Demonstration</td><td>50 Marks</td></tr>
<tr><td>Innovation</td><td>10 Marks</td><td>Project Report</td><td>25 Marks</td></tr>
<tr><td>Problem Solving</td><td>15 Marks</td><td>Viva-Voce</td><td>15 Marks</td></tr>
<tr><td>Project Demonstration</td><td>10 Marks</td><td>Total</td><td>100 Marks</td></tr>
<tr><td colspan="3">Project weekly assessment 50 Marks will be reduced to 25 Marks</td><td colspan="2"></td></tr>
<tr><td colspan="2">Total CIE (Certification + Project Weekly Assessment)</td><td>50 Marks</td><td colspan="2">Total SEE : 100 Marks Reduced to 50 Marks</td></tr>
</table>

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 viva 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 endeavours.
- Helps students to become technologically literate
- Establishes connections to life outside the classroom, addressing real-world concerns, and developing real-world skills
- Skills learned through PBL are those desired by today's employers.

6. Benefits of PBL

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

7. Process

- Project batches will be formed after the commencement of 3rdsemester.
- The Students Batch Comprising of 4 members in a batch should be formed by the Project Based

Learning co-ordinator.

- Each Semester consists of 16 Weeks of Project based Learning.
- The Level of the Projects to be identified.

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

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

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

7.1 Two phases for Assessment

Phase 1:

1. Phase 1 is for 4 weeks

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

Phase 2:

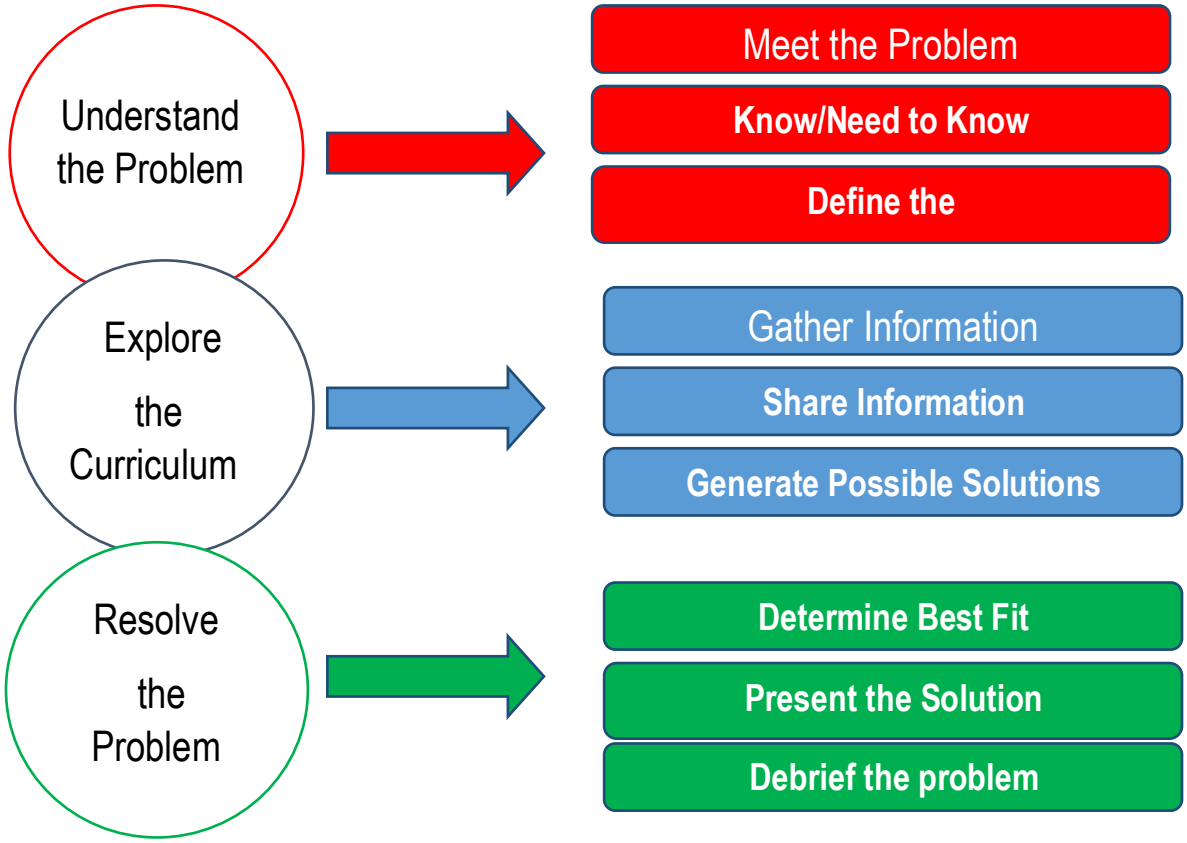
1. Phase 2 is for 6 Weeks

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

The marks distribution for PBL Work:

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

8. PBL Teaching and Learning Template



9.Practice

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

9. Obstacles/Gaps

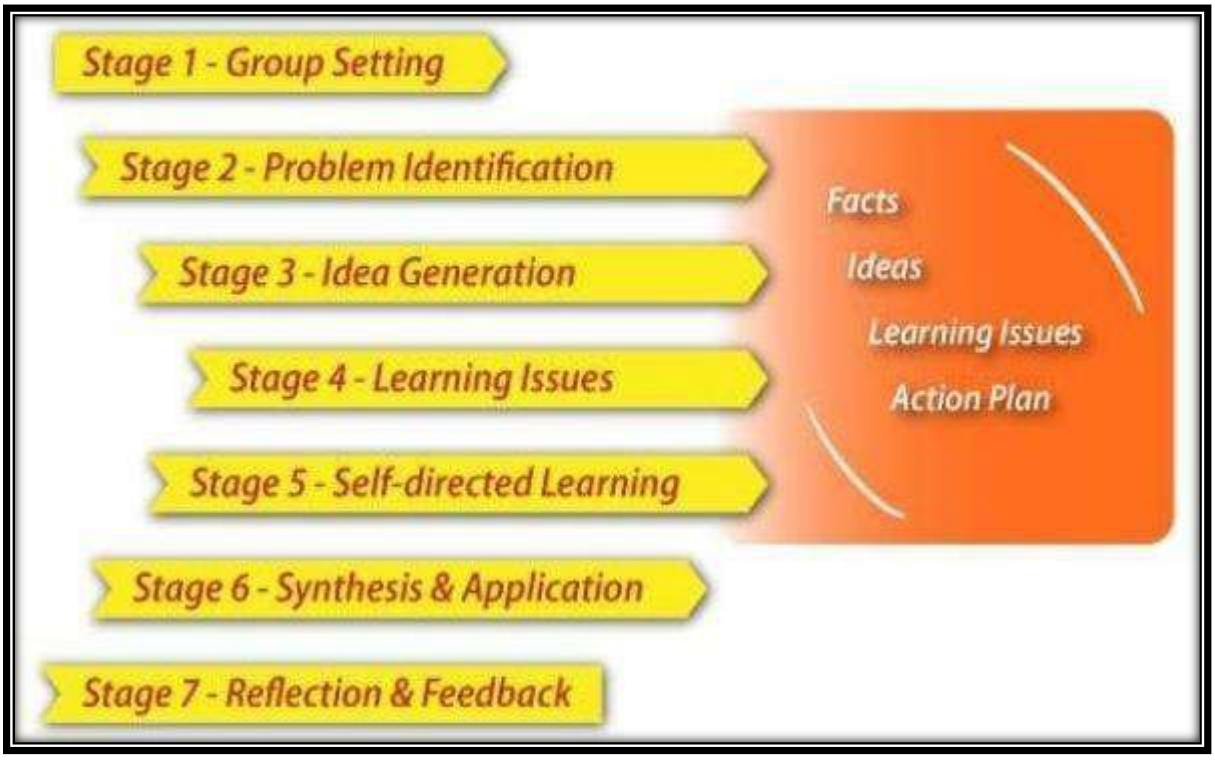
- Lack of student's interest
- Lack of assessment
- Lack of Basic knowledge
- Lack of consistence attendance and monitoring.

- Lack of abundant time allotment and time management

10. How to Overcome?

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

11. Block diagram of PBL



12. Impact Analysis

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

13. PBL – Guidelines

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

14.1 Main phases of the project

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

14.2 Final Presentation Structure

1. Title of the project & 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

14. Guidelines to prepare the Project report

- Project reports should be typed neatly only on one side of the paper with 1.5 or double line spacing on a A4 size bond paper (210 x 297mm).
- The margins should be: Left – 1.25", Right – 1", Top and Bottom –0.75".
- The total number of reports to be prepare dare

- 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)notexceeding100words,indicatingsalientfeaturesofthework.

15. Outcome of the project

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

Project-Based Learning Rubric

Score Levels	Content	Conventions	Organization	Presentation
5	▪ Is well thought out and supports the solution to the challenge or question ▪ Reflects application of critical thinking ▪ Has clear goal that is related to the topic ▪ Is pulled from a variety of sources ▪ Is accurate	▪ No spelling, grammatical, or punctuation errors ▪ High-level use of vocabulary and word choice	▪ Information is clearly focused in an organized and thoughtful manner. ▪ Information is constructed in a logical pattern to support the solution.	▪ Multimedia is used to clarify and illustrate the main points. ▪ Format enhances the content. ▪ Presentation captures audience attention. ▪ Presentation is organized and well laid out.
4	▪ Is well thought out and supports the solution ▪ Has application of critical thinking that is apparent ▪ Has clear goal that is related to the topic ▪ Is pulled from several sources ▪ Is accurate	▪ Few (1 to 3) spelling, grammatical, or punctuation errors ▪ Good use of vocabulary and word choice	▪ Information supports the solution to the challenge or question.	▪ Multimedia is used to illustrate the main points. ▪ Format is appropriate for the content. ▪ Presentation captures audience attention. ▪ Presentation is well organized.
3	▪ Supports the solution ▪ Has application of critical thinking that is apparent ▪ Has no clear goal ▪ Is pulled from a limited number of sources	▪ Minimal (3 to 5) spelling, grammatical, or punctuation errors ▪ Low-level use of vocabulary and word choice	▪ Project has a focus but might stray from it at times. ▪ Information appears to have a pattern, but the pattern is not consistently	▪ Multimedia loosely illustrates the main points. ▪ Format does not suit the content. ▪ Presentation does not capture audience attention.

2	▪ Provides inconsistent information for solution ▪ Has no apparent application of critical thinking ▪ Has no clear goal ▪ Is pulled from few sources ▪ Has significant factual errors, misconceptions, or misinterpretations	▪ More than 5 spelling, grammatical, or punctuation errors ▪ Poor use of vocabulary and word choice	▪ Content is unfocused and haphazard. ▪ Information does not support the solution to the challenge or question. ▪ Information has no apparent pattern.	▪ Presentation appears sloppy and/or unfinished. ▪ Multimedia is overused or underused. ▪ Format does not enhance e content. ▪ Presentation has no clear organization.

Subject Identified for Project Based Learning

Semester	3rd
Subject Identified for PBL	Applications of JAVA Programming
Prerequisite	Basic JAVA Programming
Justification for the selected subject	JAVA projects provides tangible evidence of your skills and Preparation for the Industry
List of possible projects	1. Simple Chat application 2. To – do List 3 Hotel Management 4.Games 5.Weather forecast applications 6.Online Quiz System

Signature of the Guide **Signature of HOD**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**3**				
Course Title	:	**Applications of Java Programming**				
Course Code	:	**BAI306**				
Course Type (Theory/Practical/Integrated/Project)	:	**Project**				
Category	:	**PBL**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**0:2:0:2**		**SEE**	:	**50**
Total Hours	:	**24 Hours -10 Theory + 14 Project**		**SEE Duration**	:	**3 Hrs.**
Credits	:	**02**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Demonstrate the use of Eclipse/IntelliJ IDE to create Java Applications
2	Using java programming to develop programs for solving real-world problems
3	Reinforce the understanding of basic object-oriented programming concepts
4	Apply the concepts of exception/event handling, abstraction to develop robust programs

Teaching-Learning Process

Pedagogical Initiatives:

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

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

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	Revision of basics of java: Object-Oriented Programming, A First Simple Program, A Second Short Program, Two Control Statements, Using Blocks of Code, The Java Class Libraries, Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, Variables, Type Conversion and Casting, Arrays, A Few Words About Strings Experiments: 1) Develop a JAVA program to add TWO matrices of suitable order N (The value of N should be read from command line arguments). Develop a stack class to hold a maximum of 10 integers with suitable methods. Develop a JAVA main method to illustrate Stack operations	2
Pedagogy	**ICT Based Learning**	
2	Revision of Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The? Operator, Operator Precedence, Using Parentheses, Control Statements: Java's Selection Statements, Iteration Statements, Jump Statements.	2
Pedagogy	**ICT Based Learning**	
3	Revision of Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, A Stack Class, A Closer Look at Methods and Classes: Overloading Methods, A Closer Look at Argument Passing, Recursion, Understanding static, Introducing final, Arrays Revisited, Exploring String Class, using command line argument, variable length arguments Experiments: 2) A class called Employee, which models an employee with an ID, name and salary, is designed as shown in the following class diagram. The method raise Salary (percent) increases the salary by the given percentage. Develop the Employee class and suitable main method for demonstration 3) A class called MyPoint, which models a 2D point with x and y coordinates, is designed as follows: ● Two instance variables x (int) and y (int).	2

	● A default (or "no-arg") constructor that construct a point at the default location of (0, 0). ● A overloaded constructor that constructs a point with the given x and y coordinates. ● A method setXY() to set both x and y. ● A method getXY() which returns the x and y in a 2-element int array. ● A toString() method that returns a string description of the instance in the format "(x, y)". ● A method called distance(int x, int y) that returns the distance from this point to another point at the given (x, y) coordinates ● An overloaded distance(MyPoint another) that returns the distance from this point to the given MyPoint instance (called another) ● Another overloaded distance() method that returns the distance from this point to the origin (0,0) Develop the code for the class MyPoint. Also develop a JAVA program (called TestMyPoint) to test all the methods defined in the class.	
Pedagogy	**ICT Based Learning**	
4	Revision of Inheritance concepts: Inheritance basics, using Super, creating a Multilevel Hierarchy, When Constructors Are Executed, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance Experiments: 4) Develop a JAVA program to create a class named shape. Create three sub classes namely: circle, triangle and square, each class has two member functions named draw () and erase (). Demonstrate polymorphism concepts by developing suitable methods, defining member data and main program 5) Develop a JAVA program to create an abstract class Shape with abstract methods calculateArea() and calculatePerimeter(). Create subclasses Circle and Triangle that extend the Shape class and implement the respective methods to calculate the area and perimeter of each shape.	**2**
Pedagogy	**ICT Based Learning**	
5	Revision of Packages and Interfaces: Packages, Packages and member Access, Importing Packages, Interfaces, Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Java's Built-in Exceptions, Experiments: 6) Develop a JAVA program to create an interface Resizable with methoresizeWidth(int width) and resizeHeight(int height) that allow an object to be resized. Create a class Rectangle that implements the Resizable	**2**

	interface and implements the resize methods 7) Create a vehicle management system where you have different types of vehicles (e.g., Car, Truck). Each vehicle has common properties such as `licenseNumber` and `model`. Implement an interface `Serviceable` with a method `service()`, and an abstract class `Vehicle` that implements this interface. Each specific vehicle type will extend the `Vehicle` class and implement the `service()` method. Include exception handling for invalid license numbers 8) Create an employee management system where there are different types of employees (e.g., FullTimeEmployee, PartTimeEmployee). Each employee has common properties such as `name` and `employeeId`. Implement an interface `Payable` with a method `calculatePay()`, and an abstract class `Employee` that implements this interface. Each specific employee type will extend the `Employee` class and implement the `calculatePay()` method. Include exception handling for invalid employee IDs. 9) Create a library management system where there are different types of books (e.g., Fiction, Non Fiction). Each book has common properties such as `title` and `author`. Implement an interface `Readable` with a method `read()`, and an abstract class `Book` that implements this interface. Each specific book type will extend the `Book` class and implement the `read()` method. Include exception handling for invalid book titles	
Pedagogy	**ICT Based Learning, Introduction to 1 framework**	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Java: The Complete Reference, Twelfth Edition, by Herbert Schildt, November 2021, McGraw-Hill, ISBN:9781260463422
2	E Balagurusamy, Programming with Java, Graw Hill, 6th Edition, 2019

Reference Books	
1	Programming with Java, 6th Edition, by E Balagurusamy, Mar-2019, McGraw Hill Education, ISBN: 9789353162337.
2	2. Thinking in Java, Fourth Edition, by Bruce Eckel, Prentice Hall, 2006 (https://sd.blackball.lv/library/thinking_in_java_4th_edition.pdf)

Sl. No.	Mini Projects	COs
1	Create a library management system where there are different types of books (e.g., Fiction, NonFiction). Each book has common properties such as `title` and `author`. Implement an interface `Readable` with a method `read()`, and an abstract class `Book` that implements this interface. Each specific book type will extend the `Book` class and implement the `read()` method. Include exception handling for invalid book titles.	CO4
2	Create a payment processing system where there are different types of payment methods (e.g., Credit Card, PayPal). Each payment method has common properties such as `amount` and `currency`. Implement an interface `Processable` with a method `processPayment()`, and an abstract class `Payment` that implements this interface. Each specific payment method will extend the `Payment` class and implement the `processPayment()` method. Include exception handling for invalid payment amounts.	CO4
3	Create an animal classification system where there are different types of animals (e.g., Mammal, Bird). Each animal has common properties such as `name` and `species`. Implement an interface `Describable` with a method `describe()`, and an abstract class `Animal` that implements this interface. Each specific animal type will extend the `Animal` class and implement the `describe()` method. Include exception handling for invalid species names	CO4
Open ended Programs		
1	A problem statement for each batch is to be generated in consultation with the co-examiner and student should develop an algorithm, program and execute the program for the given problem with appropriate outputs	CO5

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand Eclipse/IntelliJ IDE to design, develop, debug Java Projects.	Understand	L1/L2
CO2	To Apply the JAVA JDK environment to create, debug and run simple Java programs	Apply	L3
CO3	Analyze the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in	Analyse	L4
CO4	Demonstrate the ability to design and develop java programs, analyze, and interpret object-oriented data and document results	Design	L5
CO5	Evaluate the concepts of exception/event handling, abstraction to develop robust java programs	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=OjdT2l-EZJA&list=PLfn3cNtmZdPOe3R_wO_h540QNfMkCQ0ho
2	https://www.youtube.com/watch?v=hBh_CC5y8-s

Project Based Learning - Batch

From, **Date:**

Name: & USN:

Name: & USN:

Name: & USN:

Name: & USN:

Semester:

Respected Sir/Madam,

Sub: Regarding PBL Batch

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

Thanking you, Yours faithfully

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

Signature of the Guide

Name of the Guide Designation

Department of ……. Engineering

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

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

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

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

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

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

Project Based Learning – Continuous Evaluation

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

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

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Project Based Learning –Review

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

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

Project Based Learning Outcomes

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

ABILITY ENHAMCEMENT COURSE

EXPERIENTIAL LEARNING

Semester	**:**	**3**				
Course Title	**:**	**Project Management with Git**				
Course Code	**:**	**BAI307**				
Course Type (Theory/Practical/Integrated/Project)	**:**	**Practical- Experiential Learning**				
Category	**:**	**AEC**				
Stream	**:**	**AIML**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**0:0:2:0**		**SEE**	**:**	**50**
Total Hours	**:**	**15 Hrs.**		**SEE Duration**	**:**	**3 Hrs**
Credits	**:**	**1**				

1. (a) Define Objectives

Identify Goals: Determine what skills and knowledge you want students to acquire through Experiential Learning.	
Learning Goal (LG)-1	Understand the principles and practices of project management
Learning Goal (LG) -2	Learn to plan, execute, monitor and control projects effectively.
Learning Goal (LG) -3	Gain proficiency in using Git for version control.
Learning Goal (LG)-4	Collaborate on projects using GitHub.
Learning Goal (LG)-5	Apply project management tools and techniques to software development projects.

(b) Course Outcomes

Identify Goals: Determine what skills and knowledge you want students to acquire through Experiential Learning.	
Course Outcomes (CO)-1	Understand the principles and practices of project management
Course Outcomes (CO)-2	Apply project management tools and techniques to software development projects.

Course Outcomes (CO)-3	Learn to plan, execute, monitor and control projects effectively.
Course Outcomes (CO)-4	Collaborate on projects using GitHub.
Course Outcomes (CO)-5	Gain proficiency in using Git for version control.

(c) Alignment

Align with Curriculum: Ensure these goals align with the overall educational objectives of the engineering program.

Sl.No	Learning Goals	Course Outcomes	Assessment	In-Class Activity	Out-of- Class Activity	Weightage
1.	Understand the principles and practices of project management	Understand the principles and practices of project management	CIE	Chalk & Talk / Presentation	Assignment	20%
2.	Learn to plan, execute, monitor and control projects effectively.	Apply project management tools and techniques to software	CIE	Demonstration	Hands-on assignment	20%

		development projects.				
3.	*Gain proficiency in using Git for version control.*	Learn to plan, execute, monitor and control projects effectively.	CIE	Demonstration	Hands-on assignment	20%
4.	Collaborate on projects using GitHub.	Collaborate on projects using GitHub. .	CIE	Demonstration	Hands-on assignment	20%
5.	Apply project management tools and techniques to software development projects.	Gain proficiency in using Git for version control.	CIE	Demonstration	Hands-on assignment	20%

2. Curriculum Design

(a) Course integration

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

Sl.No	Course Name	Course Code	Justification for selecting the Course for Experiential Learning
1	**Applications of JAVA Programming**	**36**	**Git is widely used in various industries for version control and project management**

(b) Develop Modules

Develop Modules: Create specific modules within these courses that focus on hands-on experiences.

Module No	Lecture No.	Session Topics	RBT Levels	Activities Planned	Course Outcome Mapping	Mode of Delivery	Planned Date	Actual Date
1	1	**Basics of Git**: Introduction to version control, Installing Git and basic configuration, Git workflow: cloning, committing, pushing, pulling	L1 / L2	Demonstration	CO1	Chalk & Talk / Presentation		
2	2	**Git Repositories:** Creating and managing repositories, Understanding branches and merging, Resolving conflicts.	L1 / L2	Demonstration	CO1	Chalk & Talk / Presentation		
3	3-4	**Advanced Git Techniques**: Branching Strategies, Branching models (feature branching, Git flow), Best practices for branching and merging ○	L3	Demonstration	CO2	Chalk & Talk / Presentation		
4	5-6	**Collaboration with Git:** Using Git in team projects, Pull requests and code reviews, Managing contributions and permissions	L4	Demonstration	CO3	Chalk & Talk / Presentation		

5	7-8	**Project Management with Git:** Integrating Git with Project Management Tools, Using Git with project management tools (e.g., GitHub, GitLab, Bitbucket), Issue tracking and task management. Continuous integration and deployment (CI/CD)	**L5**	**Demonstration**	**CO4**	**Chalk & Talk / Presentation**		
6	9 - 15	**Projects**	**L6**	**Selection of problem statement, design, implementation, Project Report**	**CO5**			

3. Mapping of Learning objectives with Learning Outcomes

Course/Modules	Learning Objective	Learning Outcome	Assessment Method
Basics of Git: Introduction to version control, Installing Git and basic configuration, Git workflow: cloning, committing, pushing, pulling	Understand the principles and practices of project management	Understand the principles and practices of project management	CIE
Git Repositories: Creating and managing repositories, Understanding branches and merging, Resolving conflicts.	Learn to plan, execute, monitor and control projects effectively.	Apply project management tools and techniques to software development projects.	CIE

Advanced Git Techniques: Branching Strategies, Branching models (feature branching, Gitflow), Best practices for branching and merging	*Gain proficiency in using Git for version control.*	Learn to plan, execute, monitor and control projects effectively.	CIE
Collaboration with Git: Using Git in team projects, Pull requests and code reviews, Managing contributions and permissions	Collaborate on projects using GitHub.	Collaborate on projects using GitHub. .	CIE
Project Management with Git: Integrating Git with Project Management Tools, Using Git with project management tools (e.g., GitHub, GitLab, Bitbucket), Issue tracking and task management. Continuous integration and deployment (CI/CD)	Collaborate on projects using GitHub.	Collaborate on projects using GitHub. .	CIE
Projects	Apply project management tools and techniques to software development projects.	Gain proficiency in using Git for version control.	CCA/SEE

4. Partnerships and Resources

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

Implement Experiential Activities

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

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

Experiential Learning - Batch

From, **Date:**

Name: & USN:

Name: & USN:

Name: & USN:

Name: & USN:

Semester:

Respected Sir/Madam,

Sub: Regarding Experiential Learning Batch

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

Thanking you, Yours faithfully

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

Signature of the Guide

Name of the Guide Designation

Department of ……. Engineering

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

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

Signature of the Guide **Signature of HOD**

Assessment

Rubrics for Experiential Learning Assessment

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

			Innovation	shows significant innovation and out-of-the-box thinking.	demonstrates innovation in some aspects.	minimal innovation.	evidence of innovative thinking.	
			Problem Solving	Identifies problems accurately and develops effective, comprehensive solutions.	Identifies problems correctly and develops good solutions.	Identifies problems but solutions are somewhat effective or incomplete.	Struggles to identify problems and develop effective solutions.	
			Project Management	Manages project timelines, resources, and tasks exceptionally well; meets all deadlines.	Manages project timelines, resources, and tasks effectively; meets most deadlines.	Manages project timelines, resources, and tasks with some difficulty; misses some deadlines.	Poor management of project timelines, resources, and tasks; frequently misses deadlines.	
			Documentation	Thorough, clear, and well-organized documentation; all necessary details included.	Clear and organized documentation; most necessary details included.	Basic documentation; some necessary details are missing or unclear.	Poor documentation; lacks necessary details and organization.	
				Engaging and	Good presentation;	Basic presentation;	Ineffective	

			Presentation Skills	well-organized presentation; communicates ideas clearly and effectively.	communicates ideas clearly but lacks some engagement or organization.	some ideas are unclear or poorly organized.	presentation; ideas are unclear and poorly organized.	
			Collaboration	Works exceptionally well with team members; shows strong teamwork and leadership skills.	Works well with team members; demonstrates good teamwork.	Works with team members but has some difficulties in collaboration.	Struggles to work with team members; lacks teamwork and collaboration skills.	
			Faculty Assessment	Meets or exceeds faculty expectations in all areas; shows exceptional performance.	Meets faculty expectations in most areas; shows good performance.	Meets some faculty expectations; shows average performance.	Does not meet faculty expectations; shows poor performance.	
			Reflection	Provides deep insights and critical analysis of	Provides good insights and analysis of own work; demonstrates	Provides basic insights and analysis of own work; shows some	Provides minimal or no insights and analysis of own	

				own work; demonstrates significant learning and growth.	learning and growth.	learning and growth.	work; shows little to no learning and growth.	
			Overall Assessment	Exceptional overall performance; exceeds expectations in most or all areas.	Good overall performance; meets expectations in most areas.	Average overall performance; meets expectations in some areas.	Poor overall performance; does not meet expectations in most areas.	

Skills Assessment

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

SOCIAL CONNECT
&
RESPONSIBILITY (SCR)

SCR- Social Connect & Responsibility

Teaching Hours/Week (L: T:P:S)	0:0:2:0
Total Hours of Pedagogy	40 hour Practical Session +15 hour Planning
Credits:	01
Programs / Experiments	12
CIE Marks	100
SEE Marks	------
Total Marks	100
Exam Hours	3
Examination nature (SEE)	No SEE only CIE For CIE Assessment - Activities Report Evaluation by College NSS Officer / HOD / Sports Dept / Any Dept.

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**3**				
Course Title	:	**Social Connect and Responsibility**				
Course Code	:	**BSCK308**				
Course Type (Theory/ Practical/ Integrated)	:	**Practical**				
Category	:	**SCR**				
Stream	:	**AIML**		**CIE**	:	**100**
Teaching hours/ week (L:T:P:S)	:	**0:0:2:0**		**SEE**	:	**--**
Total Hours	:	**15 hour**		**SEE Duration**	:	**--**
Credits	:	**1**				

Course Learning Objectives: Students will be able to:

Sl.No	Course Objectives
1	Provideaformalplatformforstudentstocommunicateandconnecttothesurrounding.
2	Create a responsible connection with the society.
3	Understand the community in general in which they work.
4	Identifytheneedsandproblemsofthecommunityandinvolvetheminproblem–solving.
5	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
6	Develop competence required for group-living and sharing of responsibilities &gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes

Teaching-Learning Process

General Instructions-Pedagogy:

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

- In addition to the traditional lecture method,different types of innovative teaching methods may be adopted so that the activities will develop students' theoretical and applied social and cultural skills.
- State the need for activities and its present relevance in the society and Provide real-life examples.
- Support and guide the students for self-planned activities.
- You will also be responsible for assigning home work,grading assignments and quizzes,and documenting students'progress in real activities in the field.
- Encourage the students for group work to improve their creative and analytical skills

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Contents:

The course is mainly activity-based that will offer a set of activities for the student that enables them to connect with fellow human beings, nature, society, and the world at large.

The course will engage students for interactive sessions ,open mic ,reading group,story telling sessions,and semester-long activities conducted by faculty mentors.

In the following a set of activities planned for the course have been listed:

Module No.	Topics	Hours
1	**Part I:** **Plantation and adoption of a tree:** Plantation of a tree that willbe adopted for four years by a group of BE/B.Tech students. (ONESTUDENTONETREE) They will also make an excerpt either as a document a or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature - – Objectives, Visit, case study, report, outcomes.	3
Pedagogy	**ICT Tools**	
2	**Part II:** **Heritage walk and crafts corner:** Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms - – Objectives,Visit, case study, report, outcomes.	3
Pedagogy	**ICT Tools**	
3	**Part III :** **Organic farming and waste management:** Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus –Objectives,Visit, case study, report, outcomes.	3
Pedagogy	**ICT Tools**	
	Part IV: **Water conservation:**	3

4	Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices – Objectives, Visit, case study, report, outcomes.	
Pedagogy	**ICT Tools**	
5	**Part V :** **Food walk:** City's culinary practices, food lore, and indigenous materials of the region used in cooking – Objectives, Visit, case study,report, outcomes.	**3**
	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	

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Communicate and connect to the surrounding.	**Understand**	**L2**
CO2	Create a responsible connection with the society.	**Understand**	**L2**
CO3	Involve in the community in general in which they work.	**Understand**	**L2**
CO4	Notice the needs and problems of the community and involve them in problem –solving.	**Understand**	**L2**
CO5	Develop among themselves a sense of social & civic responsibility & utilize their knowledge	**Understand**	**L2**

Mapping of Course Outcomes to Program Outcomes:

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

Activities:

Jamming session, open mic, and poetry: Platform to connect to others. Share the stories with others. Share the experience of Social Connect. Exhibit the talent like playing instruments,singing, one-act play, art-painting, and fine art.

PEDAGOGY:

The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources todefine the social problem to address and take up the solution as the course project, with your group. Social immersion with NGOs/social sections will be a key part of the course. Will all lead to the course project that will address the needs of the social sector?

COURSE TOPICS:

The course will introduce social context and various players in the social space, and present approaches to discovering and understanding social needs. Social immersion and inspiring conversional will culminate in developing an actual, idea for problem-based intervention, based on an in-depth understanding of a key social problem.

Duration :

A total of 40 - 50 hrs engagement per semester is required for the 3rd semester of the B.E./B.Tech. program. The students will be divided into groups. Each group will be handled by faculty mentor. Faculty mentor will design the activities (particularly Jamming sessions open mic ,and poetry) Faculty mentors has to design the evaluation system as per guidelines of scheme& syllabus.

Continuous Internal Evaluation (CIE):

- After completion of the course, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period.
- The report should be signed by the mentor.
- The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed. Marks allotted for the diary are out of 50.
- Planning and scheduling the social connect Information/Data collected during the social connect Analysis of the information/data and report writing
- Considering all above points allotting the marks as mentioned below

Excellent : 80 to 100

Good : 60 to 79

Satisfactory : 40 to 59

Unsatisfactory and fail:<39

Pedagogy – Guidelines:

It may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution.

Sl.No	Topic	Group size	Location	Activity execution	Reporting	Evaluation Of the Topic
1.	Plantation and adoption of a tree:	May be individual or team	Farmers land/ parks / Villages / roadside/ community area / College campus etc….	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
2.	Heritage walk and crafts corner:	May be individual or team	Temples / monumental places / Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc…..	Site selection /proper consultation/Contiuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
3.	Organic farming and waste management:	May be individual or team	Farmers land / parks / Villages visits / roadside/ community area / College campus etc….	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
4.	Water conservation: & conservation techniques	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers / campus etc…..	Site selection / proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty
5.	Food walk: Practices in societ	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc…	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by Faculty

1 Credit Course – Practical + Planning

Assessment Details (both CIE and SEE)

NO SEE – Semester End Exam – Completely Practical and activities based evaluation

Plan of Action (Execution of Activities)	
Sl.No	**Practice Session Description**
1.	Lecture session in field to start activities
2.	Students Presentation on Ideas
3.	Commencement of activity and its progress
4.	Execution of Activity
5.	Execution of Activity
6.	Execution of Activity
7.	Execution of Activity
8.	Case study-based Assessment, Individual performance
9.	Sector/ Team wise study and its consolidation
10.	Video based seminar for 10 minutes by each student At the end of semester with Report.

- Each student should do activities according to the scheme and syllabus.
- At the end of semester student performance has to be evaluated by the faculty for the assigned activity progress and its completion.
- At last consolidated report of all activities from 1st to 5th, compiled report should be submitted as per the instructions and scheme.

Assessment Details for CIE (both CIE and SEE)

<table>
<tr><td>Weightage</td><td>CIE – 100%</td><td rowspan="7">• Implementation strategies of the project (NSS work).
• The last report should be signed by NSS Officer, the HOD and principal.
• At last report should be evaluated by the NSS officer of the institute.</td></tr>
<tr><td>Field Visit, Plan, Discussion</td><td>10 Marks</td></tr>
<tr><td>Commencement of activities and its progress</td><td>20 Marks</td></tr>
<tr><td>Case study-based Assessment Individual performance with report</td><td>20 Marks</td></tr>
<tr><td>Sector wise study & its consolidation 5*5 = 25</td><td>25 Marks</td></tr>
<tr><td>Video based seminar for 10 minutes by each student At the end of semester with Report. Activities 1 to 5, 5*5 = 25</td><td>25 Marks</td></tr>
<tr><td>Total marks for the course in each semester</td><td>100 Marks</td></tr>
<tr><td colspan="3">For each activity, 20 marks CIE will be evaluated for IA marks at the end of semester, Report and assessment copy should be made available in the department.</td></tr>
<tr><td colspan="3">Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general through activities.</td></tr>
</table>

4thSEMESTER

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

Semester	:	**4th**				
Course Title	:	**Statistics and Probability**				
Course Code	:	**BMATA401**				
Course Type (Theory/Practical/Integrated)	:	**Theory**				
Course Category	:	**ASC**				
Stream	:	**Common to CSE & Allied branches**		**CIE**	:	**50 Marks**
Teaching hour/week(L:T:P:S)	:	**2:2:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs**		**SEE Duration**	:	**3 Hours**
Credits:	:	**3**				

Course Learning Objectives: Students will be taught

Sl.No	Course Objectives
1	Acquire basic knowledge of Mathematical concepts for understanding engineering problems
2	Use concepts of statistics and probability in solving problems
3	Analyze problems using concepts of statistics and probability
4	Use MATLAB to obtain solutions of various mathematical problems.

Teaching-Learning Process

Pedagogy (General Instructions):

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

1. Lecture method (L) does not mean only the traditional lecture method, but a different type ofteaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in theprinciple.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes criticalthinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, developthinking skills such as the ability to evaluate, generalize, and analyze information rather thansimply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come upwith their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helpsimprove the students' understanding.

9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for BE Programme -2023-24
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2023-24)

COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Statistics** Introduction, curve fitting (Least squares method), fitting of a straight line, fitting of a second-degree parabola, fitting of exponential curves, correlation and correlation coefficient r, regression lines,rank correlation.	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
2	**Probability Distribution** Review of basic probability theory, random variables (discrete and continuous), probability mass and density functions,mathematical expectation, mean and variance, binomial, Poisson, normal, exponential distribution,Weibull and uniform distributions.	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
3	**Sampling Theory** Introduction, sampling distribution, standard error, testing of hypothesis,central limit theorem, levels of significance,z- test for large samples, confidence limits,Student's 't' distribution, Chi-square distribution as a test of goodness of fit, F-Distribution.	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
4	**ANOVA** The ANOVA technique, basic principle of ANOVA, one-way ANOVA, Two-way ANOVA, Latin-square Design	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
5	**Time series and Markov chain** **Time series:** Introduction to times series data, Components of a time series, Decomposition of time series, method of semi averages, fitting a various mathematical curve and growth curves. **Markov chain**: Introduction to stochastic process, probability vectors, stochastic matrices, regular stochastic matrices, Markov chains, higher transition probabilities, stationary distribution of regular Markov chains.	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	

List of Experiments or Programs

Sl.No	Experiments/Programs	COs
	NIL	

Reference Books	
Text Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Probability and Statistics, Murray R. Spiegel, John Schiller, R. Alu Srinivasan**,** Schaum's outline series, Mc Graw Hill Publication, 4th Edition, 2012.
2	Research Methodology Methods & Techniques, C R Kothari and Gaurav Garg, New Age International Limited, 3rd Edition, 2014
3	Probability & Statistics for Engineers & Scientists, Ronald E. Walpole, Raymond H Myers, Sharon L Myers & Keying Ye, Pearson Education, 9th edition, 2017.

Reference Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)	
1	Higher Engineering Mathematics, B. S. Grewal, Khanna publishers, 44th Ed., 2021.
2	Practical Statistics for Data Scientists,Peter Bruce, Andrew Bruce & Peter GedeckO'Reilly Media, Inc., 2nd edition 2020.
3	Fundamentals of Mathematical Statistics,S.C.Gupta and V.K.Kapoor, Chand Publishers,12th edition,2020.

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

CO	Course Outcomes	RBT Level	Level Indicator
CO1	Understand the basic concepts of statistics and probability	**Remember, Understand**	**L1, L2**
CO2	Apply techniques of statistics and probability to solve engineering problems	**Apply**	**L3**
CO3	Analyze engineering problems using statistics and probability	**Analyze**	**L4**
CO4	Develop mathematical solutions to various real time problems using MATLAB	**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
CO1													--	--
CO2	3												--	--
CO3		2											--	--
CO4			2		2				1	1			--	--

Weblinks and Video Lectures (e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2	https://avcce.digimat.in/nptel/courses/video/111107058/L05.html
3	https://archive.nptel.ac.in/courses/111/106/111106086/

Assessment Pattern (both CIE and SEE)

Applied Science Courses								
3 credits - Theory								
Assessment Method	**Component**	**Type of Assessments**	**Syllabus Coverage**	**Maximum Marks**	**Average**	**Reduced Marks**	**Minimum Passing Marks**	**Evaluation Details**
Total CIE Theory + Practical				**50**			**20**	
CIE	**Theory**	Internal Assessment Test (IAT) -I	Module – 1, 2& 3(half module)	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25 Marks
		Internal Assessment Test (IAT) -II	Module- 3(half module), 4& 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives	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		50				
	Total CIE Theory					**50**	20	Scale down Marks of IAT and CCA to 50

SEE		Theory exam	Entire theory syllabus including questions from labcomponent	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.				

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 of the IPCC shall be for CIE only. However, in SEE the questions from the Laboratory Component shall be included in the respective Modules only.

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).
Astudent 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.

Possible continuous and comprehensive assessment:

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, storytelling. The assessment of these techniques can be either based on Quiz or rubrics.
The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Continuous Internal Evaluation (CIE):

The CIE Marks for the theory component of the IC shall be **25 Marks** and for the laboratory component **25 Marks**.

CIE for the theory component of the IC
Internal Assessment test:

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

Two Tests each of **50 Marks** scaled down to **25 Marks**

- First test after 7th week of the semester (syllabus completion of 50%)
- Second test after 14th week of semester (syllabus completion of 100%)

The average score of three test is taken and scaled down to **25 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 **25 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 **25 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **50 Marks**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day. The **10 Marks** are for conducting the experiment and preparation of the laboratory record, the other **10 Marks shall be for the test** conducted at the end of the semester and **5 Marks** for conducting Open Ended Experiments.
- The CIE Marks awarded in the case of the practical component shall be based on the continuous evaluation of the laboratory report and the conduction. Each experiment report can be evaluated for 05 Marks conduction(Observation Book) and 5 Marks for Record Book. Marks of all experiments' write-ups and conduction are added and scaled to **10 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 **10 Marks.**
- Open Ended Experiments are conducted after the completion of regular Experiments/Programs for 20 Marks and scaled down to **5 Marks**
- Scaled-down Marks of write-up, evaluations and tests, will be added as CIE Marks for the laboratory component of IC/IPCC for **25 Marks**.
- The minimum Marks to be secured in CIE to appear for SEE shall be 10 (40% of maximum Marks) in the theory component and 10 (40% of maximum Marks) in the practical component.
- The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 05 questions is to be set from the practical component of IC/IPCC, the total Marks of all questions should not be more than 25 Marks.

The theory component of the IC shall be for both CIE and SEE.

Semester End Examination (SEE):

- Theory SEE will be conducted as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**
- 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.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 Marks. The student has to answer 5 full questions, selecting one full question from each module summing up to maximum score of 100 Marks. Marks **scored out of 100 shall proportionally be reduced to 50 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 two questions should be of same course outcome, program outcome and Blooms RBT level. Emphasis to be given for higher order RBT levels

CIE- Continuous Internal Evaluation (50 Marks)

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

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module-3	Module-3	Module-4	Module-5		
CO1	5	5	5		5	5	25	25%
CO2	10	10	5	5	10	10	50	50%
CO3	5	5		5	5	5	25	25%
CO4								
CO5								
CO6								
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	--

Understand	**5**
Apply	**35**
Analyse	**10**
Evaluate	**--**
Create	**--**

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module-3	Module-4	Module-5		
CO1	5	--	--	--	--	5	10%
CO2	5	5	10	5	10	35	70%
CO3	--	5	--	5	--	10	20%
CO4	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--
CO6	--	--	--	--	--	--	--
Total	10	10	10	10	10	50	100%

Course Contents and Lecture Schedule

Module No.	Topics	No. of Lectures
1	Introduction to Curve fitting	1
1	Curve fitting (Least squares method)	1
1	Fitting of a straight line	1
1	Fitting of a second-degree parabola	1
1	Fitting of curves of the form y=ab^x	1
1	Fitting of curves of the formy=ae^{bx}, y=ax^b	1
1	Correlation coefficient r, Regression lines	1
1	Rank Correlation	1
2	Introduction on basic probability theory	1
2	Discrete random variables and Continuous random variables	1
2	Probability mass and density functions	1
2	Mathematical expectation, Mean and variance	1
2	Binomialdistribution, Poissondistribution	1
2	Normaldistribution	1
2	Exponential distribution	1

2	Weibull and uniform distribution	**1**
3	Introduction to Sampling Theory, Sampling distribution	**1**
3	Standard error, testing of hypothesis	**1**
3	Central limit theorem	**1**
3	Levels of significance	**1**
3	Test of significance, Confidence limits	**1**
3	Student's 't' distribution, Problems	**1**
3	Chi-square distribution as atest of goodness of fit	**1**
3	F-Distribution, Problems	**1**
4	Introduction to ANOVA.	**1**
4	The ANOVA technique.	**1**
4	Explanation on ANOVA technique.	**1**
4	Basic principle of ANOVA.	**1**
4	Explanation on one-way ANOVA.	**1**
4	Problems on one-way ANOVA.	**1**
4	Two-way ANOVA and Problems	**1**
4	Latin-square Design and Problems	**1**
5	Introduction to time series data, Components of a time series	**1**
5	Decomposition of time series	**1**
5	Method of semi averages	**1**
5	Fitting a various mathematical curveand growth curves.	**1**
5	Introduction to stochastic process	**1**
5	Probability vectors	**1**
5	Stationary distribution of regular Markov chains	**1**
5	Markov chains	**1**
	Total	**40 Hrs**

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

IPCC Course–Integrated Professional Core Course

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

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

Integrated Professional Core Course (IPCC) - 4 Credit Course

Assessment Details (both CIE and SEE)

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

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

Internal Assessment Test (IAT):

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

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

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

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

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

Semester End Examination (SEE) for IPCC Theory

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

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

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

Continuous and Comprehensive Assessment (CCA):

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

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

Total score for CCA is **10 Marks**

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

Possible Continuous and Comprehensive Assessment (CCA):

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

4 Credits Courses – Integrated Professional Core Course (IPCC)

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

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

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

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

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**4**				
Course Title	:	**Analysis and Design of Algorithms**				
Course Code	:	**BAI402**				
Course Type (Theory/Practical/Integrated/Project)	:	**Integrated**				
Category	:	**IPCC**				
Stream	:	**AIML**		**CIE**	:	**50 Marks**
Teaching hours/ week (L:T:P:S)	:	**3:0:2:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 T + 20 P Hrs**		**SEE Duration**	:	**3 hours**
Credits	:	**04**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	**Understand** the methods of analyzing the algorithms and to analyze performance of algorithms.
2	**Apply** algorithm's efficiencies using asymptotic notations
3	**Analyze** problems using algorithm design methods such as the brute force method, greedy method, divide and conquer, decrease and conquer, transform and conquer, dynamic programming, backtracking and branch and bound
4	**Design** the appropriate data structure and algorithm design method for a specified application
5	**Develop** solutions for the given real-world data and introduce P and NP classes.

Teaching-Learning Process

Pedagogical Initiatives:

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

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

solutions.

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

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	Introduction: What is an Algorithm?, Algorithm Specification, Analysis Framework ,Performance Analysis: Space complexity, Time complexity . Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), and Little-oh notation (o), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples BRUTE FORCE APPROACHES: Selection Sort and Bubble Sort, Sequential Search Chapter 1 : 1.1,1.2 Chapter 2 : 2.1-2.5 Chapter 3 : 3.1 ,3.2	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
2	Divide and Conquer: General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum , Merge sort, Quick sort, Strassen's matrix multiplication. Decrease and Conquer Approach: Topological Sort Chapter 5 : 5.1- 5.5	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Problem Solving**	
3	**Greedy Method:** General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines. Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm. Single source shortest paths: Dijkstra's Algorithm. Optimal Tree problem: Huffman Trees and Codes . Transform and Conquer Approach: Heaps and Heap Sort . Chapter 4 : 4.1- 4.4 Chapter 9 : 9.1- 9.4	8

Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Problem Solving**	
4	Dynamic Programming: Transitive Closure:Warshall's Algorithm, All Pairs Shortest Paths:Floyd's Algorithm, Knapsack problem Bellman-Ford Algorithm , Travelling Sales Person problem Chapter 8 : 8.1- 8.4	**8**
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
5	Backtracking: General method , N-Queens problem, Sum of subsets problem Branch and Bound: Assignment Problem, Travelling Sales Person problem , 0/1 Knapsack problem NP-Complete and NP-Hard problems: Basic concepts, non-deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes. Approximation Algorithm-Vertex Cover, set cover and travelling salesman Chapter 12 : 12.1 – 12.3	**8**
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

List of Programs:

Sl. No.	Experiments/Programs	Cos
1	Sort a given set of n integer elements using Selection Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the brute force method works along with its time complexity analysis: worst case, average case and best case	**CO1**
2	Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort.	**CO2**

	Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.	
3	Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.	**CO2**
4	To solve Knapsack problem using Greedy method.	**CO2**
5	To find shortest paths to other vertices from a given vertex in a weighted connected graph, using Dijkstra's algorithm.	**CO3**
6	To find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program.	**CO3**
7	To find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.	**CO3**
8	Design and implement C++/Java Program to find a subset of a given set S = {Sl, S2,…,Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S = {1, 2, 5, 6, 8} and d= 9, there are two solutions {1, 2, 6} and {1, 8}. Display a suitable message, if the given problem instance doesn't have a solution.	**CO4**
Open ended Programs		
1	Solve 0/1 Knapsack problem using Dynamic Programming method.	**CO4**
2	Solve Travelling Sales Person problem using Dynamic programming.	**CO5**

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2009. Pearson.
2	Computer Algorithms/C++, Ellis Horowitz, SatrajSahni and Rajasekaran, 2nd Edition, 2014, Universities Press.
Reference Books	
1	Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI
2	Design and Analysis of Algorithms, S. Sridhar, Oxford

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Understand** the basic concepts of algorithms, asymptotic notations, and various design techniques	Understand	L1/L2
CO2	**Apply** the concepts of algorithms in problem solving	Apply	L3
CO3	**Analyze** the given scenario and use appropriate algorithm	Analyze	L4
CO4	**Evaluate** the efficiency of the algorithms used in problem solving	Evaluate	L5
CO5	**Design** and implement solution for a given problem component using Modern tools	Design	L6

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015
2	https://nptel.ac.in/courses/106/101/106101060/
3	http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms

CIE- Continuous Internal Evaluation (50 Marks)

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

CIE Course Assessment Plan

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

SEE- Semester End Examination (50 Marks)

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

SEE Course Plan

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**4**				
Course Title	:	**Database Management System**				
Course Code	:	**BAI403**				
Course Type (Theory/Practical/Integrated/Project)	:	**Integrated**				
Category	:	**IPCC**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:2:0**		**SEE**	:	**50**
Total Hours	:	**40 T + 20 P**		**SEE Duration**	:	**3hr**
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	Outline the various systematic database design approaches.
3	To Demonstrate the use of concurrency and transactions in database.
4	To Design and build database applications for real world problems
5	Demonstrate the working of different concepts of DBMS

Teaching-Learning Process

Pedagogical Initiatives:

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

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

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

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. 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, attributes, roles, and structural constraints, Weak entity types, ER diagrams, examples, Specialization and Generalization. Textbook 1: Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.10	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
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. SQL: SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL. Textbook 1: Ch4.1 to 4.5, 5.1 to 5.3, 6.1 to 6.5, 8.1; Textbook 2: 3.5	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
3	SQL: Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL. Database Application Development: Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Case study: The internet Bookshop. Internet Applications: The three-Tier application architecture, The presentation layer, The Middle Tier. Textbook 1: Ch7.1 to 7.4; Textbook 2: 6.1 to 6.6, 7.5 to 7.7.	8
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
	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	8

4	and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. Normalization Algorithms: Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational Designs, Further discussion of Multivalued dependencies and 4NF, Other dependencies and Normal Forms Textbook 1: Ch14.1 to 14.7, 15.1 to 15.6	
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
5	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. Concurrency Control in Databases: Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multi-version Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking. Introduction to Database Recovery Protocols: Recovery Concepts, NO-UNDO/REDO recovery based on Deferred update, Recovery techniques based on immediate update, Shadow paging, Database backup and recovery from catastrophic failures. Textbook 1: 20.1 to 20.6, 21.1 to 21.7, 22.1 to 22.4, 22.7	**8**
Pedagogy	**Chalk and talk, PPT, Discussion with real-time examples, Demonstration using modern tools**	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinkingandenables creative problemsolving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

List of Programs:

Sl. No.	Experiments/Programs	Cos
1	Create a table called Employee that contain attributes EMPNO, ENAME, JOB, MGR, SAL and execute the following. 1. Add a column commission with domain to the Employee table. 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.	**CO4**
2	Consider the schema for Movie Database: ACTOR(Act_id, Act_Name, Act_Gender)	**CO4**

	DIRECTOR(Dir_id, Dir_Name, Dir_Phone) MOVIES(Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id) MOVIE_CAST(Act_id, Mov_id, Role) RATING(Mov_id, Rev_Stars) Write SQL queries to 1. List the titles of all movies directed by 'Hitchcock'. 2. Find the movie names where one or more actors acted in two or more movies. 3. List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN operation). 4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title. 5. Update rating of all movies directed by 'Steven Spielberg' to 5.	
3	Consider the schema for of airline flight information: Flights (no: integer, from: string, to: string, distance: integer, Departs: time, arrives: time, price: real) Aircraft (aid: integer, aname: string, cruising range: integer) Certified (eid: integer, aid: integer) Employees (eid: integer, ename: string, salary: integer) Note that the Employees relation describes pilots and other kinds of employees as well; Every pilot is certified for some aircraft, and only pilots are certified to fly. Write SQL queries to 1.Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80, 000. 2. For each pilot who is certified for more than three aircrafts, find the eid and the maximum cruising range of the aircraft for which she or he is certified. 3. Find the names of pilots whose salary is less than the price of the cheapest route from Bengaluru to Frankfurt. 4. For all aircraft with cruising range over 1000 Kms. find the name of the aircraft and the average salary of all pilots certified for this aircraft. 5.Find the names of pilots certified for some Boeing aircraft. .	**CO4**
Mini Project		
	For any problem selected make sure that the application should have five or more tables indicative areas include; health care, salary management, office automation, etc.Triggers and assertions to be implemented in Mini Project.	
Open ended Programs		
1	Queries using aggregate functions(COUNT,AVG,MIN,MAX,SUM),Group by,Orderby. Employee(E_id, E_name, Age, Salary) 1. Create Employee table containing all Records E_id, E_name, Age, Salary. 2. Count number of employee names from employee table 3. Find the Maximum age from employee table. 4. Find the Minimum age from employee table. 5. Find salaries of employee in Ascending Order. 6. Find grouped salaries of employees.	**CO4**

2	Consider the following schema for a Library Database: BOOK(Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS(Book_id, Author_Name) PUBLISHER(Name, Address, Phone) BOOK_COPIES(Book_id, Branch_id, No-of_Copies) BOOK_LENDING(Book_id, Branch_id, Card_No, Date_Out, Due_Date) LIBRARY_BRANCH(Branch_id, Branch_Name, Address) Write SQL queries to 1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc. 2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017. 3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation. 4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query. 5. Create a view of all books and its number of copies that are currently available in the Library	**CO4**

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Fundamentals of Database Systems, RamezElmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2	Database management systems, Rama krishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill.
Reference Books	
1	Silberschatz Korth and Sudharshan, Database System Concepts, 6th Edition, Mc-Graw Hill, 2013.
2	Coronel, Morris, and Rob, Database Principles Fundamentals of Design, Implementation and Management, Cengage Learning 2012.

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 basic elements of a relational database management system	**Understand**	**L1/L2**
CO2	Apply various Structured Query Language (SQL) statements for database manipulation	**Apply**	**L3**
CO3	Analyse various normalization forms for the given application	**Analyse**	**L4**

CO4	Develop database applications for the given real-world problem	**Design**	**L5**
CO5	Demonstrate database applications using front-end tools and back-end DBMS.	**Evaluate**	**L6**

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=6Iu45VZGQDk&list=PLBInK6fEyqRi_CUQ-FXxgzKQ1dwr_ZJWZ
2	https://www.geeksforgeeks.org/sql-ddl-dql-dml-dcl-tcl-commands/

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

CIE Course Assessment Plan

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

SEE- Semester End Examination (50 Marks)

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

SEE Course Plan

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

PROFESSIONAL CORE COURSE (PCC)

PCC Course - Professional Core Course

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

3 Credit Course – Professional Core Course (PCC)

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

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

assessment.

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

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

Semester-End Examination:

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

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

Continuous and Comprehensive Assessment (CCA):

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

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

Total score for CCA is **10 Marks**

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

Possible Continuous and Comprehensive Assessment (CCA):

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

Professional Core Course (PCC) – 3 Credit course – Theory

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

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**4**				
Course Title	:	**Introduction to Artificial Intelligence**				
Course Code	:	**BAI404**				
Course Type (Theory/Practical/Integrated/Project)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40 hours Theory**		**SEE Duration**	:	**3 Hrs**
Credits	:	**03**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the Foundations of AI Methods
2	Apply Basic AI Principles in Problem Solving
3	Analyze AI Algorithms for Problem Solving
4	Evaluate and Implement Basic AI Models
5	Design Intelligent Systems for Computational Problem-Solving

Teaching-Learning Process

Pedagogical Initiatives:

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

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

- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	. **Introduction:** What is AI? Foundations and History of AI **Intelligent Agents:** Agents and environment, Concept of Rationality, The nature of environment, The structure of agents. **Textbook 1 :** Chapter 1 - 1.1,1.2,1.3 Chapter 2 – 2.1 ,2.2,2.3,2.4	8
Pedagogy	**Problem Solving, Demonstration**	
2	. **Problem-solving**: Problem-solving agents, Example problems, Searching for Solutions Uninformed Search Strategies: Breadth First search, Depth First Search, Iterative deepening depth first search. **Textbook 1 :** Chapter 3 – 3.1,3.2,3.3,3.4 **Programming Component:** • Implement and Demonstrate Depth First Search Algorithm on Water Jug Problem • Solve 8-Queens Problem with suitable assumptions	8
Pedagogy	**Problem Solving, Demonstration**	
3	**Informed Search Strategies**: Heuristic functions, Greedy best first search, A*search. Heuristic Functions **Logical Agents**: Knowledge–based agents, The Wumpus world, Logic, Propositional logic **Textbook 1 :** Chapter 3 – 3.5,3.6 Chapter 7 - 7.1 ,7.2,7.3,7.4 **Programming Component:** 1. Implement and Demonstrate Best First Search Algorithm on Missionaries-Cannibals Problems using Python 2. Implement A* Search algorithm 3. Implement AO* Search Algorithm 4. Implementation of TSP using heuristic approach	8
Pedagogy	**Problem Solving, Demonstration**	
4	**First Order Logic**: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic **Inference in First Order Logic** :Propositional Versus First Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution. **Textbook 1 :** Chapter 8 – 8.1 ,8.2, 8.3 Chapter 9 - 9.1,9.2,9.3,9.4,9.5 **Programming Component:**	8

	1. Implementation of the problem solving strategies: either using Forward Chaining or Backward Chaining 2. Implement resolution principle on FOPL related problems 3. Implement Tic-Tac-Toe game using Python	
Pedagogy	**Problem Solving, Demonstration**	
5	**Uncertain Knowledge and Reasoning: Quantifying Uncertainty**: Acting under Uncertainty, Basic Probability Notation, Inference using Full Joint Distributions, Independence, Baye's Rule and its use. Wumpus World Revisited. **Textbook 1 :** Chapter 13 - 13-1,13.2,13.3,13.4,13.5,13.6 **Contemporary issues:** Guest lecture by Industry Experts or R&D organization **Programming Component:** 1. Build a bot which provides all the information related to text in search box	**8**
Pedagogy	**Problem Solving, Demonstration**	
	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	Stuart J. Russell and Peter Norvig , Artificial Intelligence, 3rd Edition, Pearson,2015
Reference Books	
1	George F Lugar, Artificial Intelligence Structure and strategies for complex, Pearson Education, 5th Edition, 2011
2	Nils J. Nilsson, Principles of Artificial Intelligence, Elsevier, 1980
3	Saroj Kaushik, Artificial Intelligence, Cengage learning, 2014

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the Artificial Intelligence methods and describe their foundations	Remember/ Understand	L1/L2
CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation and learning	Apply	L3
CO3	Analyze the AI algorithm to obtain insights to solve a given problem	Analyse	L4
CO4	Design intelligent systems by assembling solutions to solve computational	Create	L6
CO5	Evaluate and implement the basic AI models for a given problem	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.kdnuggets.com/2019/11/10-free-must-read-books-ai.html
2	https://www.udacity.com/course/knowledge-based-ai-cognitive-systems--ud409
3	https://nptel.ac.in/courses/106/105/106105077/

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	20	--	--	--
Understand	20	20	--	--
Apply	10	20	--	--
Analyse	--	10	--	--
Evaluate	--	--	50	--
Create	--	--	--	50

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	4	4	--	--	4	4	16	32%
CO2	6	6	--	--	4	4	20	40%
CO3	--	--	5	5	2	2	14	28%
CO4	--	--	--	--	--	--	--	0%
CO5	--	--	--	--	--	--	--	0%
Total	10	10	5	5	10	10	50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	10
Understand	10
Apply	20
Analyse	20
Evaluate	20
Create	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	20	20%
CO2	10	10	--	--	--	--	20	20%
CO3	--	10	5	5	--	--	20	20%
CO4	--	--	5	5	10	--	20	20%
CO5	--	--	--	--	10	10	20	20%
Total	20	20	10	10	20	20	100	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**4**				
Course Title	:	**Web Programming**				
Course Code	:	**BAI405**				
Course Type (Theory/Practical/Integrated/Project)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40 T**		**SEE Duration**	:	**3 Hrs**
Credits	:	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To use the syntax and semantics of HTML and XHTML
2	To develop different parts of a web page
3	To understand how CSS can enhance the design of a webpage.
4	To create and apply CSS styling to a webpage
5	To get familiarity with the JavaScript language and understand Document Object Model handling of Java Script

Teaching-Learning Process

Pedagogical Initiatives:

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

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills

such as evaluating, generalizing, and analyzing information rather than simply recalling it.

- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	DTDs: The Specifications Up Close, (X)HTML Document Structure, Browsers and (X)HTML, The Rules and Major Themes of (X)HTML, The Future of Markup—Two Paths? HTML5: Hello HTML5, Loose Syntax Returns, XHTML5, HTML5: Embracing the Reality of Web Markup, Presentational Markup Removed and Redefined, HTML5 Document Structure Changes **TextBook1: Chapter 1,2** **Practical Based Learning** 1) Draw a square using HTML5 SVG , fill the square with any color and make 10px Red stroke width (Any Measurements) Write the following mathematical expression by using HTML5 MathML. d=x2 -y2 Redirecting current page to another page after 5 seconds using HTML5 meta tag	8
Pedagogy	**Demonstration**	
2	**Cascading Style Sheets (CSS) Introduction**, CSS Overview , CSS Rules, Example with Type Selectors and the Universal Selector, CSS Syntax and Style, Class Selectors, ID Selectors, span and div Elements, Cascading, style Attribute, style Container, External CSS Files, CSS Properties, Color Properties, RGB Values for Color, Opacity Values for Color, HSL and HSLA Values for Color, Font Properties, line-height Property, Text Properties, Border Properties, Element Box, padding Property, margin Property , Case 2 Study: Description of a Small City's Core Area. **TextBook2: Chapter 3** **Practical Based Learning:** Create a web page using HTML and CSS with tabular layout	8
Pedagogy	**Demonstration**	

3	**Tables and CSS, Links and Images Table Elements**, Formatting a Data Table: Borders, Alignment, and Padding, CSS Structural PseudoClass Selectors, thead and tbody Elements, Cell Spanning, Web Accessibility, CSS display Property with Table Values, a Element, Relative URLs, Navigation Within a Web Page, CSS for Links, Bitmap Image Formats: GIF, JPEG, PNG, img Element, Responsive Images, Positioning Images, Shortcut Icon, iframe Element. **Introduction to JavaScript: Functions, DOM, Forms, and Event Handlers Introduction,** Hello World Web Page, Buttons, Functions, Variables, Identifiers, Assignment Statements and Objects, Document Object Model, Forms and How They're Processed: Client-Side Versus Server-Side, form Element, Controls, Text Control, accessing a Form's Control Values, reset and focus Methods **TextBook2: 5.2 to 5.8, 6.2, 6.3, 6.6., 6.7, 6.9, 6.10, 6.12, 7.2 to 7.4** **TextBook2: 8.2 to 8,13, 8.15, 8.16** **Practical Based Learning:** a. Create Mathematical calculator interface with HTML and CSS b. Write a Java Script program that on clicking a button, displays scrolling text which moves from left to right with a small delay	**8**
Pedagogy	**Demonstration**	
4	**Additional JavaScript Basics: window Object, if Statement, Strings, Numbers, and Input Validation:**Introduction, Window object, alert and confirm methods,if statement,Game Night Web Page,prompt Method,Game Night Web Page Revisited,if Statement: else and else if Clauses,Strings,Word Ordering Web Page,More String Details,Arithmetic Operators,Math Object Methods,Parsing Numbers: parseInt, parseFloat,Water Balloons Web Page,Constraint Validation for Form Controls,Constraint Validation Using the Number Control's Attributes,Constraint Validation Using CSS Pseudo-Classes,Comparison Operators and Logical Operators,JavaScript for the Improved Water Balloons Web Page. Case Study: Dynamic Positioning and Collector Performance Web Page. **Loops, Additional Controls, Manipulating CSS with JavaScript:** Introduction,while Loop,External JavaScript Files,Compound Interest Web Page,do Loop,Radio Buttons,Checkboxes,Job Skills Web Page,for Loop **Text Book 2: 9.1.to 9.21 & 10.1 to 10.9**	**8**

	Practical Based Learning a. JavaScript Program to Print all Armstrong Numbers Between Two Intervals. b. JavaScript Program to Print All Prime Numbers in an Interval	
Pedagogy	**Demonstration**	
5	Fundamentals of React: Hello React, Requirements, Setting up a React Project, Meet the React Component, React JSX, Lists in React, **Meet another React Component, React Component Instantiation, React DOM**, React Component, Definition(Advanced), **Handler Function in JSX**, React Props, React State, Callback **Handlers in JSX**, **Lifting State in React, React Controlled Components , Props Handling(Advanced)** **Text Book: 3** 1) .	**8**
Pedagogy	**Demonstration**	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinkingandenables creative problemsolving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	HTML & CSS: The Complete Reference Thomas A. Powell, Fifth Edition, Tata McGraw Hill
2	WEB PROGRAMMING with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, First Edition
3	Brad Dayley, Brendan Dayley, Caleb Dayley, "Node.js, Mongo DB and Angular JS Web Development", 2017, 2nd Edition, Addison Wesley - Oreilly, USA
4	Vasan Subramanian, "Pro MERN Stack: Full stack web app development", 2019, 2nd Edition, APress, Oreilly
Reference Books	
1	Jessica Minnick, Responsive, "Web Design with HTML 5 & CSS, Cengage Learning", 2020, 9th Edition.
2	Ethan Brown, "Web Development with Node and Express", 2019, 2nd Edition, O'Reilly Media Inc.
3	Frank Zammetti, "Modern Full-Stack Development: Type Script, React, Node. JS", 2020, 1st Edition, Apress

4	Harvey M Deitel, Paul J Deitel and Tem R Nieto, Internet and World Wide Web How to Program, Pearson, 6 th Edition, 2020. 2
5	Rebah, H.B., Boukthir, H. and Chedebois, A., Website Design and Development with HTML5 and CSS3. John Wiley & Sons, 2022.
6	Minnick, C. Beginning ReactJS foundations building user interfaces with ReactJS: An Approachable Guide, OReillly, 2022.

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 historical context and justification for HTML over XHTML	**Remember/Understand**	**L1/L2**
CO2	Apply various semantic markup tags and Develop HTML5 documents	**Apply**	**L3**
CO3	Analyse various attributes, values and types of CSS	**Analyse**	**L4**
CO4	Design using various core constructs and event handling mechanisms of JavaScript.	**Design**	**L5**
CO5	Design React app using different components and hooks and routing of ReactJS.	**Design**	**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	3	--	--	--	2	--	--	--	--	--	--	2	--	--	2
CO3	--	3	--	--	2	--	--	--	--	--	--	2	--	--	2
CO4	3	--	--	--	2	--	--	--	--	--	--	2	--	--	2
CO5	--	--	3	--	2	--	--	--	2	--	2	--	--	--	2

Weblinks and Video Lectures (e-Resources)	
1	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013301317537767424791 2_shared/overview
2	https://infyspringboard.onwingspan.com/web/en/app/search/learning?lang=en&q=dynamodb
3	https://www.coursera.org/learn/web-development

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	20	--	--	--
Understand	20	20	--	--
Apply	10	20	--	--
Analyse	--	10	--	--
Evaluate	--	--	50	50
Create	--	--	--	--

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	4	3	3				10	20%
CO2	6	6	3				15	30%
CO3			4	4	4		12	24%
CO4				3	2	2	07	14%
CO5				2	2	2	06	12%
Total	10	9	3		8	4	50	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks

	(90% Theory+10% Practical Questions)
Remember	12
Understand	13
Apply	15
Analyse	--
Evaluate	--
Create	10

SEE Course Plan

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

PROJECT BASED LEARNING (PBL)

PBL- Project Based Learning

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

2 Credit Course – Project (PBL)	
	Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum Marks (20 Marks out of 50). The minimum passing mark for the SEE is 35% of the maximum Marks (18 Marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 Marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together. **Continuous Internal Evaluation (CIE):** The CIE Marks for the internal assessment test shall be 50 **Marks**. **Internal Assessment test:** Continuous Internal Evaluation (CIE): CIE marks for the project are 50 Marks. • Students must complete a certification from Infosys Springboard. This will be evaluated for 25 marks. • Project weekly assessment in phase – 1 and phase – 2 will be evaluated for 50 marks which will be scaled down to 25 marks. • Each project will be evaluated weekly for 50 marks and the rubrics for the evaluation includes project understanding, technical competence, innovation, problem solving and project demonstration. • The marks scored in project weekly assessment shall be scaled down to 25 marks. • The Sum of final project weekly assessment and marks of the Infosys Springboard certification is the total CIE marks scored by the student **Semester End Examination (SEE):** • SEE will be evaluated for 100 marks and will be scaled down to 50 marks. • Write-up of the project will be evaluated for 10 marks. • Project demonstration and evaluation will be evaluated for 50 marks. • Project report will be evaluated for 25 marks. • Viva-voce will carry 15 marks. • The marks scored shall be scaled down to 50 marks

<table>
<tr><td></td><td colspan="2">CIE</td><td colspan="2">SEE</td></tr>
<tr><td>Certfication</td><td>Infosys Springboard Certification</td><td>25 Marks</td><td colspan="2" rowspan="2"></td></tr>
<tr><td colspan="3">Project Weekly Assessment</td></tr>
<tr><td rowspan="5">Project</td><td>Project Understanding</td><td>05 Marks</td><td>Writeup</td><td>10 Marks</td></tr>
<tr><td>Technical Competence</td><td>10 Marks</td><td>Presentation& Demonstration</td><td>50 Marks</td></tr>
<tr><td>Innovation</td><td>10 Marks</td><td>Project Report</td><td>25 Marks</td></tr>
<tr><td>Problem Solving</td><td>15 Marks</td><td>Viva-Voce</td><td>15 Marks</td></tr>
<tr><td>Project Demonstration</td><td>10 Marks</td><td>Total</td><td>100 Marks</td></tr>
<tr><td colspan="3">Project weekly assessment 50 Marks will be reduced to 25 Marks</td><td colspan="2"></td></tr>
<tr><td colspan="2">Total CIE (Certification + Project Weekly Assessment)</td><td>50 Marks</td><td colspan="2">Total SEE : 100 Marks Reduced to 50 Marks</td></tr>
</table>

16. 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.

17. 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

18. Purpose

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

19. 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.

20. 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 endeavours.
- Helps students to become technologically literate
- Establishes connections to life outside the classroom, addressing real-world concerns, and developing real-world skills
- Skills learned through PBL are those desired by today's employers.

21. 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.

22. Process

- Project batches will be formed after the commencement of 3rdsemester.
- The Students Batch Comprising of 4 members in a batch should be formed by the Project Based Learning co-ordinator.

- Each Semester consists of 16 Weeks of Project based Learning.
- The Level of the Projects to be identified.

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

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

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

7.1 Two phases for Assessment

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:

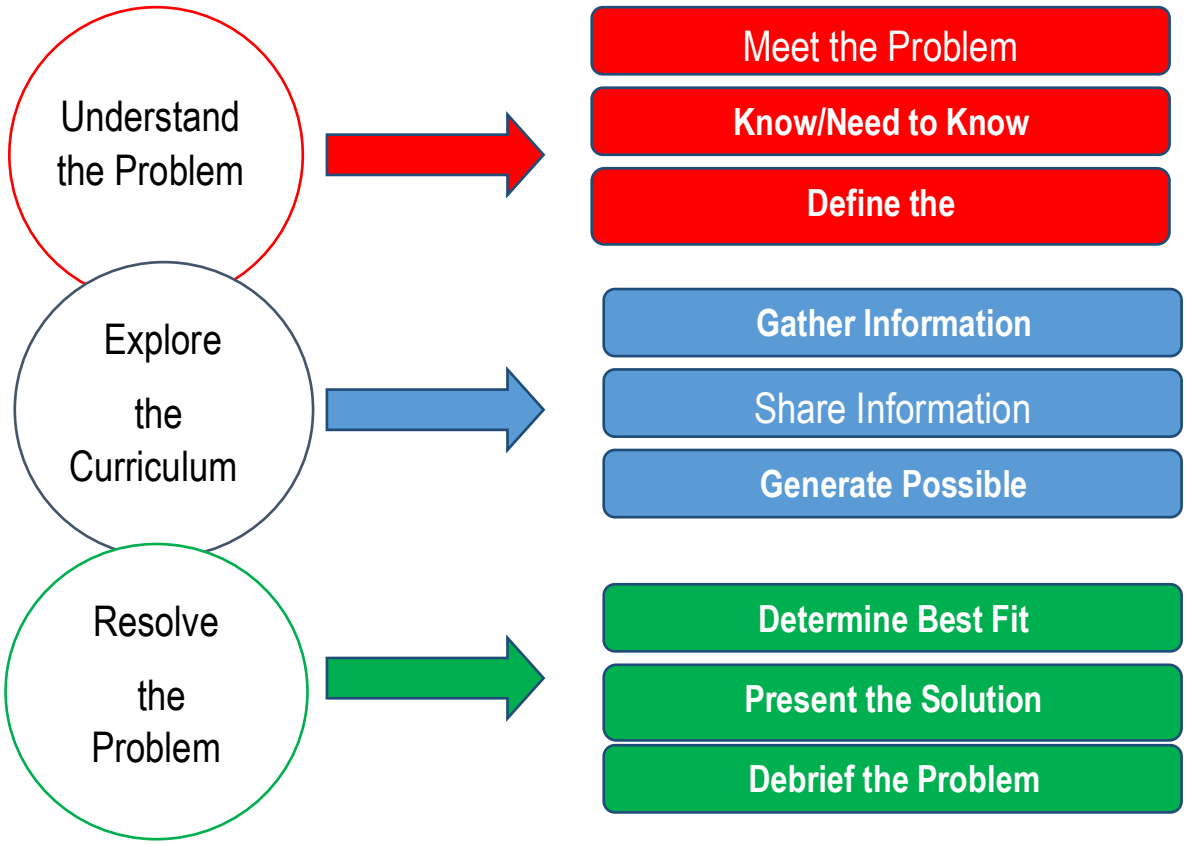
1. Phase 2 is for 6 Weeks

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

The marks distribution for PBL Work:

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

23. PBL Teaching and Learning Template



24. 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.

25. Obstacles/Gaps

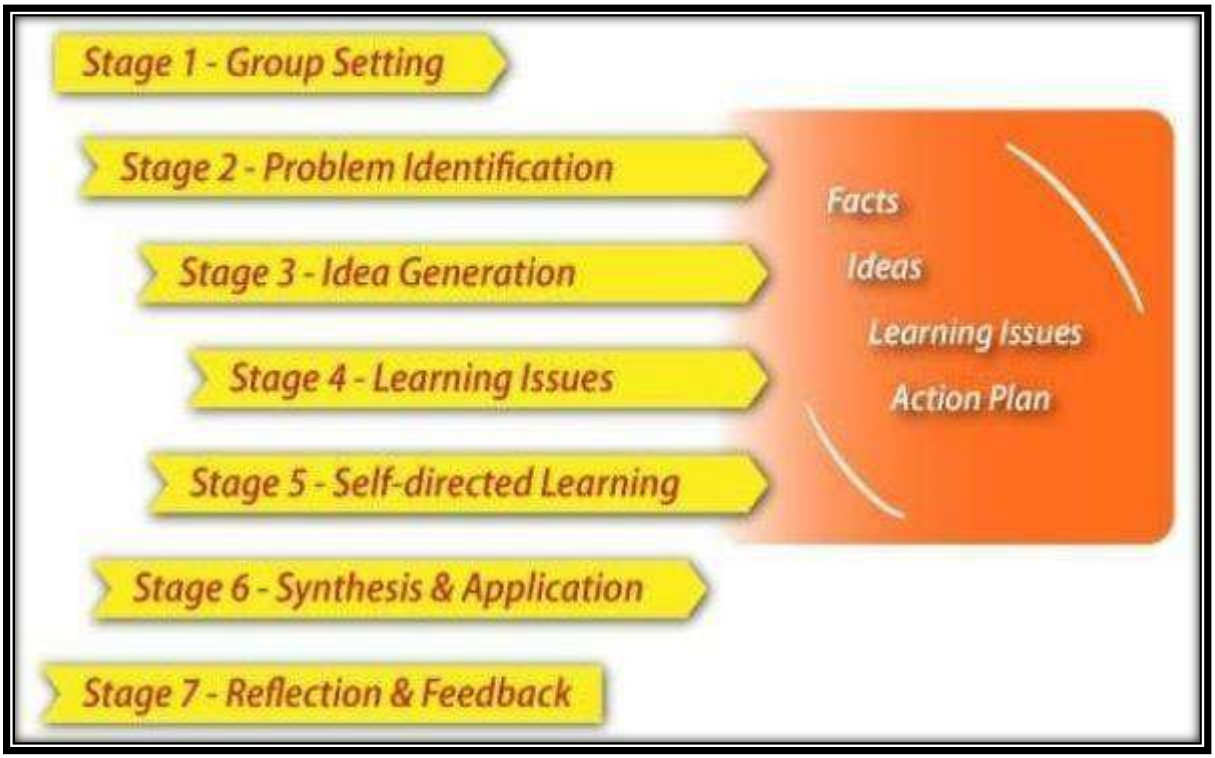
- Lack of student's interest

- Lack of assessment
- Lack of Basic knowledge
- Lack of consistence attendance and monitoring.
- Lack of abundant time allotment and time management

26. 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.

27. Block diagram of PBL



28. 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.

29. PBL – Guidelines

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

14.1 Main phases of the project

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

14.2 Final Presentation Structure

10. Title of the project & Batch Information
11. Agenda /Topics
12. Problem Statement / Project Definition
13. Background / Literature Review
14. Methodology
15. Analysis and Design
16. Implementation
17. Testing
18. Conclusion and Scope for Future Works

14.3 Project Based Learning Report Structure

17. Cover Page
18. Certificate
19. Declaration
20. Acknowledgement
21. Table of Contents
22. List of Tables
23. List of Figures
24. Introduction
25. Background / Literature Review
26. Methodology /Solution
27. Analysis and Design
28. Implementation
29. Results
30. Conclusion and Future Works
31. Bibliography /References
32. Appendices

30. Guidelines to prepare the Project report

- Project reports should be typed neatly only on one side of the paper with 1.5 or double line spacing on a A4 size bond paper (210 x 297mm).
- The margins should be: Left – 1.25", Right – 1", Top and Bottom –0.75".
- The total number of reports to be 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.
- Anabstract(synopsis)notexceeding100words,indicatingsalientfeaturesofthework.

31. Outcome of the project

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

Project-Based Learning Rubric

Score Levels	Content	Conventions	Organization	Presentation
5	▪ Is well thought out and supports the solution to the challenge or question ▪ Reflects application of critical thinking ▪ Has clear goal that is related to the topic ▪ Is pulled from a variety of sources ▪ Is accurate	▪ No spelling, grammatical, or punctuation errors ▪ High-level use of vocabulary and word choice	▪ Information is clearly focused in an organized and thoughtful manner. ▪ Information is constructed in a logical pattern to support the solution.	▪ Multimedia is used to clarify and illustrate the main points. ▪ Format enhances the content. ▪ Presentation captures audience attention. ▪ Presentation is organized and well laid out.
4	▪ Is well thought out and supports the solution ▪ Has application of critical thinking that is apparent ▪ Has clear goal that is related to the topic ▪ Is pulled from several sources ▪ Is accurate	▪ Few (1 to 3) spelling, grammatical, or punctuation errors ▪ Good use of vocabulary and word choice	▪ Information supports the solution to the challenge or question.	▪ Multimedia is used to illustrate the main points. ▪ Format is appropriate for the content. ▪ Presentation captures audience attention. ▪ Presentation is well organized.
3	▪ Supports the solution ▪ Has application of critical thinking that is apparent ▪ Has no clear goal ▪ Is pulled from a limited number of sources	▪ Minimal (3 to 5) spelling, grammatical, or punctuation errors ▪ Low-level use of vocabulary and word choice	▪ Project has a focus but might stray from it at times. ▪ Information appears to have a pattern, but the pattern is not consistently	▪ Multimedia loosely illustrates the main points. ▪ Format does not suit the content. ▪ Presentation does not capture audience attention.

2	▪ Provides inconsistent information for solution ▪ Has no apparent application of critical thinking ▪ Has no clear goal ▪ Is pulled from few sources ▪ Has significant factual errors, misconceptions, or misinterpretations	▪ More than 5 spelling, grammatical, or punctuation errors ▪ Poor use of vocabulary and word choice	▪ Content is unfocused and haphazard. ▪ Information does not support the solution to the challenge or question. ▪ Information has no apparent pattern.	▪ Presentation appears sloppy and/or unfinished. ▪ Multimedia is overused or underused. ▪ Format does not enhance e content. ▪ Presentation has no clear organization.

Subject Identified for Project Based Learning

Semester	4th
Subject Identified for PBL	**Engineering AI Solutions: Integrating Prompts and Language Models**
Prerequisite	Foundations of Machine Learning, Introduction to Natural Language Processing (NLP), Programming Skills (Python), Basic Software Engineering Concepts
Justification for the selected subject	The rapid evolution of Large Language Models (LLMs) such as GPT, Claude, and LLaMA has fundamentally reshaped how AI systems are developed and deployed. These models are increasingly being integrated into products across sectors like healthcare, education, business automation, creative industries, and software engineering. However, the true potential of LLMs lies not only in their raw capabilities but in the engineering of effective prompts and system integration strategies. This course addresses a crucial emerging skill set that bridges AI, NLP, and software engineering.
List of possible projects	1. Context-Aware Chatbot for University Helpdesk 2. Resume Analyzer and Job Matching Assistant 3. Legal Document Summarizer 4. Mental Health Support Bot 5. AI Tutor for Competitive Exam Prep 6. Automated Email Drafting Tool 7. Interactive Code Explainer 8. News Bias Detection and Rewriting 9.Smart Recipe Generator

Signature of the Guide **Signature of HOD**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**4**				
Course Title	:	**Engineering AI Solutions: Integrating Prompts and Language Models**				
Course Code	:	**BAI406**				
Course Type (Theory/Practical/Integrated/Project)	:	**Project**				
Category	:	**PBL**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**0:2:0:2**		**SEE**	:	**50**
Total Hours	:	**24 hours – 10 Theory + 14 Project**		**SEE Duration**	:	**3 Hrs.**
Credits	:	**2**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the principles and importance of data visualization.
2	Learn to use python libraries for creating various types of visualizations.
3	Gain proficiency in creating and customizing plots and charts.
4	Develop skills to visualize complex datasets and communicate insights effectively.
5	Apply data visualization techniques to real worlds projects.

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)

r VTU) **(Effective from the Academic Year 2024-25)**

COURSE CURRICULUM

Module No.	Topics	Hours
1	Introduction to Generative AI and LLMs What is GenAI? The role of LLMs in GenAI Key types of LLMs (e.g., GPT, PaLM, Gemini) How LLMs learn and generate text LLM Use Cases and Applications	2
2	Real-world examples of LLMs in various industries LLMs for content creation, customer service, and more Discussion: Identifying opportunities for LLMs in your own field LLM Limitations and Ethical Considerations Potential biases in LLM outputs Challenges with LLM reliability and accuracy Ethical implications of using LLMs	2
3	Introduction to Prompt Engineering What is prompt engineering? The importance of clear and specific prompts Understanding prompt tuning and iterative refinement Types of prompts (zero-shot, few-shot) Prompt Engineering Techniques and Best Practices Zero-shot prompting Few-shot prompting Chain-of-thought prompting Other prompt engineering techniques (e.g., role-playing, example-based)	2
4	Hands-on Prompt Engineering Exercises Real-world scenarios and prompts Hands-on practice with LLM tools Refining prompts based on feedback and iterative experimentation Advanced Prompt Engineering Techniques Using LLMs for more complex tasks (e.g., code generation, translation) Fine-tuning LLMs for specific tasks Utilizing advanced prompt engineering techniques for better results	2
5	Learn how to use LLMs via APIs	2

	- Learn how to use prompt engineering to tune the LLM response - Use cases will be provided to students in groups as mini projects to evaluate the LLM response using Prompt Engineering.	
Pedagogy	**ICT Tools and Demonstration**	
	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	

Open ended Programs		
1	Design and implement a web-based or command-line tool where users can experiment with different prompt patterns for a chosen NLP task using an LLM API.	**CO4**
2	Develop a domain-specific conversational AI system using prompt engineering and LLMs. Integrate validation logic to handle potential inaccuracies or ethical risks.	**CO4**
3	Create a feedback tool that uses LLMs to evaluate the coherence, grammar, and tone of short essays or responses. Allow prompt tuning to adapt feedback style.	**CO5**
4	Design a prompt-based system or use post-processing logic to detect ethically problematic content from LLMs. Allow customization based on application context.	**CO5**
5	Build a terminal-based or web-based interface where users input tasks in natural language and receive code suggestions. Incorporate prompt variations for better accuracy.	**CO4**
6	Use an LLM to generate weekly study plans based on syllabus topics and user input. Add prompt templates for different study styles (e.g., revision-heavy, practice-focused).	**CO4**
7	Design a resume advisor that takes a resume (text or PDF) and uses an LLM to suggest improvements in tone, structure, and skills alignment for a chosen job role.	**CO4**
8	Build a story generation app using prompt tuning to control tone (e.g., dark, humorous, inspiring). Allow users to input constraints like plot twist or ending style.	**CO4**
9	Use LLMs to summarize complex documents and rephrase them in user-friendly language. Include prompts to adapt summaries for different reading levels (e.g., 6th grade, college).	**CO4**
10	Develop an assistant that takes an image and a user question, and uses a vision-language model or prompt chaining to generate intelligent answers.	**CO5**
11	Design a system that, based on task input, recommends a few optimized prompts and explains their expected effect.	**CO4**
12	Develop a virtual tutor that adjusts explanations and tone based on student responses. Include prompt logic for "explain like I'm 5" vs. advanced levels.	**CO5**

Text Books

Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	Natural Language Processing with Transformers: Building Language Applications with Hugging Face Authors: Lewis Tunstall, Leandro von Werra, Thomas Wolf Publisher: O'Reilly Media, 2022 ISBN: 978-1098103246 Link: https://www.oreilly.com/library/view/natural-language-processing/9781098103239/
2	Designing Intelligent Systems: Concepts, Techniques, and Applications of GPT and Prompt Engineering Authors: Rajeev Alur, Shubham Goyal (or any current alternative – fictional or pending release) Note: If not available, use the below substitute. Alternate: Deep Learning for NLP and Speech Recognition, Author: Uday Kamath, John Liu, James Whitaker, Publisher: Springer, 2019, ISBN: 978-3030183510 Link: https://link.springer.com/book/10.1007/978-3-030-18352-7.
Reference Books	
1	Deep Learning Authors: Ian Goodfellow, Yoshua Bengio, and Aaron Courville** Publisher: MIT Press, 2016, ISBN: 978-0262035613, Link: https://www.deeplearningbook.org/
2	Speech and Language Processing (3rd Edition, Draft) Authors: Daniel Jurafsky and James H. Martin**, Publisher: Prentice Hall (Final Ed. upcoming), Draft Link: https://web.stanford.edu/~jurafsky/slp3/

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Explain the architecture and functioning of transformer-based LLMs	**Remember/Understand**	**L1/L2**
CO2	Apply LLM capabilities to build and integrate intelligent components into real-world software systems	**Apply**	**L3**
CO3	Analyze and mitigate ethical and operational risks in LLM deployments end to end solutions	**Analyze**	**L4**
CO4	Evaluate the performance and reliability of prompt-engineered solutions	**Evaluate**	**L5**
CO5	Design effective prompts to perform specific NLP tasks	**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	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	--	--	--	--	2	2	2	--	2	2	--	2
CO3	--	3	--	--	2	--	--	--	--	--	--	--	--	--	2
CO4	--	--	3	--	3	---	--	3	3	3	--	3	3	2	2
CO5	--	--	--	3	3	--	--	3	3	3	--	3	3	3	3

	Weblinks and Video Lectures (e-Resources)
1	**1. Transformer Architecture & LLM Foundations** • **The Illustrated Transformer – Jay Alammar** https://jalammar.github.io/illustrated-transformer/ *(Visual guide to how transformers and attention work)* • **Hugging Face NLP Course (Chapters 1–2)** https://huggingface.co/learn/nlp-course/chapter1 *(Practical introduction to LLMs and transformers)* **2. Prompt Engineering Techniques** • **OpenAI Prompt Engineering Guide** https://platform.openai.com/docs/guides/gpt-best-practices *(Official guide on writing effective prompts)* • **Prompt Engineering Guide (GitHub)** https://github.com/dair-ai/Prompt-Engineering-Guide *(Comprehensive resource with patterns, case studies, and papers)* **3. Building and Integrating AI Solutions** • **OpenAI API Documentation** https://platform.openai.com/docs *(Instructions to use GPT models in applications)* • **LangChain Documentation** https://docs.langchain.com/ *(Framework for building LLM-based tools with memory, agents, etc.)* **4. Evaluation and Optimization** • **HELM: Holistic Evaluation of Language Models – Stanford** https://crfm.stanford.edu/helm/latest/ *(Benchmark suite for evaluating LLMs across tasks and metrics)* • **Papers with Code – Text Generation Evaluation** https://paperswithcode.com/task/text-generation *(Common metrics: BLEU, ROUGE, METEOR, etc.)* **5. Ethics and Responsible AI** • **Microsoft Responsible AI Resources** https://www.microsoft.com/en-us/ai/responsible-ai-resources *(Frameworks, case studies, and principles)* • **OECD AI Principles** https://oecd.ai/en/ai-principles *(International guidelines for trustworthy AI)*

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

Project Based Learning - Batch

From, **Date:**

Name: & USN:

Name: & USN:

Name: & USN:

Name: & USN:

Semester:

Respected Sir/Madam,

Sub: Regarding PBL Batch

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

Thanking you, Yours faithfully

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

Signature of the Guide

Name of the Guide Designation

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

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

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

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Project Based Learning – Continuous Evaluation

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

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

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Project Based Learning –Review

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

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

Project Based Learning Outcomes

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

ABILITY ENHANCEMENT COURSE

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)

Dayananda Sagar Academy of Technology & Management

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ABILITY ENHAMCEMENT COURSE

EXPERIENTIAL LEARNING

Semester	**:**	**4**				
Course Title	**:**	**Mongo DB**				
Course Code	**:**	**BAI407**				
Course Type (Theory/Practical/Integrated/Project)	**:**	**Practical- Experiential Learning**				
Category	**:**	**AEC**				
Stream	**:**	**AIML**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**0:0:2:0**		**SEE**	**:**	**50**
Total Hours	**:**	**15 Hrs.**		**SEE Duration**	**:**	**3 Hrs**
Credits	**:**	**1**				

5. (a) Define Objectives

Identify Goals: Determine what skills and knowledge you want students to acquire through Experiential Learning.	
Learning Goal (LG)-1	Understand the fundamentals of NoSQL databases and differentiate them from traditional relational databases and perform CRUD (Create, Read, Update, Delete) operations using MongoDB.
Learning Goal (LG) -2	To apply the indexing, aggregation, and other advanced querying techniques in MongoDB.
Learning Goal (LG) -3	To develop problem-solving skills by working on real-world database management scenarios.
Learning Goal (LG)-4	To design and implement MongoDB schemas for various applications.
Learning Goal (LG)-5	To integrate MongoDB with programming languages and frameworks.

(b) Course Outcomes

Identify Goals: Determine what skills and knowledge you want students to acquire through Experiential Learning.	
Course Outcomes (CO)-1	To perform CRUD (Create, Read, Update, Delete) operations using MongoDB.
Course Outcomes (CO)-2	Apply the use of Indexing, Aggregation and other advanced querying techniques in MongoDB
Course Outcomes (CO)-3	Develop problem-solving skills by working on real-world database management scenarios.

Course Outcomes (CO)-4	Demonstrate and implement MongoDB schemas for various applications.
Course Outcomes (CO)-5	Integrate MongoDB with other programming languages and frameworks like Python

(c) Alignment

Align with Curriculum: Ensure these goals align with the overall educational objectives of the engineering program.

Sl.No	Learning Goals	Course Outcomes	Assessment	In-Class Activity	Out-of- Class Activity	Weightage
1.	To understand the fundamentals of NoSQL databases and differentiate them from traditional relational databases and Learn to perform CRUD (Create, Read, Update, Delete) operations using MongoDB.	To perform CRUD (Create, Read, Update, Delete) operations using MongoDB.	CIE	Chalk & Talk / Presentation	Assignment	20%
2.	To apply the indexing, aggregation, and other advanced querying techniques in MongoDB.	Apply the use of Indexing, Aggregation and other advanced querying techniques in MongoDB	CIE	Demonstration	Hands-on assignment	20%
3.	To develop problem-solving skills by working on real-world database management scenarios.	Develop problem-solving skills by working on real-world database management scenarios.	CIE	Demonstration	Hands-on assignment	20%
4.	To design and implement MongoDB schemas for	Demonstrate and implement MongoDB schemas for various	CIE	Demonstration	Hands-on assignment	20%

	various applications.	applications.				
5.	To integrate MongoDB with programming languages and frameworks.	Integrate MongoDB with other programming languages and frameworks like Python	CIE	Demonstration	Hands-on assignment	20%

6. Curriculum Design

(c) Course integration

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

Sl.No	Course Name	Course Code	Justification for selecting the Course for Experiential Learning
1	**Data Base Management Systems**	**43**	**MongoDB is a NoSQL database which is widely used in various industries for Big-Data and Cloud-based solutions.**

(d) Develop Modules

Develop Modules: Create specific modules within these courses that focus on hands-on experiences.

Module No	Lecture No.	Session Topics	RBT Levels	Activities Planned	Course Outcome Mapping	Mode of Delivery	Planned Date	Actual Date

1	1	**Introduction to NoSQL and MongoDB**
		• **NoSQL Databases:**
		  ○ **Overview of NoSQL databases.**
		  ○ **Comparison between NoSQL and relational databases.**
		  ○ **Types of NoSQL databases: Document, Key-Value, Column-Family, Graph.**
		• **Introduction to MongoDB:**
		  ○ **Features of MongoDB.**
		  ○ **MongoDB architecture.**
		  ○ **Use cases of MongoDB.**
		• **Installation and Configuration:**
		  ○ **Installing MongoDB on various platforms.**
		  ○ **MongoDB Compass and Atlas.**
		  ○ **Basic configuration and setup.**
		• **MongoDB Shell and Basic Commands:**
		  ○ **Introduction to mongo shell.**
		  ○ **Basic MongoDB commands.**
			L1 / L2	**Demonstration**	**CO1**	**Chalk & Talk / Presentation**		

2	2	**Data Generation and Testing (Including Faker Module)**
		• **Introduction to Data Generation**
		  ○ **Importance of Data Generation in Testing**
		  ○ **Overview of the Faker Module**
		• **Using the Faker Module**
		  ○ **Installation and Setup**
		  ○ **Generating Random Data (Names, Addresses, Emails, etc.)**
		  ○ **Customizing and Extending Faker**
		  ○ **Generating Large Datasets for MongoDB**
		• **Integration with MongoDB**
		  ○ **Inserting Fake Data into MongoDB Collections**
		  ○ **Creating Sample Datasets for Testing Queries and Aggregations.**
			L1 / L2	**Demonstration**	**CO1**	**Chalk & Talk / Presentation**		

3	3-4	**CRUD Operations in MongoDB using Pymongo package in Python**
		• **Creating and Inserting Documents:**
		  ○ **Insert operations: insertOne, insertMany.**
		• **Reading Documents:**
		  ○ **Querying documents.**
		  ○ **Projection in queries.**
		• **Updating Documents:**
		  ○ **Update operations: updateOne, updateMany, replaceOne.**
		• **Deleting Documents:**
		  ○ **Delete operations: deleteOne, deleteMany.**
			L3	**Demonstration**	**CO2**	**Chalk & Talk / Presentation**		

4	5-6	**Indexing and Aggregation**
		• **Indexing:**
		  ○ **Importance of indexing.**
		  ○ **Creating and managing indexes.**
		  ○ **Indexing strategies.**
		• **Aggregation Framework:**
		  ○ **Introduction to the aggregation framework.**
		  ○ **Aggregation pipeline and**
			L4	**Demonstration**	**CO3**	**Chalk & Talk / Presentation**		

5	7-8	**Advanced MongoDB Features** • **Replication:** ○ **Concept of replication.** ○ **Setting up replica sets.** ○ **Failover and recovery.** • **Sharding:** ○ **Concept of sharding.** ○ **Setting up a sharded cluster.** ○ **Managing sharded data.**	**L5**	**Demonstration**	**CO4**	**Chalk & Talk / Presentation**		
6	9 - 15	**Projects**	**L6**	**Selection of problem statement, design, implementation, Project Report**	**CO5**			

7. Mapping of Learning objectives with Learning Outcomes

Course/Modules	Learning Objective	Learning Outcome	Assessment Method
Module 1: **Introduction to NoSQL and MongoDB** • **NoSQL Databases:** ○ **Overview of NoSQL databases.** ○ **Comparison between**	LO-1: Understand the fundamentals of NoSQL databases and differentiate them from traditional relational databases and perform CRUD (Create, Read, Update, Delete)	To perform CRUD (Create, Read, Update, Delete) operations using MongoDB.	CIE

NoSQL and relational databases. ○ **Types of NoSQL databases: Document, Key-Value, Column-Family, Graph.** • **Introduction to MongoDB:** ○ **Features of MongoDB.** ○ **MongoDB architecture.** ○ **Use cases of MongoDB.** • **Installation and Configuration:** ○ **Installing MongoDB on various platforms.** ○ **MongoDB Compass and Atlas.** ○ **Basic configuration and setup.** • **MongoDB Shell and Basic Commands:** ○ **Introduction to mongo shell.** ○ **Basic MongoDB commands.**	operations using MongoDB.		
CRUD Operations in MongoDB • **Creating and Inserting Documents:** ○ **Insert operations: insertOne, insertMany.** • **Reading Documents:** ○ **Querying documents.** ○ **Projection in queries.** • **Updating Documents:** ○ **Update operations: updateOne, updateMany, replaceOne.** • **Deleting Documents:** **Delete operations: deleteOne, deleteMany.**	LO-2: To apply the indexing, aggregation, and other advanced querying techniques in MongoDB	CO2: Apply the use of Indexing, Aggregation and other advanced querying techniques in MongoDB	CIE
Module 3:**Indexing and Aggregation**		CO3: Develop problem-solving skills by working on	CIE

• **Indexing:**
  ○ **Importance of indexing.**
  ○ **Creating and managing indexes.**
  ○ **Indexing strategies.**
• **Aggregation Framework:**
  ○ **Introduction to the aggregation framework.**
  ○ **Aggregation pipeline and stages.**
Common aggregation operations.
	LO-3: To develop problem-solving skills by working on real-world database management scenarios.	real-world database management scenarios.	

Module 4: **Advanced MongoDB Features**
• **Replication:**
  ○ **Concept of replication.**
  ○ **Setting up replica sets.**
  ○ **Failover and recovery.**
• **Sharding:**
  ○ **Concept of sharding.**
  ○ **Setting up a sharded cluster.**
  ○ **Managing sharded data.**
	LG-4: To design and implement MongoDB schemas for various applications.	CO4: Demonstrate and implement MongoDB schemas for various applications.	CIE

Module 5: **Integrating MongoDB with Applications**
• **Drivers and Client Libraries:**
  ○ **Introduction to MongoDB drivers for various programming languages.**
  ○ **Basic CRUD operations using drivers.**
• **Integration with Frameworks:**
  ○ **Integrating MongoDB with Node.js, Python, and other popular frameworks.**
Example applications
	LG-5: To integrate MongoDB with programming languages and frameworks.	CO5: Integrate MongoDB with other programming languages and frameworks like Python	CIE

Projects	LG-5: To integrate MongoDB with	CO5: Integrate MongoDB with other programming	CCA/SEE

	programming languages and frameworks.	languages and frameworks like Python	

8. Partnerships and Resources

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

Implement Experiential Activities

PBL Component	Details
Project Title	[Enter the project title]
Real-World Problem	[Describe the real-world problem the project addresses]
Learning Objectives	**Subject Areas:** [List subjects integrated] **Skills Developed:** [List skills]
Timeline	**Start Date:** [Enter start date]

	Milestones/Checkpoints: [List milestones] **End Date:** [Enter end date]
Resources Needed	**Materials:** [List materials] **Technology:** [List technology] **Guest Speakers/Experts:** [List experts]
Team Formation	**Group Size:** [Enter group size] **Team Roles:** [List roles such as Project Manager, Researcher, Presenter]
Background Information	[Describe the prior knowledge students need]
Research Methods	**Primary Sources:** [List methods such as interviews, surveys] **Secondary Sources:** [List methods such as articles, books, videos]
Team Meetings	**Frequency:** [Enter frequency of meetings] **Structure:** [Describe the structure of the meetings]
Collaboration Tools	**Digital Platforms:** [List platforms such as Google Docs, Trello] **Communication Methods:** [List methods such as in-person, virtual meetings]
Project Deliverables	[List what students will produce such as reports, presentations, prototypes]
Presentation Format	**Options:** [List options such as PowerPoint, video, live demonstration] **Audience:** [List audience such as classmates, community members]

	Schedule: [Enter presentation schedule]
Project Exhibition	[Describe how students' projects will be displayed or shared with a wider audience]

Experiential Learning - Batch

From, **Date:**

Name: & USN:

Name: & USN:

Name: & USN:

Name: & USN:

Semester:

Respected Sir/Madam,

Sub: Regarding Experiential Learning Batch

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

Thanking you, Yours faithfully

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

Signature of the Guide

Name of the Guide Designation

Department of ……. Engineering

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

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

Signature of the Guide **Signature of HOD**

Assessment

Rubrics for Project-Based Learning Assessment

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

			Innovation	shows significant innovation and out-of-the-box thinking.	demonstrates innovation in some aspects.	minimal innovation.	evidence of innovative thinking.	
			Problem Solving	Identifies problems accurately and develops effective, comprehensive solutions.	Identifies problems correctly and develops good solutions.	Identifies problems but solutions are somewhat effective or incomplete.	Struggles to identify problems and develop effective solutions.	
			Project Management	Manages project timelines, resources, and tasks exceptionally well; meets all deadlines.	Manages project timelines, resources, and tasks effectively; meets most deadlines.	Manages project timelines, resources, and tasks with some difficulty; misses some deadlines.	Poor management of project timelines, resources, and tasks; frequently misses deadlines.	
			Documentation	Thorough, clear, and well-organized documentation; all necessary details included.	Clear and organized documentation; most necessary details included.	Basic documentation; some necessary details are missing or unclear.	Poor documentation; lacks necessary details and organization.	
				Engaging and	Good presentation;	Basic presentation;	Ineffective	

			Presentation Skills	well-organized presentation; communicates ideas clearly and effectively.	communicates ideas clearly but lacks some engagement or organization.	some ideas are unclear or poorly organized.	presentation; ideas are unclear and poorly organized.	
			Collaboration	Works exceptionally well with team members; shows strong teamwork and leadership skills.	Works well with team members; demonstrates good teamwork.	Works with team members but has some difficulties in collaboration.	Struggles to work with team members; lacks teamwork and collaboration skills.	
			Faculty Assessment	Meets or exceeds faculty expectations in all areas; shows exceptional performance.	Meets faculty expectations in most areas; shows good performance.	Meets some faculty expectations; shows average performance.	Does not meet faculty expectations; shows poor performance.	
			Reflection	Provides deep insights and critical analysis of	Provides good insights and analysis of own work; demonstrates	Provides basic insights and analysis of own work; shows some	Provides minimal or no insights and analysis of own	

				own work; demonstrates significant learning and growth.	learning and growth.	learning and growth.	work; shows little to no learning and growth.	
			Overall Assessment	Exceptional overall performance; exceeds expectations in most or all areas.	Good overall performance; meets expectations in most areas.	Average overall performance; meets expectations in some areas.	Poor overall performance; does not meet expectations in most areas.	

Universal Human Values

Universal Human Values

Teaching Hours/Week (L: T:P:S)	0:0:2:0
Total Hours of Pedagogy	15 hour Theory Session 15hourSelfstudy
Credits:	01
Programs / Experiments	12
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	No SEE only CIE For CIE Assessment - Activities Report Evaluation by College NSS Officer / HOD / Sports Dept / Any Dept.

Dayananda Sagar Academy of Technology & Management

(Autonomus Institute under VTU)

Semester	:	**4**				
Course Title	:	**Universal Human Values**				
Course Code	:	**BUHV408**				
Course Type (Theory/ Practical/ Integrated)	:	**Practical**				
Category	:	**UHV**				
Stream	:	**AIML**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**0:0:2:0**		**SEE**	:	**50**
Total Hours	:	**15 hour Theory Session** **15 hour Self study**		**SEE Duration**	:	**1 Hrs**
Credits	:	**1**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings
2	To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way
3	To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.
4	This course is intended to provide a much-needed orientation input in value education to the young enquiring minds.

Teaching-Learning Process

The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.

In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that

the activities will develop students' theoretical and applied skills.
State the need for UHV activities and its present relevance in the society and Provide real-life examples. Support and guide the students for self-study activities.
You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field.
This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous selfevolution.
Encourage the students for group work to improve their creative and analytical skills.

General Instructions-Pedagogy:

Scheme of Teaching and Examinations for BE Programme -2024-25

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Contents:

The course is mainly activity-based that will offer a set of activities for the student that enables them to connect with fellow human beings, nature, society, and the world at large.

Thecoursewillengagestudentsforinteractivesessions,openmic,readinggroup,storytelling sessions ,and semester-long activities conducted by faculty mentors.

In the following a set of activities planned for the course have been listed:

Module No.	Topics	Hours
1	Introduction to Value Education Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity — the Basic Human Aspirations, Happiness and Prosperlty — Current Scenario, Method to Fulfil the Basic Human Aspirations	3
Pedagogy		
2	Harmony in the Human Being : Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health	3
Pedagogy		
	Harmony in the Family — the Basic Unit of Human Interaction, 'Trust' — the Foundational Value in Relationship, 'Respect' — as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the	3

3	Universal Human Order	
Pedagogy		
4	Harmony in the Nature/Existence : Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, TheHolistic Perception of Harmony in Existence	**3**
Pedagogy		
5	Implications of the Holistic Understanding — a Look at Professional Ethics : Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models Typical Case Studies, Strategies for Transition towards Value-based Life and Profession	**3**
	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	The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978- 93-87034- 47-1
2	The Teacher's Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G
Reference Books	
1	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3	The Story of Stuff(Book).
4	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	They would become more responsible in life, and in handling problems with sustainablesolutions, while keeping human relationships and human nature in mind.	-	-
CO2	They would have better critical ability.	-	-
CO3	They would also become sensitive to their commitment towards what they have understood	-	-
CO4	It is hoped that they would be able to apply what they have learnt to their own self indifferent day-to-day settings in real life, at least a beginning would be made in this direction.	-	-

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

Continuous Internal Evaluation (CIE):

- After completion of the course, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period.
- The report should be signed by the mentor.
- The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed. Marks allotted for the diary are out of 50.
- Planning and scheduling the social connect Information/Data collected during the social connect Analysis of the information/data and report writing
- Considering all above points allotting the marks as mentioned below

Excellent	: 80 to 100
Good	: 60 to 79
Satisfactory	: 40 to 59
Unsatisfactory and fail: <39	

1 Credit Course – Practical + Planning

Assessment Details (both CIE and SEE)

NO SEE – Semester End Exam – Completely Practical and activities based evaluation

Plan of Action (Execution of Activities)	
Sl.No	**Practice Session Description**
1.	Lecture session in field to start activities
2.	Students Presentation on Ideas
3.	Commencement of activity and its progress
4.	Execution of Activity
5.	Execution of Activity
6.	Execution of Activity
7.	Execution of Activity
8.	Case study-based Assessment, Individual performance
9.	Sector/ Team wise study and its consolidation
10.	Video based seminar for 10 minutes by each student At the end of semester with Report.

- Each student should do activities according to the scheme and syllabus.
- At the end of semester student performance has to be evaluated by the faculty for the assigned activity progress and its completion.
- At last consolidated report of all activities from 1st to 5th, compiled report should be submitted as per the instructions and scheme.

Assessment Details for CIE (both CIE and SEE)

Weightage	**CIE – 100%**	• Implementation strategies of the project (NSS work). • The last report should be signed by NSS Officer, the HOD and principal. • At last report should be evaluated by the NSS officer of the institute.
Field Visit, Plan, Discussion	10 Marks	
Commencement of activities and its progress	20 Marks	
Case study-based Assessment Individual performance with report	20 Marks	
Sector wise study & its consolidation 5*5 = 25	25 Marks	
Video based seminar for 10 minutes by each student At the end of semester with Report. Activities 1 to 5, 5*5 = 25	25 Marks	
Total marks for the course in each semester	100 Marks	
For each activity, 20 marks CIE will be evaluated for IA marks at the end of semester, Report and assessment copy should be made available in the department.		
Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general through activities.		