DAYANANDA SAGAR ACADEMY OF TECHNOLOGY & MANAGEMENT

CURRICULUM

Scheme and Syllabus III to IV Semester

Outcome Based Education

(Academic Year 2024-2025)

Department of CSE in Data Science

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, currently there are 10UG courses, BArch course, and 2 PG courses 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,(10 years),with NAAC A+ Grade,5 courses NBA Accreditated.

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 challenge.
- To encourage, reflection on and evaluation of emerging needs and priorities with state-of-the-art infrastructure at institution.
- To support research and services establishing enhancements in technical, economic, human and cultural development.
- To establish interdisciplinary centre of excellence, supporting/ promoting student's implementation.
- To increase the number of Doctorate holders to promote research culture on campus.
- To establish IIPC, IPR, EDC, innovation cells with functional MOU's supporting student's quality growth.

QUALITY POLICY

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

ABOUT THE DEPARTMENT

Year of Establishment: 2022
Intake of the Department = 60

Brief Details about CSE in Data Science:

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

VISION OF THE DEPARTMENT

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

MISSION OF THE DEPARTMENT

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

PEO's

PROGRAM EDUCATION OBJECTIVES (PEO'S):

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

PROGRAM OUTCOMES (PO's)

Engineering Graduates will be able to:

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

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

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

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

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

PROGRAM SPECIFIC OUTCOMES (PSO's)

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

PROPOSED UG CREDIT STRUCTURE IN ALIGNMENT WITH VTU

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

PROPOSED UG SCHEME

Sl. No	Course Category	BOS	TD	Teaching Hours/Week					Credits
				Lecture	Tutorial	Practical	Project	Total	
				L	T	P	S	(Hrs/week)	
1	BSC	MAT	MAT	3	0	0	0	3	3
2	IPCC-1	CSE	CSE	3	0	2	0	5	4
3	IPCC-2	CSE	CSE	3	0	2	0	5	4
4	PCC-1	CSE	CSE	3	0	0	0	3	3
5	PCC-2	CSE	CSE	3	0	0	0	3	3
6	PBL	CSE	CSE	0	0	2	2	4	2
7	AEC	CSE	CSE	0	0	2	0	2	1
8	SCR	CSE	CSE	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

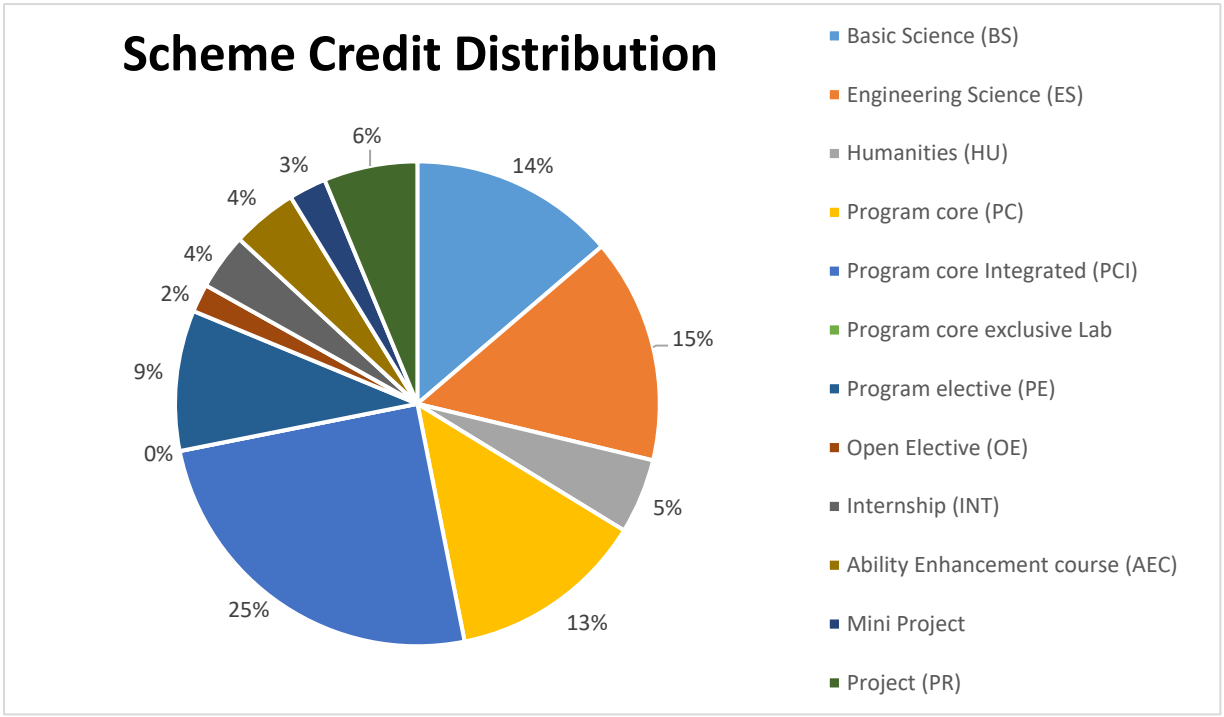
3rd Sem & 4th Sem

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 CSE in Data Science

Course Component	Credits	% of Credits
Basic Science (BS)	22	14
Engineering Science (ES)	24	15
Humanities (HU)	8	5
Program core (PC)	21	13
Program core Integrated (PCI)	40	25
Program core exclusive Lab	0	0
Program elective (PE)	15	9
Open Elective (OE)	3	2
Internship (INT)	6	4
Ability Enhancement course (AEC)	7	4
Mini Project (MPR)	4	3
Project (PR)	10	6
Total	**160**	**100**



SEMESTER WISE CREDIT BREAKDOWN FOR B.E. DEGREE CURRICULUM

BATCH 2023-2027

Course Category	Semester								Total Credits
	1st	2nd	3rd	4th	5th	6th	7th	8th	
Basic Sciences (BSC)			3	3					6
Engineering Sciences (ESC)			0	0					0
Humanities, Social Sciences and Management (HSMC)			0	0					0
Ability Enhancement Course (AEC)			1	1					2
Universal Human Values (UHV)			0	1					1
Professional Core Courses (PCC)			6	6					12
Integrated Professional core Course (IPCC)			8	8					16
Professional Elective Course (PEC)			0	0					0
Institutional Open Elective Courses (IOE)			0	0					0
Internship (INT)			0	0					0
Mini Project / Project Work (PW)			2	2					4
Social Connect & Responsibility (SCR)			1	0					1
Non-credit Mandatory Courses (NCMC)			0	0					0
Total Credits			**21**	**21**					**42**

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: Computer Science Engineering in Data Science

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture	Tutorial	Practical	Project	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
						L	T	P	S						
1	BMATD301	Linear Algebra, Discrete Mathematics and Game Theory	BSC	MAT	MAT	3	0	0	0	3	3	03	50	50	100
2	BCD302	Data Structures and Applications	IPCC	CSE-DS	CSE-DS	3	0	2	0	5	4	03	50	50	100
3	BCD303	Data Science for Engineering	IPCC	CSE-DS	CSE-DS	3	0	2	0	5	4	03	50	50	100
4	BCD304	Computer Organization and Architecture	PCC	CSE-DS	CSE-DS	3	0	0	0	3	3	03	50	50	100
5	BCD305	Operating System	PCC	CSE-DS	CSE-DS	3	0	0	0	3	3	03	50	50	100
6	BCD306	OOPS using JAVA	PBL	CSE-DS	CSE-DS	0	0	2	2	4	2	03	50	50	100
7	BCD317 BCD327	R Language Go Lang	AEC	CSE-DS	CSE-DS	0	0	2	0	2	1	03	50	50	100
8	BSCK308	Social Connect and Responsibility	SCR	CSE-DS	CSE-DS	0	0	2	0	2	1	03	100	0	100
9	BNSK309 BPEK309 BYOK309	Non-Credit Mandatory Courses	NCMC	-	-	0	0	0	0	0	0	0	0	0	0
					Total	**15**	**0**	**10**	**2**	**27**	**21**	**24**	**450**	**350**	**800**

AICTE Activity Points:

4th SEMESTER: Computer Science Engineering in Data Science

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture	Tutorial	Practical	Project	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
						L	T	P	S						
1	BMATD401	Statistics and Probability	BSC	MAT	MAT	3	0	0	0	3	3	03	50	50	100
2	BCD402	Analysis and Design of Algorithms	IPCC	CSE-DS	CSE-DS	3	0	2	0	5	4	03	50	50	100
3	BCD403	Database Management System	IPCC	CSE-DS	CSE-DS	3	0	2	0	5	4	03	50	50	100
4	BCD404	Advance Java	PCC	CSE-DS	CSE-DS	3	0	0	0	3	3	03	50	50	100
5	BCD405	Data Communication and Networks	PCC	CSE-DS	CSE-DS	3	0	0	0	3	3	03	50	50	100
6	BCD406	Machine Learning Fundamentals	PBL	CSE-DS	CSE-DS	0	0	2	0	2	2	03	50	50	100
7	BCD417 BCD427	JULIA MongoDB	AEC	CSE-DS	CSE-DS	0	0	2	0	2	1	03	50	50	100
8	BCD408	Universal Human Values	UHV	CSE-DS	CSE-DS	2	0	0	0	2	1	03	100	0	100
9	BNSK409 BPEK409 BYOK409	Non-Credit Mandatory Courses	NCMC	-	-	0	0	0	0	0	0	0	0	0	0
					Total	**15**	**0**	**10**	**0**	**25**	**21**	**24**	**450**	**350**	**800**

AICTE Activity Points:

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	----------	----------
2.	List of New Existing Elective Courses	----------	----------
3.	List of New Industry Aligned Course	Data Science for Engineering (IPCC)	Machine Learning Fundamentals (PBL)

Percentage of Change in the Syllabus

3rd Semester						
Sl. No	**Course Code**	**Course Name**	**Topics Added**	**Topics removed**	**Revised in %**	**Justification**
1	BCD302	Data Structures and Applications	**Module 1**, Chapter 1: Data structure Operations (Traversing, inserting, deleting, searching, and sorting). Review of Arrays. Structures: Array of structures Self-Referential Structures Accessing variables through pointers, pointer declaration and definition, initialization of pointer variables, pointers for inter function communication, pointers to pointers, Arrays and pointers, pointer arithmetic and arrays, passing an array to a function, memory allocation functions, array of pointers, Type Definition, Enumerated types. **Module 2:** Infix, Postfix and Prefix expressions and their types of conversions from one form to another form, Evaluation of Expression, Matching the parenthesis, And other common application of stacks Input/Output Restricted Queues, DEQUE. Application of Queues		6%	To Fill the gap of Advance data structures and to achieve full coverage

			Module 4: Application of Trees- Evaluation of Expression, Red-Black Trees, Multiway Search Trees, B-Trees, Selection Trees, Forests, Representation of Disjoint sets, Counting Binary Trees. **Module 5:** Applications, Properties, The Graph & Digraph as ADTs, Representation of graphs and Digraphs, Traversal methods: Breadth First Search, Depth First Search, finding a path, Connected Graphs & Components, Spanning trees. Hashing Techniques: : Hash Table organizations, Hash function, Static and Dynamic Hashing. Address calculation techniques, Common hashing functions, Collision resolution techniques, open addressing, closed addressing, separate chaining, Linear probing, Quadratic probing, double hashing.			
2	BCD303	Data Science for Engineering	**New Course**			
3	BCD304	Computer Organization and Architecture	Basic Concepts and Computer Evolution, Instruction Sets	Introduction to Digital Design, Four-Variable Combinational Logic, Map, HDL Models of Combinational Circuits	10%	1. To Understand the Foundations of Computing. 2. To build the strong architecture base.

4	BCD305	Operating System	**M-1:** Open-source operating systems. **M-5:** Case study on UNIX based Operating system: Design principles, Kernel modules, Process management, Memory management.	**M-5:** Secondary Storage Structure: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management;	10%	Students will learn about open-source Operating System and Learn different types of Case Studies
5	BCD306	OOPS using JAVA	**M-1:** The Java Buzzwords **M-4:** String Handling: The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, Modifying a String, Data Conversion Using valueOf(). **M-5: I/O Basics:** The Stream classes, Byte Streams and Character Streams, The Predefined Streams, Reading Console Input, Reading Characters, Reading Strings, Writing Console Output, The PrintWriter Class, Reading and Writing Files. **The concept of JDBC:** JDBC Driver Types; JDBC packages; A brief overview of the JDBC Process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data Types; Exceptions. **Swings**		25%	Students will learn more concepts related to application development.

			Swing fundamentals, writing swing application, swing library, layouts and controls. Introduction to event handling			
6	BCD327	Go Lang	New Course			

4th Semester						
Sl.No	**Course Code**	**Course Name**	**Topics Added**	**Topics removed**	**Revised in %**	**Justification**
1	BCD402	Analysis and Design of Algorithms	**M-1:** Space and Time complexity **M-2:** Selection problem, Closest pair of points, Solving Recurrence Equations. **M-3:** Array Representation of Binary Tree, Binary search trees, Heap Tree and Heap Sort, AVL Tree, B Trees, B+ trees, Red Black Trees. Hashing: Open Hashing (Separate Chaining), Closed Hashing (Open Addressing). **M-4:** 0/1 Knapsack problems, Matrix Multiplication Chains, All pair's shortest paths. Optimization problems, Fractional Knapsack problem, Topological sorting, Single-Source Shortest paths. **M-5:** Polynomial Time and verification, P and NP Problems, NP-Completeness and Reducibility, NP-Hard problems, Backtracking (Max clique and Travelling	**M-3:** Balanced Search Trees, Heaps and Heapsort. **M-4:** Three basic examples **M-5:** P, NP, and NP-Complete Problems.	25%	Students will learn more concepts related to problem-solving purpose added all these topics

			salesperson), Branch-and-Bound (0/1 Knapsack problem, Max clique and Travelling salesperson).			
2	BCD403	Database Management System	NOSQL, TWOSCHEMA architecture triggers		5%	
3	BCD406	Machine Learning Fundamentals	New Course			
4	BCD417	JULIA	Package Installation, Julia calculator, Arrays and Strings	Rational, Irrational number, dot product, cross product	10%	1.To enhance the practical skill development 2. To Understand basics of arrays and strings.
	BCD427	MongoDB	Package Installation, Designing your applications, Server administration	Text search using catalog data collection, listings in MongoDB, projection operators	10%	1.To enhance the practical skill development 2. To Understand the Infrastructure and the server administration.

3rd SEMESTER

BASIC SCIENCE (BSC)

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

Semester	:	3rd				
Course Title	:	**Linear Algebra, Discrete Mathematics and Game Theory**				
Course Code	:	**BMATD301**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Course Category	:	**ASC**				
Stream	:	**CS-DS & CS-AI**		**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, Discrete Mathematics and Game Theory in solving problems
3	Analyze problems using concepts of Linear algebra, Discrete Mathematics and Game Theory
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 of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for BE Programme -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 to solve system of linear equations. 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 Strategic Games** Introduction to game theory, strategic games, the prisoner's dilemma, Bach or Stravinsky, matching pennies, Nash equilibrium, zero-sum games, min max strategy, best response functions, dominated action.	8
Pedagogy	**Chalk and board, group discussion, ppt, videos**	
5	**Mixed Strategy and Extensive Games** Strategic games in which players may randomize, mixed strategy Nash equilibrium, extensive games with perfect information, sub-game perfect equilibrium, finding sub-game perfect equilibria of finite horizon games, backward induction.	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	Theory and problems of linear algebra, Seymour Lipschutz, Marc Lipso, Schaum's outline series, McGraw-Hill Education, 6th edition, 2017.
2	Discrete Mathematics and its Applications, Kenneth H Rosen, McGraw Hill publications, 7th edition.
3	An Introduction to Game Theory, Martin Osborne: , Oxford University Press, 7th impression, 2009

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	Linear Algebra: An Introduction, Richard Bronson & Gabriel B. Costa, Academic Press, 2nd edition, 2014.

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, discrete mathematics and game theory	**Remember, Understand**	**L1, L2**
CO2	Apply techniques of linear algebra, discrete mathematics and game theory to solve engineering problems	**Apply**	**L3**
CO3	Analyze engineering problems using linear algebra, discrete mathematics and game theory	**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)	
1	https://archive.nptel.ac.in/courses/111/106/111106086/
2	https://archive.nptel.ac.in/courses/111/107/111107106/
3	https://youtu.be/h0bdo06qNVw?si=dBHPlak7D16z8fOX

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 lab component	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).
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.

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	Elementary transformations on a matrix	1
1	Echelon form & 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	1
2	Truth tables	1

2	Logical equivalence-laws of logic	**1**
2	Predicates	**1**
2	Quantifiers,	**1**
2	Logical equivalence involving Quantifiers,	**1**
2	Logical implication-rules of inference,	**1**
2	Proofs of theorems.	**1**
3	Cartesian Products	**1**
3	Relations, Properties	**1**
3	Computer Recognitions-Zero-One Matrices,	**1**
3	Partial Orders	**1**
3	Equivalence relations	**1**
3	Partitions, Hasse Diagrams	**1**
3	Functions: one-one and onto Functions, Composition of functions	**1**
3	Invertible functions	**1**
4	Introduction to Strategic Games: What is game theory? Strategic games	**1**
4	The prisoner's dilemma	**1**
4	Bach or Stravinsky	**1**
4	Matching pennies	**1**
4	Nash equilibrium and Examples	**1**
4	Zero-Sum games	**1**
4	MinMax Strategy	**1**
4	Best response functions, Dominated action	**1**
5	Mixed Strategy and Extensive Games	**1**
5	Strategic games in which players may randomize	**1**
5	Mixed strategy Nash equilibrium	**1**
5	Extensive games with perfect information	**1**
5	Sub-game perfect equilibrium	**1**
5	Sub-game perfect equilibrium	**1**
5	Finding sub-game perfect equilibria of finite horizon games	**1**
5	Backward induction	**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 20 marks. 20 marks reduced to 05 marks
			Execution	10					
			Viva-voce	05					
						Total CIE Practical	**25**	**10**	Scale down Marks of Experiments, Record, Observation, Practical Test and Open-Ended Experiment

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

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

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**3rd Semester**				
Course Title	:	**DATA STRUCTURES AND APPLICATIONS**				
Course Code	:	**BCD302**				
Course Type (Theory/Practical/Project/Integrated)	:	**Integrated**				
Category	:	**IPCC**				
Stream	:	**CSE-DS**		**CIE**	:	**50**
Teaching hours/ week (L: T:P:S)	:	**3-0-2-0**		**SEE**	:	**50**
Total Hours	:	**40 hours Theory + 20 hours Practical**		**SEE Duration**	:	**3 hours**
Credits	:	**4**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Explain the fundamentals of data structures and their applications essential for implementing solutions to problems.
2	Analyze Linear Data Structures: Stack, Queues, Lists
3	Illustrate representation of data structures: Stack, Queues, Linked Lists, Trees and Graphs.
4	Design and Develop Solutions to problems using Arrays, Structures, Stack, Queues, Linked Lists, and Explore usage of Trees and Graph for application development and Apply the Hashing techniques in mapping key value pairs.
5	Assess appropriate data structure during program development/Problem Solving Application.

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 and 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 (Traversing, inserting, deleting, searching, and sorting). **ARRAYS and STRUCTURES:** Review of Arrays, Structures: Array of structures Self-Referential Structures Arrays, Dynamic Allocated Arrays, Structures and Unions. **Review of pointers and dynamic Memory Allocation. Review of RECURSION.**	**8 Hours**
Pedagogy	**Think Pair and Share (Blended Learning)**	
2	**Stacks:** Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays. Stacks ADT operations: Push, Pop and Peek operations; **Stack Applications**: Different representation of (Prefix, Infix and Postfix) expression and conversion using stack, Evaluation of Expression, Matching the parenthesis, evaluation of postfix expression, recursion. **QUEUES:** Definition, Array Representation of Queues, Queue Operations, Circular Queues, Using Dynamic Arrays, Multiple Stacks and queues. Priority Queues and their Representation, Input/Output Restricted Queues, DEQUE. Application of Queues.	**8 Hours**
Pedagogy	**Problem Solving**	
3	**LINKED LISTS AND THEIR APPLICATIONS:** Linked Lists: Definition, classification of linked lists. Representation of different types of linked lists in Memory, Traversing, Insertion, Deletion, Searching, Sorting, and Concatenation Operations on Singly linked list, and Chains, Representing Chains in C, Linked Stacks and Queues, Polynomials, Doubly Linked Lists, Circular Linked Lists, Linked Lists with Header Node, Sparse Matrices, Applications using linked lists – Polynomials, Sparse matrix representation. Programming Examples.	**8 Hours**
Pedagogy	**Quiz**	
4	**TREES AND THEIR APPLICATIONS:** Tree Terminologies, Representation of Trees, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - In order, post order, preorder, Additional Binary Tree Operations, Threaded Binary Trees, Binary Search Trees- Definition, searching a Binary Search Tree, - Definition, Inserting into and Deletion from Binary Search Tree, Introduction to the concepts of Optimal Binary Search Trees, Traversal, and Searching operation on Binary search tree. Application of Trees- Multiway Search Trees, Selection Trees, Forests. AVL tree, Red-black tree, B-tree.	**8 Hours**
Pedagogy	**Poster Presentation**	

5	**Graphs:** Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Applications, Properties, The Graph & Digraph as ADTs, Representation of graphs and Digraphs, Traversal methods: Breadth First Search, Depth First Search, finding a path, Connected Graphs & Components, Spanning trees. **Hashing Techniques:** Hash Table organizations, Hash function, Static and Dynamic Hashing. Address calculation techniques, Common hashing functions, Collision resolution techniques, open addressing, closed addressing, separate chaining, Linear probing, Quadratic probing, double hashing. **Sorting**: Bubble sorting, Selection sorting, Bucket Sorting, Radix Sorting.	**8 Hours**
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 thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

List of Programs:

Sl. No.	Experiments/Programs	COs
1	Develop a Program in C for the following: a) Declare a calendar as an array of 7 elements (A dynamically Created array) to represent 7 days of a week. Each Element of the array is a structure having three fields. The first field is the name of the Day (A dynamically allocated String), The second field is the date of the Day (A integer), the third field is the description of the activity for a particular day (A dynamically allocated String). b) Write functions create (), read () and display (); to create the calendar, to read the data from the keyboard and to print weeks activity details report on screen.	
2	Develop a Program in C for the following operations on Strings. a) Read a main String (STR), a Pattern String (PAT) and a Replace String (REP) b) Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Don't use Built-in functions.	
3	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	
4	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 operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands.	
5	Develop a Program in C for the following Stack Applications a) Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^ b) Solving Tower of Hanoi problem with n disks	
6	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.	
7	Develop a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Programme, Sem, PhNo a) Create a SLL of N Students Data by using front insertion. b) Display the status of SLL and count the number of nodes in it c) Perform Insertion / Deletion at End of SLL d) Perform Insertion / Deletion at Front of SLL (Demonstration of stack) e) Exit	
8	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) Exit	
9	Develop a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes a) Represent and Evaluate a Polynomial P(x,y,z) = 6x2y2z-4yz5+3x3yz+2xy5z-2xyz3 b) Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z) Support the program with appropriate functions for each of the above operations	
10	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 order, Preorder and Post Order c) Search	
Open ended Programs		
1	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	
2	Given a File of N employee records with a set K of Keys (4-digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table (HT) of m Memory locations with L as the set of memory addresses (2-digit) of locations in HT. Let the Keys in K and addresses in L are Integers. Develop a Program in C that uses Hash function H: K →L as H(K)=K mod m (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.	
3	Write a C program to implement Multiple stacks, Multiple Queues using arrays and linked Lists	
4	Develop a Program in C for the following operations on Graph(G) of Cities Create a Graph of N cities using Adjacency Matrix. Print all the nodes reachable from a given starting node in a digraph using DFS/BFS method	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.
2	Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.
Reference Books	
1	Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
2	Debasis Samanta, Classic Data Structures, (2e), PHI Learning Pvt. Ltd., India, 2010
3	Gilberg and Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, 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 and remember the basic concepts of data structures and their applications.	**R & U**	**Level-1 & Level-2**
CO2	Apply stack and queues in solving problems, and solve real world problems using concepts like queues and stacks.	**A**	**Level-3**
CO3	Analyze linear and non-linear data structures concepts and its real-world applications.	**An**	**Level-4**

CO4	Investigate the methods of problem solving related to trees and graphs to model and solve the real-world problem.	**E**	**Level-5**
CO5	Design and demonstrate the concepts of hashing techniques and resolve collisions during mapping of key value pairs and choose the appropriate data structure for solving real world problems.	**C**	**Level-6**

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS35.html
2	https://nptel.ac.in/courses/106/105/106105171/
3	http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
4	http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS35.html
5	https://nptel.ac.in/courses/106/105/106105171/
6	http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
7	https://www.youtube.com/watch?v=3Xo6P_V-qns&t=201s
8	https://ds2-iiith.vlabs.ac.in/exp/selection-sort/index.html
9	https://nptel.ac.in/courses/106/102/106102064/
10	https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html
11	https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html
12	https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html
13	https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/index.html
14	https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/depth-first-traversal/dft-practice.html
15	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013501595428077568125 59/overview

CIE- Continuous Internal Evaluation (50 Marks)

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

CIE Course Assessment Plan

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

SEE- Semester End Examination (50 Marks)

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

SEE Course Plan

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**3rd Semester**				
Course Title	**:**	**Data Science for Engineering**				
Course Code	**:**	**BCD03**				
Course Type (Theory/Practical/Project/Integrated)	**:**	**Integrated**				
Category	**:**	**IPCC**				
Stream	**:**	**CSE-DS**		**CIE**	**:**	**50**
Teaching hours/ week (L: T:P:S)	**:**	**3-0-2-0**		**SEE**	**:**	**50**
Total Hours	**:**	**40 hours Theory + 20 hours Practical**		**SEE Duration**	**:**	**3 hours**
Credits	**:**	**4**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To provide a foundation in data Science terminologies, fundamentals and process and tools available for data science and data analytics and to Define big data and its key characteristics and understand the challenges associated with processing big data using traditional methods, and Gain proficiency in Apache Spark for distributed data processing
2	To describe the data for the data science process and to get familiarize data science process and steps and Study usage of various data sources, and to develop ETL pipelines for data preparation using Spark on Databricks, and Apply statistical concepts to summarize and analyze data, understand hypothesis testing and perform statistical inference
3	To describe the relationship between data and to Demonstrate the data visualization tools, and Learn data extraction from various data sources, and create informative data visualizations using Python libraries, also identify relationships and patterns within datasets through EDA techniques
4	To analyze the data science applicability in real time applications., and working with various Data analytics Charts. And grasp the fundamental principles of supervised and unsupervised machine learning algorithms
5	To utilize the Python libraries for Data Wrangling, Understand the various calculations and best practices. To present and interpret data using visualization libraries in Python used for data science

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 Data Science.
- 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)**.
- Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
- Use of Video/Animation to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Introduce Topics in manifold representations.
- Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
- Discuss how every concept can be applied to the real world - and when that's possible, it
- helps improve the students' understanding.

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 Science**: Evolution of Data Science, Data Science Roles, Life cycle of Data Science, Representation of Data Science as a Venn Diagram, Technologies revolving around Data Science, Data Science definition and types Big Data and Data Science hype – and getting past the hype. THE DATA SCIENCE PROCESS, Data Science Workflow, The Data Ecosystem, Big Data Fundamentals, Apache Spark, A Distributed Processing Engine, Building ETL Pipelines with Spark on Databricks	**8 Hours**
Pedagogy	**Group activity**	
2	**PREPARING AND GATHERING DATA AND KNOWLEDGE:** Statistical Analysis, Deep Dive into ETL with Spark, Data Ingestion and Cleaning, Data Transformation with Spark Functions, Data Quality Checks and Missing Value Handling, Introduction to Apache Spark SQL	**8 Hours**
Pedagogy	**Demonstration**	
3	Feature Generation and Feature Selection, Data Science Workflow – CRISP-DM, Descriptive Statistics, Introduction to statistics, Probability Concepts and Random Variables, Hypothesis Testing, Correlation and Regression Analysis, Exploratory Data Analysis and the Data Science Process, Introduction to Exploratory Data Analysis, Univariate and Multivariate Data Analysis	**8 Hours**
Pedagogy	**Poster Presentation**	
4	PYTHON LIBRARIES FOR DATA WRANGLING, Data Visualization with Matplotlib and Seaborn, Feature Engineering for Machine Learning, Machine Learning Algorithms for data science, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Model Development	**8 Hours**
Pedagogy	**Group Discussion with Demonstration**	
5	**Modeling, Machine Learning concepts,** Overfitting and Underfitting, Correctness, The Bias-Variance Tradeoff, Feature Extraction and Selection, k-Nearest Neighbors, The Model, Example: The Iris Dataset, The Curse of Dimensionality, Naive Bayes, A Really Dumb Spam Filter, A More Sophisticated Spam Filter, Implementation, Testing Our Model, Using Our Model, Simple Linear Regression, The Model, Using Gradient Descent, Maximum Likelihood Estimation, Multiple Regression, The Model, Further Assumptions of the Least Squares Model, Fitting the Model, Interpreting the Model, Goodness of Fit, Digression: The Bootstrap, Standard Errors of Regression Coefficients, Regularization, Logistic Regression, The Problem, The Logistic Function, Applying the Model, Goodness of Fit, Support Vector Machines. Regression, The Problem, The Logistic Function, Applying the Model, Goodness of Fit, Support Vector Machines. **A Deep Dive into Matplotlib and Case studies:** Introduction, Overview of Plots in Matplotlib, Pyplot Basics: Creating Figures, Closing Figures, Format Strings, Plotting, Plotting Using pandas DataFrames, Displaying Figures, Saving Figures; Basic Text and Legend Functions: Labels,	**8 Hours**

	Titles, Text, Annotations, Legends; Basic Plots:Bar Chart, Pie Chart, Stacked Bar Chart, Stacked Area Chart, Histogram, Box Plot, Scatter Plot, Bubble Plot; Layouts: Subplots, Tight Layout, Radar Charts, GridSpec; Images: Basic Image Operations, Writing Mathematical Expressions. Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three-dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.	
Pedagogy	**Case studies**	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

List of Programs:

Sl. No.	Experiments/Programs	COs
1	A. **Big Data Processing with Apache Spark: Objective:** Understand the fundamentals of big data processing using Apache Spark. **Tasks:** **i.** **Set up a Databricks workspace:** Create a free Databricks account. Set up a new workspace and cluster. **ii.** **Data Ingestion:** Load a large dataset (e.g., a CSV file containing transaction data) into Databricks. • **Basic Data Exploration:** Use Spark Data Frames to explore the dataset. And perform basic operations like filtering, grouping, and aggregating data. • **ETL Pipeline:** Build an ETL pipeline to clean and transform the data. Save the transformed data back to a storage system (e.g., DBFS). **iii.** Installation of Python/R/Go language, Visual Studio code editors can be demonstrated along with Kaggle data set usage. **iv.** Write programs in Python/R and Execute them in either Visual Studio Code or PyCharm Community Edition or any other suitable environment. **v.** A study was conducted to understand the effect of number of hours the students spent studying on their performance in the final exams. Write a code to plot line chart with number of hours spent studying on x-axis and score in final exam on y-axis. Use a red '*' as the point character, label the axes and give the plot a title.	**CO3,4,5**

Number of hrs spent studying (x)	10	9	2	15	10	16	11	16
Score in the final exam (0 – 100) (y)	95	80	10	50	45	98	38	93

<table>
<tr><td></td><td>d. For the given dataset mtcars.csv (www.kaggle.com/ruiromanini/mtcars), plot a histogram to check the frequency distribution of the variable ‘mpg’ (Miles per gallon)</td><td></td></tr>
<tr><td>2</td><td>a. Consider the books dataset BL-Flickr-Images-Book.csv from Kaggle (https://www.kaggle.com/adeyoyintemidayo/publication-of-books) which contains information about books. Write a program to demonstrate the following.
• Import the data into a Data Frame
• Find and drop the columns which are irrelevant for the book information.
• Change the Index of the Data Frame
• Tidy up fields in the data such as date of publication with the help of simple regular expression.
• Combine str methods with NumPy to clean columns.
b. Statistical Analysis with Python: Objective: Apply statistical concepts to summarize and analyze data.
Tasks:
1. Descriptive Statistics:
o Calculate measures of central tendency (mean, median, mode) and dispersion (variance, standard deviation) for a dataset.
2. Probability Distributions:
o Analyze a dataset to identify its underlying probability distribution (e.g., normal, binomial).
o Visualize the distribution using histograms and probability plots.
3. Hypothesis Testing:
o Formulate null and alternative hypotheses for a given problem.</td><td></td></tr>
<tr><td>3</td><td>a. Train a regularized logistic regression classifier on the iris dataset (https://archive.ics.uci.edu/ml/machine-learning-databases/iris/ or the inbuilt iris dataset) using sklearn. Train the model with the following hyperparameter C = 1e4 and report the best classification accuracy.
b. Train an SVM classifier on the iris dataset using sklearn. Try different kernels and the associated hyperparameters. Train model with the following set of hyperparameters RBF- kernel, gamma=0.5, one-vs-rest classifier, no-feature-normalization. Also try C=0.01,1,10C=0.01,1,10. For the above set of hyperparameters, find the best classification accuracy along with total number of support vectors on the test data</td><td></td></tr>
<tr><td>4</td><td>a. Consider the following dataset. Write a program to demonstrate the working of the decision tree based ID3 algorithm.
<table>
<tr><th>Price</th><th>Maintenance</th><th>Capacity</th><th>Airbag</th><th>Profitable</th></tr>
<tr><td>Low</td><td>Low</td><td>2</td><td>No</td><td>Yes</td></tr>
<tr><td>Low</td><td>Med</td><td>4</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Low</td><td>Low</td><td>4</td><td>No</td><td>Yes</td></tr>
<tr><td>Low</td><td>Med</td><td>4</td><td>No</td><td>No</td></tr>
<tr><td>Low</td><td>High</td><td>4</td><td>No</td><td>No</td></tr>
<tr><td>Med</td><td>Med</td><td>4</td><td>No</td><td>No</td></tr>
<tr><td>Med</td><td>Med</td><td>4</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Med</td><td>High</td><td>2</td><td>Yes</td><td>No</td></tr>
<tr><td>Med</td><td>High</td><td>5</td><td>No</td><td>Yes</td></tr>
<tr><td>High</td><td>Med</td><td>4</td><td>Yes</td><td>Yes</td></tr>
<tr><td>high</td><td>Med</td><td>2</td><td>Yes</td><td>Yes</td></tr>
<tr><td>High</td><td>High</td><td>2</td><td>Yes</td><td>No</td></tr>
</table></td><td></td></tr>
</table>

	high | High | 5 | yes | Yes b. Consider the dataset spiral.txt (https://bit.ly/2Lm75Ly). The first two columns in the dataset corresponds to the co-ordinates of each data point. The third column corresponds to the actual cluster label. Compute the rand index for the following methods: o K – means Clustering o Single – link Hierarchical Clustering o Complete link hierarchical clustering. Also visualize the dataset and which algorithm will be able to recover the true clusters.	
5	a) 1. Import any CSV file to Pandas Data Frame and perform the following: i. Visualize the first and last 10 records ii. Get the shape, index and column details iii. Select/Delete the records (rows)/columns based on conditions. iv. Perform ranking and sorting operations. v. Do required statistical operations on the given columns. vi. Find the count and uniqueness of the given categorical values. vii. Rename single/multiple columns b) import any CSV file to Pandas Data Frame and perform the following: i. Handle missing data by detecting and dropping/ filling missing values. ii. Transform data using apply () and map() method. iii. Detect and filter outliers. iv. Perform Vectorized String operations on Pandas Series. v. Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.	
6	A. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set. B. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following: 1. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis. 2. Bivariate analysis: Linear and logistic regression modeling 3. Multiple Regression analysis 4. Also compare the results of the above analysis for the two data sets. C. Apply and explore various plotting functions on UCI data sets. 1. Normal curves 2. Density and contour plots 3. Correlation and scatter plots 4. Histograms 5. Three-dimensional plotting D. Visualizing Geographic Data with Basemap	
7	Demonstrate Decision tree classification model and evaluate the performance of classifier on Iris dataset.	
Open ended Programs		
1	Load the Iris dataset as a list of lists (each of the 150 lists should have 5 elements). Compute and print the mean and the standard deviation for each of the 4 measurement columns (i.e.	**CO3,4,5**

	sepal length and width, petal length and width). Compute and print the mean and the standard deviation for each of the 4 measurement columns, separately for each of the three Iris species (Versicolor, Virginica and Setose). Which measurement would you consider "best", if you were to guess the Iris species based only on those four values?	
2	Load the MNIST dataset. Create a function that, given a position $1 \leq k \leq 10,000$, prints the kthdigit of the dataset (i.e. thekthrow of the csv file) as a grid of 28 × 28 characters. More specifically, you should map each range of pixel values to the following characters: $[0, 64) \rightarrow$ " " $[64, 128) \rightarrow$ "." $[128, 192) \rightarrow$ "*" $[192, 256) \rightarrow$ "#" Compute the Euclidean distance between each pair of the 784-dimensional vectors of the digits at the following positions: 26th, 30th, 32nd, 35th. Based on the distances computed in the previous step and knowing that the digits listed are 7, 0, 1, 1, can you assign the correct label to each of the digits?	**CO3,4,5**
3	Split the Iris dataset into two the datasets - IrisTest_TrainData.csv, IrisTest_TestData.csv. Read them as two separate data frames named Train_Data and Test_Data respectively. Answer the following questions: • How many missing values are there in Train_Data? • What is the proportion of Setosa types in the Test_Data? • What is the accuracy score of the K-Nearest Neighbor model (model_1) with 2/3 neighbors using Train_Data and Test_Data? • Identify the list of indices of misclassified samples from the „model_1". Build a logistic regression model (model_2) keeping the modelling steps constant. Find the accuracy of the model_2	**CO3,4,5**
4	Demonstrate any of the Clustering model and evaluate the performance on **Iris dataset**.	**CO3,4,5**

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Introducing Data Science, Davy Cielen, Arno D. B. Meysman and Mohamed Ali,Manning Publications, 2016
2	Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Units II and III)
Reference Books	
1	Joel Grus, "Data Science from Scratch", 2ndEdition, O'Reilly Publications/Shroff Publishers and Distributors Pvt. Ltd., 2019. ISBN-13: 978-9352138326
2	Data Visualization workshop, Tim Grobmann and Mario Dobler, Packt Publishing, ISBN 9781800568112

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 data science terminologies an To Understand the basics of data science	R, U	Level 1
CO2	Apply the Data Science process on real time scenario and explain how data is collected, managed and stored for data science.	R, U	Level 2
CO3	Analyze data visualization tools, Build, and prepare data for use with a variety of statistical methods and models	Ap	Level 3
CO4	Apply Data storage and processing with frameworks and Analyze Data using various Visualization techniques.	Ap, An	Level 4
CO5	Apply visualization Libraries in Python to interpret and explore data, Use the Python Libraries for Data Wrangling and Choose contemporary models, such as machine learning, AI, techniques to solve practical problems	Ap, An	Level 4

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.python.org
2	https://www.r-project.org/
3	https://www.nltk.org/book/
4	https://bit.ly/2Lm75Ly
5	https://archive.ics.uci.edu/ml/datasets.html
6	www.kaggle.com/ruiromanini/mtcars
7	https://www.jetbrains.com/pycharm/
8	https://nptel.ac.in/courses/106/106/106106179/

9	https://nptel.ac.in/courses/106/106/106106212/
10	http://nlp-iiith.vlabs.ac.in/List%20of%20experiments.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					
Understand					
Apply					
Analyse					
Evaluate					
Create					

CIE Course Assessment Plan

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

SEE- Semester End Examination (50 Marks)

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

SEE Course Plan

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

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 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	**:**	**3rd Semester**				
Course Title	**:**	**Computer Organization and Architecture**				
Course Code	**:**	**BCD304**				
Course Type (Theory/Practical/Project/Integrated)	**:**	**Theory**				
Category	**:**	**PCC**				
Stream	**:**	**CSE-DS**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**3-0-0-0**		**SEE**	**:**	**50**
Total Hours	**:**	**40 Hours**		**SEE Duration**	**:**	**3 hours**
Credits	**:**	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To impart basic concepts of computer architecture and organization,
2	To familiarize the basic CPU organization.
3	To help students in understanding various memory devices
4	To facilitate students in learning IO communication

Teaching-Learning Process

Pedagogical Initiatives:

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

- **i.** Adopt different teaching methods to attain the course outcomes.
- **ii.** Include videos to demonstrate various concepts in C.
- **iii.** Encourage collaborative (Group) Learning to encourage team building.
- **iv.** Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- **v.** 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.
- **vi.** Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- **vii.** Discuss various case studies to map with real-world scenarios and improve the understanding.
- **viii.** 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	**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, Addressing Modes.	8
Pedagogy	**Blended Learning**: Addressing Modes	
2	**Input/output Organization**: Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access: Bus Arbitration, Speed, size and Cost of memory systems. Cache Memories – Mapping Functions.	8
Pedagogy	**Demo:** Enabling and Disabling Interrupts	
3	**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.	8
Pedagogy	**Poster Presentation:** Pipelining	
4	**Instruction Sets:** characteristics and functions, Machine instruction characteristics, types of operands, Intel X86 and ARM Data types, types of operations, Intel X86 and ARM operation types, X86 and ARM addressing modes, instruction formats, Intel X86 and ARM instruction formats.	8
Pedagogy	**Group Discussion:** Intel X86 and ARM Processors	
5	**Graphics Processing Unit architectures**: Graphics Processing Unit (GPU), conventional CPU architecture, modern GPU architecture, GPU vendors, Nvidia architecture, G80 hardware implementation: a set of SIMD multiprocessors, hardware implementation: memory architecture, Nvidia GPU – fermi architecture, AMD platform – OpenCL, INTEL architecture	8
Pedagogy	**Case Study:** Nvidia GPU AMD and INTEL architecture	
	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	Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5th Edition, Tata McGraw Hill.
2	Computer Organization and Architecture – Designing for Performance, 10th Edition, William Stallings
3	https://www.nvidia.com/en-in/technologies/ https://www.amd.com/en/technologies/zen-core.html https://www.intel.com/
Reference Books	
1	M. Moris Mano (2006), Computer System Architecture, 3rd edition, Pearson/PHI, India
2	Digital Design and Computer Architecture", David Money Harris, Sarah L Harris, 2nd Edition, Morgan Kaufmann, 2012

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 basics of Computer Organization, concepts of program as sequences and operation of computers.	R	Level 2
CO2	Demonstrate the different ways of communication with I/O devices and standard I/O interfaces.	U	Level 2
CO3	Compare the basics of memory systems and cache Memories.	An	Level 4
CO4	Analyze various types of IO mapping techniques	An	Level 3
CO5	Compare the performance issues of Intel X86 and ARM Processors	Ap	Level 4

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.nvidia.com/en-in/technologies/
2	https://www.amd.com/en/technologies/zen-core.html
3	https://www.intel.com/

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**3rd Semester**				
Course Title	**:**	**OPERATING SYSTEMS**				
Course Code	**:**	**BCD305**				
Course Type (Theory/Practical/Project/Integrated)	**:**	**Theory**				
Category	**:**	**PCC**				
Stream	**:**	**CSE-DS**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:0:0**		**SEE**	**:**	**50**
Total Hours	**:**	**40 Hours**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To learn the basic concepts of modern operating system.
2	To Demonstrate the need for OS and different types of OS
3	To discuss suitable techniques for management of different resources
4	To demonstrate different APIs/Commands related to processor, memory, storage and file system management.
5	To discuss about process synchronization and deadlocks handling techniques

Teaching-Learning Process

Pedagogical Initiatives:

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

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

DSATM

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

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction to operating systems, Operating System structures:** What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments, Open-source operating systems. **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; Operating System debugging, Operating System generation; System boot.	8
Pedagogy	**Presentation**	
2	**Process Management:** Process concept; Process scheduling; Operations on processes; Inter process communication **Threads & Concurrency:** Overview; Multithreading models; Thread Libraries; Threading issues. **CPU Scheduling:** Basic concepts; Scheduling Criteria; Scheduling Algorithms; Thread scheduling; Multiple-processor scheduling,	8
Pedagogy	**Problem Solving**	
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.	8
Pedagogy	**Poster Presentation**	
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. **File System, Implementation of File System:** File system: File concept; Access methods; Directory and Disk structure; File system mounting; File sharing;	8
Pedagogy	**Case study Assignment**	
5	**Implementing File system:** File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. **Protection:** Goals of protection, Principles of protection, Domain of protection, Access matrix. **Case study on UNIX based Operating system:** Design principles, Kernel modules, Process management, Memory management.	8

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

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System concepts, 10th edition, Wiley-India, 2018.
Reference Books	
1	Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
2	D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.
3	P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, HI(EEE), 2014.
4	William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

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 structure and functionality of operating system	R,U	Level1 & Level2
CO2	Apply appropriate CPU scheduling algorithms for the given problem.	A	Level3
CO3	Analyse the various techniques for process synchronization and deadlock handling.	An	Level4
CO4	Find various techniques for memory management like file and secondary storage management strategies.	E	Level5
CO5	Analyze the need for information protection mechanisms in operating systems concepts.	An	Level4

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://youtu.be/mXw9ruZaxzQ
2	https://youtu.be/vBURTt97EkA
3	https://www.youtube.com/watch?v=783KABtuE4&list=PLIemF3uozcAKTgsCIj82voMK3TMR0YE_f
4	https://www.youtube.com/watch?v=3-ITLMMeeXY&list=PL3pGy4HtqwD0n7bQfHjPnsWzkeRn6mkO
5	https://www.bing.com/videos/riverview/relatedvideo?q=Abraham%20Silberschatz,%20Peter%20Baer%20Galvin,%20Greg%20Gagne,%20Operating%20System%20Principles%208th%20edition

PROJECT BASED LEARNING (PBL)

PBL- Project Based Learning

Teaching Hours/Week (L: T:P: S)	0:0:2:2
Total Hours of Pedagogy	30 hours – Theory + Project
Credits:	02
Modules	5
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Project Evaluation

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

1. Introduction

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

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

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

2. Characteristics of Project-Based Learning:

- Students making decisions within a framework
- A problem or challenge to be solved;
- Students designing the process for reaching a solution
- Students gathering and managing information
- Continuous Evaluation
- Students regularly reflecting on the process
- A final product to be evaluated for quality
- An atmosphere that tolerates error and change

3. Purpose

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

4. Objectives

- Introducing mini project based on the curriculum.
- Develop in depth knowledge of the topic and technology.

- Use critical thinking skills and make real world connections
- Demonstrate and understand through products.
- Industry and concept-oriented learning.

5. Why Incorporate PBL?

- Promotes collaboration and interaction
- Learners communicate meaningfully and for authentic purposes
- Allows students with a variety of learning styles to demonstrate their acquired knowledge
- Students learn language, content, and skills simultaneously
- Increases learner autonomy
- Provides opportunities for students to pursue their own interests and questions and make decisions about how they will find answers and solve problems.
- Improves education for all students Facilitates student integration of the content of different subjects
- Teaches children to use their own minds well and applies what they learn in school to life-long endeavors.
- Helps students to become technologically literate
- Establishes connections to life outside the classroom, addressing real-world concerns, and developing real-world skills
- Skills learned through PBL are those desired by today's employers.

6. Benefits of PBL

- Offers multiple ways for students to participate and to demonstrate their knowledge.
- Accommodates different kinds of intelligences.
- Shifts students away from doing only what they typically do in a classroom Environment.
- Encourages the mastery of technological tools, thus preparing them for the workforce.
- Serves as a medium for students who don't usually participate.
- Prompts students to collaborate while at the same time support self-directed learning.
- Offers a learning experience that draws on the thinking and shared efforts of several individuals.
- Helps students develop a variety of social skills relating to group work and negotiation.

- Promotes the internalization of concepts, values, and modes of thought, especially those related to cooperation and conflict resolution.
- Establishes a supportive and non-competitive climate for students.
- Provides a means for transferring the responsibility for learning from teachers to students.
- Calls upon students to explain or defend their position to others in their project groups, so that learning is more apt to be personalized and valued.

7. Process

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

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

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

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

7.1 Two phases for Assessment

Phase 1:

1. Phase 1 is for 4 weeks

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

Phase 2:

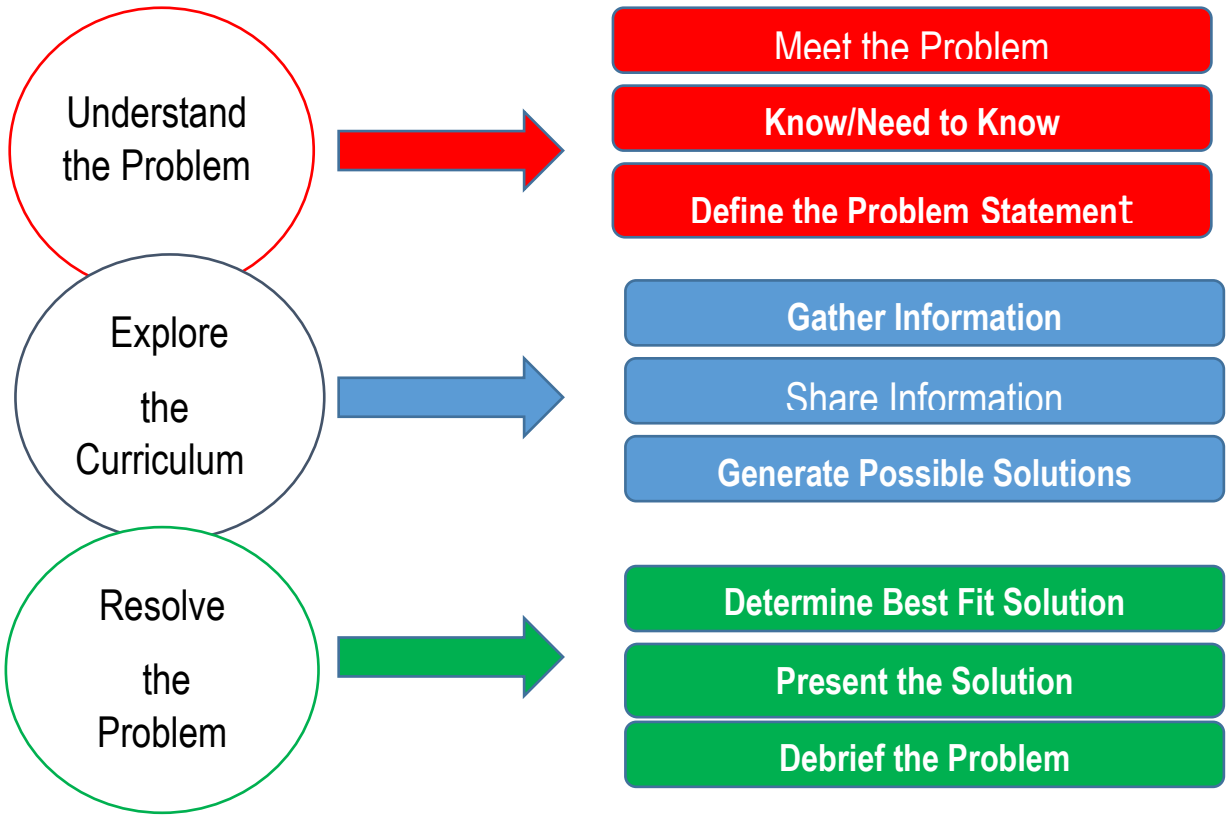
1. Phase 2 is for 11 Weeks

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

The marks distribution for PBL Work:

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.

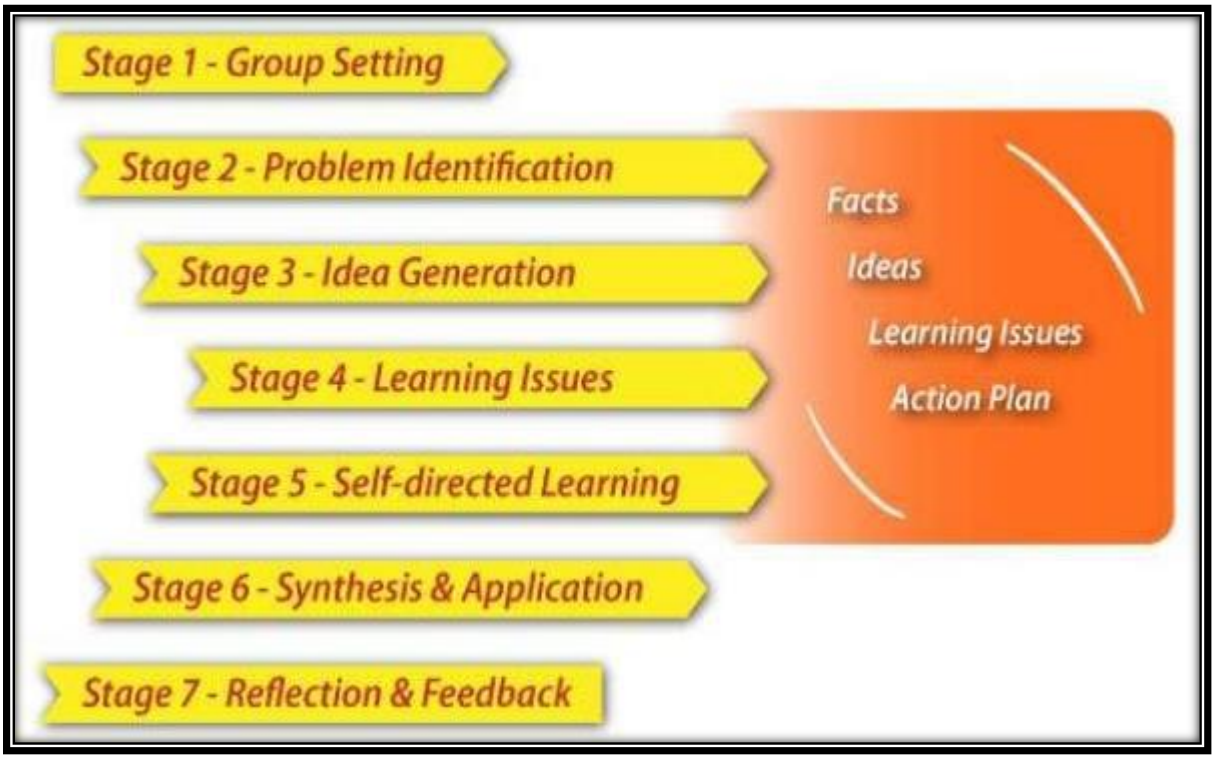
10. Obstacles/Gaps

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

11. 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.

12. Block diagram of PBL



13. Impact Analysis

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

14. PBL – Guidelines

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

14.1 Main phases of the project

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

15. Guidelines to prepare the Project report

- Project reports should be typed neatly only on one side of the paper with 1.5 or double line spacing on a A4 size bond paper (210 x 297 mm).
- The margins should be: Left – 1.25", Right – 1", Top and Bottom – 0.75".
- The total number of reports to be prepared are
    - One copy to the department.
    - One copy to the concerned guide
    - One copy to the candidate.
- Before taking the final printout, the approval of the concerned guide is mandatory and suggested corrections, if any, must be incorporated in the Final Report.
- For making copies dry tone Xerox is suggested.

- An abstract (synopsis) not exceeding 100 words, indicating salient features of the work.

16. Outcome of the project

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

Project - 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 content. ▪ Presentation has no clear organization.

Subject Identified for Project Based Learning

Semester	**3**
Subject Identified for PBL	**Object Oriented Programming using Java**
Prerequisite	Any programming language
Justification for the selected subject	**OOPS concept with JAVA is useful in implementing the projects and industry applications.**
List of possible projects	**This course is engaged by industry experts with projects assigned by them.**

Signature of the Guide **Signature of HOD**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**3rd Semester**				
Course Title	**:**	**Object Oriented Programming using Java**				
Course Code	**:**	**BCD306**				
Course Type (Theory/Practical/Project/Integrated)	**:**	**Project**				
Category	**:**	**PBL**				
Stream	**:**	**CSE-DS**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**0:0:2:2**		**SEE**	**:**	**50**
Total Hours	**:**	**30 hours – Theory + Project**		**SEE Duration**	**:**	**3 Hours Project Evaluation**
Credits	**:**	**2**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To learn primitive constructs JAVA programming language.
2	To understand Object Oriented Programming Features of JAVA.
3	To gain knowledge on: packages, multithreaded programming and exceptions.
4	To learn primitive concepts of I/O basics in JAVA programming language.
5	To implement applications using java concepts

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	**An Overview of Java:** The Java Buzzwords, Object-Oriented Programming (Two Paradigms, Abstraction, The Three OOP Principles), Using Blocks of Code, Lexical Issues (Whitespace, Identifiers, Literals, Comments, Separators, The Java Keywords). **Data Types, Variables, Arrays:** The Primitive Data Types, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, Introducing Type Inference with Local Variables. **Operators:** Arithmetic 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.	6
Pedagogy	**Presentation**	
2	**Introducing Classes:** Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, This Keyword, Garbage Collection. **Methods and Classes:** Overloading Methods, Objects as Parameters, Argument Passing, Returning Objects, Recursion, Access Control, understanding static, introducing final, Introducing Nested and Inner Classes. **Inheritance:** Inheritance Basics, using super keyword, creating a Multilevel Hierarchy, When Constructors Are Executed, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, Local Variable Type Inference and Inheritance, The Object Class.	6
Pedagogy	**Demonstration**	
3	**Packages:** Packages, Packages and Member Access, Importing Packages. **Interfaces:** Interfaces, Default Interface Methods, Use static Methods in an Interface, Private Interface Methods. **Exceptions:** Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions.	6
Pedagogy	**Group Discussion**	
4	**Multithreaded Programming:** The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Interthread Communication, Suspending, Resuming, and Stopping Threads, Obtaining a Thread's State. **Enumerations, Type Wrappers and Autoboxing/Unboxing**: Enumerations, Type Wrappers. Autoboxing and Methods, Autoboxing/Unboxing Occurs in Expressions, Autoboxing/Unboxing Boolean and Character Values. **String Handling:** The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, modifying a String, Data Conversion Using valueOf ().	6

Pedagogy	Case study Assignment	
5	**I/O Basics:** The Stream classes, Byte Streams and Character Streams, The Predefined Streams, Reading Console Input, Reading Characters, Reading Strings, Writing Console Output, The Print Writer Class, Reading and Writing Files. **The concept of JDBC:** JDBC Driver Types; JDBC packages; A brief overview of the JDBC Process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; Result Set; Transaction Processing; Metadata, Data Types; Exceptions. **Swings** Swing fundamentals, writing swing application, swing library, layouts and controls. Introduction to event handling.	6
	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
Reference Books	
1	Programming with Java, 6th Edition, by E Balagurusamy, Mar-2019, McGraw Hill Education, ISBN: 9789353162337.
2	Thinking in Java, Fourth Edition, by Bruce Eckel, Prentice Hall, 2006
3	Thinking in Java, Fourth Edition, by Bruce Eckel, PrenticeHall, 2006 (https://sd.blackball.lv/library/thinking_in_java_4th_edition.pdf)
4	Horstmann C. S. & Cornell G., *Core Java Volume I – Fundamentals (9e),* Prentice Hall 2013.
5	Horstmann C. S. & Cornell G., *Core Java Volume II – Advanced Features (9e)*, Prentice Hall 2013.

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Remember and understand the basic concepts of java with object-oriented programming structure.	R, U	Level1 & Level2
CO2	Apply the OOPs concepts to involving data members and methods for the given scenario.	A	Level3
CO3	Analyse the concept of Inheritance, packages and exception handling to solve complex problems.	An	Level4
CO4	Apply the concepts of inheritance and interfaces in solving real world problems.	A	Level3
CO5	Investigate the concept of given problem and use java concepts to implement real world problems.	E	Level5
CO6	Use modern tools with Java concepts to design and develop application programming.	C	Level6

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															
CO3															
CO4															
CO5															
CO6															

Weblinks and Video Lectures (e-Resources)	
1	Java Tutorial: https://www.javatpoint.com/java-tutorial
2	Java Tutorial: https://www.geeksforgeeks.org/java/
3	Introduction To Programming In Java (by Evan Jones, Adam Marcus and Eugene Wu):
4	https://ocw.mit.edu/courses/6-092-introduction-to-programming-in-java-january-iap-2010/
5	Java Tutorial: https://www.w3schools.com/java/

CIE- Continuous Internal Evaluation (50 Marks)

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

CIE Course Assessment Plan

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

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**

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 – 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**

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 – Review

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

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)

AEC Course – Ability Enhancement Course

Teaching Hours/Week (L: T:P: S)	0:0:2:0
Total Hours of Pedagogy	15 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

(Autonomous Institute under VTU)

Semester	**:**	**3rd**				
Course Title	**:**	**R Language**				
Course Code	**:**	**BCD317**				
Course Type (Theory/Practical/Project/ Integrated)	**:**	**Practical - Experiential Learning**				
Category	**:**	**AEC**				
Stream	**:**	**CSE-DS**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**0:0:2:0**		**SEE**	**:**	**50**
Total Hours	**:**	**15 Hours**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**01**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	CLO 1: To Gain the knowledge of R Programming Concepts
2	CLO 2: To Explain the concepts of Data Visualization
3	CLO 3: To Explain the concept of Statistics in R.
4	CLO 4: To Work with R charts and Graphs

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 R-Lang.
- 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	**Basics of R** Introducing R, Initiating R, Packages in R, Environments and Functions, Flow Controls, Loops, Basic Data Types in R, Vectors **Lab Component:** Demonstrate the steps for installation of R and R Studio. Perform the following: a) Assign different type of values to variables and display the type of variable. Assign different types such as Double, Integer, Logical, Complex and Character and understand the difference between each data type. b) Demonstrate Arithmetic and Logical Operations with simple examples. c) Demonstrate generation of sequences and creation of vectors. d) Demonstrate Creation of Matrices e) Demonstrate the Creation of Matrices from Vectors using Binding Function. f) Demonstrate element extraction from vectors, matrices and arrays	**3 Hours**
Pedagogy	**Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another	
2	**Basics of R Continued** Matrices and Arrays, Lists, Data Frames, Factors, Strings, Dates and Times **Lab Component:** Assess the Financial Statement of an Organization being supplied with 2 vectors of data: Monthly Revenue and Monthly Expenses for the Financial Year. You can create your own sample data vector for this experiment) Calculate the following financial metrics: • Profit for each month. • Profit after tax for each month (Tax Rate is 30%). • Profit margin for each month equals to profit after tax divided by revenue. • Good Months – where the profit after tax was greater than the mean for the year. • Bad Months – where the profit after tax was less than the mean for the year. • The best month – where the profit after tax was max for the year. • The worst month – where the profit after tax was min for the year. **Note:** a. All Results need to be presented as vectors b. Results for Dollar values need to be calculated with $0.01 precision, but need to be presented in Units of $1000 (i.e 1k) with no decimal points c. Results for the profit margin ratio need to be presented in units of % with no decimal point. d. It is okay for tax to be negative for any given month (deferred tax asset) e. Generate CSV file for the data.	**3 Hours**
Pedagogy	Project based, Problem Based, Building Models, Model Development	
3	**Data Preparation:** Datasets, Importing and Exporting files, Accessing Databases, Data cleaning, and Transformation	**3 Hours**

<table>
<tr><td></td><td>Lab Component:
1.Develop a program to create two 3 X 3 matrices A and B and perform the following operations a) Transpose of the matrix b) addition c) subtraction d) multiplication
2. Develop a program to find the factorial of given number using recursive function calls.</td><td></td></tr>
<tr><td>Pedagogy</td><td colspan="2">Problem Solving: encourages cognitive thinking and enables creative problem solving</td></tr>
<tr><td>4</td><td>Graphics using R
Exploratory Data Analysis, Main Graphical Packages, Pie Charts, Scatter Plots, Line Plots, Histograms, Box Plots, Bar Plots, Other Graphical packages
Lab Component:
1. Develop an R Program using functions to find all the prime numbers up to a specified number by the method of Sieve of Eratosthenes.
2. The built-in data set mammals contain data on body weight versus brain weight. Develop R commands to:
a. Find the Pearson and Spearman correlation coefficients. Are they similar?
b. Plot the data using the plot command.
c. Plot the logarithm (log) of each variable and see if that makes a difference.
1. Develop R program to create a Data Frame with following details and do the following operations.
<table>
<tr><th>Item Code</th><th>Item Category</th><th>Item Price</th></tr>
<tr><td>1001</td><td>Electronics</td><td>700</td></tr>
<tr><td>1002</td><td>Desktop Supplies</td><td>300</td></tr>
<tr><td>1003</td><td>Office Supplies</td><td>350</td></tr>
<tr><td>1004</td><td>USB</td><td>400</td></tr>
<tr><td>1005</td><td>CD Drive</td><td>800</td></tr>
</table>
a. Subset the Data frame and display the details of only those items whose price is greater than or equal to 350.
b. Subset the Data frame and display only the items where the category is either “Office Supplies” or “Desktop Supplies”
c. Create another Data Frame called “item-details” with three different fields item Code, Item Qty on Hand and ItemReorderLvl and merge the two frames</td><td>3 Hours</td></tr>
<tr><td>Pedagogy</td><td colspan="2">Demonstration: exhibits the implementation process
Project based, Problem Based, Building Models, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom</td></tr>
<tr><td>5</td><td>Statistical Analysis using R
Basic Statistical Measures, Normal distribution, Binomial distribution, Correlation Analysis, Regression Analysis-Linear Regression Analysis of Variance
Lab Component:
1. Let us use the built-in dataset air quality which has Daily air quality measurements in New York, May to September 1973. Develop R program to generate histogram by using appropriate arguments for the following statements.
• Assigning names, using the air quality data set.
• Change colors of the Histogram
• Remove Axis and Add labels to Histogram
• Change Axis limits of a Histogram
• Add Density curve to the histogram</td><td>3 Hours</td></tr>
</table>

	2. Design a data frame in R for storing about 20 employee details. Create a CSV file named "input.csv" that defines all the required information about the employee such as id, name, salary, start date, dept. Import into R and do the following analysis. • Find the total number rows & columns • Find the maximum salary • Retrieve the details of the employee with maximum salary • Retrieve all the employees working in the IT Department. • Retrieve the employees in the IT Department whose salary is greater than 20000 and write these details into another file "output.csv". 3. Using the built in dataset mtcars which is a popular dataset consisting of the design and fuel consumption patterns of 32 different automobiles. The data was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption and 10 aspects of automobile design and performance for 32 automobiles (1973-74 models). Format A data frame with 32 observations on 11 variables: [1] mpg Miles/(US) gallon, [2] cyl Number of cylinders [3] disp Displacement (cu.in.), [4] hp Gross horsepower [5] drat Rear axle ratio,[6] wt Weight (lb/1000) [7] qsec 1/4-mile time, [8] vs V/S, [9] am Transmission (0 = automatic, 1 = manual), [10] gear Number of forward gears, [11] carb Number of carburetors Develop R program, to solve the following: a. What is the total number of observations and variables in the dataset? b. Find the car with the largest hp and the least hp using suitable functions c. Plot histogram / density for each variable and determine whether continuous variables are normally distributed or not. If not, what is their skewness? d. What is the average difference of gross horse power(hp) between automobiles with 3 and 4 number of cylinders(cyl)? Also determine the difference in their standard deviations. e. Which pair of variables has the highest Pearson correlation?	
	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	R Programming: An Approach to Data Analytics, G. Sudhamathy and C. Jothi Venkateswaran, MJP Publishers, 2019
Reference Books	
1.	An Introduction to R, Notes on R: A Programming Environment for Data Analysis and Graphics. W. N. Venables, D.M. Smith and the R Development Core Team. Version 3.0.1 (2013-05-16)
2.	Cotton, R. (2013). Learning R: A Step-by-Step Function Guide to Data Analysis. 1st ed. O'Reilly Media Inc

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 structures of R Programming.	Understand	L2
CO2	Illustrate the basics of Data Preparation with real world examples.	Apply	L3
CO3	Apply the Graphical Packages of R for visualization.	Analyse	L4
CO4	Apply various Statistical Analysis methods for data analytics.	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)
1. https://users.phhp.ufl.edu/rlp176/Courses/PHC6089/R_notes/intro.html 2. https://cran.r-project.org/web/packages/explore/vignettes/explore_mtcars.html 3. https://www.w3schools.com/r/r_stat_data_set.asp 4. https://rpubs.com/BillB/217355 5. http://www.tutorialspoint.com/r/r_tutorial.pdf 6. https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf

CIE- Continuous Internal Evaluation (50 Marks)

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

CIE Course Assessment Plan

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

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks
Remember	
Understand	
Apply	
Analyse	
Evaluate	
Create	

SEE Course Plan

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**3rd Semester**				
Course Title	**:**	**Go Lang**				
Course Code	**:**	**BCD327**				
Course Type (Theory/Practical/Project/Integrated)	**:**	**Practical - Experiential Learning**				
Category	**:**	**AEC**				
Stream	**:**	**CSE-DS**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**0:0:2:0**		**SEE**	**:**	**50**
Total Hours	**:**	**15 hours**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**01**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Learn the syntax and semantics of the Go-Lang programming language.
2	Illustrate the process of structuring the data using lists, tuples
3	Analyse string manipulation and pattern matching methods
4	Demonstrate the use of built-in functions to navigate the file system.
5	Implement the Object-Oriented Programming concepts in Go-Lang.

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 Go-Lang.
- 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	The Origins of Go xi The Go Project **Introduction:** Hello, World Program, Command-Line Arguments, Finding Duplicate Lines, Animated GIFs, fetching a URL, Fetching URLs Con currently, A We b Server, Loose Ends **Program Structure:** Names, Declarations, Variables, Assignments, Type Declarations, Packages and Files, Scope **Basic Data Types:** Integers, Floating-Point Numbers, Complex Numbers, Booleans, Strings, Constants **Composite Types:** Arrays, Slices, Maps, Structs, JSON, Text and HTML Templates **Lab Component**: 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 check whether a given number is palindrome or not and also count the number of occurrences of each digit in the input number c. Develop a program to generate Fibonacci sequence of length (N). Read N from the console. d. Write a function to calculate factorial of a number with and without recursion.	**3 Hours**
Pedagogy	**Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another	
2	**Functions:** Function Declarations, Recursion, Multiple Return Values, Errors, Function Values, Anonymous Functions, Variadic Functions, Deferred Function Cal ls, Panic, Recover **Methods:** Method Declarations, Methods with a Pointer Receiver, Composing Types by Struct Embedding, Method Values and Expressions, Example: Bit Vector Type, Encapsulation **Lab Component:** a. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages using functions. b. Develop a program to convert binary to decimal, octal to hexadecimal using functions.	**3 Hours**
Pedagogy	**Problem Solving**	
3	**Interfaces:** Interfaces as Contracts, Interface Types, Interface Satisfaction, Parsing Flags with flag. Value, Interface Values, Sor ting with sort. Interface, The http. Handler Interface, the error Interface, Example: Expression Evaluator, Type Assertions, Discriminating Errors with Type Assertions, Querying Behaviours with Interface Type Assertions, Type Switches, Example: Token-Based XML Decoding, A Fe w Words of Adv ice **Goroutines and Channels:** Goroutines: Example: Concur rent Clock Server, Example: Concurrent Echo Server, Channel s, Looping in Parallel, Example: Concurrent Web	**3 Hours**

	Crawler, multiplexing with select, Example: Con current Directory Traversal, Cancellation, Example: Chat Server **Lab Component:** a. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable messages b**.** 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] c. Develop a program to sort the contents of a text file and write the sorted contents into a separate text file d. Develop a program to backing Up a given Folder (Folder in a current working directory) into a ZIP File by using relevant modules and suitable methods. e. Write a function named DivExp which takes TWO parameters a, b and returns a value c (c=a/b). Write suitable assertion for a>0 in function DivExp and raise an exception for when b=0. Develop a suitable program which reads two values from the console and calls a function DivExp.	
Pedagogy	**Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.	
4	**Concurrency with Shared Variables:** Race Conditions, Mutual Exclusion: sync. Mutex, Read/Write Mut exes: sync. RWMutex, Memory Synchronization, Lazy Initialization: sync. Once, The Race Detector, Example: Con current Non-Blocking Cache, Goroutines and Threads, **Pack ages and the Go Tool:** Introduction, Import Paths, The Package Declaration, Imp ort Declarations, Blank Imports, Packages and Naming, The Go Tool Text Book1 Chapter 9 and 10 **Lab Component** a. Develop a program to demonstrate find all function and character class using regex module. b. Develop a program that could search the text in a file for phone numbers (+919900889977) and email addresses (sample@gmail.com). c. Define a function which takes TWO objects representing complex numbers and returns new complex number with a addition of two complex numbers. Define a suitable class 'Complex' to represent the complex number. Develop a program to read N (N >=2) complex numbers and to compute the addition of N complex numbers.	**3 Hours**
Pedagogy	**Case studies:** maps different domains in real time applications	
5	**Reflection:** Why Reflection? reflect. Type and reflect. Value, Display, a Recursive Value Printer, Example: Encoding S-Expressions, Setting Variables with reflect. Value, Example: Decoding S-Expressions, Accessing Struct Field Tags, Displaying the Methods of a Type, A Word of Caution, **Low-Level Programming,** unsafe. Size of, Alignof, and Offset of, unsafe. Pointer, Example: Deep Equivalence, Cal ling C Code with cgo, Another Word of Caution **Lab Component:** a. Develop a program that uses class Student which prompts the user to enter marks in three subjects and calculates total marks, percentage and displays the score card details. [Hint: Use list to store the marks in three subjects and total marks. Use __init__ () method to initialize name, USN and the lists to store marks and total, Use getMarks() method to read marks into the list, and display() method to display the score card details.].	**3 Hours**

	b. Demonstrate Web scraping using suitable example.	
	Open Ended Questions: 1. Demonstrate Web scraping using suitable example. 2. Demonstrate API Integration. 3. Demonstrate about Data Visualization. 4. Demonstrate GUI Applications. 5. Demonstrate E-mail Automation.	
	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 Go Programming Language, Alan A. A. Donovan, Google Inc., Brian W. Kernighan Princeton University Addison Wesley, www.it-ebooks.info http://www.cs.uniroma2.it/upload/2017/TSC/The%20Go%20Programming%20Language.pdf
2	https://www.golang-book.com/public/pdf/gobook.pdf
Reference Books	
1.	Go for Python Programmers Documentation, Release 0.1a, Jason McVetta Jul 04, 2018
2.	A Tour of Go Russ Cox *rsc@golang.org* http://golang.org/ *USENIX 2010*
3.	An Introduction to Programming in Go, 2012 by Caleb Doxsey https://www.golang-book.com/books/intro

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 syntax and schematics of Go Lang programming.	Understand	L2
CO2	Apply data structures, functions for effective implementation of solution.	Apply	L3
CO3	Analyse object-oriented concepts and file operations.	Analyse	L4
CO4	Evaluate strings using pattern recognition techniques.	Evaluate	L5
CO5	Implement real world problems by using Data analysis and Scientific computation methods.	Create	L6

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://go.dev/learn/
2	Go: The Complete Developer's Guide (Golang): https://bit.ly/3NF0msd 2. Programming with Google Go Specialization: https://bit.ly/3lFG0Dh 3. Go Fundamentals By Nigel Poulton: https://bit.ly/3MNVfpz 4. Learn to Go at Codecademy: https://bit.ly/39Tg6cg 5. Learn How To Code: Google's Go (Golang) Programming Language: https://bit.ly/3wJJsTp 6. Golang Mastery Course on Boot.Dev - https://bit.ly/3lNqFQM 7. Go (Golang): The Complete Bootcamp [Udemy Course] - https://bit.ly/3aodzXZ 8. Go Programming (Golang): The Complete Developer's Guide - https://bit.ly/3NwKsA0
3	https://www.mygreatlearning.com/academy/learn-for-free/courses/go-programming-language https://www.w3schools.com/go/

Credit Course – Practical

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
The minimum passing mark for the CIE is 40% of the maximum Marks (20 Marks out of 50).
The minimum passing mark for the SEE is 35% of the maximum Marks (18 Marks out of 50).
A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the Semester-End Examination (SEE), and a minimum of 40% (40 Marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are 50 Marks. The split-up of CIE marks for record/ journal and test are in the ratio 60:40.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to 20 marks (40% of the maximum marks). The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course are 50 Marks.

	• SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the Head of the Institute.
	• The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University. All laboratory experiments are to be included for practical examination.
	• (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered by the examiners or based on the course requirement evaluation rubrics shall be decided jointly by examiners.
	• Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
	• Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
	• General rubrics suggested for SEE are mentioned here,
	  • Writeup-20%,
	  • Conduction procedure and result in -60%,
	  • Viva-voce 20% of maximum marks.
	SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
	• Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.
	• The minimum duration of SEE is 02 hours.

SOCIAL CONNECT
&
RESPONSIBILITY (SCR)

SCR- Social Connect & Responsibility

Teaching Hours/Week (L: T: P: S)	0:0:0:2
Total Hours of Pedagogy	15 hours
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	**:**	**3rd Semester**				
Course Title	**:**	**Social Connect & Responsibility**				
Course Code	**:**	**BSCK308**				
Course Type (Theory/Practical/Project/Integrated)	**:**	**Practical**				
Category	**:**	**SCR**				
Stream	**:**	**CSE-DS**		**CIE**	**:**	**100**
Teaching hours/ week (L:T:P:S)	**:**	**0:0:2:0**		**SEE**	**:**	**---**
Total Hours	**:**	**15 Hours**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**1**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Provide a formal platform for students to communicate and connect to the surrounding.
2	create a responsible connection with the society.
3	Understand the community in general in which they work.
4	Identify the needs and problems of the community and involve them in problem –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 teachers can 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 homework, 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, 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	**Part I:** **Plantation and adoption of a tree:** Plantation of a tree that will be adopted for four years by a group of BE / B. Tech students. (ONE STUDENT ONE TREE) They will also make an excerpt either as a documentary 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 Hours**
Pedagogy		
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 Hours**
Pedagogy		
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 Hours**
Pedagogy		
4	**Part IV:** **Water conservation:** Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photoblog presenting the current practices – Objectives, Visit, case study, report, outcomes.	**3 Hours**
Pedagogy		

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

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

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

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

Mapping of Course Outcomes to Program Outcomes:

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

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 to define 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/Contin uous 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/Contin uous 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/ Governme nt 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>

Course - Skills Mapping Table

3rd Semester					
Sl. No	**Name of the Course**	**Course Code**	**Course Type**	**Course Category**	**Skills attained by the students**
1	Data Structures and Applications	23CSDS32	Integrated	IPCC	➢ System Programming, ➢ Organizing data structure ➢ Information retrieval Developing data structure applications
2	Data science for Engineering	23CSDS33	Integrated	IPCC	➢ Model development ➢ PySpark for data visualization ➢ Managing various data sets ➢ Data curation
3	Object Oriented Programming using Java	23CSDS36	Project	PBL	➢ Object oriented programming concepts. ➢ Application design ➢ Project implementation
4	R language for Data Analytics / Go lang for Data Analytics	23CSDS37	Practical Experiential learning	AEC	➢ Data Analysis ➢ Model development ➢ Data visualization ➢ Implement models using datasets ➢ Data visualization ➢ Feature selection and extraction

4th SEMESTER

BASIC SCIENCE (BSC)

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**4th**				
Course Title	:	**Statistics and Probability**				
Course Code	:	**BMATD401**				
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 of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for BE Programme -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 Gedeck O'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	**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)	
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 lab component	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).
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.

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 form y=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	Binomial distribution, Poisson distribution	1
2	Normal distribution	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 a test 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 curve and 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 of IPCC (that is for 25 marks).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

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

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

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

Semester End Examination (SEE) for IPCC Theory

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

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

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

Continuous and Comprehensive Assessment (CCA):

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

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

Total score for CCA is **10 Marks**

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

Possible Continuous and Comprehensive Assessment (CCA):

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

4 Credits Courses – Integrated Professional Core Course (IPCC)

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

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

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

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

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**4th Semester**				
Course Title	**:**	**Analysis & Design of Algorithms**				
Course Code	**:**	**BCD402**				
Course Type (Theory/Practical/Project/Integrated)	**:**	**Integrated**				
Category	**:**	**IPCC**				
Stream	**:**	**CSE-DS**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:2:0**		**SEE**	**:**	**50**
Total Hours	**:**	**40 Hours of Theory + 20 Hours of Practical**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**4**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To learn the methods for analyzing algorithms and evaluating their performance.
2	To demonstrate the efficiency of algorithms using asymptotic notations.
3	To solve problems using various algorithm design methods, including brute force,
4	To get knowledge on greedy, divide and conquer, decrease and conquer, transform and conquer, dynamic programming, backtracking, and branch and bound concepts.
5	To Learn programming in backtracking, and branch and bound concepts.

Teaching-Learning Process

Pedagogical Initiatives:

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

- **ix.** Adopt different teaching methods to attain the course outcomes.
- **x.** Include videos to demonstrate various concepts in C.
- **xi.** Encourage collaborative (Group) Learning to encourage team building.
- **xii.** Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- **xiii.** 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.
- **xiv.** Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- **xv.** Discuss various case studies to map with real-world scenarios and improve the understanding.
- **xvi.** 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? Fundamentals of Algorithmic Problem Solving. **FUNDAMENTALS OF THE ANALYSIS OF ALGORITHM EFFICIENCY:** Analysis Framework, Space and Time complexity, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non recursive Algorithms, Mathematical Analysis of Recursive Algorithms. **BRUTE FORCE APPROACHES**: Selection Sort and Bubble Sort, Sequential Search and Brute Force String Matching.	8
Pedagogy	**Demonstration**	
2	**BRUTE FORCE APPROACHES (contd..):** Exhaustive Search (Travelling Salesman problem and Knapsack Problem). **DECREASE-AND-CONQUER:** Insertion Sort, Topological Sorting. **DIVIDE AND CONQUER:** Merge Sort, Quick Sort, Binary Tree Traversals, Multiplication of Large Integers and Strassen's Matrix Multiplication, Selection problem, Closest pair of points, Solving Recurrence Equations.	8
Pedagogy	**Problem Solving**	
3	**TRANSFORM-AND-CONQUER:** Array Representation of Binary Tree, Binary search trees, Heap Tree and Heap Sort, AVL Tree, B Trees, B+ trees, Red Black Trees. **SPACE-TIME TRADEOFFS:** Sorting by Counting: Comparison counting sort, Input Enhancement in String Matching: Horspool's Algorithm. **Hashing:** Open Hashing (Separate Chaining), Closed Hashing (Open Addressing).	8
Pedagogy	**Case study Assignment**	
4	**DYNAMIC PROGRAMMING:** Basic Examples, 0/1 Knapsack problems and Memory Functions, Matrix Multiplication Chains, All pair's shortest paths, Warshall's and Floyd's Algorithms. **THE GREEDY METHOD:** Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees and Codes, Optimization problems, Fractional Knapsack problem, Topological sorting, Single-Source Shortest paths.	8
Pedagogy	**Poster Presentation**	
5	**LIMITATIONS OF ALGORITHMIC POWER:** Decision Trees, Polynomial Time and verification, P and NP Problems, NP-Completeness and Reducibility, NP-Hard problems. **COPING WITH LIMITATIONS OF ALGORITHMIC POWER:** Backtracking (n-Queens problem, Subset-sum problem, Max clique and Travelling salesperson), Branch-and-Bound (0/1 Knapsack problem, Max clique and Travelling salesperson), Approximation algorithms for NP-Hard problems (Knapsack problem).	8

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

List of Programs:

Sl. No.	Experiments/Programs	COs
1	Design and implement C/C++ Program to 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.	CO1
2	Design and implement C/C++ Program to 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. 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.	CO3
3	Design and implement C/C++ Program to 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	CO3
4	a. Design and implement C/C++ Program to find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. b. Design and implement C/C++ Program to find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.	CO4
5	a.Design and implement C/C++ Program to solve All-Pairs Shortest Paths problem using Floyd's algorithm. b. Design and implement C/C++ Program to find the transitive closure using Warshal's algorithm.	CO4
6	a. Design and implement C/C++ Program to find shortest paths from a given vertex in a weighted connected graph to other vertices using Dijkstra's algorithm. b. Write a Program to perform the following and find the time complexity using step count method: 1. Finding a path in the graph 2. Finding a cycle in the graph 3. Check whether the given graph is connected or not.	CO4
7	Design and implement C/C++ Program to obtain the Topological ordering of vertices in a given digraph.	CO1

8	a. Design and implement C/C++ Program to solve 0/1 Knapsack problem using Dynamic Programming method. b. Design and implement C/C++ Program to solve discrete Knapsack and continuous Knapsack problems using greedy approximation method.	**CO4**
9	a. Design and implement C/C++ 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. b. Program to find the maximum element of an array using divide and conquer technique. Write a Program to multiply two matrices using Strassen's method and analyze the time complexity.	**CO1**
10	a. Design and implement C/C++ Program for N Queen's problem using Backtracking b. Implement N-Queens problem using branch and bound technique and compare the efficiency of the both.	**CO3**
Open ended Programs		
1	a. Write a C++ program to implement Minimum Heap Sort algorithms and display its time complexity value. b. Write a C++ program to design and implement Matrix Chain Multiplication and display space complexity of the above logic for different sample values.	**CO1**
2	a. A vertex cover of an undirected graph G = (V, E) is a subset V' of set V such that if (u, v) is an edge of G, then either u Є V' or v Є V' (or both). The size of a vertex cover is the number of vertices in it. Write a program to find a vertex cover of minimum size in a given undirected graph. b. Write a program to implement travelling sales person's problem in polynomial time approximate using minimum spanning tree. c. Write a program to determine the minimum number of colors needed to color a planar graph G = (V, E).	**CO1**
3	a. Write a program to implement container loading problem using Max-Heap branch and bound technique. b. Implement Travelling Sales Person problem using branch and bound technique. Use proper bounding functions.	**CO4**

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, By Anany Levitin, 3rd Edition (Indian), 2017, Pearson.
2	T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein, *Introduction to Algorithms (3e),* Prentice-Hall India, 2009.
3	Sartaj Sahni, *Data Structures, Algorithms and Applications in C++ (2e),* Silicon Press, 2005.

Reference Books	
1	Computer Algorithms/C++, Ellis Horowitz, SatrajSahni and Rajasekaran, 2nd Edition, 2014, Universities Press.
2	Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
3	Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)
4	Mark Allen Weiss, *Data Structures and Algorithm Analysis in C*, Pearson Education *(3e),* 2009.

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Remember asymptotic notational method and understand the performance of the algorithms in terms of time complexity.	U,R	Level1 & Level2
CO2	Apply divide & conquer approaches and decrease & conquer approaches to solve computational problems.	A	Level3
CO3	Analyze transform & conquer and dynamic programming design approaches to solve the given real world or complex computational problems.	An	Level4
CO4	Analyze greedy and input enhancement methods to solve graph & string based computational problems.	An	Level4
CO5	Investigate various classes (P, NP and NP Complete) of problems solving technique	E	Level5
CO6	Use the method of backtracking, branch & bound and approximation methods for real world problem solving in application development.	E	Level5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															
CO3															
CO4															
CO5															
CO6															

Weblinks and Video Lectures (e-Resources)	
1	Design and Analysis of Algorithms: https://nptel.ac.in/courses/106/101/106101060/
2	A. Levitin "Introduction to the Design & Analysis of Algorithms," 3rd ed., Ch. 3 ©2012 Pearson Education, Inc. Upper Saddle River, NJ. All Rights Reserved. - ppt download (slideplayer.com)

CIE- Continuous Internal Evaluation (50 Marks)

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

CIE Course Assessment Plan

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

SEE- Semester End Examination (50 Marks)

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

SEE Course Plan

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**4th Semester**				
Course Title	**:**	**Database Management system**				
Course Code	**:**	**BCD403**				
Course Type (Theory/Practical/Project/Integrated)	**:**	**Integrated**				
Category	**:**	**IPCC**				
Stream	**:**	**CSE-DS**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**3.:0:2:0**		**SEE**	**:**	**50**
Total Hours	**:**	**40 Hours of Theory + 20 Hours practical**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**4**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the fundamental of data base management systems.
2	Apply and create the database design models- ER and Relational model.
3	Analyze and create database and Design queries using SQL.
4	Apply and analyze the normalization techniques to design good database.
5	Analyse the various non-relational / NoSQL database.

Teaching-Learning Process

Pedagogical Initiatives:

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

xvii. Adopt different teaching methods to attain the course outcomes.

xviii. Include videos to demonstrate various concepts in C.

xix. Encourage collaborative (Group) Learning to encourage team building.

xx. Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.

xxi. 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.

xxii. Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.

xxiii. Discuss various case studies to map with real-world scenarios and improve the understanding.

xxiv. 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, Data modules: Database Architectures: Introduction, Characteristics of database approach, Advantages of using the DBMS approaches, History of database applications. Data Models and Architecture: Data Models, Schemas and Instances. Two schema architecture, three schema architecture and data independence, database language and interfaces.	8 hrs
Pedagogy	**Think Pair and Share**	
2	Conceptual Data. Module, Relational Model and Relational Algebra: Entity type, Entity sets and structural constraints Weak entity types, ER diagrams, Specialization and Generalization Relational Model: Relational Model concepts, constrains and relational database schemas, Update operations, transactions, and dealing with constraints violations. Relation Algebra: unary, binary relational operations, additional relational operations, Examples of Queries in Relational Algebra, relational database design using ER to Relational mapping.	8 hrs
Pedagogy	**Problem Solving**	
3	SQL, Advanced SQL, NOSQL, Triggers: SQL data definition, data type, Schema change statements in SQL, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE And UPDATE statements in SQL. Advanced SQL: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, views in SQL.	8 hrs
Pedagogy	**Problem Solving**	
4	Normalization: Introduction to Normalization using Functional and Multivalued. Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form. NOSQL: Introduction to NOSQL, The CAP Theorem, Document –based SQL system and MongoDB, NOSQL key value stores, column –based or wide column NOSQL system, Graph Database.	8 hrs
Pedagogy	**Problem Solving**	
5	Transaction control and concurrency control: Introduction to transaction processing, Transaction and system concepts, Desirable properties of transaction, characterizing schedules based on recoverability, transaction support in SQL. Concurrency Control: Two-phase locking techniques for concurrency control, concurrency control based on timestamp ordering, Multi version concurrency control techniques, validation concurrency control technique, Granularity of Data itemed and Multiple Granularity Locking.	8hrs
Pedagogy	**Case studies**	

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

List of Programs:

Sl. No.	Experiments/Programs	Cos
1	**1.** DATA DEFINITION LANGUAGES (DDL) COMMANDS Of Base Tables and Views - To study and execute the DDL commands in RDBMS. DDL commands: ✳ CREATE ✳ ALTER ✳ DROP ✳ RENAME ✳ TRUNCATE	**CO2**
2	DATA MANIPULATION LANGUAGE (DML) OF BASE TABLES AND VIEWS- To study DML commands in RDBMS. DML COMMANDS: ❖ INSERT ❖ UPDATE ❖ DELETE ❖ SELECT	**CO2**
3	DATA MANIPULATION LANGUAGE (DML) OF BASE TABLES AND VIEWS- To study DML commands in RDBMS. DML COMMANDS: ❖ INSERT ❖ UPDATE ❖ DELETE ❖ SELECT	**CO2**
4	**Using the tables "DEPARTMENTS" and "EMPLOYEES" perform the following queries** a) Display the employee details, departments that the departments are same in both the emp and dept. b) Display the employee name and Department name by implementing a left outer join. c) Display the employee name and Department name by implementing a right outer join. d) Display the details of those who draw the salary greater than the average salary.	**CO3**
5	**Using the tables "DEPARTMENTS" and "EMPLOYEES" perform the following queries** a) Display the employee details, departments that the departments are same in both the emp and dept. b) Display the employee name and Department name by implementing a left outer join. c) Display the employee name and Department name by implementing a right outer join. d) Display the details of those who draw the salary greater than the average salary.	**C03**
6	**Consider the schema for College Database:** STUDENT(USN, SName, Address, Phone, Gender) SEMSEC(SSID, Sem, Sec) CLASS(USN, SSID) COURSE(Subcode, Title, Sem, credits) IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA) Write SQL queries to: 1. List all the students details studying in 4th semester C section 2. Compute the total no. of male and female students in each section. 3. Calculate final IA and update the corresponding table for all students for all students. 4. Create a view of test1 marks of student USN 1B115CS101 in all courses.	**CO2**

Open ended Programs		
1	Install an Open-Source NoSQL Data base MangoDB & perform basic CRUD (Create, Read, Update & Delete) operations. Execute MangoDB basic Queries using CRUD operations.	**CO5**
2	Create a table called Employee & execute the following. **Employee(EMPNO, ENAME,JOB, MANAGER_NO, SAL, COMMISSION)** 1. Create a user and grant all permissions to the user. 2. Insert the any three records in the employee table contains attributes EMPNO, ENAME JOB, MANAGER_NO, SAL, COMMISSION and use rollback. Check the result. 3. Add primary key constraint and not null constraint to the employee table. 4. Insert null values to the employee table and verify the result.	**CO3**
3	Mini Project Implementation based on the concepts learnt	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Fundamentals of Database systems, Ramwz Elmasri and Shamkant B. Navathe, 7th Edition, 2017, pearson.
2	Database management system, Ramakrishna and Gehreke, 3rd edition ,2014, MCGraw hill.
Reference Books	
1	Database system concepts sixth Edition 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	Understand the fundamental of database management systems	**1**	**U**
CO2	Apply the database design models- ER and Relational model.	**2**	**Ap**
CO3	Analyze the database and Design queries using SQL.	**3**	**An**
CO4	Apply the normalization techniques to design good database.	**2**	**Ap**
CO5	Analyse the various non-relational / NoSQL database.	**3**	**An**

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.freecodecamp.org/news/sql-and-databases-full-course/
2	https://www.tutorialspoint.com/dbms/index.htm

CIE- Continuous Internal Evaluation (50 Marks)

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

CIE Course Assessment Plan

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

SEE- Semester End Examination (50 Marks)

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

SEE Course Plan

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

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 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	**:**	**4th Semester**				
Course Title	**:**	**Advanced Java Programming**				
Course Code	**:**	**BCD404**				
Course Type (Theory/Practical/Project/Integrated)	**:**	**Theory**				
Category	**:**	**PCC**				
Stream	**:**	**CSE-DS**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:0:0**		**SEE**	**:**	**50**
Total Hours	**:**	**40 Hours**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To learn primitive constructs of generic JAVA programming language.
2	To understand Collection class and Map concepts in JAVA.
3	To gain knowledge on: Applet, and Servlet programming.
4	To learn primitive concepts of JSP and J2EE basics in JAVA programming language.
5	To implement applications using J2EE concepts and Web Services.

Teaching-Learning Process

Pedagogical Initiatives:

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

1. Adopt different teaching methods to attain the course outcomes.
2. Include videos to demonstrate various concepts in C.
3. Encourage collaborative (Group) Learning to encourage team building.
4. Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
5. 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.
6. Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
7. Discuss various case studies to map with real-world scenarios and improve the understanding.
8. 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	**Generics:** What are Generics, A Simple Generics Example, A Generic Class with Two Type Parameters, The General Form of a Generic Class, Bounded Types, Using Wildcard Arguments, Bounded Wildcards, Creating a Generic Method, Generic Interfaces, Raw types and Legacy code, Generic Class Hierarchies, Erasure, Ambiguity errors, Some Generic Restrictions.	8
Pedagogy	**Presentation**	
2	**The Collection Classes:** The Array List Class, The LinkedList Class, The HashSet Class, The Tree Set Class, The PriorityQueue Class; **Working with Maps:** The Map Interfaces, The Navigable Map Interface, The Map Classes; More Utility Classes, String Tokenizer, BitSet, Date, Calendar; **Scanner:** The Scanner Constructors, Scanning Basics, Some Scanner Examples, Setting Delimiters, Other Scanner Features.	8
Pedagogy	**Demonstration**	
3	**The Applet Class**: Two Types of Applets, Applet Basics and Class, Applet Architecture, An Applet Skeleton and The Applet Stub Interface, Applet Initialization and Termination, overriding update(), Simple Applet Display Methods, Requesting Repainting, A Simple Banner Applet, Using the Status Window, The HTML APPLET Tag, Passing Parameters to Applets, The Audio Clip Interface; **Servlet:** Background; The life cycle of a servlet; A simple servlet; the servlet API; The javax. servlet package Reading servlet parameter; the javax. servlet. http package; Handling HTTP Requests and Responses; using Cookies; Session Tracking,	8
Pedagogy	**Group Discussion**	
4	**Java Server Pages (JSP):** JSP tags, Variables and Objects, Methods, Control statements, Loops, Request String, Parsing other information, User sessions, Cookies, Session Objects; **J2EE basics:** Java 2 enterprise edition overview, J2EE multi-tier architecture, J2EE best practices -- J2EE design patterns and frameworks; J2EE databases: J2EE database concepts -- JDBC objects;	8
Pedagogy	**Case study Assignment**	
5	HTML, XML, and XHTML -- Java and XML, Enterprise JavaBeans; J2EE interconnectivity; JavaMail API -- Java Interface definition language and CORBA -- Java remote method invocation -- Java message service; Web services: SOAP -- Universal description, discovery, and integration (UDDI), Tha Java API for XML Registries (JAXR), Web services description language (WSDL).	8

Pedagogy	Case study Implementation
	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	Jim Keogh, The Complete Reference J2EE, Tata McGraw-Hill
Reference Books	
1	Y. Daniel Liang: Introduction to JAVA Programming, 7th Edition, Pearson Education, 2007.

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 Generic and advanced concepts of Java programs	U & R	Level – 1 & Level - 2
CO2	Apply the concept of collection classes and related methods to develop applications.	A	Level – 3
CO3	Analyze window and web application development using applet and Servlet.	An	Level4 – 4
CO4	Design and Develop web-based applications using JSP and J2EE	E	Level – 5
CO5	Investigate and implement Enterprise web application using modern tools with J2EE and web services.	C	Level - 5

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	Java Tutorial: https://www.javatpoint.com/j2EE-tutorial
2	https://nptel.ac.in/courses/106/105/106105191/
3	https://nptel.ac.in/courses/106/105/106105225/
4	Introduction To Programming In Java (by Evan Jones, Adam Marcus and Eugene Wu):
5	https://ocw.mit.edu/courses/6-092-introduction-to-programming-in-java-january-iap-2010/
6	Java Tutorial: https://www.w3schools.com/j2EE/

CIE- Continuous Internal Evaluation (50 Marks)

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

CIE Course Assessment Plan

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

SEE- Semester End Examination (50 Marks)

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

SEE Course Plan

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**4th Semester**				
Course Title	**:**	**Data Communication and Computer Networks**				
Course Code	**:**	**BCD405**				
Course Type (Theory/Practical/Project/Integrated)	**:**	**Theory**				
Category	**:**	**PCC**				
Stream	**:**	**CSE-DS**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**3-0-0-0**		**SEE**	**:**	**50**
Total Hours	**:**	**40 Hours**		**SEE Duration**	**:**	**3 hours**
Credits	**:**	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To introduce students to networking concepts, technologies and terminologies.
2	To provide basic computer communication and networking
3	To lay the foundations with different aspects of networking
4	To enhance the knowledge of routing algorithms

Teaching-Learning Process

Pedagogical Initiatives:

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

- **xxv.** Adopt different teaching methods to attain the course outcomes.
- **xxvi.** Include videos to demonstrate various concepts in C.
- **xxvii.** Encourage collaborative (Group) Learning to encourage team building.
- **xxviii.** Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- **xxix.** 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.
- **xxx.** Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- **xxxi.** Discuss various case studies to map with real-world scenarios and improve the understanding.
- **xxxii.** 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: Concept of Communication, Communication Model, Protocols and Architectures: Protocol Characteristics, Implementation of protocols, OSI-ISO 7 Layer, TCP/IP	8
Pedagogy	Case study - Protocols and Architectures	
2	Data Encoding & Transmission: Digital and Analog Signals, Transmission Media, Encoding Techniques, Transmission Impairments, DLC and Multiplexing: Error Detection and Control, Flow Control, Multiplexing	8
Pedagogy	Demo: Encoding Techniques	
3	LAN technologies: Ethernet, Ethernet Standards, Token Ring, LAN and Its Components: LAN Topology, Repeaters/Hubs, Bridges/Switches, Routers	8
Pedagogy	Poster Presentation - LAN Topology	
4	Internetworking: Internetworking concepts – Intranet, Extranet, Internet, Internetworking with TCP/IP- IP Addressing, Subnetting, Masking, Network Applications – Web, Mail, DNS, DHCP, Transport Protocols: TCP, UDP	8
Pedagogy	Students Presentation – TCP/IP- IP Addressing	
5	WAN technologies: ISDN, X.25, Frame Relay, ATM, Switching and Routing: Circuit Switching, Circuit switching application, Packet Switching - Virtual Packet Switching, Datagram Packet Switching, Packet Switching application.	8
Pedagogy	Group Discussion - Circuit switching application	
	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	William Stallings: Data & Computer Communications
2	M. White: Fundamentals of Networking and Data Communication
Reference Books	
1	Fred Halsall: Computer Networking and the Internet [Available in library]

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 importance of data communication	R	Level 2
CO2	Analyze the conversion of signals from Digital to Digital, Analog to Digital & Digital to Analog conversion, bandwidth utilization techniques.	An	Level 3
CO3	Demonstrate the Error detection and correction techniques, Flow control & error control and DLC services.	Ap	Level 4
CO4	Apply networking concepts, technologies and terminologies	Ap	Level 4
CO5	Analyze operations of Channelization protocols, Random Access protocols and Wired & Wirless LAN.	An	Level 3

Mapping of Course Outcomes to Program Outcomes:

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

PROJECT BASED LEARNING (PBL)

PBL- Project Based Learning

Teaching Hours/Week (L: T:P: S)	0:0:2:2
Total Hours of Pedagogy	30 hours – Theory + Project
Credits:	02
Modules	5
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Project Evaluation

	CIE		SEE	
	Project Weekly Assessment			
Project	**Project Understanding**	05 Marks	**Write up**	10 Marks
	Technical Competence	10 Marks	**Presentation & Demonstration**	50 Marks
	Innovation	10 Marks	**Project report**	25 Marks
	Problem Solving	15 Marks	**Viva-Voce**	15 Marks
	Project Demonstration	10 Marks	**Total**	**100 Marks**
Total		**50 Marks**	**100 Marks Reduced to 50 Marks**	

17. 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.

18. 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

19. Purpose

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

20. 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.

21. Why Incorporate PBL?

- Promotes collaboration and interaction
- Learners communicate meaningfully and for authentic purposes
- Allows students with a variety of learning styles to demonstrate their acquired knowledge
- Students learn language, content, and skills simultaneously
- Increases learner autonomy
- Provides opportunities for students to pursue their own interests and questions and make decisions about how they will find answers and solve problems.
- Improves education for all students Facilitates student integration of the content of different subjects
- Teaches children to use their own minds well and applies what they learn in school to life-long endeavors.
- Helps students to become technologically literate
- Establishes connections to life outside the classroom, addressing real-world concerns, and developing real-world skills
- Skills learned through PBL are those desired by today's employers.

22. 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.

23. Process

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

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

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

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

- The Evaluation of the Projects is done in Two Phases

7.1 Two phases for Assessment

Phase 1:

1. Phase 1 is for 4 weeks

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

Phase 2:

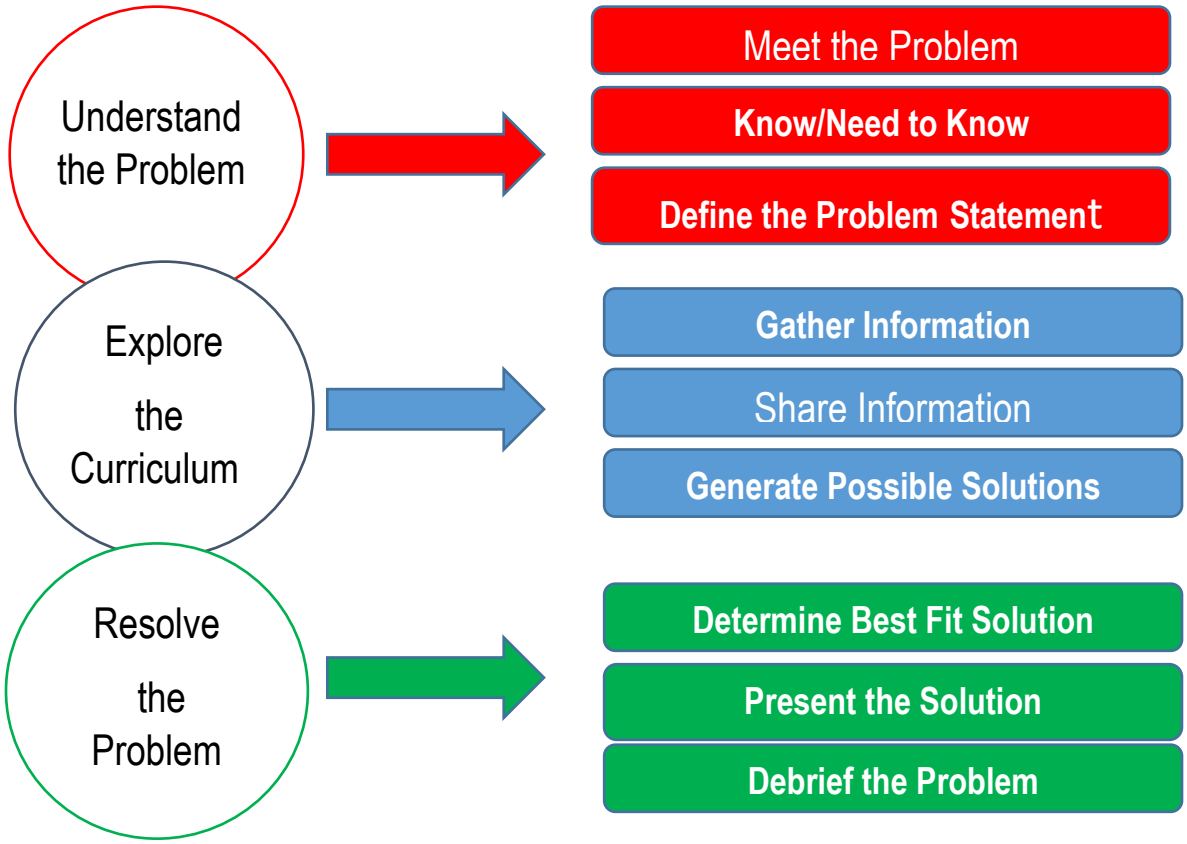
1. Phase 2 is for 11 Weeks

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

The marks distribution for PBL Work:

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

24. PBL Teaching and Learning Template



25. 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.

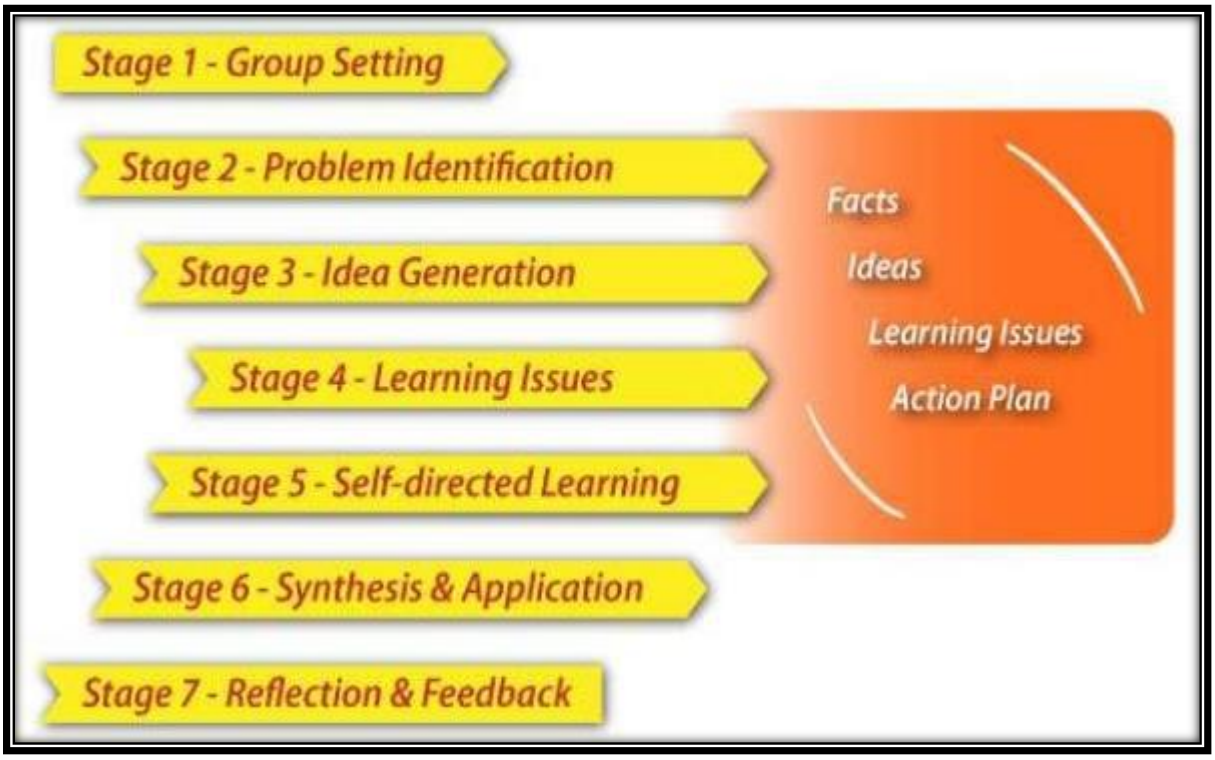
26. Obstacles/Gaps

- 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

27. 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.

28. Block diagram of PBL



29. 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.

30. 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
Phase-1		
1.	Understanding of the project and preparing a project plan	**3 Weeks**
2.	Literature review	**1 Week**
3.	Planning	**1 Week**
Phase-2		
4.	Analysis and Design	**3 Weeks**
5.	Implementation	**6 Weeks**
6.	Testing	**1 Week**
7.	Writing the project report	**1 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

31. Guidelines to prepare the Project report

- Project reports should be typed neatly only on one side of the paper with 1.5 or double line spacing on a A4 size bond paper (210 x 297 mm).
- The margins should be: Left – 1.25", Right – 1", Top and Bottom – 0.75".
- The total number of reports to be prepared are
    - One copy to the department.
    - One copy to the concerned guide
    - One copy to the candidate.
- Before taking the final printout, the approval of the concerned guide is mandatory and suggested corrections, if any, must be incorporated in the Final Report.
- For making copies dry tone Xerox is suggested.

- An abstract (synopsis) not exceeding 100 words, indicating salient features of the work.

32. 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 content. ▪ Presentation has no clear organization.

Subject Identified for Project Based Learning

Semester	4
Subject Identified for PBL	Fundamentals of Machine Learning for Data Science
Prerequisite	Python, Golang, R Programming, SAS, Tableau, ETL, Weka Tool
Justification for the selected subject	Machine Learning concepts is a required subject for data science course in perusing further courses of data science.
List of possible projects	Planning to engage this course by industry experts, projects will be assigned by them.

Signature of the Guide **Signature of HOD**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**4th Semester**				
Course Title	:	**MACHINE LEARNING FUNDAMENTALS**				
Course Code	:	**BCD406**				
Course Type (Theory/Practical/Project/Integrated)	:	**Project**				
Category	:	**PBL**				
Stream	:	**CSE-DS**		**CIE**	:	**50**
Teaching hours/ week (L: T:P:S)	:	**0:0:2:2**		**SEE**	:	**50**
Total Hours	:	**30 Hours Theory + Project**		**SEE Duration**	:	**3 Hours**
Credits	:	**2**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To understand the mathematical principles in Machine Learning Models, Implement, Design and Test Machine Learning Models.
2	To solve problems using Different Models, to apply the concepts of Machine Learning to solve real-world problems.
3	To apply the concepts of Machine Learning in Decision Making and Analytics.
4	To appraise the Ensemble and Web Based Learning Models,
5	To implement basic algorithms in regression and classification applied to text, numeric and multimedia data.

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 Data Science.
- 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)**.
- Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
- Use of Video/Animation to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Introduce Topics in manifold representations.
- Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
- Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding

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	**PRELIMINARIES OF MATHEMATICS IN MACHINE LEARNING** Multivariate Calculus: Gradient, Hessian, Jacobian, Chain Rule; Linear Algebra: Determinants, Eigen Values and Eigen Vectors, Singular Value Decomposition (SVD); Preliminaries in Probability Theory: Conditional Probability, Marginal Probability, Bayes Rule. **INTRODUCTION and SUPERVISED LEARNING BASICS:** Towards Intelligent Machines, Well-Posed Machine Learning Problems, Examples of Applications in Diverse Fields, Forms of Learning: Supervised Learning, Unsupervised Learning, Reinforcement Learning Learning from Observations, Bias and Variance, Computational Learning Theory, Occam's Razor Principle and Overfitting Avoidance, Metrics for Assessing Regression Accuracy, Metrics for Assessing Classification Accuracy, An Overview of the Design Cycle and Issues in Machine Learning	**6 Hours**
Pedagogy	**Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another	
2	**SUPERVISED LEARNING AND LINEAR MODELS** Supervised Learning: Learning a Class from Examples, Vapmik- Chervonikis Dimension, Model Selection and Generalization; Local/Proximity-based methods; K- Nearest Neighbor Algorithm, Condensed Nearest Neighbor. Decision Trees: Univariate Trees, Classification and Regression Trees, Pruning, Rule Extraction from Trees, Learning Rules from Data, Linear models: Support Vector Machines, Kernel Ridge Regression;	**6 Hours**
Pedagogy	**Problem Solving**: encourages cognitive thinking and enables creative problem solving	
3	**NON-LINEAR MODELS** Non-linear models: Kernel Methods, learning by probabilistic modelling- Probabilistic Discriminative Models, Generalized Linear Models for Classification- Perceptron and Winnow Algorithm, Logistic Regression, Generative methods- Bayesian Networks and Naive Bayes Classifier	**6 Hours**
Pedagogy	**Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily	
4	**PRINCIPLES IN LEARNING ASPECTS** Practical Aspects: Concepts of Over-fitting and Generalization, Overfitting and Black Swan Paradox, The Dirichlet-Multinomial Model, Model and Feature Selection, Designing a Learning System-Training Experience, Target Function and its Representation, Function Approximation Algorithm, Final Design, Issues in Machine Learning, Bias, Variance, Tradeoffs, Optimization for Machine Learning: Stochastic/Mini-batch Gradient Descent, Gibbs Algorithm	**6 Hours**

Pedagogy	**Case studies:** maps different domains in real time applications	
5	**CORE CONCEPTS IN MACHINE LEARNING** Structured output prediction: Multilabel Classification, Sequence Tagging, Ranking: Rank Boost, Ensemble Methods: Boosting-AdaBoost, eXtreme Gradient Boosting Model, Random Forests, Support Vector Classifier, Support Vector Regression **WEB BASED LEARNING** Recommendation Systems: The Problem of Recommendation, Content-Based Recommendation, Co-Citation and Bibliographic Coupling, PageRank Algorithm, HITS Algorithm, Recency Search and Timed PageRank, Collaborative Filtering using Association Rules and Matrix Factorization	**6 Hours**
Pedagogy	**Demonstration:** exhibits the implementation process	

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	Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007
2	Tom, M Mitchell: Machine Learning. Edition 2013, Burr Ridge, McGraw Hill Education (India) Edition 2017 Reprints.
3	Mehryar Mohri, Afshin Rostamizadeh, and Ameet Talwalkar. Foundations of Machine Learning, The MIT Press, 2012
Reference Books	
1	Ethem Alpaydin, Introduction to Machine Learning, 2nd edition, MIT Press. 2010.
2	Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer, 2009
3	Kevin Murphy, Machine Learning: A Probabilistic Perspective, The MIT Press, 2012.

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	1. To Understand and outline problems for each type of machine learning.	R, U	Level 1
CO2	2. Design a Decision tree and Random Forest for an application.	R, U	Level 2
CO3	3.Implement Probabilistic, and Generative algorithms for an application and analyze the results.	Ap	Level 3
CO4	4. Apply learning aspects and optimised solutions to solve problems.	Ap, An	Level 4
CO5	5. Use a tool to implement typical Classification Algorithms for different types of applications. And Design recommendation systems.	Ap, An	Level 4

Mapping of Course Outcomes to Program Outcomes:

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

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/playlist?list=PL1xHD4vteKYVpaliy295pg6_SY5qznc77
2	https://nptel.ac.in/course/106/106/106106139/
3	https://www.mygreatlearning.com/machine-learning/free-courses
4	https://www.freecodecamp.org/learn/machine-learning-with-python/

CIE- Continuous Internal Evaluation (50 Marks)

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

CIE Course Assessment Plan

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

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**

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 – 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**

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 – Review

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

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)

AEC Course – Ability Enhancement Course

Teaching Hours/Week (L: T:P: S)	0:0:2:0
Total Hours of Pedagogy	15 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

(Autonomous Institute under VTU)

Semester	**:**	**4th Semester**				
Course Title	**:**	**Julia**				
Course Code	**:**	**BCD417**				
Course Type (Theory/ Practical/ Integrated/ Project)	**:**	**Practical - Experiential Learning**				
Category	**:**	**AEC**				
Stream	**:**	**CSE-DS**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**0-0-2-0**		**SEE**	**:**	**50**
Total Hours	**:**	**15 Hours**		**SEE Duration**	**:**	**3 hours**
Credits	**:**	**1**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To introduce the basics of Julia programming language
2	To illustrate the mathematical functions of Julia programming language
3	To make use of arrays and strings usage

Teaching-Learning Process

Pedagogical Initiatives:

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

xxxiii. Adopt different teaching methods to attain the course outcomes.
xxxiv. Include videos to demonstrate various concepts in C.
xxxv. Encourage collaborative (Group) Learning to encourage team building.
xxxvi. Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
xxxvii. 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.
xxxviii. Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
xxxix. Discuss various case studies to map with real-world scenarios and improve the understanding.
xl. 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:** Introduction to Julia Programming, Package Installation, Basic Math with Julia, Hello world Program **Lab Component:** Package Installation	3 Hours
Pedagogy	**Group activity:** Package Installation	
2	**Experiments with numbers:** Number Systems, Julia as Calculator, Data type for integers and real numbers **Lab Component:** 1.Write a Julia program to simulate a calculator 2. Write a Julia program that evaluates expressions involving mixed data types, such as integers and floating-point numbers.	3 Hours
Pedagogy	**Problem Solving- Julia calculator**	
3	**Mathematical Functions:** Sign and absolute value functions, Power, logs and roots **Lab Component:** 1.Write a Julia program to demonstrate sign and absolute value functions 2.Develop a Julia program to generate a plot of mathematical equation: y = sin(x) + sin(2x).	3 Hours
Pedagogy	**Tool Usage -logs and roots**	
4	**Arrays:** Introduction to Arrays, Construction, Properties, indexing, Filling arrays with values **Lab Component:** 1. Demonstrates basic array construction, properties like length, dimensions, and element types. 2. Write a Julia program to access and modify elements using indexing, including slicing to create sub-arrays.	3 Hours
Pedagogy	**Poster Presentation -Array indexing**	
5	**Strings:** Common string functions, reading data as array from strings, defining simple Julia functions, operators defined as functions **Lab Component:** 1. Write a Julia program to demonstrate common string functions like length, uppercase, lowercase, occursin, replace, and substring extraction. 2. Write a Julia program to show how to read data from a string and convert it into an array using split and parse, and then perform operations like summing the array elements.	3 Hours
Pedagogy	**Group discussion -Julia functions**	

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

OPEN ENDED EXPERIMENTS

1. Develop a Julia program to find and print the index of a specific element (e.g., the number 3) in a list of integers. If the element is not found, print a message indicating that.
2. An amount of money P (for principal) is put into an account which earns interest at r% per annum. So, at the end of one year, the amount becomes P + P×r/100. This becomes the principal for the next year. Develop a Julia program to print the amount at the end of each year for the next 5 years. However, if the amount ever exceeds 2P, stop any further printing. Your program should prompt for the values of P and r.
3. Develop a Julia program to determine the following properties of a matrix: determinant, inverse, rank, upper & lower triangular matrix, diagonal elements, Euclidean norm and Square Root of a Matrix.
4. Illustrate how to define simple functions in Julia, including a function to calculate the square of a number and another to concatenate strings. It also demonstrates how to use operators as functions using the function call syntax with operators.

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Beginning Julia Programming (For Engineers and Scientists), by Sandeep Nagar, Apress-Springer: ISBN 978-1-4842-3170-8,2017
2	Julia – Bit by Bit (Programming for Beginners), by Noel Kalicharan, Springer: ISBN 978-3-030-73935-5, 2021.
Web links	
1	https://julialang.org/
2	https://www.w3schools.blog/julia-tutorial

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Apply concepts of data-types, selection and looping constructs of Julia programming language.	Ap	Level 3
CO2	Demonstrate the use of strings, functions, arrays and matrix operations in solving problems.	R, U	Level 2
CO3	Develop programs involving data structures to handle multi-valued data items.	Ap	Level 3
CO4	Make use of packages to generate plots of mathematical functions and equations.	An	Level 4

Mapping of Course Outcomes to Program Outcomes:

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

CIE- Continuous Internal Evaluation (50 Marks)

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

CIE Course Assessment Plan

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

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks
Remember	
Understand	
Apply	
Analyse	
Evaluate	
Create	

SEE Course Plan

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

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**4th Semester**				
Course Title	**:**	**MongoDB**				
Course Code	**:**	**BCD427**				
Course Type (Theory/Practical/Project/Integrated)	**:**	**Practical - Experiential Learning**				
Category	**:**	**AEC**				
Stream	**:**	**CSE-DS**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**0-0-2-0**		**SEE**	**:**	**50**
Total Hours	**:**	**15 Hours**		**SEE Duration**	**:**	**3 hours**
Credits	**:**	**1**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand basic MongoDB functions, operators and types of operations in MongoDB.
2	Demonstrate the use of Indexing, Advanced Indexing in MongoDB.
3	Apply the aggregation and Map Reduction in MongoDB.
4	Demonstrate text searching on collections in MongoDB.

Teaching-Learning Process

Pedagogical Initiatives:

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

- **xli.** Adopt different teaching methods to attain the course outcomes.
- **xlii.** Include videos to demonstrate various concepts in C.
- **xliii.** Encourage collaborative (Group) Learning to encourage team building.
- **xliv.** Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- **xlv.** 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.
- **xlvi.** Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- **xlvii.** Discuss various case studies to map with real-world scenarios and improve the understanding.
- **xlviii.** 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:** Introduction to MONGODB, Package Installation, Documents and Collections	**3 Hours**
Pedagogy	**Group activity:** Package Installation	
2	**Experiments with numbers:** Creating, updating and deleting documents **Lab Component:** 1. Illustration of database and collection creation, AND, OR operations in MongoDB. 2. How would you insert a single document into a MongoDB collection named students with the following fields: name, age, and grade? 3. Demonstrate on how to delete Documents in MongoDB	**3 Hours**
Pedagogy	**Blended Learning- package creation**	
3	**Designing your applications:** Indexing, Special indexing and collection types **Lab Component:** 1.Demonstrate creation of different types of indexes on collection (unique, sparse, compound and multikey indexes) 2. Demonstrates creating a text index for full-text search on string fields. 3. Demonstrates creating a geospatial index for querying location data.	**3 Hours**
Pedagogy	**Tool Usage -indexing database**	
4	**Aggregations:** Map reduce, Aggregation commands **Lab Component:** 1. Execute Aggregation Pipeline and its operations (pipeline must contain $match, $group, $sort, $project, $skip etc. students encourage to execute several queries to demonstrate various aggregation operators) **2.** Create and demonstrate how projection operators ($, $elematch and $slice) would be used in the MondoDB. 3. Execute Aggregation operations ($avg, $min,$max, $push, $addToSet etc.). students encourage to execute several queries to demonstrate various aggregation operators)	**3 Hours**
Pedagogy	**Problem solving -** Aggregation commands	
5	**Server administration:** Starting and stopping Mongodb, Making backups. deploying Mongodb	**3 Hours**
Pedagogy	**Group discussion-making backups**	

	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

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	MongoDB in Action" by KYLE BANKER et. al. 2nd ed, Manning publication, 2016
2	MongoDB: The Definitive Guide", Kristina chodorow, 2nd ed O'REILLY, 2013.
Web links	
1	installation of MongoDB Video: https://www.youtube.com/watch?v=dEm2AS5amyA
2	video on Aggregation: https://www.youtube.com/watch?v=vx1C8EyTa7Y
3	MongoDB in action book Code download URL: https://www.manning.com/downloads/529
4	MongoDB Exercise URL: https://www.w3resource.com/mongodb-exercises/

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 commands of MongoDB	R, U	Level 2
CO2	Create the MongoDB packages	Ap	Level 3
CO3	Analyse the concept of aggregation	An	Level 4
CO4	Apply the concept of Map reduce and use the Aggregations	Ap	Level 3

Mapping of Course Outcomes to Program Outcomes:

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

1 Credit Course – Practical	
	Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum Marks (20 Marks out of 50). The minimum passing mark for the SEE is 35% of the maximum Marks (18 Marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the Semester-End Examination (SEE), and a minimum of 40% (40 Marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together. **Continuous Internal Evaluation (CIE):** CIE marks for the practical course are 50 Marks. The split-up of CIE marks for record/ journal and test are in the ratio 60:40. • Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session. • Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks. • Total marks scored by the students are scaled down to 30 marks (60% of maximum marks). • Weightage to be given for neatness and submission of record/write-up on time. • Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus. • In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce. • The suitable rubrics can be designed to evaluate each student's performance and learning ability. • The marks scored shall be scaled down to 20 marks (40% of the maximum marks). The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student. **Semester End Evaluation (SEE):** SEE marks for the practical course are 50 Marks.

	• SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the Head of the Institute.
	• The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University. All laboratory experiments are to be included for practical examination.
	• (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered by the examiners or based on the course requirement evaluation rubrics shall be decided jointly by examiners.
	• Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
	• Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
	• General rubrics suggested for SEE are mentioned here,
	  • Writeup-20%,
	  • Conduction procedure and result in -60%,
	  • Viva-voce 20% of maximum marks.
	SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
	• Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.
	• The minimum duration of SEE is 02 hours.

UNIVERSAL HUMAN VALUES (UHV)

UHV – Universal Human Values

Teaching Hours/Week (L: T: P: S)	0:0:0:2
Total Hours of Pedagogy	15 hours
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	**:**	**4th Semester**				
Course Title	**:**	**Universal Human Values**				
Course Code	**:**	**BCD408**				
Course Type (Theory/Practical/Project/Integrated)	**:**	**Practical**				
Category	**:**	**UHV**				
Stream	**:**	**CSE-DS**		**CIE**	**:**	**100**
Teaching hours/ week (L:T:P:S)	**:**	**0:0:0:2**		**SEE**	**:**	**---**
Total Hours	**:**	**15 Hours**		**SEE Duration**	**:**	**3 Hours**
Credits	**:**	**1**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Provide a formal platform for students to communicate and connect to the surrounding.
2	create a responsible connection with the society.
3	Understand the community in general in which they work.
4	Identify the needs and problems of the community and involve them in problem –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 teachers can 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 homework, 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:

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

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

Reference Books	
1	
2	

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

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

Mapping of Course Outcomes to Program Outcomes:

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

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 to define the social problem to address and take up the

solution as the course project, with your group. Social immersionwith 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/Contin uous 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/Contin uous 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/ Governme nt 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>

Course - Skills Mapping Table

4th Semester

Sl.No	Name of the Course	Course Code	Course Type	Course Category	Skills attained by the students
1	Analysis and Design of Algorithms	BCD402	Integrated	IPCC	➢ Algorithm design ➢ Measuring algorithm complexity ➢ Analysis of various algorithms
2	Database Management System	BCD403	Integrated	IPCC	➢ Acquire NoSQL database skills ➢ Web development applications ➢ Real-time database creation
3	Machine learning fundamentals	BCD406	Project	PBL	➢ Advance Machine learning algorithms ➢ To device the model for available datasets ➢ Advanced tools usage like PySpark, PyCharm, tableau, ETL and SAS tool
4	Julia	BCD417	Practical Experiential learning	AEC	➢ Versatile programming tool learning. ➢ Code Optimization ➢ Domain-Specific Applications like Finance, Bioinformatics
	MongoDB	BCD427			➢ Managing and leveraging NoSQL databases ➢ Proficient in handling large-scale data ➢ Optimizing database performance ➢ Integrating databases with modern applications