# 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**

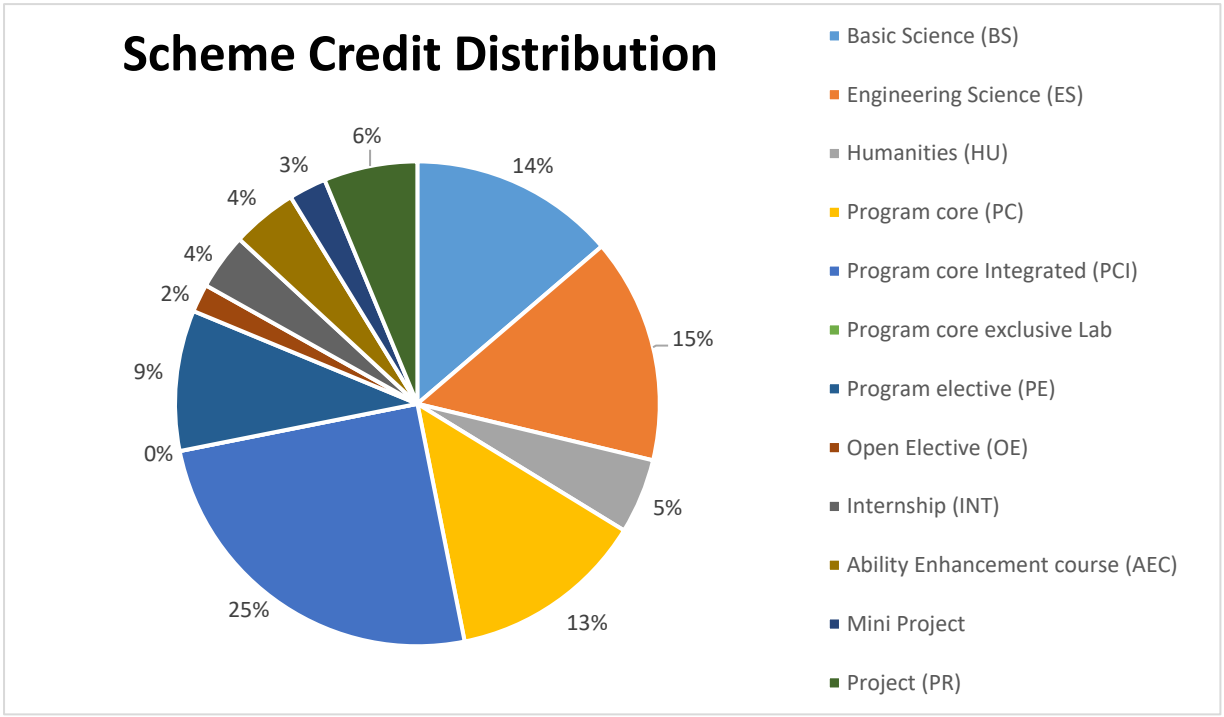
**3rd Sem & 4th Sem**

| 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<br>BCD327 | R Language<br>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<br>BPEK309<br>BYOK309 | National Service Scheme<br>Physical Education<br>Yoga | NCMC | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 100 |
| **AICTE Activity Points Mandatory** | | | | | **Total** | **15** | **0** | **10** | **2** | **27** | **21** | **24** | **550** | **350** | **900** |

## 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<br>BCD427 | JULIA<br>MongoDB | AEC | CSE-DS | CSE-DS | 0 | 0 | 2 | 0 | 2 | 1 | 03 | 50 | 50 | 100 |
| 8 | BUHK408 | Universal Human Values | UHV | CSE-DS | CE | 2 | 0 | 0 | 0 | 2 | 1 | 1.5 | 50 | 50 | 50 |
| 9 | BNSK409<br>BPEK409<br>BYOK409 | National Service Scheme<br>Physical Education<br>Yoga | NCMC | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 100 |
| **AICTE Activity Points Mandatory** | | | | | **Total** | **15** | **0** | **10** | **0** | **25** | **21** | **24** | **500** | **400** | **900** |

IPCC: Integrated Professional Core Course,

PCC: Professional Core Course

PBL: Project Based Learning

AEC: Ability Enhancement Course,

NCMC: Non-Credit Mandatory Course

L: Lecture,

T: Tutorial,

P: Practical

S= SDA: Skill Development Activity,

CIE: Continuous Internal Evaluation,

SEE: Semester End Evaluation.

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

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

**Newly introduced subjects in the syllabus**

| | | 3rd Semester | 4th Semester |
|---|---|---|---|
| 1. | List of Existing Elective Courses | ---------- | ---------- |
| 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 | **M3:** Stacks ADT operations: Push, Pop and Peek operations;<br>Priority Queues and their Representation, Input/Output Restricted Queues, DEQUE. Application of Queues. | | 6% | To Fill the gap of Advance data structures and to achieve full coverage |
| **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.<br>2. To build the strong architecture base. |
| **4** | BCD305 | Operating System | **M-1:** Open-source operating systems.<br>**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<br>**M-4:** String Handling: The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, | | 25% | Students will learn more concepts related to application development. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | Modifying a String, Data Conversion Using valueOf().<br>**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.<br>**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.<br>**Swings**<br>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<br>**M-2:** Selection problem, Closest pair of points, Solving Recurrence Equations. | **M-3:** Balanced Search Trees, Heaps and Heapsort.<br>**M-4:** Three basic examples | 25% | Students will learn more concepts related to problem- |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | **M-3:** Array Representation of Binary Tree, Binary search trees, Heap Tree and Heap Sort, AVL Tree, B Trees, B+ trees, Red Black Trees.<br>Hashing: Open Hashing (Separate Chaining), Closed Hashing (Open Addressing).<br>**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.<br>**M-5:** Polynomial Time and verification, P and NP Problems, NP-Completeness and Reducibility, NP-Hard problems, Backtracking (Max clique and Travelling salesperson), Branch-and-Bound (0/1 Knapsack problem, Max clique and Travelling salesperson). | **M-5:** P, NP, and NP-Complete Problems. | | solving purpose added all these topics |
| **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<br>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<br>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**<br>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**<br>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**<br>Cartesian products and relations, properties, computer recognitions-zero-one matrices, partial orders, equivalence relations, partitions, Hasse diagrams.<br>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**<br>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**<br>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 |

# INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

# 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:**<br>Data Structures, Classifications (Primitive & Non-Primitive), Data structure Operations (Traversing, inserting, deleting, searching, and sorting).<br>**ARRAYS and STRUCTURES:**<br>Review of Arrays, Structures: Array of structures Self-Referential Structures Arrays, Dynamic Allocated Arrays, Structures and Unions. | **8 Hours** |
| **Pedagogy** | **Think Pair and Share (Blended Learning)** | |
| 2 | **Stacks:** Definition, Stacks ADT operations: Push, Pop and Peek operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Applications of Stack: Infix to Postfix conversion, Postfix expression evaluation.<br>**Queue and Applications**: Array Representation of Queues, Queue Operations, Circular Queues, Queues and Circular queues using Dynamic arrays, Dequeues, Priority Queues and their Representation, Input/Output Restricted Queues, DEQUE. Application of Queues. | **8 Hours** |
| **Pedagogy** | **Problem Solving** | |
| 3 | **LINKED LISTS AND THEIR APPLICATIONS:**<br>Definition, classification of linked lists. Representation of different types of linked lists in Memory, Insertion, Deletion, Searching, Sorting, and Concatenation Operations on Singly linked list, Doubly Linked lists, Circular linked lists. Applications of Linked lists – Polynomials, Sparse matrix representation. | **8 Hours** |
| **Pedagogy** | **Quiz** | |
| 4 | **TREES AND THEIR APPLICATIONS:**<br>Terminologies, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, and Searching operation on Binary search tree. Application of Trees-Evaluation of Expression. | **8 Hours** |
| **Pedagogy** | **Poster Presentation** | |
| 5 | **Trees 2:**<br>AVL tree, Red-black tree, Splay tree, B-tree.<br>**Graphs:**<br>Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Traversal methods: Breadth First Search and Depth FirstSearch. | **8 Hours** |
| **Pedagogy** | **Demonstration** | |

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

**List of Programs:**

| Sl. No. | Experiments/Programs | COs |
|---|---|---|
| 1 | Develop a Program in C for the following:<br>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).<br>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 menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX)<br>a) Push an Element on to Stack<br>b) Pop an Element from Stack<br>c) Demonstrate how Stack can be used to check Palindrome<br>d) Demonstrate Overflow and Underflow situations on Stack<br>e) Display the status of Stack<br>f) Exit<br>Support the program with appropriate functions for each of the above operations | |
| 3 | Develop a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized. Expressions with the operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands. | |
| 4 | Develop a Program in C for the following Stack Applications<br>a) Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^<br>b) Solving Tower of Hanoi problem with n disks | |
| 5 | Develop a menu driven Program in C for the following operations on QUEUE of Characters (Array Implementation of Queue with maximum size MAX)<br>a) Insert an Element on to QUEUE<br>b) Delete an Element from QUEUE<br>c) Demonstrate Overflow and Underflow situations on QUEUE<br>d) Display the status of Circular QUEUE<br>e) Exit<br>c) Support the program with appropriate functions for each of the above operations. | |

| | | |
|---|---|---|
| **6** | 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<br>a) Create a SLL of N Students Data by using front insertion.<br>b) Display the status of SLL and count the number of nodes in it<br>c) Perform Insertion / Deletion at End of SLL<br>d) Perform Insertion / Deletion at Front of SLL (Demonstration of stack)<br>Exit | |
| **7** | 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<br>a) Create a DLL of N Employees Data by using end insertion.<br>b) Display the status of DLL and count the number of nodes in it<br>c) Perform Insertion and Deletion at End of DLL<br>d) Perform Insertion and Deletion at Front of DLL<br>e) Demonstrate how this DLL can be used as Double Ended Queue.<br>e) Exit | |
| **8** | Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers<br>a. Create a BST of N Integers<br>b. Traverse the BST in Inorder, Preorder and Post Order | |
| **Open ended Programs** | | |
| **1** | Develop a Program in C for the following operations on Graph(G) of Cities<br>a. Create a Graph of N cities using Adjacency Matrix.<br>b. Print all the nodes reachable from a given starting node in a digraph using DFS/BFS method | |
| **2** | Develop a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes<br>a) Represent and Evaluate a Polynomial P(x,y,z) = 6x2y2z-4yz5+3x3yz+2xy5z-2xyz3<br>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)<br>Support the program with appropriate functions for each of the above operations | |
| **3** | Write a C program to implement Multiple stacks, Multiple Queues using arrays and linked Lists | |

| **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** | **3** | **2** | | | | | | | | | | | | | |
| **CO2** | **3** | **3** | **2** | | **2** | | | | | | | | | | |
| **CO3** | **3** | **3** | **2** | **2** | | | | | | | | | | | |
| **CO4** | **3** | **3** | **3** | **3** | **3** | | | | | | | | | | |
| **CO5** | **3** | **3** | **3** | **2** | **2** | | | | | | | | | | |

| 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_01350159542807756812559/overview |

# Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

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|---|---|---|---|---|---|---|
| **Semester** | **:** | **3rd Semester** | | | | |
| **Course Title** | **:** | **Data Science for Engineering** | | | | |
| **Course Code** | **:** | **BCD303** | | | | |
| **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:** Fundamentals of Data Science - Real World applications - Data Science Challenges-Data Science Teams and Roles - Data Science Process - Software Engineering for Data Science; Data Quality and Data Infrastructure: Types of Data and Datasets - Data Quality and Issues: An overview. | **8 Hours** |
| **Pedagogy** | **Group activity** | |
| 2 | **Data Models - Data Pipelines and patterns:** Data Pipeline Stages - Modern Data Infrastructure - Diverse data sources - Cloud data warehouses and lakes. Data Preprocessing: Data cleaning - Data Aggregation, Sampling - Statistical descriptions of data - Measuring data similarity & dissimilarity. | **8 Hours** |
| **Pedagogy** | **Demonstration** | |
| 3 | **Data Preprocessing (Continues):** Handling Numeric Data - Discretization, Binarization - Normalization - Data Smoothening - Feature Engineering - Managing Categorical Attributes - Overview of visualization techniques for Data Exploratory analysis. Ethics for Data Science. | **8 Hours** |
| **Pedagogy** | **Poster Presentation** | |
| 4 | **Classification and Prediction:** Concepts of classification and prediction - Decision trees for classification - ID3 algorithm using entropy and Gini Index; - Rule based classification - Feature Subset Selection Methods - Evaluation of classification algorithms - Prediction using Regression; Association Analysis. | **8 Hours** |
| **Pedagogy** | **Group Discussion with Demonstration** | |
| 5 | **Clustering:** Cluster analysis concepts - Partitioning methods – k-Means algorithm - Hierarchical methods for cluster analysis - Density based methods for cluster analysis - DBSCAN - Evaluation of clustering algorithms; Anomaly Detection - Concepts of Outliers - Statistical approaches - Proximity and Density based outlier detection. | **8 Hours** |
| **Pedagogy** | **Case studies** | |
| | **Pedagogical Initiatives (Not limited to):**<br>• **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another<br>• **Problem Solving**: encourages cognitive thinking and enables creative problem solving<br>• **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.<br>• **Case studies:** maps different domains in real time applications<br>• **Demonstration:** exhibits the implementation process | |

**List of Programs:**

<table>
<tr><th>Sl. No.</th><th>Experiments/Programs</th><th>COs</th></tr>
<tr><td>1</td><td>A. Installation of Python/R/Go language, Visual Studio code editors can be demonstrated along with Kaggle data set usage.<br>B. Write programs in Python/R and Execute them in either Visual Studio Code or PyCharm Community Edition or any other suitable environment.<br>C. 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.
<table>
<tr><td>Number of hrs spent studying (x)</td><td>10</td><td>9</td><td>2</td><td>15</td><td>10</td><td>16</td><td>11</td><td>16</td></tr>
<tr><td>Score in the final exam (0 – 100) (y)</td><td>95</td><td>80</td><td>10</td><td>50</td><td>45</td><td>98</td><td>38</td><td>93</td></tr>
</table>
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>CO3,4,5</td></tr>
<tr><td>2</td><td>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.<br>• Import the data into a DataFrame<br>• Find and drop the columns which are irrelevant for the book information.<br>• Change the Index of the DataFrame<br>• Tidy up fields in the data such as date of publication with the help of simple regular expression.<br>• Combine str methods with NumPy to clean columns.</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.<br>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=0.01,1,10 C=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>1. 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>
</table></td><td></td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| Low | Low | 4 | No | Yes |
| Low | Med | 4 | No | No |
| Low | High | 4 | No | No |
| Med | Med | 4 | No | No |
| Med | Med | 4 | Yes | Yes |
| Med | High | 2 | Yes | No |
| Med | High | 5 | No | Yes |
| High | Med | 4 | Yes | Yes |
| high | Med | 2 | Yes | Yes |
| High | High | 2 | Yes | No |
| high | High | 5 | yes | Yes |

2. 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:

- K – means Clustering
- Single – link Hierarchical Clustering
- DBSCAN clustering
- Complete link hierarchical clustering.
- Also visualize the dataset and which algorithm will be able to recover the true clusters.

**5**

1.Import any CSV file to Pandas Data Frame and perform the following:

a) Visualize the first and last 10 records
b) Get the shape, index and column details
c) Select/Delete the records (rows)/columns based on conditions.
d) Perform ranking and sorting operations.
e) Do required statistical operations on the given columns.
f) Find the count and uniqueness of the given categorical values.
g) Rename single/multiple columns

2. import any CSV file to Pandas Data Frame and perform the following:

a) Handle missing data by detecting and dropping/ filling missing values.
b) Transform data using apply () and map() method.
c) Detect and filter outliers.
d) Perform Vectorized String operations on Pandas Series.
e) 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.<br>B. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:<br>1. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.<br>2. analysis: Linear and logistic regression modeling<br>3. Multiple Regression analysis<br>4. Also compare the results of the above analysis for the two data sets.<br>C. Apply and explore various plotting functions on UCI data sets.<br>1. Normal curves<br>2. Density and contour plots<br>3. Correlation and scatter plots<br>4. Histograms<br>5. Three-dimensional plotting<br>D. Visualizing Geographic Data with Basemap | |
| **7** | Demonstrate Decision tree classification model and evaluate the performance of classifier on Iris dataset. | |
| **8** | 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. 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? | |
| | **Open ended Programs** | |
| **1** | Load the MNIST dataset. Create a function that, given a position $1 \le k \le 10,000$, 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:<br>$[0, 64) \rightarrow$ " "<br>$[64, 128) \rightarrow$ "."<br>$[128, 192) \rightarrow$ "*"<br>$[192, 256) \rightarrow$ "#"<br>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** |
| **2** | Implement any classification algorithm (e.g., K-Nearest Neighbors, Decision Tree, or Logistic Regression) on the Iris dataset. Perform preprocessing if necessary, train the model, and evaluate its performance using appropriate metrics such as accuracy, confusion matrix, precision, and recall. | **CO3,4,5** |
| **3** | 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** | "Introduction to Data Mining", Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Pearson Publications, 2nd edition, 2018 |
| **2** | "Introducing Data Science", Davy Cielen, Arno D. B. Meysman and Mohamed Ali, Manning Publications, 1st edition, 2016 |
| **Reference Books** | |
| **1** | "Storytelling with Data, A data visualization guide for business professionals", Cole, Nussbaumer Knaflic, Wiley Publications |
| **2** | "Data Mining: Concepts and Techniques", Third Edition by Jiawei Han and Micheline Kamber Kaufmann Publishers, 2006 |

**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 and 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. | A | Level 3 |
| **CO3** | Analyze data visualization tools, Build, and prepare data for use with a variety of statistical methods and models | An | Level 4 |
| **CO4** | Investigate complex problems on data storage and processing with frameworks and analyze Data using various Visualization techniques. | A | Level 3 |
| **CO5** | Develop Python code to interpret and explore data using the Python Libraries for Data Wrangling and choose contemporary models, such as machine learning, AI, techniques to solve practical problems | E | 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 | 3 | 3 | | | | | | | | | | | | | |
| CO3 | | | 3 | | | | | | | | | 3 | | | |
| CO4 | | 3 | 3 | 3 | 3 | | | | 2 | | | 3 | | | |
| CO5 | 3 | 3 | 3 | | 3 | | | | 2 | 2 | | 3 | | | |

| 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 |

# PROFESSIONAL CORE COURSE (PCC)

# 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**.**<br>**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):**<br>• **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another<br>• **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.<br>• **Case studies:** maps different domains in real time applications<br>• **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/<br>https://www.amd.com/en/technologies/zen-core.html<br>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 | 3 | 2 | | | | | | | | | | | | | |
| CO2 | 3 | 2 | 2 | | 2 | | | | | | | | | | |
| CO3 | 3 | 3 | | | | | | | | | | | | | |
| CO4 | 3 | 3 | | 2 | | | | | | | | | | | |
| CO5 | 3 | 3 | 2 | | 2 | | | | | | | | | | |

| 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)

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|---|---|---|---|---|---|---|
| **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.<br>**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<br>**Threads & Concurrency:** Overview; Multithreading models; Thread Libraries; Threading issues.<br>**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;<br>**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.<br>**Virtual Memory Management:** Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.<br>**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.<br>**Protection:** Goals of protection, Principles of protection, Domain of protection, Access matrix.<br>**Case study on UNIX based Operating system:** Design principles, Kernel modules, Process management, Memory management. | 8 |

| | |
|---|---|
| | **Pedagogical Initiatives (Not limited to):**<br>• **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another<br>• **Problem Solving**: encourages cognitive thinking and enables creative problem solving<br>• **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.<br>• **Case studies:** maps different domains in real time applications<br>• **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 | 3 | 2 | | | | | | | | | | | | | |
| CO2 | 3 | 3 | 2 | 2 | 2 | | | | | | | | | | |
| CO3 | 3 | 3 | | 2 | | | | | | | | | | | |
| CO4 | 3 | 2 | | 2 | | | | | | | | | | | |
| CO5 | 3 | 3 | | | | 2 | 2 | 2 | | | | | | | |

| 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)

# 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)

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|---|---|---|---|---|---|---|
| **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).<br>**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.<br>**Operators:** Arithmetic Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The? Operator, Operator Precedence, Using Parentheses.<br>**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.<br>**Methods and Classes:** Overloading Methods, Objects as Parameters, Argument Passing, Returning Objects, Recursion, Access Control, understanding static, introducing final, Introducing Nested and Inner Classes.<br>**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.<br>**Interfaces:** Interfaces, Default Interface Methods, Use static Methods in an Interface, Private Interface Methods.<br>**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.<br>**Enumerations, Type Wrappers and Autoboxing/Unboxing**: Enumerations, Type Wrappers. Autoboxing and Methods, Autoboxing/Unboxing Occurs in Expressions, Autoboxing/Unboxing Boolean and Character Values.<br>**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.<br>**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.<br>**Swings**<br>Swing fundamentals, writing swing application, swing library, layouts and controls. Introduction to event handling. | **6** |
| | **Pedagogical Initiatives (Not limited to):**<br>• **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another<br>• **Problem Solving**: encourages cognitive thinking and enables creative problem solving<br>• **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.<br>• **Case studies:** maps different domains in real time applications<br>• **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** | 3 | 2 | | | | | | | | | | | | | |
| **CO2** | 3 | 3 | 2 | | | | | | | | | | | | |
| **CO3** | 3 | 3 | 2 | 2 | | | | | | | | | | | |
| **CO4** | 3 | 2 | 2 | | | | | | | | | | | | |
| **CO5** | 3 | 3 | 2 | 2 | | | | | | | | | | | |
| **CO6** | 3 | 2 | 3 | | 3 | | | | | | | | | | |

| **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/ |

# ABILITY ENHANCEMENT COURSE (AEC)

# Dayananda Sagar Academy of Technology & Management

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| | | | | | | |
|---|---|---|---|---|---|---|
| **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

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**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**<br>Introducing R, Initiating R, Packages in R, Environments and Functions, Flow Controls, Loops, Basic Data Types in R, Vectors<br>**Lab Component:**<br>Demonstrate the steps for installation of R and R Studio. Perform the following:<br>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.<br>b) Demonstrate Arithmetic and Logical Operations with simple examples.<br>c) Demonstrate generation of sequences and creation of vectors.<br>d) Demonstrate Creation of Matrices<br>e) Demonstrate the Creation of Matrices from Vectors using Binding Function.<br>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**<br>Matrices and Arrays, Lists, Data Frames, Factors, Strings, Dates and Times<br>**Lab Component:**<br>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:<br>• Profit for each month.<br>• Profit after tax for each month (Tax Rate is 30%).<br>• Profit margin for each month equals to profit after tax divided by revenue.<br>• Good Months – where the profit after tax was greater than the mean for the year.<br>• Bad Months – where the profit after tax was less than the mean for the year.<br>• The best month – where the profit after tax was max for the year.<br>• The worst month – where the profit after tax was min for the year.<br>**Note:**<br>a. All Results need to be presented as vectors<br>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<br>c. Results for the profit margin ratio need to be presented in units of % with no decimal point.<br>d. It is okay for tax to be negative for any given month (deferred tax asset)<br>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:<br>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<br>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<br>Exploratory Data Analysis, Main Graphical Packages, Pie Charts, Scatter Plots, Line Plots, Histograms, Box Plots, Bar Plots, Other Graphical packages<br>Lab Component:<br>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.<br>2. The built-in data set mammals contain data on body weight versus brain weight. Develop R commands to:<br>a. Find the Pearson and Spearman correlation coefficients. Are they similar?<br>b. Plot the data using the plot command.<br>c. Plot the logarithm (log) of each variable and see if that makes a difference.<br>3. 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.<br>b. Subset the Data frame and display only the items where the category is either “Office Supplies” or “Desktop Supplies”<br>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<br>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<br>Basic Statistical Measures, Normal distribution, Binomial distribution, Correlation Analysis, Regression Analysis-Linear Regression Analysis of Variance<br>Lab Component:<br>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.<br>• Assigning names, using the air quality data set.<br>• Change colors of the Histogram<br>• Remove Axis and Add labels to Histogram<br>• Change Axis limits of a Histogram<br>• 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.<br>• Find the total number rows & columns<br>• Find the maximum salary<br>• Retrieve the details of the employee with maximum salary<br>• Retrieve all the employees working in the IT Department.<br>• Retrieve the employees in the IT Department whose salary is greater than 20000 and write these details into another file "output.csv".<br>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,<br>[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<br>Develop R program, to solve the following:<br>a. What is the total number of observations and variables in the dataset?<br>b. Find the car with the largest hp and the least hp using suitable functions<br>c. Plot histogram / density for each variable and determine whether continuous variables are normally distributed or not. If not, what is their skewness?<br>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.<br>e. Which pair of variables has the highest Pearson correlation? | |
| | **Pedagogical Initiatives (Not limited to):**<br>• **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another<br>• **Problem Solving**: encourages cognitive thinking and enables creative problem solving<br>• **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.<br>• **Case studies:** maps different domains in real time applications<br>• **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 | 3 | 2 | | | | | | | | | | | | | |
| CO2 | 3 | 3 | 2 | | 2 | | | | | | | | | | |
| CO3 | 3 | 3 | 2 | 2 | 3 | | | | | | | | | | |
| CO4 | 3 | 3 | 2 | 3 | 2 | | | | | | | | | | |

**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

# 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<br>The Go Project<br>**Introduction:**<br>Hello, World Program, Command-Line Arguments, Finding Duplicate Lines, Animated GIFs, fetching a URL, Fetching URLs Con currently, A We b Server, Loose Ends<br>**Program Structure:** Names, Declarations, Variables, Assignments, Type Declarations, Packages and Files, Scope<br>**Basic Data Types:** Integers, Floating-Point Numbers, Complex Numbers, Booleans, Strings, Constants<br>**Composite Types:** Arrays, Slices, Maps, Structs, JSON, Text and HTML Templates<br>**Lab Component**:<br>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.<br>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<br>c. Develop a program to generate Fibonacci sequence of length (N). Read N from the console.<br>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<br>**Methods:** Method Declarations, Methods with a Pointer Receiver, Composing Types by Struct Embedding, Method Values and Expressions, Example: Bit Vector Type, Encapsulation<br>**Lab Component:**<br>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.<br>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<br>**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<br>**Lab Component:**<br>a. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable messages<br>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]<br>c. Develop a program to sort the contents of a text file and write the sorted contents into a separate text file<br>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.<br>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,<br>**Pack ages and the Go Tool:** Introduction, Import Paths, The Package Declaration, Imp ort Declarations, Blank Imports, Packages and Naming, The Go Tool<br>Text Book1 Chapter 9 and 10<br>**Lab Component**<br>a. Develop a program to demonstrate find all function and character class using regex module.<br>b. Develop a program that could search the text in a file for phone numbers (+919900889977) and email addresses (sample@gmail.com).<br>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,<br>**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<br>**Lab Component:**<br>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:**<br>1. Demonstrate Web scraping using suitable example.<br>2. Demonstrate API Integration.<br>3. Demonstrate about Data Visualization.<br>4. Demonstrate GUI Applications.<br>5. Demonstrate E-mail Automation. | |
| | **Pedagogical Initiatives (Not limited to):**<br>• **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another<br>• **Problem Solving**: encourages cognitive thinking and enables creative problem solving<br>• **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.<br>• **Case studies:** maps different domains in real time applications<br>• **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<br>*rsc@golang.org*<br>http://golang.org/<br>*USENIX 2010* |
| **3.** | An Introduction to Programming in Go, 2012 by Caleb Doxsey<br>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 | 3 | 2 | | | | | | | | | | | | | |
| CO2 | 3 | 3 | 2 | | 2 | | | | | | | | | | |
| CO3 | 3 | 3 | 2 | 2 | 2 | | | | | | | | | | |
| CO4 | 3 | 3 | 2 | 2 | | | | | | | | | | | |
| CO5 | 3 | 3 | 3 | 3 | 3 | | | | | | | | | | |

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

# SOCIAL CONNECT
# &
# RESPONSIBILITY (SCR)

# 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:**<br>**Plantation and adoption of a tree:**<br>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:**<br>**Heritage walk and crafts corner:**<br>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:**<br>**Organic farming and waste management:**<br>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:**<br>**Water conservation:**<br>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:**<br>**Food walk:**<br>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):**<br>• **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another<br>• **Problem Solving**: encourages cognitive thinking and enables creative problem solving<br>• **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.<br>• **Case studies:** maps different domains in real time applications<br>• **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.

## 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,<br>➢ Organizing data structure<br>➢ Information retrieval<br>Developing data structure applications |
| 2 | Data science for Engineering | 23CSDS33 | Integrated | IPCC | ➢ Model development<br>➢ PySpark for data visualization<br>➢ Managing various data sets<br>➢ Data curation |
| 3 | Object Oriented Programming using Java | 23CSDS36 | Project | PBL | ➢ Object oriented programming concepts.<br>➢ Application design<br>➢ Project implementation |
| 4 | R language for Data Analytics / Go lang for Data Analytics | 23CSDS37 | Practical Experiential learning | AEC | ➢ Data Analysis<br>➢ Model development<br>➢ Data visualization<br>➢ Implement models using datasets<br>➢ Data visualization<br>➢ 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**<br>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**<br>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**<br>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**<br>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**<br>**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.<br>**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/ |

# INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

# 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.<br>**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.<br>**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).<br>**DECREASE-AND-CONQUER:** Insertion Sort, Topological Sorting.<br>**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.<br>**SPACE-TIME TRADEOFFS:** Sorting by Counting: Comparison counting sort, Input Enhancement in String Matching: Horspool's Algorithm.<br>**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.<br>**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.<br>**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):**<br>• **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another<br>• **Problem Solving**: encourages cognitive thinking and enables creative problem solving<br>• **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.<br>• **Case studies:** maps different domains in real time applications<br>• **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.<br>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.<br>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.<br>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.<br>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.<br>b. Program to find the maximum element of an array using divide and conquer technique.<br>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<br>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.<br>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.<br>b. Write a program to implement travelling sales person's problem in polynomial time approximate using minimum spanning tree.<br>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.<br>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 | 3 | 2 | | | | | | | | | | | | | |
| CO2 | 3 | 3 | 3 | | | | | | | | | | | | |
| CO3 | 3 | 3 | 3 | 2 | | | | | | | | | | | |
| CO4 | 3 | 3 | 3 | 2 | | | | | | | | | | | |
| CO5 | 3 | 3 | | 3 | | | | | | | | | | | |
| CO6 | 3 | 3 | 3 | 3 | 2 | | | | | | | | | | |

| 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) |

# 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.<br>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.<br>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.<br>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.<br>Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form.<br>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.<br>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):**<br>• **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another<br>• **Problem Solving**: encourages cognitive thinking and enables creative problem solving<br>• **Case studies:** maps different domains in real time applications<br>• **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:<br>✳ 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**<br>a) Display the employee details, departments that the departments are same in both the emp and dept.<br>b) Display the employee name and Department name by implementing a left outer join.<br>c) Display the employee name and Department name by implementing a right outer join.<br>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**<br>a) Display the employee details, departments that the departments are same in both the emp and dept.<br>b) Display the employee name and Department name by implementing a left outer join.<br>c) Display the employee name and Department name by implementing a right outer join.<br>d) Display the details of those who draw the salary greater than the average salary. | **C03** |
| 6 | **Consider the schema for College Database:**<br>STUDENT(USN, SName, Address, Phone, Gender)<br>SEMSEC(SSID, Sem, Sec)<br>CLASS(USN, SSID)<br>COURSE(Subcode, Title, Sem, credits)<br>IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)<br>Write SQL queries to:<br>1. List all the students details studying in 4th semester C section<br>2. Compute the total no. of male and female students in each section.<br>3. Calculate final IA and update the corresponding table for all students for all students.<br>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.<br>**Employee(EMPNO, ENAME,JOB, MANAGER_NO, SAL, COMMISSION)**<br>1. Create a user and grant all permissions to the user.<br>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.<br>3. Add primary key constraint and not null constraint to the employee table.<br>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 | **U** | **1** |
| **CO2** | Apply the database design models- ER and Relational model. | **Ap** | **2** |
| **CO3** | Analyze the database and Design queries using SQL. | **An** | **3** |
| **CO4** | Apply the normalization techniques to design good database. | **Ap** | **2** |
| **CO5** | Analyse the various non-relational / NoSQL database. | **An** | **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** | 3 | 2 | | | | | | | | | | | | | |
| **CO2** | 3 | 3 | 3 | | 2 | | | | | | | | | | |
| **CO3** | 3 | 3 | 3 | 2 | 3 | | | | | | | | | | |
| **CO4** | 3 | 2 | 3 | | | | | | | | | | | | |
| **CO5** | 3 | 3 | | 2 | 2 | | | | | | | | | | |

| **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 |

# PROFESSIONAL CORE COURSE (PCC)

# 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;<br>**Working with Maps:** The Map Interfaces, The Navigable Map Interface, The Map Classes; More Utility Classes, String Tokenizer, BitSet, Date, Calendar;<br>**Scanner:** The Scanner Constructors, Scanning Basics, Some Scanner Examples, Setting Delimiters, Other Scanner Features. | 8 |
| **Pedagogy** | **Demonstration** | |
| 3 | **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,<br>**Java Server Pages (JSP):** JSP tags, Variables and Objects, Methods, Control statements, Loops, Request String, Parsing other information, User sessions, Cookies, Session Objects. | 8 |
| **Pedagogy** | **Group Discussion** | |
| 4 | **Spring Boot for Web Development:** Introduction to Spring Boot, Creating REST APIs with @RestController, Consuming APIs using RestTemplate and WebClient, Handling HTTP Headers in Spring Boot, Managing Cookies in Spring Boot (Set & Retrieve), Session Management using @SessionAttributes and Spring Session<br>**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):**<br>• **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another<br>• **Problem Solving**: encourages cognitive thinking and enables creative problem solving<br>• **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.<br>• **Case studies:** maps different domains in real time applications<br>• **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 | 3 | 2 | | | | | | | | | | | | | |
| CO2 | 3 | 3 | 3 | | 2 | | | | | | | | | | |
| CO3 | 3 | 3 | 3 | 2 | 2 | | | | | | | | | | |
| CO4 | 3 | 3 | 3 | 2 | 3 | | | | | | | | | | |
| CO5 | 3 | 3 | 3 | 3 | 3 | | | | | | | | | | |

| 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/ |

# Dayananda Sagar Academy of Technology & Management

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| | | | | | | |
|---|---|---|---|---|---|---|
| **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):**<br>• **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another<br>• **Problem Solving**: encourages cognitive thinking and enables creative problem solving<br>• **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.<br>• **Case studies:** maps different domains in real time applications<br>• **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** | 3 | 2 | | | | | | | | | | | | | |
| **CO2** | 3 | 3 | 2 | 2 | | | | | | | | | | | |
| **CO3** | 3 | 3 | 3 | | 2 | | | | | | | | | | |
| **CO4** | 3 | 3 | 2 | | 2 | | | | | | | | | | |
| **CO5** | 3 | 3 | 2 | 2 | 2 | | | | | | | | | | |

# PROJECT BASED LEARNING (PBL)

# 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

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| | | | | | | |
|---|---|---|---|---|---|---|
| **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**<br>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.<br>**INTRODUCTION and SUPERVISED LEARNING BASICS:**<br>Towards Intelligent Machines, Well-Posed Machine Learning Problems, Examples of Applications in Diverse Fields, Forms of Learning: Supervised Learning, Unsupervised Learning, Reinforcement Learning<br>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**<br>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**<br>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**<br>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**<br>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<br>**WEB BASED LEARNING**<br>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 | 3 | 2 | | | | | | | | | | | | | |
| CO2 | 3 | 3 | 3 | | | | | | | | | | | | |
| CO3 | 3 | 3 | 3 | 2 | 3 | | | | | | | | | | |
| CO4 | 3 | 3 | 3 | 3 | 2 | | | | | | | | | | |
| CO5 | 3 | 3 | 3 | 3 | 3 | | | | | | | | | | |

| 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/ |

# ABILITY ENHANCEMENT COURSE (AEC)

# 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)**.

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**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<br>**Lab Component:**<br>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<br>**Lab Component:**<br>1.Write a Julia program to simulate a calculator<br>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<br>**Lab Component:**<br>1.Write a Julia program to demonstrate sign and absolute value functions<br>2.Develop a Julia program to generate a plot of mathematical equation:<br>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<br>**Lab Component:**<br>1. Demonstrates basic array construction, properties like length, dimensions, and element types.<br>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<br>**Lab Component:**<br>1. Write a Julia program to demonstrate common string functions like length, uppercase, lowercase, occursin, replace, and substring extraction.<br>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):**<br>• **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another<br>• **Problem Solving**: encourages cognitive thinking and enables creative problem solving<br>• **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.<br>• **Case studies:** maps different domains in real time applications<br>• **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** | 3 | 2 | 2 | | | | | | | | | | | | |
| **CO2** | 3 | 2 | 2 | | | | | | | | | | | | |
| **CO3** | 3 | 3 | 3 | | | | | | | | | | | | |
| **CO4** | 3 | 3 | 2 | 2 | 3 | | | | | | | | | | |

# 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<br>**Lab Component:**<br>1. Illustration of database and collection creation, AND, OR operations in MongoDB.<br>2. How would you insert a single document into a MongoDB collection named students with the following fields: name, age, and grade?<br>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<br>**Lab Component:**<br>1.Demonstrate creation of different types of indexes on collection (unique, sparse, compound and multikey indexes)<br>2. Demonstrates creating a text index for full-text search on string fields.<br>3. Demonstrates creating a geospatial index for querying location data. | **3 Hours** |
| **Pedagogy** | **Tool Usage -indexing database** | |
| 4 | **Aggregations:** Map reduce, Aggregation commands<br>**Lab Component:**<br>1. Execute Aggregation Pipeline and its operations (pipeline must contain $match, $group, $sort, $project, $skip etc. students encourage to execute several queries to demonstrate various aggregation operators)<br>**2.** Create and demonstrate how projection operators ($, $elematch and $slice) would be used in the MondoDB.<br>3. Execute Aggregation operations ($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):**<br>• **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another<br>• **Problem Solving**: encourages cognitive thinking and enables creative problem solving<br>• **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.<br>• **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** | 3 | 2 | | | | | | | | | | | | | |
| **CO2** | 3 | 2 | 3 | | 2 | | | | | | | | | | |
| **CO3** | 3 | 3 | 2 | 2 | 2 | | | | | | | | | | |
| **CO4** | 3 | 3 | 3 | 2 | 3 | | | | | | | | | | |

# UNIVERSAL HUMAN VALUES (UHV)

# Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

| | | | | | | |
|---|---|---|---|---|---|---|
| **Semester** | : | **4th Semester** | | | | |
| **Course Title** | : | **Universal Human Values** | | | | |
| **Course Code** | : | **BUHK408** | | | | |
| **Course Type (Theory/Practical/Project/Integrated)** | : | **Theory** | | | | |
| **Category** | : | **UHV** | | | | |
| **Stream** | : | **All Branches** | | **CIE** | : | **50** |
| **Teaching hours/ week (L:T:P:S)** | : | **0:2:0:0** | | **SEE** | : | **50** |
| **Total Hours** | : | **15 Hours** | | **SEE Duration** | : | **1.5 Hours** |
| **Credits** | : | **1** | | | | |

**Course Learning Objectives:** Students will be able to:

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

## Teaching-Learning Process

**General Instructions:**

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

- The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
- In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students' theoretical and applied skills.
- State the need for UHV activities and its present relevance in the society and provide real-life examples.
- Support and guide the students for self-study activities.
- You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field.
- This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous self-evolution.
- 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 | **Introduction to Value Education**<br>Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations | **3 Hours** |
| **Pedagogy** | | |
| 2 | **Harmony in the Human Being:**<br>Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health | **3 Hours** |
| **Pedagogy** | | |
| 3 | **Harmony in the Family and Society:**<br>Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order | **3 Hours** |
| **Pedagogy** | | |
| 4 | **Harmony in the Nature/Existence:**<br>Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence | **3 Hours** |
| **Pedagogy** | | |
| 5 | **Implications of the Holistic Understanding – a Look at Professional Ethics:**<br>Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession | **3 Hours** |
| | **Pedagogical Initiatives (Not limited to):**<br>• **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another<br>• **Problem Solving**: encourages cognitive thinking and enables creative problem solving<br>• **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.<br>• **Case studies:** maps different domains in real time applications<br>• **Demonstration:** exhibits the implementation process | |

| Text Books | |
|---|---|
| **Sl. No.** | **Title of the Book/Name of the author/Name of the publisher/Edition and Year** |
| **1** | The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978- 93-87034- 47-1 |
| **2** | The Teacher"s Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G |
| **Reference Books** | |
| **1** | Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999. |
| **2** | . Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004 |

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

At the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature);

- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability.
- They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

**Web links and Video Lectures (e-Resources):**

**Value Education websites**

**https://www.uhv.org.in/uhv-ii**

**http://uhv.ac.in**

**http://www.uptu.ac.in**

**http://www.storyofstuff.com**

**https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw**

**https://fdp-si.aicte-india.org/8dayUHV_download.php**

**https://www.youtube.com/watch?v=8ovkLRYXIjE**

**https://www.youtube.com/watch?v=OgdNx0X923I**

**https://www.youtube.com/watch?v=nGRcbRpvGoU**

**https://www.youtube.com/watch?v=sDxGXOgYEKM**

## 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<br>➢ Measuring algorithm complexity<br>➢ Analysis of various algorithms |
| 2 | Database Management System | BCD403 | Integrated | IPCC | ➢ Acquire NoSQL database skills<br>➢ Web development applications<br>➢ Real-time database creation |
| 3 | Machine learning fundamentals | BCD406 | Project | PBL | ➢ Advance Machine learning algorithms<br>➢ To device the model for available datasets<br>➢ Advanced tools usage like PySpark, PyCharm, tableau, ETL and SAS tool |
| 4 | Julia | BCD417 | Practical Experiential learning | AEC | ➢ Versatile programming tool learning.<br>➢ Code Optimization<br>➢ Domain-Specific Applications like Finance, Bioinformatics |
| | MongoDB | BCD427 | | | ➢ Managing and leveraging NoSQL databases<br>➢ Proficient in handling large-scale data<br>➢ Optimizing database performance<br>➢ Integrating databases with modern applications |