NEW HORIZON
COLLEGE OF ENGINEERING

# Department of Information Science & Engineering

## Academic Year 2023-24

## 5th and 6th Semester

## Scheme and Syllabus

## BATCH – 2021-2025

## CREDITS: 160

## NEW HORIZON COLLEGE OF ENGINEERING

### VISION

To emerge as an institute of eminence in the fields of engineering, technology and management in serving the industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

### MISSION

- To strengthen the theoretical, practical and ethical dimensions of the learning process by fostering a culture of research and innovation among faculty members and students.
- To encourage long-term interaction between academia and industry through their involvement in the design of the curriculum and its hands-on implementation.
- To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

### QUALITY POLICY

To provide educational services of the highest quality both curricular and co-curricular to enable students integrate skills and serve the industry and society equally well at global level.

### VALUES

- Academic Freedom
- Integrity
- Inclusiveness
- Innovation
- Professionalism
- Social Responsibility

## DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

### VISION

To emerge as a Department of Eminence in Information Science and Engineering in serving the Information Technology industry and the nation by empowering students with a high degree of technical and practical competence.

### MISSION

- To strengthen the theoretical, practical and ethical dimensions of the learning process by continuous learning and establishing a culture of research and innovation among faculty members and students, in the field of information science and engineering.
- To build long-term interaction between the academia and Information Technology industry, through their involvement in the design of curriculum and its hands-on implementation.
- To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

**Program Education objectives (PEOs)**

| | |
|---|---|
| **PEO 1** | Excel as Information Science Engineers with the ability to solve a wide range of computational problems in the IT industry, Government or other work environments. |
| **PEO 2** | Pursue higher studies with profound knowledge enriched with academia and industrial skill sets. |
| **PEO 3** | Exhibit adaptive skills to develop computing systems using modern tools and technologies in multidisciplinary areas to meet technical and managerial challenges, which meet societal requirements. |
| **PEO 4** | Possess the ability to collaborate as a team member and leader with professional ethics to make a positive impact on society. |

**PEO to Mission Statement Mapping**

| PEO Statements | M1 | M2 | M3 |
|---|---|---|---|
| **PEO 1:** Excel as an Information Science Engineer with the ability to solve a wide range of computational problems in the IT industry, Government or other work environments. | 3 | 3 | 2 |
| **PEO 2:** Pursue higher studies with profound knowledge enriched with academia and industrial skill sets. | 3 | 3 | 2 |
| **PEO 3:** Exhibit adaptive skills to develop computing systems using modern tools and technologies in multidisciplinary areas to meet technical and managerial challenges which meet societal requirements. | 3 | 3 | 3 |
| **PEO 4:** Possess the ability to collaborate as a team member and leader with professional ethics to make a positive impact on society. | 2 | 2 | 3 |

**Correlation:** 3- High, 2-Medium, 1-Low

**Program Specific Outcomes (PSO's)**

**PSO1:** The ability to understand, analyze and develop computer programs in the areas of Information Science and Engineering related to System Software, Web Design, Big Data Analytics, Machine Learning, Internet of Things, Data Science, Networking and Security for efficient design of computer-based systems of varying complexity.

**PSO2:** The ability to apply standard practices and strategies in software project development using innovative ideas and open-ended programming environment with skills in teams and professional ethics to deliver a quality, sustainable product for business success in the field of Information Science.

**Program Outcomes (PO) with Graduate Attributes**

| | Graduate Attributes | Program Outcomes (POs) |
|---|---|---|
| 1 | Engineering Knowledge | **PO1:** The basic knowledge of Mathematics, Science and Engineering. |
| 2 | Problem analysis | **PO2:** An Ability to analyze, formulate and solve engineeringproblems. |
| 3 | Design and Development of Solutions | **PO3:** An Ability to design system, component or product anddevelop interfaces among subsystems of computing. |
| 4 | Investigation of Problem | **PO4:** An Ability to identify, formulate and analyze complex engineering problem and research literature through core subjects ofComputer Science. |
| 5 | Modern Tool usage | **PO5:** An Ability to use modern engineering tools and equipmentsfor computing practice. |
| 6 | Engineer and society | **PO6:** An Ability to assess societal, health, cultural, safety and legalissues in context of professional practice in Computer Science & Engineering. |
| 7 | Environment and sustainability | **PO7:** The broad education to understand the impact of engineering solution in a global, economic, environmental and societal context. |
| 8 | Ethics | **PO8:** An understanding of professional and ethical responsibility. |
| 9 | Individual & team work | **PO9:** An Ability to work both as individual and team player inachieving a common goal. |
| 10 | Communication | **PO10:** To communicate effectively both in written and oral formatswith wide range of audiences. |
| 11 | Lifelong learning | **PO11:** Knowledge of contemporary issues, Management and Finance. |
| 12 | Project management and finance | **PO12:** An Ability to recognize the need and thereby to engage in independent and life-long learning for continued professional and career advancement. |

**Mapping of POs with PEOs**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PEO1** | 3 | 3 | 3 | 2 | 3 | - | - | - | 3 | - | 3 | - |
| **PEO2** | 3 | 3 | 3 | 2 | 3 | - | - | - | 3 | - | 3 | - |
| **PEO3** | 3 | 3 | 3 | 2 | 3 | - | - | - | 3 | - | 3 | - |
| **PEO4** | 3 | 3 | 3 | 2 | 3 | - | - | - | 3 | - | 3 | - |

**Correlation:** 3- High, 2-Medium, 1-Low

**NEW HORIZON COLLEGE OF ENGINEERING**

**B. E. in Information Science and Engineering**

**Scheme of Teaching and Examinations for 2021- 2025 BATCH (2021 Scheme)**

**V Semester**

| S. No. | Course and Course Code | | Course Title | BoS | Credit Distribution | | | | Overall Credits | Contact Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | S | | | CIE | SEE | Total |
| 1 | PCC | 21ISE51 | Design and Analysis of Algorithms | IS | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | **100** |
| 2 | PCCL | 21ISL51 | Design and Analysis of Algorithms Laboratory | IS | 0 | 0 | 1 | 0 | 1 | 2 | 50 | 50 | **100** |
| 3 | PCC | 21ISE52 | Data Science | IS | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | **100** |
| 4 | PCCL | 21ISL52 | Data Science Laboratory | IS | 0 | 0 | 1 | 0 | 1 | 2 | 50 | 50 | **100** |
| 5 | PCC | 21ISE53 | Principles of Cyber Security | IS | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | **100** |
| 6 | PEC | 21ISE54X | Professional Elective Course-I | IS | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | **100** |
| 7 | AEC | 21ISL55X | Ability Enhancement Course-V | IS | 0 | 0 | 1 | 0 | 1 | 2 | 50 | 50 | **100** |
| 8 | MP | 21ISE56 | Mini Project | IS | 0 | 0 | 1 | 0 | 1 | 2 | 50 | 50 | **100** |
| 9 | AEC | 21ISK57 | Research Methodology and IPR | IS | 1 | 0 | 0 | 0 | 1 | 1 | 50 | 50 | **100** |
| 10 | UHV | 21ISK58 | Innovation and Design Thinking | IS | 1 | 0 | 0 | 0 | 1 | 1 | 50 | 50 | **100** |
| | | | | | | | | **Total** | **18** | **22** | **500** | **500** | **1000** |

**PCC**: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **NCMC**: Non-Credit Mandatory Course, **AEC**: Ability Enhancement Course, **PEC**: Professional Elective Course, **PROJ**: Mini Project work **L:** Lecture, **T**: Tutorial, **P**: Practical **S: SDA**: Self Study for Skill Development, **CIE**: Continuous Internal Evaluation, **SEE**:Semester End Evaluation

| **Professional Elective Course-I** | | | |
|---|---|---|---|
| 21ISE541 | Information Theory & Coding | 21ISE544 | Operation Research |
| 21ISE542 | Principles of Cloud Computing | 21ISE545 | Advanced Java |
| 21ISE543 | Automata Theory and computability | | |

| **Ability Enhancement Course-V** | | | |
|---|---|---|---|
| 21ISL551 | Web Internet Programming | 21ISL553 | Advanced Office Automation |
| 21ISL552 | Linux Programming | 21ISL554 | NOSQL |
| | | | |

**Professional Elective Courses (PEC):** A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering.

**Mini-project work:** Mini Project is a laboratory-oriented/hands on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications etc. Based on the ability/abilities of the student/s and recommendations of the mentor. A student can do mini project as

**(i)** A group of 2 if mini project work is single discipline (applicable to all IT allied branches)

**(ii)** A group of 2- 4 if mini project work is single discipline (applicable to all Core Branches)

**(iii)** A group of 2 - 4 students if the Mini Project work is a multidisciplinary (Applicable to all Branches)

**CIE procedure for Mini-project:**

**(i) Single discipline:** The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batches mates.

**(ii) Interdisciplinary:** Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project.

The CIE marks awarded for the Mini-project, shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the percentage ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batch mates

| | |
|---|---|
| **Credit Definition**:<br>1-hour Lecture (L) per week=1Credit<br>2-hoursTutorial(T) per week=1Credit<br>2-hours Practical / Drawing (P) per week=1Credit<br>2-hous Self Study for Skill Development (SDA) per week = 1 Credit | 03-Credits courses are to be designed for 40 hours in Teaching-Learning Session<br>02- Credits courses are to be designed for 25 hours of Teaching-Learning Session<br>01-Credit courses are to be designed for 15 hours of Teaching-Learning Sessions |

**NEW HORIZON COLLEGE OF ENGINEERING**

**B. E. in Information Science and Engineering**

**Scheme of Teaching and Examinations for 2021- 2025 BATCH (2021 Scheme)**

VI Semester

| S. No. | Course and Course Code | | Course Title | BoS | Credit Distribution | | | | Overall Credits | Contact Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | S | | | CIE | SEE | Total |
| 1 | HSMC | 21ISE61 | Software Engineering and Project Management | IS | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |
| 2 | PCC | 21ISE62 | Machine Learning | IS | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |
| 3 | PCCL | 21ISL62 | Machine Learning Laboratory | IS | 0 | 0 | 1 | 0 | 1 | 2 | 50 | 50 | 100 |
| 4 | PCC | 21ISE63 | Computer Networks | IS | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |
| 5 | PCCL | 21ISL63 | Computer Networks Laboratory | IS | 0 | 0 | 1 | 0 | 1 | 2 | 50 | 50 | 100 |
| 6 | PEC | 21ISE64X | Professional Elective Course-II | IS | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |
| 7 | UHV | 21ISK65 | Social Connect and Responsibility | IS | 0 | 0 | 1 | 0 | 1 | 2 | 50 | 50 | 100 |
| 8 | INT | 21ISE66 | Innovation/Entrepreneurship/ Societal Internship | IS | 0 | 0 | 3 | 0 | 3 | 0 | 50 | 50 | 100 |
| 9 | MP | 21ISE67 | Mini project | IS | 0 | 0 | 1 | 0 | 1 | 2 | 50 | 50 | 100 |
| 10 | OEC | 21NHOP6XX | Industrial Open Elective Course-I | Offering Dept. | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |
| | | | | | | | | **Total** | **22** | **23** | **500** | **500** | **1000** |

**PCC**: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **NCMC**: Non-Credit Mandatory Course, **AEC**: Ability Enhancement Course, **PEC**: Professional Elective Course, **PROJ**: Mini Project work **L:** Lecture, **T**: Tutorial, **P**: Practical **S: SDA**: Self Study for Skill Development, **CIE**: Continuous Internal Evaluation, **SEE**:Semester End Evaluation

21XXX61(HSMC)-This course must be pertaining to economics and management of the concerned degree program. The course syllabus should have both economics and management topics and the course title should bear the word Management.

For IT allied Branches: Software Product Management

For Core Branches: Engineering Economics and Management / Industrial Management / Construction Management

HSMC: Humanity and Social Science & Management Course, PCC: Professional Core Course, PCCL: Professional Core Course laboratory, NCMC: Non- Credit Mandatory Course, AEC: Ability Enhancement Course, PEC: Professional Elective Course, OEC: Open Elective Course, PROJ: Project work, L: Lecture, T: Tutorial, P: Practical S: SDA: Self Study for Skill Development, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation.

Industrial Open Elective Course (OEC): Credit for OEC is 03 (L: T: P: S) can be considered as (3: 0: 0 : 0). The teaching and learning of these Courses will be based on hands-on. The Course Assessment will be based on CIE and SEE in practical mode. This Courses will be offered by Centre of Excellence to students of all the branches. Registration to Industrial open electives shall be documented and monitored on college level.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering.

| **Professional Elective Course-II** | | | |
|---|---|---|---|
| 21ISE641 | Compiler Design | 21ISE644 | Bio Inspired Design and Innovation |
| 21ISE642 | Data Visualization | 21ISE645 | Cryptography and Network Security |
| 21ISE643 | Natural Language Processing | | |

| | | | | |
|---|---|---|---|---|
| NCMC | 21NSS84 | National Service Scheme (NSS) | NSS coordinator | All students have to register for any one of the courses namely National Service Scheme, Physical Education (PE) (Sports and Athletics) and Yoga with the concerned coordinator of the course during the first week of V semester. The activities shall be carried out from (for 4 semesters) between V semester to VIII semester.<br>SEE in the above courses shall be conducted during VIII semester examinations and the accumulated CIE marks shall be added to the SEE marks.<br>Successful completion of the registered course is mandatory for the award of the degree.<br>The events shall to be reflected in the calendar prepared for the NSS, PE and Yoga activities. |
| | 21PES84 | Physical Education (PE) (Sports and Athletics) | Physical Education Director | |
| | 21YOG84 | Yoga | Yoga Teacher | |

| | |
|---|---|
| Credit Definition:<br>1- hour Lecture (L) per week=1Credit<br>2-hours Tutorial(T) per week=1Credit<br>2- hours Practical / Drawing (P) per week=1Credit<br>2-hous Self Study for Skill Development (SDA) per week=1 Credit | 03-Credits courses are to be designed for 40 hours in Teaching-Learning Session<br>02-Credits courses are to be designed for 25 hours of Teaching-Learning Session<br>01-Credit courses are to be designed for 15 hours of Teaching-Learning Sessions |

| DESIGN AND ANALYSIS OF ALGORITHMS | | | |
|---|---|---|---|
| **Course Code** | **21ISE51** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| 21ISE51.1 | Analyze algorithms in terms of space and time complexity. |
| 21ISE51.2 | Solve problems using brute force, divide and conquer, decrease and conquer and transform and conquer techniques. |
| 21ISE51.3 | Solve problems using greedy and dynamic programming. |
| 21ISE51.4 | Apply backtracking and branch and bound approaches for computational problems. |
| 21ISE51.5 | Analyze string matching, parallel and online algorithms. |
| 21ISE51.6 | Apply appropriate algorithm design technique for a given problem. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISE51.1 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE51.2 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE51.3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE51.4 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE51.5 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE51.6 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |

| **MODULE-1** | **INTRODUCTION, BRUTE FORCE APPROACH** | **21ISE51.1, 21ISE51.2** | **8 Hours** |
|---|---|---|---|

Introduction: Fundamentals of Algorithms, Problem Solving- Important Problem Types, Performance Analysis: Space complexity, Time complexity–Asymptotic notations and Basic efficiency classes: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ),Mathematical analysis for Recursive and Non-recursive algorithms. Brute Force Approach: General Method, Simple string matching).

| Text Book | Text Book 1: 1.2, 1.3, 2.1,2.2,2.3,2.4,2.5,3.2 |
|---|---|

| **MODULE-2** | **DIVIDE AND CONQUER, DECREASE AND CONQUER, TRANSFORM AND CONQUER** | **21ISE51.2, 21ISE51.6** | **8 Hours** |
|---|---|---|---|

**Divide and Conquer:** General method-Recurrence equation for divide and conquer-Analysis of quick sort and merge sort algorithm- Advantages and disadvantages of divide and conquer approach.
**Decrease and Conquer:** General Method, Topological sorting.
**Transform and Conquer:** General Method, Heaps and Heap Sort

| Text Book | Text Book 1: 4.2,5.1,5.2,6.4 |
|---|---|

| **MODULE-3** | **GREEDY APPROACH, DYNAMIC PROGRAMMING** | **21ISE51.3, 21ISE51.6** | **8 Hours** |
|---|---|---|---|

**Greedy Approach**: General method, Prim's Algorithm, Kruskal's Algorithm, Single source shortest paths: Dijkstra's Algorithm, 0/1 Knapsack problem.
**Dynamic Programming:** General method, All pair shortest path problem, Longest common subsequence, Traveling salesperson problem

| Text Book | Text Book 1:8.1,8.4,9.1,9.2,9.3, Text Book 2:5.9 |
|---|---|

| **MODULE-4** | **BACKTRACKING, BRANCH AND BOUND** | **21ISE51.4, 21ISE51.6** | **8 Hours** |
|---|---|---|---|

**Backtracking**: General method, N-Queens problem, Sum of subsets problem.
**Branch and Bound:** General method, Travelling Sales Person problem, Knapsack problem
**NP Complete and NP-Hard problems:** Basic concepts-non-deterministic algorithms-P, NP, NP-Complete, and NP-Hard classes

| Text Book | Text Book 1: 11.3,12.1,12.2 |
|---|---|

| **MODULE-5** | **STRING MATCHING ALGORITHM, PARALLEL ALGORITHMS, ONLINE ALGORITHMS** | **21ISE51.5, 21ISE51.6** | **8 Hours** |
|---|---|---|---|

**String matching algorithm:** KMP String matching algorithm- Boyer Moore String matching algorithm
**Parallel algorithms:** PRAM models, Prefix computation, Sorting on a mesh.
**Online Algorithms:** K-server problem, List update problem

| Text Book | Text Book 2: 13.1,13.2,13.314.6 Reference Book:32.4 |
|---|---|

**CIE Assessment Pattern(50 Marks – Theory) –**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | - | - | - |
| L2 | Understand | 5 | - | - |
| L3 | Apply | 10 | 10 | 5 |
| L4 | Analyze | 5 | 5 | 5 |
| L5 | Evaluate | 5 | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | - |
| L2 | Understand | 10 |
| L3 | Apply | 20 |
| L4 | Analyze | 10 |
| L5 | Evaluate | 10 |
| L6 | Create | -- |

**Suggested Learning Resources:**

**Text Books:**

1) Anany Levitin , "Introduction to the Design and Analysis of Algorithms,3rd Edition, Pearson, 2012
2) Ellis Horowitz, Satraj Sahni and Rajasekaran, "Computer Algorithms/C++", 2nd Edition, Universities Press, 2014

**Reference Books:**

1) Cormen T.H., Leiserson C.E., Rivest R.L., Stein C, "Introduction to Algorithms", 4th Edition, The MIT Press, 2022

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

- https://onlinecourses.nptel.ac.in/noc19_cs47/preview
- https://archive.nptel.ac.in/courses/106/106/106106131/
- https://cs.uwaterloo.ca/~r5olivei/courses/2020-fall-cs466/lecture20-k-server-post.pdf
- https://www.cs.huji.ac.il/~ornak/publications/atva11a.pdf
- http://algo2.iti.kit.edu/vanstee/courses/kserver.pdf

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- NPTEL course
- Contents related activities (Activity-based discussions)
- For active participation of students, instruct the students to solve and analyze various algorithms

| DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY | | | |
|---|---|---|---|
| **Course Code** | **21ISL51** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **01** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| 21ISL51 .1 | Implement problems using brute force, divide and conquer and decrease and conquer techniques. |
| 21ISL51 .2 | Implement problems using greedy and dynamic programming techniques. |
| 21ISL51 .3 | Implement problems using backtracking and online approaches. |
| 21ISL51 .4 | Use different string-matching algorithms. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISL51 .1 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISL51 .2 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISL51 .3 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISL51 .4 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |

| Pgm. No. | List of Programs | Hours | COs |
|---|---|---|---|
| | **Prerequisite Experiments / Programs / Demo** | | |
| | Expected Prior Knowledge and Skills: Proficiency in a C & C++ programming language, basic program design concepts (e.g, pseudo code), proof techniques, familiarity with trees and graph data structures, familiarity with basic algorithms such as those for searching, and sorting, knowledge of Discrete Structures as minimum cost spanning trees. | 2 | NA |
| | **PART-A** | | |
| 1 | Implement and analyze quick sort algorithm. | 2 | 21ISL51 .1 |
| 2 | Implement and analyze merge sort algorithm | 2 | 21ISL51 .1 |
| 3 | Implement and analyze topological sorting in a given directed graph. | 2 | 21ISL51 .1 |
| 4 | Implement and analyze Kruskal`s algorithm and find minimum cost spanning tree of a given connected undirected graph. | 2 | 21ISL51 .2 |
| 5 | Implement and analyze Prim`s algorithm and find minimum cost spanning tree of a given connected undirected graph. | 2 | 21ISL51 .2 |
| 6 | Implement and analyze Dijkstra's algorithm to find the shortest path from a given source. | 2 | 21ISL51 .2 |
| | **PART-B** | | |
| 7 | Implement travelling salesman problem using dynamic programming. | 2 | 21ISL51 .2 |
| 8 | Implement 0/1 Knapsack problem. | 2 | 21ISL51 .2 |
| 9 | Implement N-Queens problem using backtracking. | 2 | 21ISL51 .3 |
| 10 | Implement sum of subset problem using backtracking. | 2 | 21ISL51 .3 |
| 11 | Implement and compare Simple string matching and KMP string matching algorithm. | 2 | 21ISL51 .4 |
| 12 | Implement and analyze k-server Problem | 2 | 21ISL51 .3 |

**PART-C**

**Beyond Syllabus Virtual Lab Content**

**(To be done during Lab but not to be included for CIE or SEE)**

1. Design and Develop programs for the demonstration of parallel algorithms.
    a. Merge Sort
    b. Prefix Computation

https://ds2-iiith.vlabs.ac.in/List%20of%20experiments.html

**CIE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Test (s) | Weekly Assessment |
|---|---|---|---|
| | | **20** | **30** |
| **L1** | **Remember** | **-** | **-** |
| **L2** | **Understand** | - | 5 |
| **L3** | **Apply** | 5 | 5 |
| **L4** | **Analyze** | 5 | 10 |
| **L5** | **Evaluate** | 10 | 10 |
| **L6** | **Create** | - | - |

**SEE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| **L1** | **Remember** | **-** |
| **L2** | **Understand** | **-** |
| **L3** | **Apply** | **10** |
| **L4** | **Analyze** | **20** |
| **L5** | **Evaluate** | **20** |
| **L6** | **Create** | **-** |

Suggested Learning Resources:

Reference Books


1) Cormen T.H., Leiserson C.E., Rivest R.L., Stein C, "Introduction to Algorithms", 4th Edition, The MIT Press, 2022

2) Anany Levitin , "Introduction to the Design and Analysis of Algorithms,3rd Edition, Pearson, 2012

3) Ellis Horowitz, Satraj Sahni and Rajasekaran, "Computer Algorithms/C++", 2nd Edition, Universities Press, 2014

| DATA SCIENCE | | | |
|---|---|---|---|
| **Course Code** | **2IISE52** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| 21ISE52.1 | Understand the probability, Statistics and Linear algebra concepts essential for data science. |
| 21ISE52.2 | Apply algebraic and geometric view for the real-world data set. |
| 21ISE52.3 | Analyze linear regression and multiple linear regression for model building and prediction. |
| 21ISE52.4 | Develop the classification model using classification algorithms. |
| 21ISE52.5 | Develop the clustering model using clustering algorithms. |
| 21ISE52.6 | Create the real-world data set for implementing optimization techniques. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISE52.1 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | 3 |
| 21ISE52.2 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | 3 |
| 21ISE52.3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | 3 |
| 21ISE52.4 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | 3 |
| 21ISE52.5 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | 3 |
| 21ISE52.6 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | 3 |

| **MODULE-1** | **FOUNDATIONS OF DATASCIENCE** | **21ISE52.1** | **8 Hours** |
|---|---|---|---|

Introduction to data science, Data mining and Data Warehousing, Descriptive analytics, Probability Theory, Probability distribution, Confidence interval for population mean and proportion, Hypothesis Testing and the power of Hypothesis Testing.

| Text Book | Text Book 1: 1.2,1.3, 1.5,5.1,6.1, Text Book 2: 1.1,1.2,1.3 |
|---|---|

| **MODULE-2** | **DATA PREPROCESSING** | **2OISE52.2** | **8 Hours** |
|---|---|---|---|

Types of Data, Sampling Theory, Sampling Techniques, Correlation, Feature Selection. Dimensionality Reduction Techniques: Projections, Eigen Value Decomposition, Principal Component Analysis (PCA).

| Text Book | Text Book 1: 4.1,4.3,4.4,4.5,8.1,10.7, Text Book 2: 3.4,3.5 |
|---|---|

| **MODULE-3** | **LINEAR REGRESSION** | **2OISE52.3** | **8 Hours** |
|---|---|---|---|

Simple Linear Regression- Steps in building a regression model, Model diagnostics, Multiple Linear Regression- Developing Multiple Linear Regression, Co linearity, Residual Analysis, Detecting Influencers.

| Text Book | Text Book 1: 9.1, 9.2, 9.7,9.8,9.9,9.10,10.1 |
|---|---|

| **MODULE-4** | **CLASSIFICATION** | **2OISE52.4** | **8 Hours** |
|---|---|---|---|

Logistic Regression, Naïve Bayes, K- Nearest Neighbour, Decision Trees, Random Forest.

| Text Book | Text Book 1:11.1,11.2,12.1, Text Book 2: 8.3.1,8.3.2 |
|---|---|

| **MODULE-5** | **CLUSTERING AND OPTIMIZATION** | **2OISE52.5,2OISE52.6** | **8 Hours** |
|---|---|---|---|

Clustering techniques- Hierarchical Clustering, Single – link, Complete linkage, and Clustering algorithms-K means, DB Scan, Jaccard Coefficient, Elbow technique. Optimization – Optimization techniques for Data Science.

| Text Book | Text Book 1: 14.1 to 14.6 |
|---|---|

**CIE Assessment Pattern(50 Marks – Theory) –**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 4 | - | - |
| L2 | Understand | 4 | - | - |
| L3 | Apply | 6 | 3 | 5 |
| L4 | Analyze | 8 | 7 | 5 |
| L5 | Evaluate | 3 | 5 | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 10 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | 10 |
| L6 | Create | -- |

**Suggested Learning Resources:**

**Text Books:**

1) U Dinesh Kumar, "Business Analytics :The Science of Data Driven decision making", First Edition, Wiley Publishers, 2017.

2) Jiawei Han , Micheline Kamber , Jian Pei Professor, "Data Mining: Concepts and Techniques", Third Edition, Morgan Kaufmann Series,2011.

3) Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning using Python", First Edition, Wiley Publishers, 2019.

4) Gilbert Strang, "Introduction to Linear Algebra, Fifth Edition", Wellesley-Cambridge Press and SIAM, 2016.

**Reference Books:**

1) Bruce M King, Edward W Minium , "Statistical Reasoning in the Behavioral Sciences", 5th Edition, Wiley Publishers, 2018

2) Douglas C. Montgomery, Douglas C. Montgomery, George C. Runger, "Applied Statistics and Probability for Engineers",6th Edition, Wiley Publishers, 2016

3) McKinney W. "Python for data analysis: Data wrangling with Pandas, NumPy, and IPython." O'Reilly Media, Inc., 2012

4) EMC Education Services , "Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", John Wiley & Sons, Inc.

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

- https://machinelearningmastery.com/
- https://towardsdatascience.com/data-science/home
- https://www.mastersindatascience.org/
- https://onlinecourses.nptel.ac.in/noc20_cs46/preview

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Demonstrate the need of statistics and probability for data science to students.
- Demonstration of jupyter notebook for hands-on experience with datasets.

- Construct flowcharts to represent the supervised and unsupervised learning techniques
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to understand real-world datasets and various optimization techniques.
  - Organizing Group wise discussions on issues
  - Seminars

| DATA SCIENCE LABORATORY | | | |
|---|---|---|---|
| **Course Code** | **21ISL52** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **1** | **Exam Hours** | **03** |

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

| | |
|---|---|
| 21ISL52.1 | Understand basic operations of NumPy, Pandas, and Matplotlib. |
| 21ISL52.2 | Implement Regression models for the sample datasets. |
| 21ISL52.3 | Develop Classification models and optimize the performance. |
| 21ISL52.4 | Develop clustering models and apply on suitable datasets. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISL52.1 | 3 | 3 | 3 | 3 | 2 | - | - | - | 1 | - | - | 2 | 3 | 3 |
| 21ISL52.2 | 3 | 3 | 3 | 3 | 2 | - | - | - | 1 | - | - | 2 | 3 | 3 |
| 21ISL52.3 | 3 | 3 | 3 | 3 | 2 | - | - | - | 1 | - | - | 2 | 3 | 3 |
| 21ISL52.4 | 3 | 3 | 3 | 3 | 2 | - | - | - | 1 | - | - | 2 | 3 | 3 |

| Pgm. No. | List of Programs | Hours | COs |
|---|---|---|---|
| | **Prerequisite Experiments / Programs / Demo** | | |
| | • Mathematics, like probability, statistics and calculus<br>• Object- oriented programming languages like java, C, Python<br>• Structured Query Language(SQL) for database queries | 2 | NA |
| | **PART-A** | | |
| 1 | Using pandas in python demonstrate the following operations for the sample dataset given,<br>1)Indexing of Data frame<br>2)Grouping and aggregating<br>3)Adding and removing attributes<br>4)Joining data frames<br>5)Filtering the data<br>6) Handling missing values. | 2 | 21ISL52.1 |
| 2 | Using pandas and Matplotlib demonstrate the following 36 operations for the sample dataset given, i) Bar chart and Histogram ii) Comparing Distribution iii) Box plot and mention quartiles. | 2 | 21ISL52.1 |
| 3 | Using Numpy, pandas and Matplotlib demonstrate the following operations for the sample dataset given, i) Central tendency ii) Dispersion and Distribution iii) ANOVA iv) Hypothesis testing | 2 | 21ISL52.1 |

| | | | |
|---|---|---|---|
| 4 | Develop a program to implement Simple Linear Regression model and evaluate the model by verifying the performance. | 2 | 21ISL52.2 |
| 5 | Develop a program to implement Multiple Linear Regression model and evaluate the model by verifying the performance. | 2 | 21ISL52.2 |
| 6 | Develop a program to implement Logistic Regression and indicate the class label for the test dataset | 2 | 21ISL52.2 |
| **PART-B** | | | |
| 7 | Develop a program to implement Naive Bayes classifier model and analyze the model using confusion matrix | 2 | 21ISL52.3 |
| 8 | Develop a program to implement Decision Tree model and analyze the model using confusion matrix. | 2 | 21ISL52.3 |
| 9 | Develop a program to implement Random Forest classifier model and analyze the model using confusion matrix. | 2 | 21ISL52.3 |
| 10 | Develop a program to implement KNN classifier model and analyse the model using confusion matrix. | 2 | 21ISL52.3 |
| 11 | Develop a program to implement K Means clustering model for the given value of K, where K is number of clusters. | 2 | 21ISL52.4 |
| 12 | Develop a program to implement Hierarchical clustering model for the given value of N, where N is number of clusters. | 2 | 21ISL52.4 |

**PART-C**

**Beyond Syllabus Virtual Lab Content**

**(To be done during Lab but not to be included for CIE or SEE)**

Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:

1. Uni variate analysis: Frequency, Mean, Median, Mode, Variance.
2. Standard Deviation, Skewness .
3. Bi variate analysis: Linear and logistic regression modeling.
4. Multiple Regression analysis.
5. Also compare the results of the above analysis for the two data sets.

**https://www.collaborat.com/pima-diabetes-data-discovery-predictive-model/**

**https://www.kaggle.com/code/lucky1/pima-indians-diabetes-dataset-part-1**

**CIE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Test (s) | Weekly Assessment |
|---|---|---|---|
| | | **20** | **30** |
| **L1** | **Remember** | - | - |
| **L2** | **Understand** | - | 5 |
| **L3** | **Apply** | 5 | 10 |
| **L4** | **Analyze** | 5 | 5 |
| **L5** | **Evaluate** | 10 | 10 |
| **L6** | **Create** | - | - |

**SEE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| **L1** | **Remember** | - |
| **L2** | **Understand** | - |
| **L3** | **Apply** | **10** |
| **L4** | **Analyze** | **20** |
| **L5** | **Evaluate** | **20** |
| **L6** | **Create** | - |

**Suggested Learning Resources:**

**Reference Books:**

U Dinesh Kumar, "Business Analytics :The Science of Data Driven decision making", First Edition, Wiley Publishers, 2017.

2) Jiawei Han , Micheline Kamber , Jian Pei Professor, "Data Mining: Concepts and Techniques", Third Edition, Morgan Kaufmann Series,2011.

| **PRINCIPLES OF CYBER SECURITY** | | | |
|---|---|---|---|
| **Course Code** | **21ISE53** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| 21ISE53.1 | Explain the concepts of confidentiality, availability and integrity in Information Assurance, including physical, software, devices, policies and people. |
| 21ISE53.2 | Applying knowledge in the field of cyber security to analyze real world problems. |
| 21ISE53.3 | Understand the tools and methods used in cyber crime |
| 21ISE53.4 | Describe the cybercrime vulnerabilities, exploitations of the Internet & appropriate responses to cybercriminal activity |
| 21ISE53.5 | Identify the legal perspectives in cyber security and challenges to Indian law. |
| 21ISE53.6 | Identify cyber security incidents to apply appropriate response and current structure of cyber security roles across the enterprise, including the roles and responsibilities of the relevant organizations. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISE53.1 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE53.2 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | 3 |
| 21ISE53.3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | 3 |
| 21ISE53.4 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | 3 |
| 21ISE53.5 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | 3 |
| 21ISE53.6 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | 3 |

| MODULE-1 | Introduction to Cyber Security | 21ISE53.1 | 8 Hours |
|---|---|---|---|
| Definition of Cyber Security and Cyber Security Policy, Domains of Cyber Security Policy, Laws and Regulations, Technology Operations, Technology Configuration, Strategy versus Policy; Cyber Security Evolution: Productivity, Internet, e-Commerce. | | | |
| Text Book | Text Book 2: 1.1 to 1.4,2.1 to 2.3 | | |
| **MODULE-2** | **Introduction to Cyber Crime** | **21ISE53.2** | **8 Hours** |
| Definition and evolution of Cyber Crimes, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrimes.<br>Cyber offenses: Introduction, How criminal plan the attacks, Social engineering, Cyber stalking. | | | |
| Text Book | Text Book 1: 1.1 to 1.5,2.1 to 2.4 | | |
| **MODULE-3** | **Tools and methods used in Cybercrime** | **21ISE53.3** | **8 Hours** |
| Introduction, Proxy servers and anonymizers, Password cracking, Key loggers and spywares, Virus and worms, Trojan horses and backdoors, Steganography, DoS and DDoS attacks, SQL injection, Buffer overflow. | | | |
| Self-study / Case Study /Applications | Security policy objectives, cyber security management | | |
| Text Book | Text Book1: 4.1 ,4.2,4.4 to 4.11 | | |
| **MODULE-4** | **Phishing and Identity Theft** | **21ISE53.4** | **8 Hours** |
| Phishing: Introduction, Phishing: methods of phishing, phishing techniques, spear phishing, types of phishing scams, phishing countermeasures.<br>Identity Theft (ID Theft): personally identifiable information, Types of identity theft, techniques of ID theft, Identity Theft Countermeasures. | | | |
| Self-study / Case Study / Applications | Cyber Governance Issues, Types of identity theft | | |
| Text Book | Text Book 1: 5.1 to 5.3 | | |
| **MODULE-5** | **Cybercrimes and Cyber Security** | **21ISE53.5, 21ISE53.6** | **8 Hours** |
| The legal perspectives: Introduction, Cybercrime and the legal landscape around the world, why do we need cyber laws: the Indian context, The Indian IT act, Challenges to Indian law and cybercrime scenario in India. | | | |
| Text Book | Text Book 1: 6.1 to 6.5 | | |

**SEE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| **L1** | **Remember** | 10 |
| **L2** | **Understand** | 20 |
| **L3** | **Apply** | 10 |
| **L4** | **Analyze** | 10 |
| **L5** | **Evaluate** | - |
| **L6** | **Create** | - |

**Suggested Learning Resources:**

**Text Books:**

1. Nina Godbole, Sunit Belapur, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Publications, copyright 2011, reprint 2015
2. Jennifer L. Bayuk, Jason Healey, Paul Rohmeyer, "Cyber Security Policy Guidebook" Wiley Publications.

**Referenced book:**

1. James Graham, Richard Howard, Ryan Olsan, "Cyber Security Essentials" CRC Press.

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

1. https://www.mastersindatascience.org/resources/cybersecurity-resource-guide/
2. https://www.aicte-india.org/CyberSecurity
3. https://cybersecurityventures.com/industry-news/

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Demonstration of Phishing and Identity Theft
- Demonstration of Tools and Methods used in Cyber Crime
- Demonstration of Cyber Crimes
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to prepare Flowcharts and Handouts
  - Organizing Group wise discussions on issues
  - Seminars

**INFORMATION THEORY AND CODING**

| | | | |
|---|---|---|---|
| **Course Code** | **21ISE541** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| 21ISE541.1 | Understand the basics of information theory and channel capacity. |
| 21ISE541.2 | Apply different source coding techniques |
| 21ISE541.3 | Understand the notation and concepts of error control coding. |
| 21ISE541.4 | Apply linear block codes for error detection and correction. |
| 21ISE541.5 | Implementation of cyclic codes, BCH and RS for channel coding. |
| 21ISE541.6 | Analysis of error detection and correction properties of convolution code. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISE541.1 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | 1 | 2 | 3 | - |
| 21ISE541.2 | 3 | 2 | 3 | 1 | 1 | - | - | - | - | - | 1 | - | 3 | - |
| 21ISE541.3 | 3 | 3 | 3 | 2 | 1 | - | - | - | - | - | 1 | 2 | 3 | - |
| 21ISE541.4 | 3 | 3 | 3 | 2 | 1 | - | - | - | - | - | 1 | - | 3 | - |
| 21ISE541.5 | 3 | 3 | 3 | 2 | 1 | - | - | - | - | - | 1 | - | 3 | - |
| 21ISE541.6 | 3 | 3 | 3 | 2 | 1 | - | - | - | - | - | 1 | - | 3 | - |

| | | | |
|---|---|---|---|
| **MODULE-1** | **INFORMATION THEORY** | **21ISE541.1 21ISE541.2** | **8 Hours** |

Entropy, Information rate, source coding: Shannon-Fano and Huffman coding techniques, mutual Information, channel capacity of discrete channel, Shannon- Hartley law, trade-off between bandwidth and SNR

| | | | |
|---|---|---|---|
| Text Book | Text Book 1: 4.1-4.6 | | |
| **MODULE-2** | **ERROR CONTROL CODES** | **21ISE541.3** | **8 Hours** |
| Introduction, basic notations, coding gain, characterization of error control codes, performance of error control codes, comparison of uncoded and coded systems. | | | |
| Text Book | Text Book 1: 9.1.1-9.1.4 | | |
| **MODULE-3** | **LINEAR BLOCK CODES** | **21ISE541.4** | **8 Hours** |
| Linear block codes and their properties, standard arrays, syndromes, weight distribution. error detection and correction properties modified linear block codes | | | |
| Text Book | Text Book 1: 9.2.1-9.2.4 | | |
| **MODULE-4** | **BINARY CYCLIC CODES** | **21ISE541.5** | **8 Hours** |
| Algebraic structure of cyclic codes, encoding using an (n-k) bit shift register, syndrome calculation, error detection and correction, introduction to BCH and RS Codes | | | |
| Text Book | Text Book 1: 9.3.1-9.3.6 | | |
| **MODULE-5** | **CONVOLUTION CODES** | **21ISE541**.6 | **8 Hours** |
| Convolution encoders, Structural properties of convolution codes, trellis diagrams, Viterbi algorithm, and performance analysis. | | | |
| Text Book | Text Book 1: 9.6.1-9.6.4 | | |

**CIE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Marks Distribution | |
|---|---|---|---|
| | | Test (s) | NPTEL |
| | | 25 | 25 |
| L1 | Remember | 5 | - |
| L2 | Understand | 10 | - |
| L3 | Apply | 5 | 5 |
| L4 | Analyze | 5 | 10 |
| L5 | Evaluate | - | 10 |
| L6 | Create | - | - |

**SEE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | -- |
| L6 | Create | -- |

**Suggested Learning Resources:**

**Text Books:**

1. K. Sam Shanmugam, John ,"Digital and analog communication systems", Wiley India Pvt.Ltd, 1996.

**Reference Books:**

1. JohnProakis,“DigitalCommunications”,TMH,5thEd.,2008.
2.SimonHaykin,“CommunicationSystem”,Wiley,2008.
3.JorgeCastineira,Moreira,“EssentialsofErrorControlCoding”,Wiley,2006.
4.Information Theory and Coding, Hari Bhat, Ganesh Rao, Cengage, 2017.
5. Andre Neubauer, “Coding Theory: Algorithms, Architectures & Applications”, Wiley Publications, 2010.
6. Kennedy, “Electronic Communication systems”, McGraw Hill,4th Ed.,1999.

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Video demonstration of latest topics in Information Theory and Coding.
- Contents related activities (Activity-based discussions)
- For active participation of students, instruct the students to prepare PPT and Present in class
- Organizing Group wise discussions on issues
- Seminars

| **PRINCIPLES OF CLOUD COMPUTING** | | | |
|---|---|---|---|
| **Course Code** | **21ISE542** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

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

| | |
|---|---|
| 21ISE542.1 | Compare the strengths and limitations of cloud computing |
| 21ISE542.2 | Identify the architecture, infrastructure and delivery models of cloud computing |
| 22ISE542.3 | Demonstrate the working of VM and VMM on any cloud platforms(public/private) |
| 21ISE542.4 | Examine the cloud services, Applications and Virtualization |
| 21ISE542.5 | Analyze the different Storage Technology |
| 21ISE542.6 | Identify the known threats, risks, vulnerabilities and privacy issues associated with Cloud based IT services. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISE542.1 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE542.2 | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 22ISE542.3 | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE542.4 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE542.5 | 3 | 3 | 1 | 1 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE542.6 | 3 | 3 | 1 | 1 | - | - | - | - | - | - | - | 2 | 3 | 3 |

| **MODULE-1** | **INTRODUCTION TO CLOUD COMPUTING** | **21ISE542.1** | **8 Hours** |
|---|---|---|---|

Introduction, Cloud Infrastructure: Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities.

| | |
|---|---|
| Case study | Compare the three cloud computing delivery models, SaaS, PaaS, and IaaS, from the point of view of application developers and users. Discuss the security and the reliability of each model. Analyze the differences between PaaS and IaaS. |
| Text Book | Text Book 1: 1.1,1.2, 1.3, 1.4, 1.13, 1.15, 1.16 |

| **MODULE-2** | **CLOUD COMPUTING PLATFORM** | **21ISE542.2** | **8 Hours** |
|---|---|---|---|

Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open source software platforms for private clouds.

| | |
|---|---|
| Self-study | Compare the Oracle Cloud offerings (see https://cloud.oracle.com) with the cloud services provided by Amazon, Google, and Microsoft, User Experience, Software Licensing. |
| Text Book | Text Book 1: 3.1,3.2,3.3,3.4,3.5,3.10 |

| MODULE-3 | CLOUD VIRTUALIZATIONS | 21ISE542.3, 21ISE542.4 | 8 Hours |
|---|---|---|---|
| Cloud Resource Virtualization: Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and para virtualization | | | |
| Case Study | Case Study: Xen a VMM based para virtualization | | |
| Text Book | Text Book 1: 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.11 | | |
| **MODULE-4** | **CLOUD STORAGE SYSTEM** | **21ISE542.5** | **8 Hours** |
| Storage Systems - The Evolution of Storage Technology, Storage Models, File Systems, and Databases, Distributed File Systems: The Precursors, General Parallel File System, Google File System | | | |
| Self-Study | Analyze the advantage of memory-based check pointing. | | |
| Text Book | Text Book 1: 8.1,8.2,8.3,8.4,8.5,8.6,8.10 | | |
| **MODULE-5** | **CLOUD SECURITY** | **21ISE542**.6 | **8 Hours** |
| Cloud Security, Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization | | | |
| Case Study | Compare the benefits and the potential problems due to virtualization on public, private, and hybrid clouds. | | |
| Text Book | Text Book 1: 9.1,9.2,9.3,9.4,9.5,9.6,9.7,9.9 | | |

**CIE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Marks Distribution | |
|---|---|---|---|
| | | Test (s) | NPTEL |
| | | 25 | 25 |
| L1 | Remember | 5 | - |
| L2 | Understand | 10 | - |
| L3 | Apply | 5 | 5 |
| L4 | Analyze | 5 | 10 |
| L5 | Evaluate | - | 10 |
| L6 | Create | - | - |

**SEE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | -- |
| L6 | Create | -- |

**Suggested Learning Resources:**

**Text Books:**

1. Cloud Computing: Theory and Practice, Dan C Marinescu Elsevier (MK), 2013.

**Reference Books:**

1.RajkumarBuyya , James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey,2014.
2.Soyata, Tolga, "Enabling Real-Time Mobile Cloud Computing through Emerging Technologies", IGI Global, 2015, ISBN: 978-1-4666-8662-5
3. Computing Principles and Paradigms, Rajkumar Buyya , James Broberg, Andrzej Goscinsk,i Willey, 2014.
4. Cloud Computing Implementation, Management and Security John W Rittinghouse, James F Ransome, CRC Press, 2013.

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

- https://www.javatpoint.com/cloud-computing-tutorial
- https://www.tutorialspoint.com/cloud_computing/index.htm
- https://www.digimat.in/nptel/courses/video/106105167/L01.html (Video Lectures)

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Video demonstration of latest trends in Cloud Computing
- Contents related activities (Activity-based discussions)
- For active participation of students, instruct the students to prepare PPT and Present in class
- Organizing Group wise discussions on issues
- Seminars

| **Automata Theory and Computability** | | | |
|---|---|---|---|
| **Course Code** | **21ISE543** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| 21ISE543.1 | Understand the core concepts in Automata and Theory of Computation |
| 21ISE543.2 | Identify different Formal language Classes and their Relationships |
| 21ISE543.3 | Design Grammars and Recognizers for different formal languages |
| 21ISE543.4 | Evaluate the theorems in automata theory using their properties. |
| 21ISE543.5 | Develop understating of Computation through Pushdown Automata and Turing Machine |
| 21ISE543.6 | Determine the decidability and intractability of Computational problems |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISE543.1 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE543.2 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE543.3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE543.4 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE543.5 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISE543.6 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |

-

| **MODULE-1** | **INTRODUCTION TO AUTOMATA THEORY** | **21ISE543.1** | **8 Hours** |
|---|---|---|---|

**Why study the Theory of Computation, Languages and Strings**: Strings, Languages. A Language Hierarchy, Computation, Finite State Machines (FSM): Deterministic FSM, Designing FSM, Nondeterministic Epsilon- NFA, NFA to DFA Conversion using Subset method, Minimization of FSM

| Text Book | Text Book 1: **1.1,2.4, 3.1,4.2, 5.1 to 5.10 ,** Textbook 3: **– 2.2,2.3,2.5 ,4.4** |
|---|---|

| **MODULE-2** | **REGULAR EXPRESSIONS & REGULAR LANGUAGES** | **21ISE543.2** | **8 Hours** |
|---|---|---|---|

**Regular Expressions (RE):** Definition, Operators of Regular Expressions, Building Regular Expressions, Properties of Regular Expressions, Applications of Regular Expressions., Converting Regular Expressions to Automata– Theorem & problems; Converting DFA to Regular Expressions–Kleene's Theorem & problems, Regular Grammars: Definition, Regular Grammars and Regular languages. Regular Languages (RL) and Non-regular Languages: To show that a language is regular, Closure properties of RLs, to show some languages are not RLs.

| Text Book | Text Book 1: **6.1 to 6.4, 7.1, 7.2, 8.1 to 8.4** |
|---|---|

| MODULE-3 | CONTEXT FREE GRAMMARS | 21ISE543.3, 21ISE543.4 | 8 Hours |
|---|---|---|---|

**Context-Free Grammars(CFG):** Introduction to Rewrite Systems and Grammars, CFGs and languages, designing CFGs, simplifying CFGs, proving that a Grammar is correct, Derivation and Parse trees, Ambiguity, Normal Forms. Context-Free and Non-Context-Free Languages: Where do the Context-Free Languages(CFL) fit, Showing a language is context-free, Pumping theorem for CFL, Important closure properties of CFLs

| Text Book | Text Book 1: **11.1 to 11.8, 12.1, 12.2, 12,4, 12.5, 12.6** |
|---|---|

| MODULE-4 | PUSHDOWN AUTOMATA & TURING | 21ISE543.5 | 8 Hours |
|---|---|---|---|

**Pushdown Automata (PDA):** Definition of non-deterministic PDA, Deterministic and Non-deterministic PDAs, Non- determinism and Halting, alternative equivalent definitions of a PDA, alternatives that are not equivalent to PDA **,**Turing Machine: Turing machine model, Representation, Language acceptability by TM, design of TM, Techniques for TM construction.

| Text Book | **Textbook 1: 13.1 to 13.5, 14.1, 14.2, Textbook 2: 9.1 to 9.8** |
|---|---|

| MODULE-5 | VARIANTS OF TURING MACHINE & DECIDABILITY | 21ISE543.6 | 8 Hours |
|---|---|---|---|

**Decidability:** Variants of Turing Machines (TM), The model of Linear Bounded automata.
Definition of an algorithm, decidability, decidable languages, Undecidable languages, halting problem of TM, Post correspondence problem. Complexity: Growth rate of functions, the classes of P and NP, Quantum Computation: quantum computers, Church- Turing thesis.

| Text Book | **Textbook 2: 10.1 to 10.7, 12.1, 12.2, 12.8, 12.8.1, 12.8.2** |
|---|---|

**CIE Assessment Pattern (50 Marks – Theory) –**

| RBT Levels | | Marks Distribution | |
|---|---|---|---|
| | | Test (s) | NPTEL |
| | | 25 | 25 |
| L1 | Remember | 5 | - |
| L2 | Understand | 5 | - |
| L3 | Apply | 5 | 5 |
| L4 | Analyze | 5 | 10 |
| L5 | Evaluate | 5 | 10 |
| L6 | Create | - | - |

**SEE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 10 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | 10 |
| L6 | Create | -- |

**Suggested Learning Resources:**

**Text Books:**


1. Elaine Rich, Automata, Computability and Complexity,1st Edition , Pearson education,2012/2013
2. K L P Mishra, N Chandrasekaran , 3rd Edition, Theory of Computer Science, PhI, 2012.


**Reference Book:**


1. John E Hopcroft, Rajeev Motwani, Jeffery D Ullman, Introduction to Automata Theory, Languages, and Computation, 3rd Edition, Pearson Education, 2013

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

1. https://nptel.ac.in/courses/106/106/106106049/#
2. https://nptel.ac.in/courses/106/104/106104123/
3. https://www.jflap.org/

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- For active participation of students, instruct the students to prepare for puzzles and presentations.
- Discussions on applications of Finite Automata , pushdown automata and Turing machines.

| **Operation Research** | | | |
|---|---|---|---|
| **Course Code** | **21ISE544** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| 21ISE544.1 | Realize the importance of Operations Research and explain the basic concepts |
| 21ISE544.2 | Construct Linear Programming Problems for its optimal solutions by graphical method |
| 21ISE544.3 | Apply the concept of Simplex method and its extensions to Solve Linear Programming Problems for its optimal solutions |
| 21ISE544.4 | Solve specialized linear programming problems like assignment problems using various OR methods |
| 21ISE544.5 | Solve the problem of transporting the products from origins to destinations with least transportation cost. |
| 21ISE544.6 | Analyze network technique namely PERT/CPM and optimal project duration and cost |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISE54.1 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 2 | 2 | 2 |
| 21ISE54.2 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 2 | 2 | 2 |
| 21ISE54.3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 2 | 2 | 2 |
| 21ISE54.4 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 2 | 2 | 2 |
| 21ISE54.5 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 2 | 2 | 2 |
| 21ISE54.6 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | 2 | 2 | 2 |

| **MODULE-1** | **INTRODUCTION & LINEAR MODEL-I:** | **21ISE544.1, 21ISE544.2** | **8Hours** |
|---|---|---|---|
| Definition and Historical development of OR, Nature and Meaning of OR, Characteristics of OR, Phases of OR, Scope of OR. Introduction to Linear Model, Formulation of LPP problem, Graphical Solution, standard form of LPP | | | |
| Text Book | Text Book 1: 1.1 ,1.2,1.3,1.4,1.5,1.6 | | |
| **MODULE-2** | **LINEAR MODEL-II:** | **21ISE544.3** | **8 Hours** |
| Computational procedure of simplex method, Degeneracy problem, method to resolve degeneracy. Special cases: Alternative optimum solution, unbounded solution, Big-M method, Concept of duality | | | |
| Text Book | Text Book 1: 2.4,21.6,5.2,5.6,7.2,7.6 | | |
| **MODULE-3** | **ASSIGNMENT MODEL:** | **21ISE544.4** | **8 Hours** |
| Introduction, Mathematical formulation of assignment problem, Hungarian method to solve assignment problems, unbalanced assignment problems, maximal assignment problem, restriction on assignments, travelling salesman problem | | | |
| Text Book | Text Book 2: 2.4,2.,6.1,6.2,6.3,6.4 | | |

| MODULE-4 | TRANSPORTATION MODEL: | 21ISE544.5 | 8 Hours |
|---|---|---|---|
| Introduction, Mathematical formulation of transportation problem, definitions, initial basic feasible solution, moving towards optimality, Transportation Algorithm for minimization (MODI method) unbalanced transportation problem. | | | |
| Text Book | Text Book 1: 2.8,2.9,15.6.15.8 | | |
| **MODULE-5** | **NETWORK ANALYSIS:** | **21ISE544.6** | **8 Hours** |
| Introduction to Project management, basic steps in PERT / CPM techniques, network diagram representations and rules, Time estimates and Critical Path in Network Analysis, Optimum duration and Minimum duration cost, Project Evaluation and Review Technique (PERT), Applications | | | |
| Text Book | Text Book 1: 4.6,4.8,6,4,6.6,8.2,8.4,9.4.9.6 | | |

**CIE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Marks Distribution | |
|---|---|---|---|
| | | Test (s) | NPTEL |
| | | 25 | 25 |
| L1 | Remember | 5 | - |
| L2 | Understand | 5 | - |
| L3 | Apply | 5 | 5 |
| L4 | Analyze | 5 | 10 |
| L5 | Evaluate | 5 | 10 |
| L6 | Create | - | - |

**SEE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 10 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | 10 |
| L6 | Create | -- |

**Suggested Learning Resources:**

**Text Books:**

1) S. D. Sharma, "OPERATIONS RESEARCH – Theory, Methods & Applications", , Seventeenth Review Edition 2014, Reprint 2015, Kedarnath Ram Nath Publisher

**Reference Books:**

1) Frederick S Hillier, Gerald J Lieberman, Bodhibrata Nag and Preetam Basu "Introduction to OPERATIONS RESEARCH ", Ninth Edition, Tenth Reprint , 2015, TATA McGraw Hill

2.Hamdy Taha, " Operations Research: An Introduction", Pearson Education Inc. (2009)

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

- https://onlinecourses.nptel.ac.in/noc22_ma48/preview
- https://www.udemy.com/course/operations-research-
- https://www.coursera.org/learn/operations-research-modeling
- https://www.coursera.org/learn/operations-research-theory

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Contents related activities (Activity-based discussions)
- For active participation of students, instruct the students to prepare PPT and Present in class
- Organizing Group wise discussions on issues
- Seminars

| Advanced Java | | | |
|---|---|---|---|
| **Course Code** | **21ISE545** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| 21ISE545.1 | Analyze the importance of event-based programming in Java. |
| 21ISE545.2 | Make use of JDBC to access database through Java Programs |
| 21ISE545.3 | Apply servlet technologies to build server-side applications. |
| 21ISE545.4 | Develop JSP based server-side solutions. |
| 21ISE545.5 | Build web-based software components to solve real world problems. |
| 21ISE545.6 | Interpret the importance of Spring frame works in enterprise software solutions. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISE545.1 | 3 | 3 | 3 | 2 | 2 | - | - | - | 1 | - | - | 1 | 2 | 2 |
| 21ISE545.2 | 3 | 3 | 3 | 2 | 2 | - | - | - | 1 | - | - | 1 | 2 | 2 |
| 21ISE545.3 | 3 | 3 | 3 | 2 | 2 | - | - | - | 1 | - | - | 1 | 2 | 2 |
| 21ISE545.4 | 3 | 3 | 3 | 2 | 2 | - | - | - | 1 | - | - | 1 | 2 | 2 |
| 21ISE545.5 | 3 | 3 | 3 | 2 | 2 | - | - | - | 1 | - | - | 1 | 2 | 2 |
| 21ISE545.6 | 3 | 3 | 3 | 2 | 2 | - | - | - | 1 | - | - | 1 | 2 | 2 |

| **MODULE-1** | **INTRODUCTION TO EVENT HANDLING** | **21ISE545.1** | **8 Hours** |
|---|---|---|---|
| Event driven programming in Java, Event handling Process, Swing Controls and UI elements ,The Delegation Event Model, Swing Event Classes, Event Sources, Event Listener, Adapter Classes. | | | |
| Text Book | Text Book 1: Chapter 24 | | |
| **MODULE-2** | **WORKING WITH JDBC** | **21ISE545.2** | **8 Hours** |
| Exploring web architecture models, Exploring the MVC architecture, Introducing JDBC, Exploring JDBC Drivers, Describing JDBC APIs, Exploring JDBC processes with java. sql package | | | |
| Text Book | Text Book 2: Chapter 6 | | |
| **MODULE-3** | **WORKING WITH SERVLETS** | **21ISE545.3** | **8 Hours** |
| Http protocol, Exploring the features of java servlets, Exploring the servlets API, Servlets life cycle, Working with the Http servlets request and Http servlets response interfaces, Exploring request delegation and request scope | | | |
| Text Book | Text Book 2: Chapter 10 | | |
| **MODULE-4** | **WORKING WITH JAVA SERVER PAGES** | **21ISE545.4 21ISE45.5** | **8 Hours** |
| Introducing JSP, Listing advantages of JSP over java servlets, Exploring the architecture of a JSP page, Describing the life cycle of a JSP page, Working with JSP basic tags and implicit objects, Working with the action tags in JSP<br>Case Study/Application: Demonstrate the learnt concept of JSP and Servlets to develop a web registration module and integrate with Database using JDBC. A three tier based application needs to be developed and presented as case study. | | | |
| Text Book | Text Book 2: Chapter 11 | | |

| MODULE-5 | INTRODUCTION TO SPRING FRAMEWORK | 21ISE545.6 | 8 Hours |
|---|---|---|---|
| Introduction to Spring framework, Benefits ,Spring Architecture, Components, Bean Life Cycle, XML Configuration on Spring, Spring Model View Controller (MVC) | | | |
| Text Book | Text Book 3: Chapter 1 | | |

**CIE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Marks Distribution | |
|---|---|---|---|
| | | Test (s) | NPTEL |
| | | 25 | 25 |
| L1 | Remember | 5 | - |
| L2 | Understand | 5 | - |
| L3 | Apply | 5 | 5 |
| L4 | Analyze | 5 | 10 |
| L5 | Evaluate | 5 | 10 |
| L6 | Create | - | - |

**SEE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 10 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | 10 |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Books:**


1. HerbertSchildt,"JAVAtheCompleteReference",11thEdition,TataMcGrawHill,2020(print).
2. JimKeogh,"J2EE-TheComplete Reference",McGrawHill,2017.
3. Rod Johnson, "Professional Java Development with the Spring Framework",Wrox ,July 2018(Re-print)


Reference Books:


1. Stephanie Bodoff et al, "The J2EE Tutorial", 3rd Edition, Pearson Education,2015(Reprint).
2. Uttam K Roy, "Advanced JAVA programming", Oxford University press, 2018.


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

- https://onlinecourses.nptel.ac.in/noc22_cs47/preview
- https://www.udemy.com/course/how-to-connect-java-jdbc-to-mysql/
- https://www.javatpoint.com/html-tutorial
- https://www.geeksforgeeks.org/life-cycle-of-a-servlet/?ref=ml_lbp
- https://www.youtube.com/results?search_query=java+jdbc+connection
- https://spring.io/projects/spring-framework

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Quizzes &Assignments
- Create Dynamic web projects by using JDBC drivers.
- Contents related activities (Activity-based discussions)
- Organizing Group wise discussions on issues
- Seminars

| WEB INTERNET PROGRAMMING | | | |
|---|---|---|---|
| **Course Code** | **21ISL551** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **1** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| **21ISL551.1** | Design web pages using mark-up languages like XHTML, HTML5 and XML. |
| **21ISL551.2** | Use CSS and XSLT to display contents of web page in different styles. |
| **21ISL551.3** | Design dynamic web pages using client-side scripting language like JavaScript |
| **21ISL551.4** | Design web pages to store, access and process the data from database using server-side scripting language like PHP |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **21ISL551.1** | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | 3 | 3 | 3 |
| **21ISL551.2** | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | 2 | 3 | 3 | 3 |
| **21ISL551.3** | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | 3 | 3 | 3 |
| **21ISL551.4** | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | 3 | 3 | 3 |

| **Pgm. No.** | **List of Programs** | **Hours** | **COs** |
|---|---|---|---|
| | **Prerequisite Experiments / Programs / Demo** | | |
| | • Write the HTML code that is presented in the user's browser.<br>• Develop and demonstrate the usage of inline, internal, and external style sheet using CSS.<br>• To create an html file to link to different html page which contains images, tables, and link within a page<br>• To change an html page to change the background colour for every click of a button using javascript<br>• Write program code to make the site respond to the user's clicks. | 2 | NA |
| | **PART-A** | | |
| 1 | Design a personal web page using HTML5 which should include:<br>a.) A brief description about yourself.<br>b.) A small quote describing you.<br>c.)Your photo as the profile picture using canvas<br>d.)An index which should be a list of different headings/sections present in a document in the form of link which when clicked takes you to that heading/section<br>The different sections:<br>Your educational details(Has to be displayed using a table)<br>Your hobbies/interests with small description about that particular hobby.<br>Your Achievements.<br>Apply styles to the web page using CSS. | 2 Hours | 21ISL551.1 |
| 2 | Using Linux platform with Apache, develop and demonstrate a XHTML file that includes Javascript script for the following problem: | 2 Hours | 21ISL551.1 |

| | | | |
|---|---|---|---|
| | a) Input: A number n obtained using prompt, Output: The first n Fibonacci number<br>b) input: A number , output: factorial of the number | | |
| 3 | Design and develop a XHTML document that includes JavaScript script to create stack of images such that images appear one top on another with images slightly visible. Whenever cursor is placed on an image that image should be completely visible and on moving cursor out image should go back to original position. | 2 Hours | 21ISL551.1 |
| 4 | Develop and demonstrate, using Javascript, a XHTML document that collects the USN ( the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) and semester (valid format digit from 1 to 8) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected. | 2 Hours | 21ISL551.1 |
| 5 | Develop and demonstrate, using Javascript, a XHTML document that displays text "TEXT-GROWING" with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays "TEXT-SHRINKING" in BLUE color. Then the font size decreases to 5pt. | 2 Hours | 21ISL551.2 |
| 6 | Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems:<br>a. Parameter: A string<br>b. Output: The position in the string of the left-most vowel<br>c. Parameter: A number<br>d. Output: The number with its digits in the reverse order | 2 Hours | 21ISL551.2 |
| | **PART-B** | | |
| 7 | Design a web page using XHTML and student marks card form. Student marks name, USN and marks of any 3 subject the total marks, grade and the data must XHTML document to display.<br>Table for calculating the grade is Marks in Percentage<br>PHP to process the data from a card form must collect the student<br>s. The CGI program must compute be sent back to the user as another given below:<br>Grade<br>>=90 A<br>>=80 B<br>>=60 C<br>>=40 D<br><40 F | 2 Hours | 21ISL551.2 |
| 8 | Design a web page using XHTML and PHP to insert emp_id, emp_name andexperience information entered by the user into a table created using MySQLand to display the current contents of this table. Also retrieve the details of the employee based on the emp_id as specified by the user. | 2 Hours | 21ISL551.2 |
| 9 | Write a PHP program to display a digital clock which displays the current time of the server. | 2 Hours | 21ISL551.3 |
| 10 | Design a web page using XHTML and PHP to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page uponreopening of the same page. | 2 Hours | 21ISL551.3 |
| 11 | Design an XML document with DTD specification to store information about a student in an engineering college affiliated to VTU. The | 2 Hours | 21ISL551.4 |

| | | | |
|---|---|---|---|
| | informationmust include USN, Name, Name of the College, Brach, Year of Joining, ande-mail id. Make up sample data for 3 students. Create a CSS style sheet and<br>use it to display the document. | | |
| 12 | Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make upsample data for 2 students. Display the details using XSLT | 2 Hours | 21ISL551.4 |

**PART-C**

**Beyond Syllabus Virtual Lab Content(To be done during Lab but not to be included for CIE or SEE)**

1.Write a program to design a simple calculator using
(a) JavaScript (b) PHP (c) Servlet and (d) JSP.
https://html-iitd.vlabs.ac.in/exp/introduction-to-html/references.html
2.Consider a case where we have two web Services- an airline service and a travel agent and the travel agent is searching for an airline. Implement this scenario using Web Services and Data base.
https://html-iitd.vlabs.ac.in/exp/introduction-to-html/references.html

**CIE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Test (s) | Weekly Assessment |
|---|---|---|---|
| | | **20** | **30** |
| **L1** | **Remember** | - | - |
| **L2** | **Understand** | - | |
| **L3** | **Apply** | 05 | 10 |
| **L4** | **Analyze** | 05 | 10 |
| **L5** | **Evaluate** | 10 | 10 |
| **L6** | **Create** | - | - |

**SEE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| **L1** | **Remember** | - |
| **L2** | **Understand** | - |
| **L3** | **Apply** | 10 |
| **L4** | **Analyze** | 20 |
| **L5** | **Evaluate** | 20 |
| **L6** | **Create** | - |

**Suggested Learning Resources:**

**Reference Books:**


- Paul Deitel, Harvey Deitel, Abbey Deitel, “Internet & World Wide Web How to program”, 5th Edition, Pearson Education / PHI, 2012.
- Erik Bruchez, Danny Ayers, Eric Van Der Vlist, “Professional Web 2.0 Programming”,1stEdition, Wiley India Pvt. Ltd, 2014.
- Robin Nixon, “Learning PHP, MySQL & JavaScript with jQuery, CSS and HTML5”,5 th Edition, O’Reilly Publications, 2018.

| LINUX PROGRAMMING | | | |
|---|---|---|---|
| **Course Code** | **21ISL552** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **01** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| 21ISL552.1 | Apply various LINUX commands on a multi user operating system |
| 21ISL552.2 | Analyze the file permissions and ownership using advance LINUX commands |
| 21ISL552.3 | Evaluate system programs using LINUX APIs. |
| 21ISL552.4 | Interpret real time scripts using shell and AWK |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISL552.1 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISL552.2 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISL552.3 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISL552.4 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | 2 | 3 | 3 |

| Pgm. No. | List of Programs | Hours | COs |
|---|---|---|---|
| | **PART-A** | | |
| 1 | Execution of various general purpose utility commands | 2 | 21ISL552.1 |
| 2 | Execution of various filter commands | 2 | 21ISL552.1 |
| 3 | Execution of various file/directory handling commands | 2 | 21ISL552.1 |
| 4 | Write a program to emulate the ln command. | 2 | 21ISL552.1 |
| 5 | Write a program to read the alternate nth byte and write it in another file. | 2 | 21ISL552.2 |
| 6 | Write a program that creates a zombie and then calls system to execute the ps command to verify that theprocess is zombie. | 2 | 21ISL552.2 |
| | **PART-B** | | |
| 7 | Write a program to implement the system function. | 2 | 21ISL552.2 |
| 8 | Write a program which demonstrates inter-process communication between a reader process and a writerprocess. (Use mk fifo, open, read, write and close APIs) | 2 | 21ISL552.2 |
| 9 | Write a shell script to accept a file and check if it isexecutable. If not make it executable. | 2 | 21ISL552.3 |
| 10 | Write a shell script which displays a list of all the files in the current directory to which you have read, write and execute permissions. | 2 | 21ISL552.3 |
| 11 | Write a shell script which gets executed the moment the user logs in. It should display the message, " Good Morning", " Good Afternoon", " Good Evening", depending upon the time at which the user logs in. | 2 | 21ISL552.4 |
| 12 | Write a script to demonstrate built in variables available inAWK | 2 | 21ISL552.4 |

**PART-C**

**Beyond Syllabus Virtual Lab Content**

**(To be done during Lab but not to be included for CIE or SEE)**

**1.** A shell script receives even number of filenames as arguments. Suppose four files are supplied as arguments then the first file should get copied into second, third file into fourth and so on. If odd number of filenames is supplied then no copying should take place and an error message should be displayed.

https://www.tutorialspoint.com/execute_bash_online.php

**2.** Write a shell script which accepts any number of argumentsand prints them in reverse order. Ex: If file name is test then $sh test A B C should produce C B A.
https://www.tutorialspoint.com/execute_bash_online.php

**3.** Write a script to demonstrate built in functions available in AWK
https://www.tutorialspoint.com/execute_bash_online.php

**CIE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Test (s) | Weekly Assessment |
|---|---|---|---|
| | | **20** | **30** |
| **L1** | **Remember** | - | - |
| **L2** | **Understand** | - | 10 |
| **L3** | **Apply** | 5 | 10 |
| **L4** | **Analyze** | 5 | 10 |
| **L5** | **Evaluate** | 10 | - |
| **L6** | **Create** | - | - |

**SEE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| **L1** | **Remember** | **-** |
| **L2** | **Understand** | **05** |
| **L3** | **Apply** | **10** |
| **L4** | **Analyze** | **20** |
| **L5** | **Evaluate** | **10** |
| **L6** | **Create** | **05** |

**Suggested Learning Resources:**

**Reference Books:**


1. Linux for Beginners: A Practical and Comprehensive Guide to Learn Linux, EthemMining, ISBN: 978-1671228085, 2019.
2. Your UNIX – The ultimate Guide, SUMITABHA DAS, TATA McGraw Hill Edition, 4th Edition Paperback 2017, McGraw Hill, ISBN: 978-0070446878.
3. UNIX System Programming Using C++, Terrence Chan, Prentice-Hall of India PrivateLimited, ISBN: 978-9332549975, 2015.

| ADVANCED OFFICE AUTOMATION | | | |
|---|---|---|---|
| **Course Code** | **21ISL553** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **01** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| 21ISL553.1 | Understand the fundamentals of MS. Word |
| 21ISL553.2 | Understand the concepts of MS. Excel to perform accounting operations |
| 21ISL553.3 | Develop a PowerPoint presentation from the requirements specified for a particular problem. |
| 21ISL553.4 | Design a PowerPoint presentation by inserting background images, Slide transition |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISL553.1 | 2 | 2 | 2 | - | 3 | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISL553.2 | 2 | 2 | 2 | - | 3 | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISL553.3 | 2 | 2 | 2 | - | 3 | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISL553.4 | 2 | 2 | 2 | - | 3 | - | - | - | - | - | - | 2 | 3 | 3 |

| Pgm. No. | List of Programs | Hours | COs |
|---|---|---|---|
| | **Prerequisite Experiments / Programs / Demo** | | |
| | • Basic concepts of MS. Word, MS. PowerPoint, MS. EXCEL | 2 | NA |
| | **PART-A** | | |
| 1 | Create a Mathematical question paper using, at least five equations<br>a. With fractions, exponents, summation function<br>b. With at least one „m*n" matrix<br>c. Basic mathematical and geometric operators.<br>d. Use proper text formatting, page color and page border. | 2 | 21ISL553.1 |
| 2 | Create a flowchart using,<br>a. Proper shapes like ellipse, arrows, rectangle, and parallelogram.<br>b. Use grouping to group all the parts of the flowchart intoone single object. | 2 | 21ISL553.1 |
| 3 | Create a letter, which must be sent to multiple recipients.<br>a. Use Mail-Merge to create the recipient list.<br>b. Use excel sheet to enter the recipient. Start the mail merge using letter and directory format. State the difference | 2 | 21ISL553.1 |
| 4 | Create a newsletter Features to be covered:-Newspaper columns, Images from files and clipart, Drawing tool bar and Word Art ,Formatting Images, Textboxes and Paragraphs | 2 | 21ISL553.1 |

| | | | |
|---|---|---|---|
| 5 | Create a table “Student result” with following conditions.<br>1. The heading must contain, Sl. No., Name, Mark1, Mark2, Mark3, Total, average andresult with manual entry.<br>2. Use formulas for total and average.<br>3. Find the name of the students who has secured the highest and lowest marks.<br>4. Round the average to the nearest highest integer and lowest integer (use ceiling andfloor function respectively). | 2 | 21ISL553.2 |
| 6 | **Do as directed**<br>**Create a notepad file as per the following fields**<br>Slno name th1 th2 th3 th4 th5 total % grade<br>Import this notepad file into excel sheet using „data fromtext‟ option.<br>Grade is calculated as,<br>i. If %>=90, then grade A<br>ii. If %>=80 and <90, then grade B<br>iii. If %>=70 and <80, then grade C<br>iv. If %>=60 and <70, then grade D<br>v. If %<60, then grade F | 2 | 21ISL553.2 |
| | **PART-B** | | |
| 7 | Create a sales table for three items purchased in past threeconsecutive years and perform the following operations<br>a. Draw the bar-graph to compare the sales of thethree items for four years using insert option.<br>b. Draw a line-graph to compare the sales ofthree items for four years using insert option.<br>c. Draw different pie-charts for the given data usinginsert option.<br>d. Use condition, to highlight all the cells Having value >=1000 with red color (useconditional formatting). | 2 | 21ISL553.2 |
| 8 | Create a Cricket Score Card- Features to be covered:-PivotTables, Interactive Buttons, Importing Data, Data Protection, Data Validation | 2 | 21ISL553.2 |
| 9 | Create a power-point presentation with minimum 10 slides<br>a. Use word art to write the heading for each slides.<br>b. Insert at least one clip-art, one picture<br>c. Insert at least one audio and one video<br>d. Hide at least two slides | 2 | 21ISL553.3, 21ISL553.4 |
| 10 | Create a power-point presentation with minimum 5 slides<br>a. Use custom animation option to animate the text; the text must move left to right one line at a time.<br>b. Use proper transition for the slides. | 2 | 21ISL553.3, 21ISL553.4 |
| 11 | Create a slide show presentation for a seminar. | 2 | 21ISL553.3, 21ISL553.4 |
| 12 | Use bar chart (X-axis: Semester, Y-axis: % marks) for 6 subjects. | 2 | 21ISL553.3, 21ISL553.4 |

**PART-C**

**Beyond Syllabus Virtual Lab Content**

**(To be done during Lab but not to be included for CIE or SEE)**

**1.**Create newsletter using Ms word : https://www.edrawmax.com/newsletter/how-to-make-a-newsletter-in-word/

2.create a scheduler using MS Excel: https://clickup.com/blog/how-to-make-a-schedule-in-excel/

3.create a cricket score card by importing data using pivot tables in MS Excel: https://www.exceldemy.com/make-cricket-scorecard-in-excel/

**CIE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Test (s) | Weekly Assessment |
|---|---|---|---|
| | | 20 | 30 |
| L1 | Remember | - | - |
| L2 | Understand | - | 5 |
| L3 | Apply | 10 | 10 |
| L4 | Analyze | - | 10 |
| L5 | Evaluate | - | 5 |
| L6 | Create | 10 | - |

**SEE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | - |
| L2 | Understand | 05 |
| L3 | Apply | 10 |
| L4 | Analyze | 20 |
| L5 | Evaluate | 10 |
| L6 | Create | 05 |

**Suggested Learning Resources:**

**Reference Books:**


1) Comdex Information Technology course toolkit Vikas Gupta, WILEYDreamtech,2005

2) Comdex 14-1in-1 Computer course Kit by Vikas Gupta, published by Dream Tech

3) TheCompleteComputerupgradeandrepairbook,3rdedition Chery lA Schmidt, WILEY Dream tech

| NOSQL | | | |
|---|---|---|---|
| **Course Code** | **21ISL554** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **01** | **Exam Hours** | **03** |

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

| | |
|---|---|
| 21ISL554.1 | Understand, compare and use the four types of NoSQL Databases (Document-oriented, Key-Value Pairs, Column-oriented and Graph). Apply Document-oriented databases. |
| 21ISL554.2 | Apply the detailed architecture; define objects, load data, query data and performance tune Columnar-databases. |
| 21ISL554.3 | Analyze the detailed architecture, define objects, load data, query data and performance tune Key-Value NoSQL databases. |
| 21ISL554.4 | Analyze the detailed architecture, define objects, load data, query data and performance graph-based Databases. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISL554.1 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISL554.2 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISL554.3 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 21ISL554.4 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |

| Pgm. No. | List of Experiments / Programs | Hours | COs |
|---|---|---|---|
| | **Prerequisite Experiments / Programs / Demo** | | |
| | Database Management System. | **2** | **NA** |
| | **PART-A** | | |
| **1** | Create a database and collection using MongoDB. | **2** | 21ISL554.1 |
| **2** | Apply the respective functions to create one document and many documents at a time. | **2** | 21ISL554.1 |
| **3** | Apply the respective functions to access one and many documents. | **2** | 21ISL554.1 |
| **4** | Apply the respective functions to update one and many documents. | **2** | 21ISL554.1 |
| **5** | Apply the respective functions to delete one and many documents. | **2** | 21ISL554.1 |
| **6** | Create the key space and column family (table) in Cassandra using CQL. | **2** | 21ISL554.2 |
| | **PART-B** | | |
| **7** | Apply the respective functions to insert one and many rows in Cassandra. | **2** | 21ISL554.2 |
| **8** | Apply the respective functions to update one and many rows in Cassandra. | **2** | 21ISL554.2 |
| **9** | Apply the respective functions to delete one and many rows | **2** | 21ISL554.2 |
| **10** | Create a key-value pair using redis database and apply the following commands; | **2** | 21ISL554.3 |
| **11** | Create a key-value pair using redis database and apply the following commands; | **2** | 21ISL554.3 |
| **12** | Draw the graph database for college database using 5 nodes with their associated relationships also write the query for all 5 nodes creation along with its properties and relationship creation. | **2** | 21ISL554.4 |

**PART-C**

**Beyond Syllabus Virtual Lab Content**

**(To be done during Lab but not to be included for CIE or SEE)**

1. Create replica sets on windows Operating System

https://www.youtube.com/watch?v=t_9QJTBbo30&t=546s

**For SEE Examination:**

- One experiment from part A & One experiment from part B to be given
- Examination will be conducted for 50 marks.
- Marks Distribution : Procedure write-up – 20%
  Conduction – 60%
  Viva – Voce – 20%

Change of the experiment is allowed only once and procedure write-up marks will beconsidered as '0'

**CIE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Test (s) | Weekly Assessment |
|---|---|---|---|
| | | 20 | 30 |
| L1 | Remember | - | - |
| L2 | Understand | - | 5 |
| L3 | Apply | 10 | 10 |
| L4 | Analyze | 10 | 10 |
| L5 | Evaluate | - | 5 |
| L6 | Create | - | - |

**SEE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | - |
| L2 | Understand | - |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | 10 |
| L6 | Create | 20 |

**Suggested Learning Resources:**

**Reference Books:**


1. Amit Phaltankar, Juned Ahsan, Michael Harrison, LiviuNedov "MongoDB Fundamentals: A hands-on guide to using MongoDB and Atlas in the real world", Packt Publishing Ltd, Dec 22, 2020.
2. Andreas Meier, Michael Kaufmann, "SQL &NoSQL Databases: Models, Languages, Consistency Options and Architectures for Big Data Management",Springer Vieweg, Aug 29, 2019.
3. R. Elmasri S. B. Navathe, "Fundamentals of Database Systems", Addison Wesley, 2018.
4. Raghu Ramakrishnan, "Database Management Systems", Mcgraw-Hill, 4th edition,2018.
5. Pramod J. Sadalage and Marin Fowler, NoSQL Distilled: A brief guide tomerging world of Polyglot persistence, Addison Wesley, 2018.
6. Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation and Management,6th Edition,2018


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

1. "Introduction to NOSQL", https://www.simplilearn.com/introduction-to-nosql-databases-tutorial-video.
2. MongoDB For Beginners, https://www.youtube.com/watch?v=8eJJe4Slnik
3. Introduction to MongoDB, https://www.youtube.com/watch?v=XeDM28c5kO4&list=PLwGdqUZWnOp1P9xSsJg7g3AY0CUjs-WOa
4. Getting Started with NoSQL, https://www.youtube.com/watch?v=F1TklaUfKcM&list=PLsyeobzWxl7r0bn6dzVA8bQNxcx7DRl5F&index=2
5. Cassandra Query Language, https://www.youtube.com/watch?v=HTuSgkDlbSA
6. Cassandra Query Language, UPSERT, https://www.youtube.com/watch?v=Y-vY49lDeKY

| MINI PROJECT | | | |
|---|---|---|---|
| **Course Code** | **21ISE56** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **01** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| **21ISE56.1** | Analyze the Real-world problem through survey of existing problems |
| **21ISE56.2** | Design the modules for solving the problems identified |
| **21ISE56.3** | Implement the design modules with suitable programming language |
| **21ISE56.4** | Test the working modules at different levels |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **21ISE56.1** | 3 | 3 | 3 | 2 | 3 | - | 1 | 1 | 3 | 1 | 3 | 2 |
| **21ISE56.2** | 3 | 3 | 3 | 2 | 3 | - | 1 | 1 | 3 | 1 | 3 | 2 |
| **21ISE56.3** | 3 | 3 | 3 | 2 | 3 | - | 1 | 1 | 3 | 1 | 3 | 2 |
| **21ISE56.4** | 3 | 3 | 3 | 2 | 3 | - | 2 | 1 | 3 | 1 | 3 | 2 |

**Mapping of Course Outcomes to Program Specific Outcomes:**

Use C,C++,Java, C#, PHP, Python, or any other similar front-end tool. All applications must be demonstrated ondesktop/laptop as a stand-alone or web based application.

**Note :**

- Every student should do mini project in a team consists of maximum 2 members in the areas suggested by the department expert committee
- Minimum 2 reviews will be conducted by the department expert committee to know the progress of themini project work
- In each review student should give presentation on the work carried out and show the relevant models/output
- A mini project report should be submitted to the department at the end of the mini project work
- Plagiarism check for the report : Similarity index of the report should not exceed more than 30%.

**CIE - Continuous Internal Evaluation (50 Marks)**

| Bloom's Category | Tests (50 Marks) |
|---|---|
| Remember | - |
| Understand | - |
| Apply | - |
| Analyze | - |
| Evaluate | 25 |
| Create | 25 |

**SEE – Semester End Examination (50 Marks)**

| Bloom's Taxonomy | Marks |
|---|---|
| Remember | - |
| Understand | - |
| Apply | - |
| Analyze | - |
| Evaluate | 25 |
| Create | 25 |

| RESEARCH METHODOLOGY AND IPR | | | |
|---|---|---|---|
| **Course Code** | **21ISK57** | **CIE Marks** | **50** |
| **L:T:P:S** | **1:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **02** | **Total Marks** | **100** |
| **Credits** | **01** | **Exam Hours** | **02** |

**Course outcomes:**

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

| | |
|---|---|
| **21ISK57**.1 | Characterize the significance and suitability of research in engineering applications |
| **21ISK57**.2 | Demonstrate the various processing techniques of research |
| **21ISK57**.3 | Evaluate the research in the development of engineering materials, process and tools |
| **21ISK57**.4 | Analyze criteria to fit own intellectual work in particular form of IPR |
| **21ISK57**.5 | Apply statutory provisions to protect particular form of research |
| **21ISK57**.6 | Develop the art of scholarly writing and evaluate its quality |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **21ISK57**.1 | 3 | 3 | 3 | - | - | - | - | - | 3 | 3 | 2 | 3 | | |
| **21ISK57**.2 | 3 | 3 | 3 | 1 | 2 | - | - | - | 3 | 3 | 2 | 3 | | |
| **21ISK57** | 3 | 3 | 3 | 1 | 2 | - | - | 2 | 3 | 3 | 2 | 3 | | |
| **21ISK57**.4 | 3 | 3 | - | - | - | - | - | 2 | 3 | 3 | 2 | 3 | | |
| **21ISK57**.5 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | 2 | 3 | | |
| **21ISK57**.6 | 3 | 3 | 3 | 1 | 2 | - | - | 1 | 3 | 3 | 2 | 3 | | |

| **MODULE-1** | **RESEARCH FORMULATION AND DESIGN** | **21ISK57.1, 21ISK57.2** | **3 Hours** |
|---|---|---|---|

Definition and objective of research, types of research, steps in research process, research design, concept and types of research design, defining and formulating the research problems, importance of literature review- primary and secondary sources, reviews, monographs, patent, research database, web sources, identifying gap areas from the literature and research data base, surveying synthesis, Interpretation.

| | |
|---|---|
| Self-study / Case Study / Applications | Department Specific Self-study / Case Study / Applications can be added. |
| Text Book | Text Book 1: Ch. 1, 2& 6 |

| **MODULE-2** | **SAMPLING & DATA INTERPRETATION** | **21ISK57.2, 21ISK57.3** | **3 Hours** |
|---|---|---|---|

Mathematical tools for analysis, statistical analysis of data, regression analysis, correlation, concept of best fit and exact fit, exact fit, theory, examples from linear regression with one and more unknowns.

| | |
|---|---|
| Self-study / Case Study / Applications | Department Specific Self-study / Case Study / Applications can be added. |
| Text Book | Text Book 1: Ch. 4& 7 |

| **MODULE-3** | **PATENT RIGHTS AND IPR** | **21ISK57.3, 21ISK57.4** | **3 Hours** |
|---|---|---|---|

Patents and its basics, process of filing patent at national and international level, Introduction and significance of intellectual property rights, commercialization, royalty, copyright, trade related aspects of IPR, Administration of patent system in India, licensing and transfer of technology, case studies.

| | |
|---|---|
| Self-study / Case Study / Applications | Department Specific Self-study / Case Study / Applications can be added. |
| Text Book | Text Book 2: Ch. 1 & 2/ IPR India website |

| MODULE-4 | RESEARCH AND PUBLICATIONETHICS | 21ISK57.4, 21ISK57.5 | 3 Hours |
|---|---|---|---|
| Research and Integrity, Scientific mis conduct: Falsification, Fabrication and Plagiarism (FFP), Conflict of research, Predatory publishers and Journals, Open access publication, citation and acknowledgement, reproducibility and accountability, software tools for similarity check | | | |
| Self-study / Case Study / Applications | Department Specific Self-study / Case Study / Applications can be added. | | |
| Text Book | Text Book 1: Ch. 14 & 15 | | |
| **MODULE-5** | **REPORT WRITING** | **21ISK57.5, 21ISK57.6** | **3 Hours** |
| Structure and components of research report, types of report, layout of research report, mechanism of writing a research report, referencing in academic writing, Abstracting, Bibliography | | | |
| Self-study / Case Study / Applications | Department Specific Self-study / Case Study / Applications can be added. | | |
| Text Book | Text Book 1: Ch. 14 | | |

**CIE Assessment Pattern (50 Marks – Theory) –**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | - | - |
| L2 | Understand | 5 | - | - |
| L3 | Apply | 5 | 5 | 5 |
| L4 | Analyze | 5 | 5 | 5 |
| L5 | Evaluate | 5 | 5 | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 10 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | 10 |
| L6 | Create | -- |

**Suggested Learning Resources:**

**Text Books:**


1) Kothari, C.R., "Research Methodology: Methods and Techniques". New Age International, 2018, ISBN-13: 978-8122436235
2) Ramakrishna Chintakunta, A Text book of Intellectual Property rights, Blue Hill Publication, ASIN: B09T6YDB5N, 2022


**Reference Books:**


1) Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K, An introduction to Research Methodology, RBSA Publishers. 2015, ISBN-13:978-8176111652
2) Ranjith Kumar, Research methodology, Saga publications,4th edition, 2014, ISBN-13- 978-9351501336Anderson, T. W., "An Introduction to Multivariate Statistical Analysis", Wiley Eastern Pvt., Ltd., New Delhi, 2011, ISBN-13: 978-8126524488
3) Montgomary, Douglas C. &Runger, George C. (2016) 6/e, Applied Statistics & probability for Engineers (Wiley India) ISBN-13: 978-1118539712

4) Montgomary, Douglas C. (2012) 8th edition, Design and Analysis of Experiments (Wiley India) ISBN: 978-1-118-14692-7
5) Sinha, S.C. and Dhiman, A.K., 2012. Research Methodology, EssEss Publications. 2 volumes. ISBN : 81-7000-324-5, 81-7000-334-2

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

- Department specific web links have to be added.

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Department specific activity-based learning have to be added.

**INNOVATION AND DESIGN THINKING**

| | | | |
|---|---|---|---|
| **Course Code** | **21ISK58** | **CIE Marks** | **50** |
| **L:T:P:S** | **1:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **01** | **Total Marks** | **100** |
| **Credits** | **01** | **Exam Hours** | **01** |

**Course outcomes:**

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

| | |
|---|---|
| **21ISK58**.1 | Articulate a comprehensive understanding of the concept of Design Thinking |
| **21ISK58**.2 | Apply Design Thinking methodologies to solve complex and ambiguous problems effectively |
| **21ISK58**.3 | Utilize design thinking tools for creative solutions |
| **21ISK58**.4 | Implement design thinking in IT that showcase the ability to drive meaningful innovation |
| **21ISK58**.5 | Develop strategic innovation for Business Model Design |
| **21ISK58**.6 | Create the Minimum Viable Product to solve societal needs using Design Thinking |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **21ISK58**.1 | 3 | - | - | - | - | - | - | - | 3 | 3 | - | 3 | | |
| **21ISK58**.2 | 3 | 3 | 2 | - | - | - | - | - | 3 | 3 | - | 3 | | |
| **21ISK58**.3 | 3 | 3 | 2 | - | 2 | - | - | - | 3 | 3 | - | 3 | | |
| **21ISK58**.4 | 3 | 3 | 2 | 2 | 2 | - | - | - | 3 | 3 | - | 3 | | |
| **21ISK58**.5 | 3 | 3 | 2 | 2 | - | - | - | - | 3 | 3 | - | 3 | | |
| **21ISK58**.6 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 3 | 3 | 1 | 3 | | |

| | | | |
|---|---|---|---|
| **MODULE-1** | **UNDERSTANDING DESIGN THINKING** | **21ISK58.1 21ISK58.2** | **3 Hours** |

Definition, Origin and features of Design Thinking, Design thinker in organization, Principles and stages of Design thinking. Design Shared model in team-based design, Theory and practice in Design thinking. Collaborative design thinking. Live examples of MVP or Prototyping

| | |
|---|---|
| Self-study / Case Study / Applications | Department specific Self-study / Case Study / Applications |

| | | | |
|---|---|---|---|
| **MODULE-2** | **TOOLS FOR DESIGN THINKING** | **21ISK58.3** | **3 Hours** |

Visualization, Journey mapping, Value Chain Analysis, The mind map, Rapid Concept development, Assumption testing, Prototype, Co creation, Learning launches and Storytelling.

| | | | |
|---|---|---|---|
| Self-study / Case Study / Applications | Department specific Self-study / Case Study / Applications | | |
| **MODULE-3** | **DESIGN THINKING IN IT** | **21ISK58.4** | **3 Hours** |
| Business process modelling (BPM). Agile in Virtual collaboration environment. Scenario based Prototyping. Case studies on Design thinking | | | |
| Self-study / Case Study / Applications | Department specific Self-study / Case Study / Applications | | |
| **MODULE-4** | **DESIGN THINKING FOR STRATEGIC INNOVATION** | **21ISK58.5** | **3 Hours** |
| Strategic management and Innovation management, Types of Innovations, Features and Scope of strategic innovations, Design thinking and strategic innovation, Practices of integrating Design thinking in Strategic Innovation. | | | |
| Self-study / Case Study / Applications | Department specific Self-study / Case Study / Applications | | |
| **MODULE-5** | **DESIGN THINKING WORK SHOP** | **21ISK58.6** | **3 Hours** |
| Focus, Need and stages of Design thinking workshop. Empathize, Design, Ideate, Prototype and Test | | | |
| Self-study / Case Study / Applications | Department specific Self-study / Case Study / Applications | | |

**CIE Assessment Pattern (50 Marks – Theory) –**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s)(15) | Assignment (10) | Seminar/ Activity (25) |
| | | 15 | 10 | 25 |
| L1 | Remember | 5 | - | - |
| L2 | Understand | 5 | - | 5 |
| L3 | Apply | 5 | 5 | 5 |
| L4 | Analyze | - | 5 | 10 |
| L5 | Evaluate | - | - | 5 |
| L6 | Create | - | - | - |

**SEE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 25 |
| L3 | Apply | 15 |
| L4 | Analyze | -- |
| L5 | Evaluate | -- |
| L6 | Create | -- |

**Suggested Learning Resources:**


1. Christian Mueller-Roterberg, Handbook of Design Thinking - Tips & Tools for how to design thinking.
2. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) Second Edition, 2013.
3. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009.
4. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve - Apply", Springer, 2011
5. Yousef Haik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.

| |
|---|
| 6. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author) |
| **Web links and Video Lectures (e-Resources):**<br>• https://www.ibm.com/design/thinking/<br>• https://www.ideou.com/pages/design-thinking<br>• https://www.youtube.com/watch?v=3RemkU4BH8U |
| **Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**<br>➢ Department specific activity-based learning can be planned |

**SOFTWARE ENGINEERING AND PROJECT MANAGEMENT**

| | | | |
|---|---|---|---|
| **Course Code** | **21ISE61** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs /Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

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

| | |
|---|---|
| 21ISE61.1 | Understand the phases in a software project. |
| 21ISE61.2 | Understand fundamental concepts of requirements engineering and Analysis Modelling. |
| 21ISE61.3 | Understand the various software design and coding methodologies. |
| 21ISE61.4 | Apply various testing and maintenance measures. |
| 21ISE61.5 | Apply various project management activities. |
| 21ISE61.6 | Analyze various project management activities. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISE61.1 | 3 | 3 | 1 | 2 | - | - | - | - | 2 | 2 | 3 | 1 | 2 | 2 |
| 21ISE61.2 | 2 | 2 | 1 | 2 | - | - | - | - | 2 | 2 | 3 | 1 | 1 | 3 |
| 21ISE61.3 | 2 | 2 | 3 | 2 | - | - | - | - | 2 | 2 | 3 | 1 | 2 | 3 |
| 21ISE61.4 | 2 | 2 | 3 | 3 | - | - | - | - | 2 | 2 | 3 | 1 | 2 | 1 |
| 21ISE61.5 | 1 | 2 | 1 | 2 | - | - | - | - | 2 | 2 | 3 | 1 | 2 | 2 |
| 21ISE61.6 | 1 | 2 | 1 | 2 | - | - | - | - | 2 | 2 | 3 | 1 | 1 | 2 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **Introduction** | **21ISE61.1** | **8 Hours** |

Software Engineering; Software Processes: Life Cycle Models, Unified process; Agile Process Model development; Extreme Programming, Aspect-oriented software engineering and process

| | |
|---|---|
| Text Book | Text Book 1: 2.1, 2.2, 4.1, 4.3, 5.3, 5.4, 6.1. |

| | | | |
|---|---|---|---|
| **MODULE-2** | **Requirements** | **21ISE61.2** | **8 Hours** |

Software Requirements, Feasibility study, Requirements elicitation and analysis; Requirements Specification, validation and management.

| | |
|---|---|
| Text Book | Text Book 1: 2.2, 2.3, 2.4 to 2.15 |

| MODULE-3 | Software Design | 21ISE61.3 | 8 Hours |
|---|---|---|---|
| Data Design, Architectural Design; Component Level Design, User Interface Design, Object Oriented Design, Software Design Notations. | | | |
| Self-study / Case Study / Applications | Object Oriented Design, Software Design Notations | | |
| Text Book | Text Book1:13.1,14.1,15.1 | | |
| **MODULE-4** | **Software Coding and Testing** | **21ISE61.4** | **8 Hours** |
| **Software Coding:** Features of Software Code, Coding Guidelines, Coding Methodology, Programming Practice, Code verification Techniques, Coding Tools, Code Documentation<br>**Software Testing:** Software Testing basics, Test Plan, Levels of Software Testing, Testing Techniques, Debugging, Safety, Security and reliability | | | |
| Self-study / Case Study / Applications | Coding Tools, Code Documentation, Testing Techniques, Debugging, Safety | | |
| Text Book | Text Book 1: 22.1,23.1,25.2,25.8,26.1 to 26.2 | | |
| **MODULE-5** | **Configuration Management** | **21ISE61.5, 21ISE61.6** | **8 Hours** |
| Configuration Management Planning; Change management, Distributed Version Control Systems<br>Project Management: Project planning; Project scheduling; Risk management, Management activities. | | | |
| Text Book | Text Book 1:33.2,33.5,34,35 | | |

**CIE Assessment Pattern (50 Marks – Theory) –**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | - | - |
| L2 | Understand | 10 | - | - |
| L3 | Apply | 5 | 5 | 5 |
| L4 | Analyze | 5 | 5 | 5 |
| L5 | Evaluate | - | 5 | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Books:**

1. Roger S Pressman: Software Engineering – A Practitioner's Approach, McGraw Hill, Eight editions, 2019.

**Reference Books:**

1. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India, 2009.
2. Hans Van Vliet: Software Engineering: Principles and Practices, Wiley India, 2018.
3. Richard Fairley: Software Engineering Concepts, McGraw Hill, 2018.
4. Ian Somerville: Software Engineering, Pearson Education, Tenth edition, 2017

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

1. https://www.tutorialspoint.com/software_engineering/index.htm
2. https://www.computerscience.org/careers/software-engineer/
3. https://www.javatpoint.com/software-engineering-tutorial
4. https://www.guru99.com/what-is-software-engineering.html
5. https://www.geeksforgeeks.org/software-engineering/

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Visit to any Software organization to know more about the coding tools and data design.
- Demonstration of Levels of Software Testing
- Demonstration of Aspect-oriented software engineering and process
- Demonstration of Levels of Software Testing
- Video demonstration of latest trends in Distributed Version Control Systems and Project planning
- Contents related activities (Activity-based discussions)
    - For active participation of students, instruct the students to prepare Flowcharts and Handouts
    - Organizing Group wise discussions on issues
    - Seminars

| MACHINE LEARNING | | | |
|---|---|---|---|
| **Course Code** | **21ISE62** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **4** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

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

| | |
|---|---|
| 21ISE62.1 | Understand the problems for machine learning and select the either supervised, unsupervised and reinforcement learning. |
| 21ISE62.2 | Apply Classification concepts for solving machine learning problems. |
| 21ISE62.3 | Analyze Artificial Neural Networks (ANN's). |
| 21ISE62.4 | Implementation of association rule mining in data mining. |
| 21ISE62.5 | Evaluating Mathematical Models for Machine Learning algorithms. |
| 21ISE62.6 | Analyze Convolution Neural Networks and implementation for solving machine learning problems. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISE62.1 | 3 | 3 | 3 | 2 | 2 | 1 | - | - | 1 | - | 1 | 1 | 3 | 2 |
| 21ISE62.2 | 3 | 3 | 3 | 3 | 2 | 1 | - | - | 1 | - | 1 | 1 | 3 | 2 |
| 21ISE62.3 | 3 | 3 | 3 | 3 | 2 | 1 | - | - | 1 | - | 1 | 1 | 3 | 2 |
| 21ISE62.4 | 3 | 3 | 3 | 3 | 2 | 1 | - | - | 1 | - | 1 | 1 | 3 | 2 |
| 21ISE62.5 | 3 | 3 | 3 | 3 | 2 | 1 | - | - | 1 | - | 1 | 1 | 3 | 2 |
| 21ISE62.6 | 3 | 3 | 3 | 3 | 2 | 1 | - | - | 1 | - | 1 | 1 | 3 | 2 |

| **MODULE-1** | **INTRODUCTION TO MACHINE LEARNING** | **21ISE62.1** | **8 Hours** |
|---|---|---|---|

**Introduction**: Introduction to Machine Learning, Types of ML, Gradient (Steepest) Descent/Learning Rule, Introduction to Regression
**Concept Learning:** Concept learning task, Concept learning as search, Find-S algorithm.

| | |
|---|---|
| Self-study | Learn Reinforcement learning algorithms - Q Learning, Bellman Equations. |
| Textbook | Textbook 3 : Ch 1, Textbook 2 : Ch 2, Textbook 1: Ch 6.2 |

| **MODULE-2** | **CLASSIFICATION OF DATA** | **21ISE62.2** | **8 Hours** |
|---|---|---|---|

**Decision Trees:** Chi-Square Automatic Interaction Detectors (CHAID), Classification and Regression Tree (CART), C4.5.
**Support Vector Machine**: Kernel Function and Kernel SVM.

| | |
|---|---|
| Self-study | Learn ID3 algorithm and implement them on any dataset for classification. |
| Textbook | Textbook 2: Ch 3, Textbook 1: Ch 5.5, Textbook 3: Ch 13 |

| **MODULE-3** | **ASSOCIATION & CORRELATION OF DATA** | **21ISE62.3** | **8 Hours** |
|---|---|---|---|

**Association Rule Mining**: Apriori, FP – Growth,
**Correlations**: Basic Concepts and Methods, Pattern Mining in Multilevel, Multidimensional Space, Sequential Pattern Mining.

| | |
|---|---|
| Case Study | How and which association rule mining algorithms are implemented in Amazon Prime / Netflix. |

| | | | |
|---|---|---|---|
| Textbook | Textbook 1: Ch 9 | | |
| **MODULE-4** | **NEURAL NETWORKS** | **21ISE62.4** | **8 Hours** |
| **Artificial Neural Networks**: Introduction, Neural Network representation, Appropriate Problems, Perceptron, Back Propagation algorithm.<br>**Federated Machine Learning:** Introduction | | | |
| Application | Analyze the application of ANN in face detection biometric system. | | |
| Textbook | Textbook 2: Ch 4 | | |
| **MODULE-5** | **DATA IN ACTION** | **21ISE62.5** | **8 Hours** |
| **Convolutional Neural Networks (CNN)**: Convolutional, Pooling and Soft-Max Layers, Training CNNs, and activation functions<br>**Reinforcement Learning:** Introduction, The learning task, Q Learning. | | | |
| Case Study | How Machine learning techniques used in IOT, Data Science, and Artificial Intelligence. | | |
| Textbook | Textbook 2: Ch 13 | | |

**CIE Assessment Pattern (50 Marks – Theory) –**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | **25** | **15** | **10** |
| **L1** | **Remember** | 5 | 5 | - |
| **L2** | **Understand** | 5 | 5 | 5 |
| **L3** | **Apply** | 5 | 5 | 5 |
| **L4** | **Analyze** | 5 | - | - |
| **L5** | **Evaluate** | 5 | - | - |
| **L6** | **Create** | - | - | - |

**SEE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| **L1** | **Remember** | 10 |
| **L2** | **Understand** | 10 |
| **L3** | **Apply** | 10 |
| **L4** | **Analyze** | 10 |
| **L5** | **Evaluate** | 10 |
| **L6** | **Create** | - |

**Suggested Learning Resources:**

**Text Books:**


1. Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning using Python", Wiley, First Edition, 2020.
2. Tom M. Mitchell, "Machine Learning", McGraw Hill Education, Indian Edition, 2017.
3. Ethem Alpaydin, "Introduction to Machine Learning", MIT press, Second Edition, 2010.


**Reference Books:**


1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer Series in Statistics, Second Edition, 2017.
2. Dipanjan Sarkar, Raghav Bali ,Tushar Sharma, "Practical Machine Learning with Python-A Problem-Solver's Guide to Building Real-World Intelligent Systems", A Press, First Edition, 2018.
3. Simon Haykin, "Neural Networks and Learning Machines", Pearson, Third Edition, 2016
4. Kevin P. Murphy , Francis Bach , "Machine Learning: A Probabilistic Perspective", Massachusets Institute of Technology, First Edition, 2012.


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

- https://onlinecourses.nptel.ac.in/noc22_cs29
- https://onlinecourses.nptel.ac.in/noc22_cs08/
- https://www.youtube.com/watch?v=I7NrVwm3apg
- https://www.analyticsvidhya.com/machine-learning/
- https://www.javatpoint.com/decision-tree-induction
- https://www.hackerearth.com/practice/machine-learning/machine-learning- algorithms/ml-decision-tree/tutorial/
- https://www.youtube.com/watch?v=N6BghzuFLIg
- https://www.coursera.org/lecture/what-is-datascience/fundamentals-of-data-science-tPgFU
- https://www.youtube.com/watch?v=ua-CiDNNj30

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Peer Learning
- Pictography
- Flip Class
- Group Discussion
- Case Study / Demonstration
- Gamified Learning

**MACHINE LEARNING LABORATORY**

| | | | |
|---|---|---|---|
| **Course Code** | **21ISL62** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **01** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| 21ISL62.1 | Demonstrate Supervised, Unsupervised Learning algorithms. |
| 21ISL62.2 | Implement Concept Learning, Supervised Learning Algorithms. |
| 21ISL62.3 | Model the Association Rule Mining algorithms with real world problems. |
| 21ISL62.4 | Illustrate Artificial Neural Networks and Convolutional Neural Networks to solve machine learning problems |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | **PO1** | **PO2** | **PO 3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO 9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISL62.1 | 3 | 3 | 3 | 2 | 3 | - | - | - | - | - | 1 | 1 | 3 | 2 |
| 21ISL62.2 | 3 | 3 | 3 | 2 | 3 | - | - | - | - | - | 1 | 1 | 3 | 2 |
| 21ISL62.3 | 3 | 3 | 3 | 2 | 3 | - | - | - | - | - | 1 | 1 | 3 | 2 |
| 21ISL62.4 | 3 | 3 | 3 | 2 | 3 | - | - | - | - | - | 1 | 1 | 3 | 2 |

| **Pgm. No.** | **List of Programs** | **Hours** | **COs** |
|---|---|---|---|
| | **Prerequisite Experiments / Programs / Demo** | | |
| | • Programming knowledge of Java / Python.<br>• Able to identify appropriate dataset to the respective program.<br>• Knowledge / detail understanding of the respective algorithm. | 2 | NA |
| | **PART-A** | | |
| 1 | Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file. | 2 | 21ISL62.1 |
| 2 | For a given set of training data examples stored in a .CSV file, implement and demonstrate the Document classifier using Naive Bayes. | 2 | 21ISL62.1 |
| 3 | Develop a program to demonstrate the working of the decision tree based CHAID algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. | 2 | 21ISL62.1 |
| 4 | Develop a program to demonstrate the working of the | 2 | 21ISL62.1 |

| | | | |
|---|---|---|---|
| | Regression tree based CART algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. | 2 | |
| 5 | Develop a program to demonstrate the working of the Regression tree based C4.5 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. | 2 | 21ISL62.2 |
| 6 | Develop a program to construct Support Vector Machine considering a Sample Dataset. | 2 | 21ISL62.2 |
| **PART-B** | | | |
| 7 | Implement a program in python to illustrate the Bias Variance Trade-off in a machine learning model. | 2 | 21ISL62.2 |
| 8 | Implement and demonstrate the Association Rule Mining using Apriori Algorithm. | 2 | 21ISL62.2 |
| 9 | Implement and demonstrate the Association Rule Mining using FP-Growth Algorithm. | 2 | 21ISL62.3 |
| 10 | Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets. | 2 | 21ISL62.3 |
| 11 | Build a Convolutional Neural Networks and test the same using appropriate data sets. | 2 | 21ISL62.4 |
| 12 | Implement Q learning algorithm. | 2 | 21ISL62.4 |

**PART-C**

**Beyond Syllabus Virtual Lab Content**

**(To be done during Lab but not to be included for CIE or SEE)**

1. Familiarization of geospatial data analysis and geographic information system process http://vlabs.iitkgp.ac.in/psac/newlabs2020/gnss/exp3/index.html
2. Perception learning https://cse22-iiith.vlabs.ac.in/exp/perceptron-learning/simulation.html

**CIE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Test (s) | Weekly Assessment |
|---|---|---|---|
| | | **20** | **30** |
| **L1** | **Remember** | **-** | **-** |
| **L2** | **Understand** | - | 5 |
| **L3** | **Apply** | 5 | 10 |
| **L4** | **Analyze** | 5 | 10 |
| **L5** | **Evaluate** | 10 | 5 |
| **L6** | **Create** | - | - |

**SEE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | - |
| L2 | Understand | 10 |
| L3 | Apply | 10 |
| L4 | Analyze | 20 |
| L5 | Evaluate | 10 |
| L6 | Create | - |

**Suggested Learning Resources:**

**Reference Books:**


1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer Series in Statistics, Second Edition, 2017.
2. Dipanjan Sarkar, Raghav Bali ,Tushar Sharma, "Practical Machine Learning with Python-A Problem-Solver's Guide to Building Real-World Intelligent Systems", A Press, First Edition, 2018.
3. Simon Haykin, "Neural Networks and Learning Machines", Pearson, Third Edition, 2016.


| COMPUTER NETWORKS | | | |
|---|---|---|---|
| **Course Code** | **21ISE63** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| **21ISE63.1** | Understand the basic concepts of computer networks, types of networks and Reference models such as OSI model and TCP/IP Model, Addressing. |
| **21ISE63.2** | Analyze physical layer signaling and encoding, and techniques of error detection and correction to detect and solve error bit during data transmission. |
| **21ISE63.3** | Apply IP addressing and routing algorithms to find shortest paths for network- layer packet delivery and to contrast the IPv4 and IPv6 headers. |
| **21ISE63.4** | Illustrate the essential principles of a transport layer protocol used for reliable data Transfer, flow control, congestion control. |
| **21ISE63.5** | Analyze the essential principles of application layer protocol |
| **21ISE63.6** | Analyze the protocols such as DNS, HTTP, FTP, SMTP, TCP, UDP and IP. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **21ISE63.1** | 3 | 2 | 2 | 2 | - | 1 | - | - | - | - | - | 1 | 3 | 2 |
| **21ISE63.2** | 3 | 2 | 2 | 2 | - | 1 | - | - | - | - | - | 1 | 3 | 2 |
| **21ISE63.3** | 3 | 3 | 2 | 2 | - | 1 | - | - | - | - | - | 1 | 3 | 2 |
| **21ISE63.4** | 3 | 3 | 3 | 2 | - | 1 | - | - | - | - | - | 1 | 3 | 2 |
| **21ISE63.5** | 3 | 3 | 3 | 2 | - | 1 | - | - | - | - | - | 1 | 3 | 2 |
| **21ISE63.6** | 3 | 2 | 2 | 2 | - | 1 | - | - | - | - | - | 1 | 3 | 2 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **Introduction to computer networks** | **21ISE63.1** | **8 Hours** |
| Evolution of network, Network hardware and software, Types of Networks, Network Topologies, Protocols & Standards, and Reference Models: OSI Reference model, TCP/IP Reference model, Addressing. | | | |
| Text Book | Text Book 1: Chapter 1 and 2<br>Text Book 2:1.2,1.3,1.6 | | |
| **MODULE-2** | **Physical Layer & Data link Layer** | **21ISE63.2** | **8 Hours** |
| Analog & Digital transmission, Transmission media, Design issues, CRC codes, Elementary Data Link Layer Protocols, sliding window protocol. | | | |
| Text Book | Text Book 1: Chapter 3,4,5,7,9,10<br>Text Book 2:2.1,2.2,3.1,3.2 | | |
| **MODULE-3** | **Network Layer** | **21ISE63.3** | **8 Hours** |
| Internetworking basics, IP addressing and subnet addressing, IPv4, IPv6, Transition from IPv4 to IPv6, Routing algorithms. | | | |
| Text Book | Text Book1: Chapter 18,19,20,21,22<br>Text Book 2:5.1,5.2,5.7 | | |
| **MODULE-4** | **Transport Layer** | **21ISE63.4** | **8 Hours** |
| User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Congestion Control, Quality of services (QOS). | | | |
| Text Book | Text Book 1: Chapter 23,24<br>Text Book 2:6.1,6.2,6.3 | | |
| **MODULE-5** | **Application layer overview** | **21ISE63.5<br>21ISE63.6** | **8 Hours** |
| Domain Name System (DNS), Remote Login Protocols, E-mail, File Transfer, World Wide Web and HTTP. | | | |
| Text Book | Text Book 1: Chapter 25,26,27<br>Text Book 2:7.1,7.2,7.3 | | |

**CIE Assessment Pattern (50 Marks – Theory)**

| **RBT Levels** | | **Marks Distribution** | | |
|---|---|---|---|---|
| | | **Test (s) (25)** | **Assignment (15)** | **Quiz (10)** |
| **L1** | **Remember** | **5** | **5** | **-** |
| **L2** | **Understand** | **10** | **5** | **5** |
| **L3** | **Apply** | **5** | **5** | **5** |
| **L4** | **Analyze** | **5** | **-** | **-** |
| **L5** | **Evaluate** | **-** | **-** | **-** |
| **L6** | **Create** | - | - | - |

**SEE Assessment Pattern (50 Marks – Theory)**

| **Bloom's Taxonomy** | **Tests** |
|---|---|
| Remember | 10 |
| Understand | 20 |
| Apply | 10 |
| Analyze | 10 |
| Evaluate | - |
| Create | - |

**Suggested Learning Resources:**

**Text Books:**


1. Behrouz A. Forouzan,"Data Communications and Networking", 5thEdition ,Tata McGraw-Hills,2018.
2. Andrew S Tanenbaum, David J Wetherall, "Computer Networks", 5th Edition, Pearson Education,2018.


**Reference Books:**


1. William Stallings, "Data and Computer Communication", 10thEdition, Pearson Education, 2017.
2. James F.Kurose and Keith W.Ross," Computer Networking", 6th Edition, Pearson Education, 2018.
3. Larry L. Peterson and Bruce S. Davie, "Computer Networks – A Systems Approach", 5th Edition, Elsevier, 2018.


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

- **https://www.youtube.com/watch?v=YiPBbblHCZw**
- **https://archive.nptel.ac.in/courses/106/105/106105183/**
- **https://www.youtube.com/watch?v=qiQR5rTSshw**

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Demonstration of various network models.
- Demonstration of Sliding Window Protocol.
- Demonstration of IP addressing.
- Video demonstration of latest trends in Computer Networks
- Contents related activities (Activity-based discussions)
  - For active participation ofstudents, instruct the students to prepare Flowcharts and Handouts
  - Organizing Group wise discussions on issues
  - Seminars

| Computer Networks Lab | | | |
|---|---|---|---|
| **Course Code** | **21ISL63** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **01** | **Exam Hours** | **03** |

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

| | |
|---|---|
| **21ISL63.1** | Implement different network protocols |
| **21ISL63.2** | Analyze various routing algorithms |
| **21ISL63.3** | Analyze communicate between two desktop computers |
| **21ISL63.4** | Use simulation tools |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **21ISL63.1** | 3 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 1 | 2 | 2 |
| **21ISL63.2** | 3 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 1 | 2 | 2 |
| **21ISL63.3** | 3 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 1 | 2 | 2 |
| **21ISL63.4** | 3 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 1 | 2 | 2 |

| **Exp. No. / Pgm. No.** | **List of Experiments / Programs** | **Hours** | **COs** |
|---|---|---|---|
| | **Prerequisite Experiments / Programs / Demo** | | |
| | **Installation procedure of the required software (NCTU/NS2/NS3) must be demonstrated, carried out in groups and documented in the Record** | 2 | NA |
| | **PART-A** | | |
| 1 | Write a program for error detecting code using CRC-CCITT (16-bits). | 2 | 21ISL63.1 |
| 2 | Write a program for distance vector algorithm to find suitable path for transmission. | 2 | 21ISL63.2 |
| 3 | Implement the data link layer framing methods such as character count, character stuffing and bit stuffing | 2 | 21ISL63.1 |
| 4 | Write a program for congestion control using leaky bucket algorithm. | 2 | 21ISL63.2 |
| 5 | Implement the data link layer framing methods such as character, character stuffing and bit stuffing. | 2 | 21ISL63.1 |
| 6 | Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present. | 2 | 21ISL63.3 |
| | **PART-B** | | |
| | **For the experiments below modify the topology and parameters set for the experiment and take multiple rounds of reading and analyze the results available in log files. Plot necessary graphs and conclude. Use NCTU/NS2/NS3.** | | |
| 7 | Simulate a three nodes point – to – point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped | 2 | 21ISL63.4 |
| 8 | Simulate an Ethernet LAN using n nodes (6-10), change error rate and data rate and compare throughput. | 2 | 21ISL63.4 |

| | | | |
|---|---|---|---|
| 9 | Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination. | 2 | 21ISL63.4 |
| 10 | Simulate a four node point-to-point network with the links connected as follows: n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP /UDP. | 2 | 21ISL63.4 |
| 11 | Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion. | 2 | 21ISL63.4 |
| 12 | Simulate simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets. | 2 | 21ISL63.4 |

**CIE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Tests | Weekly Assessment |
|---|---|---|---|
| | | 20 | 30 |
| L1 | Remember | - | - |
| L2 | Understand | - | 5 |
| L3 | Apply | 5 | 10 |
| L4 | Analyze | 5 | 5 |
| L5 | Evaluate | 5 | 5 |
| L6 | Create | 5 | 5 |

**SEE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | - |
| L2 | Understand | 5 |
| L3 | Apply | 10 |
| L4 | Analyze | 20 |
| L5 | Evaluate | 10 |
| L6 | Create | 5 |

**Suggested Learning Resources:**

**Reference Books:**

1) Andrew S Tanenbaum, David J Wetherall , “Computer Networks”, 5th Edition, Pearson Education,2018.

**COMPILER DESIGN**

| | | | |
|---|---|---|---|
| **Course Code** | **21ISE641** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs/Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| 21ISE641.1 | Understand the basic Concepts and Applications of Compiler Design |
| 21ISE641.2 | Apply their basic knowledge data structure to design symbol table, Lexical Analyzer |
| 21ISE641.3 | Analyze Top-Down Paring Techniques |
| 21ISE641.4 | Implement a Bottom-Up Parsing Techniques |
| 21ISE641.5 | Design various Code Optimization Techniques and Error Recovery Mechanisms |
| 21ISE641.6 | Analyze the different Concepts in Compiler Design. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISE641.1 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 3 | 3 |
| 21ISE641.2 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 3 | 3 |
| 21ISE641.3 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 3 | 3 |
| 21ISE641.4 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 3 | 3 |
| 21ISE641.5 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 3 | 3 |
| 21ISE641.6 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 3 | 3 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **INTRODUCTION TO COMILERS** | **21ISE641.1 & 21ISE641.2** | **8 Hours** |

**Introduction:** Overview of the Translation Process, Difference between interpreter, assembler and compiler, Overview and use of linker and loader, Analysis of the Source Program, Language processors; Pass and phase, Bootstrapping, The structure of a Compiler, The science of building a Compiler; Lexical Analysis: The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens

| | |
|---|---|
| Text Book | Text Book 1: **Ch 1.1 TO 1.5 , Ch 3.1 to 3.4 &** Text Book 2**: Ch1** |

| | | | |
|---|---|---|---|
| **MODULE-2** | **LEXICAL ANAYLZER & SYNTAX ANALYSIS-I** | **21ISE641.2& 21ISE641.3** | **8 Hours** |

**Lexical Analyzer**: A Language for Specifying Lexical Analyzers, Finite Automata From a Regular Expression, Design of a Lexical Analyzer Generator, Optimization, Syntax Analysis 1: Introduction; Context-free Grammars; Writing a Grammar. Top-down Parsing : Recursive descent parsing, Non-recursive predictive parsing, LL(1) grammars.

| | |
|---|---|
| Text Book | Text Book 1: **Ch 3.4 to 3.9 Ch 4.1 to 4.4** |

| | | | |
|---|---|---|---|
| **MODULE-3** | **SYNTAX ANALYSIS-II** | **21ISE641.4** | **8 Hours** |

**Syntax Analysis II** : Bottom-up Parsing, Operator Precedence Parsing, LR Parsers, Using Ambiguous Grammars, Parser Generators.

| | |
|---|---|
| Text Book | Text Book 1: **Ch 4.5 to 4.9** |

| | | | |
|---|---|---|---|
| **MODULE-4** | **SYNTAX-DIRECTED TRANSLATION** | **21ISE641.5** | **8 Hours** |

**Syntax Directed Translation**: Syntax-Directed Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-

| | | | |
|---|---|---|---|
| Attributed Definitions, L Attributed Definitions, syntax directed definitions and translation schemes | | | |
| Text Book | **Textbook 1: Ch 5.1 to 5.4** | | |
| **MODULE-5** | **INTERMEDIATE CODE GENERATION** | **21ISE641.5 & 21ISE641.6** | **8 Hours** |

**Intermediate Code Generation**: Variants of Syntax trees, Three-Address Code, Types & Declarations, type checking, Control Flow, Data Flow Algorithms-Issues in Design of a Code Generator - The Target Language, Addresses in the Target Code,A Simple Code Generator Algorithm.

| | |
|---|---|
| Text Book | **Textbook 1: 6.1 to 6.6 Ch. 8.4 & 8.6** |

**CIE Assessment Pattern (50 Marks – Theory) –**

| RBT Levels | | Marks Distribution | |
|---|---|---|---|
| | | Test (s) (25) | NPTEL (25) |
| L1 | Remember | 5 | - |
| L2 | Understand | 5 | - |
| L3 | Apply | 5 | 5 |
| L4 | Analyze | 5 | 10 |
| L5 | Evaluate | 5 | 10 |
| L6 | Create | - | - |

**SEE Assessment Pattern (50 Marks – Theory) –**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 5 |
| L2 | Understand | 5 |
| L3 | Apply | 5 |
| L4 | Analyze | 5 |
| L5 | Evaluate | 5 |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Books:**


1. Aho, Lam, Sethi, and Ullman , “Compilers: Principles, Techniques and Tools” Pearson, 2 nd Edition, 2014
2. Steven S Muchnick, “Advanced Compiler Design and Implementation”, Morgan Kaufmann Publishers,1998.
3. John E Hopcroft, Rajeev Motwani, Jeffery D Ullman, Introduction to Automata Theory, Languages, and Computation, 3rd Edition, Pearson Education, 2013


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

1. https://onlinecourses.nptel.ac.in/noc21_cs07/preview
2. https://nptel.ac.in/courses/106105190
3. https://nptel.ac.in/courses/106104123

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- For active participation of students, instruct the students to prepare for puzzles and presentations.
- Discussions on applications of Finite Automata , Compiler Design

| Data Visualization | | | |
|---|---|---|---|
| **Course Code** | **21ISE642** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **100** |
| **Hrs / Week** | **03** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **3 Hours** |

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

| | |
|---|---|
| **21ISE642.1** | Understand the basic structure of python programming language. |
| **21ISE642.2** | Apply MatPlotLib and Seaborn library to various datasets and infer the insights through visualizations. |
| **21ISE642.3** | Apply visual analytics techniques using tableau for multidimensional datasets. |
| **21ISE642.4** | Analyze the concept and application of interaction techniques, color, animation and mapping and cartography in visualization of data. |
| **21ISE642.5** | Create the interactive data related applications using Bokeh. |
| **21ISE642.6** | To effectively design and deliver the project presentations related to visualization tools. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **21ISE642.1** | 3 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 2 | 2 |
| **21ISE642.2** | 3 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 2 | 2 |
| **21ISE642.3** | 3 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 2 | 2 |
| **21ISE642.4** | 3 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 2 | 2 |
| **21ISE642.5** | 3 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 2 | 2 |
| **21ISE642.6** | 3 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 2 | 2 |

| | | | |
|---|---|---|---|
| **MODULE-1** | Introduction to Data Visualization | **21ISE642.1** | **8 Hours** |

Introduction to Data Visualization, Why do we use Data Visualization, Introduction to NumPy and pandas and Basic Plotting with MatPlotLib.

| | |
|---|---|
| Text Book | Text Book 1: : Ch. 4<br>Text Book 2: Ch.2 |

| | | | |
|---|---|---|---|
| **MODULE-2** | Exploratory Data Analysis | **21ISE642.2** | **8 Hours** |

Waffle Charts, Word Clouds, Introduction to Folium and Map Styles, Maps with Markers, Choropleth Maps. Case Study/Application

| | |
|---|---|
| Text Book | Text Book 2: : Ch. 5 |

| | | | |
|---|---|---|---|
| **MODULE-3** | Seaborn | **21ISE642.3** | **8 Hours** |

Seaborn - Strip plot, pair grid plot, violin plots, cluster map, heat map, facet grid, KDE plot, join plot, Seaborn and Regression Plots, pair plots. Getting Started & Introduction to Data Visualization – Tableu, Exploring and Navigating Tableau, Making Data Connections.

| | |
|---|---|
| Text Book | Text Book 2: : Ch. 6 |

| | | | |
|---|---|---|---|
| **MODULE-4** | Visual analytics | **21ISE642.4, 21ISE642.5** | **8 Hours** |

Introduction to Table Calculations, Calculated Fields, Quick Table Calculations, Custom Table Calculations, Filters, Parameters, Introduction to Mapping, Working with Geographic Data, Shapes, Colors and Sizes, Custom Mapping Techniques, Custom Geocoding, Dual Layer Mapping.

| | |
|---|---|
| Text Book | Text Book 2: Ch. 7 |

| | | | |
|---|---|---|---|
| **MODULE-5** | Interactive Data Visualization With Bokeh | **21ISE642.6** | **8 Hours** |

| Introduction to Bokeh, Benefits of Bokeh, Challenges with Bokeh, Case Study. | |
|---|---|
| Text Book | Text Book 3: : Ch. 8 |

**CIE Assessment Pattern (50 Marks – Theory) –**

| RBT Levels | | Marks Distribution | |
|---|---|---|---|
| | | Test (s) | NPTEL |
| | | 25 | 25 |
| L1 | Remember | 5 | - |
| L2 | Understand | 10 | - |
| L3 | Apply | 10 | 5 |
| L4 | Analyze | - | 10 |
| L5 | Evaluate | - | 10 |
| L6 | Create | - | - |

**SEE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 20 |
| L4 | Analyze | - |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Books:**


1. Scott Murray, "Interactive Data Visualization", O'Reilly Publications, 2013
2. David Baldwin, "Mastering Tableau: Smart Business Intelligence techniques to get maximum insights from your data" , Packt Publications,2016.
3. Kevin Jolly ,"Hands-On Data Visualization with Bokeh: Interactive web plotting for Python using Bokeh" , Packt Publications,2015.


**Reference Books:**


1) Efraim Turban , Jay E. Aronson , Ting-Peng Liang, "Decision Support Systems & Intelligent Systems", 9th edition, Prentice Hall, 2016.
2) Data, data everywhere, "Special report on managing information, Economist", February 27th, 2016.
3) Liberatore and Luo, "The Analytics Movement, Interfaces, Articles in Advance"


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

- https://nptel.ac.in/courses/110107092
- https://nptel.ac.in/courses/106107220
- https://onlinecourses-archive.nptel.ac.in/noc17_mg24/preview
- https://onlinecourses.nptel.ac.in/noc21_cs78/preview
- https://elearn.nptel.ac.in/shop/iit-workshops/completed/data-visualization-with-

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Case Study.
- Organizing Group wise discussions on issues
- Seminars

| **Natural Language Processing** | | | |
|---|---|---|---|
| **Course Code** | **21ISE643** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| 21ISE643.1 | Understand the basic concepts of natural language |
| 21ISE643.2 | Analyze the natural language text, speech and tag a text with basic language features |
| 21ISE643.3 | Analyze the text and extract the relations from the text |
| 21ISE643.4 | Apply text mining techniques to generate mining diagnostic reports |
| 21ISE643.5 | Apply various methods to word matching, identifying different text types and evaluate the results of the methods |
| 21ISE643.6 | Analyze the applications of NLP |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21ISE643.1 | 3 | 2 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 2 |
| 21ISE643.2 | 2 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 3 |
| 21ISE643.3 | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 2 |
| 21ISE643.4 | 2 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 |
| 21ISE643.5 | 3 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 3 |
| 21ISE643.6 | 2 | 2 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 |

| **MODULE-1** | **OVERVIEW AND LANGUAGE MODELING** | **21ISE643.1** | **8 Hours** |
|---|---|---|---|

Overview: Origins and challenges of NLP Language and Grammar-Processing Indian Languages- NLP Applications-Information Retrieval. Language Modelling: Various Grammar- based Language Models Statistical Language Model.

| Text Book | Text Book: 1, Chapter: 1, 2 |
|---|---|

| **MODULE-2** | **WORDS AND SPEECH** | **21ISE643.2** | **8 Hours** |
|---|---|---|---|

**Words**-Regular Expressions and Automata - Words and Transducers - N-grams - Part-of-Speech–Tagging - Hidden Markov and Maximum Entropy Models.

**Speech** – Phonetics - Speech Synthesis - Automatic Speech Recognition

| Text Book | Text Book: 1, Chapter: 3, 4 |
|---|---|

| MODULE-3 | Extracting Relations from Text: From Word Sequences to Dependency Paths: | 21ISE643.3<br>21ISE643.4 | 8 Hours |
|---|---|---|---|
| Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation.<br>Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles: Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labelling, Learning to Annotate Cases with Knowledge Roles and Evaluations. | | | |
| Text Book | Text Book: 2, Chapter: 3, 4, 5 | | |
| **MODULE-4** | **Evaluating Self-Explanations in iSTART.** | **21ISE643.5** | **8 Hours** |
| Word Matching, Latent Semantic Analysis, and Topic Models: Introduction, iSTART: Feedback Systems, iSTART: Evaluation of Feedback Systems,<br>Textual Signatures: Identifying Text-Types Using Latent Semantic Analysis to Measure the Cohesion of Text Structures:<br>Introduction, Cohesion, Coh-Metrix, Approaches to Analysing Texts, Latent Semantic Analysis, Predictions, Results of Experiments. | | | |
| **Automatic Document Separation: A Combination of Probabilistic Classification and Finite-State Sequence Modelling:**<br>Introduction, Related Work, Data Preparation, Document Separation as a Sequence Mapping Problem, Results. | | | |
| Text Book | Text Book: 2, Chapter: 6, 7, 8, 9 | | |
| **MODULE-5** | **INFORMATION RETRIEVAL AND LEXICAL RESOURCES** | **21ISE643.6** | **8 Hours** |
| Information Retrieval: Design features of Information Retrieval Systems-Classical, Non classical, Alternative Models of Information Retrieval – valuation Lexical Resources: World Net-Frame NetStemmers-POS Tagger- Research Corpora. | | | |
| Text Book | Textbook 1: Ch. 9,12 | | |

**CIE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Marks Distribution | |
|---|---|---|---|
| | | Test (s) | NPTEL |
| | | 25 | 25 |
| L1 | Remember | 5 | - |
| L2 | Understand | 10 | - |
| L3 | Apply | 5 | 5 |
| L4 | Analyze | 5 | 10 |
| L5 | Evaluate | - | 10 |
| L6 | Create | - | - |

**SEE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | -- |
| L6 | Create | -- |

**Suggested Learning Resources:**

**Text Books:**

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

2. Anne Kao and Stephen R. Poteet (Eds), "Natural Language Processing and Text Mining", Springer-Verlag LondonLimited 2007.

**Reference Books:**

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", 2nd Edition, Prentice Hall, 2008.

2. James Allen, "Natural Language Understanding", 2nd edition, Benjamin/Cummings publishing company, 1995.

3. Gerald J. Kowalski and Mark.T. Maybury, "Information Storage and Retrieval systems", Kluwer academic Publishers, 2000.

Web links and Video Lectures (e-Resources):

- https://www.techtarget.com/searchenterpriseai/definition/language-modeling
- https://www.ibm.com/topics/natural-language-processing
- https://.scaler.com/topics/nlp/relation-extration-in-nlp/
- https://files www.eric.ed.gov/fulltext/ED577164.pdf
- https://www.analyticsvidhya.com/blog/2021/09/latent-semantic-analysis-and-its-uses- in-natural-language-processing/
- https://nlp.stanford.edu/IR-book/html/htmledition/finite-automata-and-language- models-1.html
- https://www.geeksforgeeks.org/top-7-applications-of-natural-language-processing/

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to prepare Flowcharts and Handouts
  - Organizing Group wise discussions on issues
  - Seminars

| BIO INSPIRED DESIGN AND INNOVATION | | | |
|---|---|---|---|
| **Course Code** | **21ISE644** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| **21ISE644**.1 | Verify the biomimetics principles in relation to the needs at that moment |
| **21ISE644**.2 | Evaluate the bio-material properties for health care applications |
| **21ISE644**.3 | Investigate novel bioengineering initiatives by evaluating design and development principles |
| **21ISE644**.4 | Formulate bio-based solutions for socially vital issues with critical thought |
| **21ISE644**.5 | Comprehend the bio computing optimization through research and experiential learning |
| **21ISE644**.6 | Review the fundamental biological ideas through pertinent industrial applications and case studies |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **21ISE644**.1 | 3 | 3 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 2 | | |
| **21ISE644**.2 | 3 | 3 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 2 | | |
| **21ISE644**.3 | 3 | 3 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 2 | | |
| **21ISE644**.4 | 3 | 3 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 2 | | |
| **21ISE644**.5 | 3 | 3 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 2 | | |
| **21ISE644**.6 | 3 | 3 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 2 | | |

| **MODULE-1** | **BIO-INSPIRED DESIGN AND ENGINEERING** | **21ISE644.1** | **8 Hours** |
|---|---|---|---|

Bio-Inspired Engineering and design, History, Evolution, Basics of Biomimetics and other Disciplines, Rawling's Classifications, Need for Bio-Inspired Designs. Bio inspired Additive manufacturing techniques, (self-healing, self-assembly).

| | |
|---|---|
| Self-study / Case Study / Applications | Investigate the Challenges of Bio inspired design, Compare with traditional areas of science and engineering. |
| Text Book | Text Book 1: 1.2, 1.3, 1.4, 1.13, 1.15, 1.16 |

| **MODULE-2** | **BIO MATERIALS AND BIO HEALTHCARE DESIGN** | **21ISE644.2** | **8 Hours** |
|---|---|---|---|

Biomaterials, Design of Forms- (Hexagonal unit cells, Intrinsic disorder, anisotropy), Design of materials- (Hierarchy, fracture tough materials, structural colours, Actuating Materials, Bio-Compatible Materials). Bio-Mechanics, Applications of Biomaterials and Bio systems in Health care design (Human Prosthetics, Parasitic Wasp-Inspired Needle, Octopus-Inspired Sucker for Tissue Grafting, Peacock-Inspired Biosensors, Gecko-Inspired Surgical Glue) Robotics, Marine and Aeronautical.

| | |
|---|---|
| Self-study / Case Study / Applications | Investigate Bio-Compatible alloys and polymers for human implants and health care applications. |
| Text Book | Text Book 1: 2.2, 2.3, 2.4 to 2.15 |

| **MODULE-3** | **BIO SUSTAINABLE DEVELOPMENT** | **21ISE644.3, 21ISE644.4** | **8 Hours** |
|---|---|---|---|

Innovations in Energy (Termite mound inspired shopping malls), Innovations in Resource-Air (purification, filtration), Dew water collection systems, water purification, desalination, Management of spaces, designs for megastructures.

| | |
|---|---|
| Self-study / Case Study / Applications | Explore the Bio inspired environmental constructions and development. |
| Text Book | Text Book 2: 3.1, 3.3, 3.5, 3.7, 3.10 |

| **MODULE-4** | **BIO COMPUTING AND OPTIMISATION** | **21ISE644.5** | **8 Hours** |
|---|---|---|---|

No Free Lunch Theorem, Bat Algorithm, Flower Pollination Algorithm, Genetic Algorithm- Crossover and Mutation Operations. Bio-Inspired Optimisation, Ant Colony Optimisation (ACO), Swam Intelligence- Particle Swam Optimisation (PSO).

| | |
|---|---|
| Self-study / Case Study / Applications | Scrutinize the Different types of Optimization techniques, genetic research. |
| Text Book | Text Book 1: 6.1, 6.3, 6.5, 6.7, Text Book 2: 10.1, 10.3, 10.5, 10.7 |

| **MODULE-5** | **APPLICATIONS OF BIO-INSPIRED INNOVATIONS** | **21ISE644.6** | **8 Hours** |
|---|---|---|---|

Bioinspired innovations in– Automotive, Automation, Materials and Manufacturing, Sensors, Controllers, Communications, Healthcare, Agriculture, food production, and Sports, Environment infrastructure. Carbon Neutral Solutions (Coral Reefs, Eco-cements), Carbon Free Solutions (Lotus leaf inspired paints), eco-restorations (Eco-friendly pesticide).

| | |
|---|---|
| Self-study / Case Study / Applications | Survey on Bio inspired Innovations, design, applications and case studies of the same. |
| Text Book | Text Book 2: 12.1 to 12.10 |

**CIE Assessment Pattern (50 Marks – Theory) –**

| **RBT Levels** | | **Marks Distribution** | |
|---|---|---|---|
| | | **Test (s)** | **NPTEL** |
| | | **25** | **25** |
| **L1** | **Remember** | 5 | **-** |
| **L2** | **Understand** | 5 | **-** |
| **L3** | **Apply** | 10 | 5 |
| **L4** | **Analyze** | 5 | 10 |
| **L5** | **Evaluate** | - | 10 |
| **L6** | **Create** | **-** | **-** |

**SEE Assessment Pattern (50 Marks – Theory)**

| **RBT Levels** | | **Exam Marks Distribution (50)** |
|---|---|---|
| **L1** | **Remember** | **10** |
| **L2** | **Understand** | **10** |
| **L3** | **Apply** | **10** |
| **L4** | **Analyze** | **10** |
| **L5** | **Evaluate** | **10** |
| **L6** | **Create** | **--** |

**Suggested Learning Resources:**

**Text Books:**

1)Helena Hashemi Farzaneh, Udo Lindemann, "A Practical Guide to Bio-inspired Design", Springer Vieweg, 1st edition 2019, ISBN-10 : 366257683X, ISBN-13 : 978-3662576830

2)Torben A. Lenau, Akhlesh Lakhtakia," Biologically Inspired Design: A Primer (Synthesis Lectures on Engineering, Science, and Technology)", Publisher: Morgan & Claypool Publishers, 2021, ISBN-10: 1636390471, ISBN-13: 978-1636390475

**Reference Books:**

1)French M, "Invention and evolution: Design in nature and engineering", Publisher: Cambridge University Press, 2020

2)Pan L., Pang S., Song T. and Gong F. eds, "Bio-Inspired Computing: Theories and Applications", 15th International Conference, BIC-TA 2020, Qingdao, China, October 23-25, 2020, Revised Selected Papers (Vol. 1363). Springer Nature, 2021

3)Wann D, "Bio Logic: Designing with nature to protect the environment", Wiley Publisher, 1994

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

- https://onlinecourses.nptel.ac.in/noc22_ge24/preview
- https://biodesign.berkeley.edu/bioinspired-design-course/
- https://www.youtube.com/watch?v=cwxXY9Qe8ss
- https://www.youtube.com/watch?v=V2GvQXvjhLA
- https://nsf-gov-resources.nsf.gov/2023-03/Bio-inspired%20Design%20Workshop%20Report_2232327_October%202022_Final.508.pdf

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Visit to any manufacturing/aero/auto industry or any power plant
- Demonstration of lathe/milling/drilling/CNC operations
- Demonstration of working of IC engine/refrigerator
- Demonstration of metal joining process
- Video demonstration of latest trends in mobility/robotics
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to prepare Flowcharts and Handouts
  - Organizing Group wise discussions on issues
  - Seminars

| **CRYPTOGRAPHY AND NETWORK SECURITY** | | | |
|---|---|---|---|
| **Course Code** | **21ISE645** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

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

| | |
|---|---|
| **21ISE645.1** | Compare various encryption techniques and learn the basic security technology. |
| **21ISE645.2** | Encrypt and decrypt messages using block ciphers, sign and verify messages using well known signature generation and verification algorithms. |
| **21ISE645.3** | Summarize the functionality of public key cryptography. |
| **21ISE645.4** | Apply various message authentication functions and secure algorithms. |
| **21ISE645.5** | Demonstrate different types of security systems and applications. |
| **21ISE645.6** | Analyze the E-MAIL, IP & WEB SECURITY |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | **PO 1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **21ISE645.1** | 2 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 2 |
| **21ISE645.2** | 2 | 2 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 2 |
| **21ISE645.3** | 2 | 2 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 2 |
| **21ISE645.4** | 3 | 2 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 2 |
| **21ISE645.5** | 2 | 2 | 3 | 2 | - | - | - | - | - | - | - | 2 | 3 | 2 |
| **21ISE645.6** | 3 | 1 | 3 | 2 | - | - | - | - | - | - | - | 3 | 3 | 2 |

| MODULE-1 | INTRODUCTION & SECURITY TECHNOLOGY | 21ISE645.1 | 8 Hours |
|---|---|---|---|
| Services, Mechanisms and security attacks, OSI security architecture, Network security model, Classical Encryption techniques, Firewalls. | | | |
| Text Book | Text Book 1:1.1 to 1.6 ,11.1,11.2,11.3 | | |
| **MODULE-2** | **BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY** | **21ISE645.2 21ISE645.3** | **8 Hours** |
| Stream ciphers and block ciphers, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with structure, example , Multiple encryption and triple DES, **PUBLIC KEY CRYPTOGRAPHY:** Principles of public key cryptosystems, The RSA algorithm | | | |
| Text Book | Text Book 1 :2.2,2.3 | | |
| **MODULE-3** | **HASH FUNCTIONS AND DIGITAL SIGNATURES** | **21ISE645.4** | **8 Hours** |
| Authentication requirement , Authentication function ,MAC, Hash function ,Security of hash function and MAC ,MD5 , SHA , HMAC , CMAC ,Digital Signature standards and algorithm. | | | |
| Text Book | Text Book 1 : 3.1,3.2,3.3,3.4 | | |
| **MODULE-4** | **SECURITY PRACTICE & SYSTEM SECURITY:** | **21ISE645.4 21ISE645.5** | **8 Hours** |
| Key management and distribution, symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Kerberos, Intrusion detection system, Virus and related threats . | | | |
| Text Book | Text Book 2: 4.1,4.2,4.3 | | |
| **MODULE-5** | **E-MAIL, IP & WEB SECURITY:** | **21ISE645.6** | **8 Hours** |
| **E-mail Security:** Security Services for E-mail-attacks possible through E-mail, Pretty Good Privacy, S/MIME. **IP Security:** Overview of IPSec - IP and IPv6-Authentication Header, Encapsulation Security Payload (ESP). **Web Security:** SSL/TLS Basic Protocol, Secure Electronic Transaction (SET).p | | | |
| Text Book | Text Book 2 :5.1,5.2,6.1,6.2,6.3,7.1,7.2 | | |

**CIE Assessment Pattern (50 Marks – Theory)**

| Bloom's Taxonomy | Tests (25 Marks) | NPTEL (25 Marks) |
|---|---|---|
| Remember | 5 | - |
| Understand | 5 | 5 |
| Apply | 5 | 5 |
| Analyze | 5 | 5 |
| Evaluate | 5 | 10 |
| Create | - | - |

**SEE Assessment Pattern (50 Marks – Theory)**

| Bloom's Taxonomy | Tests |
|---|---|
| Remember | 10 |
| Understand | 20 |
| Apply | 05 |
| Analyze | 10 |

| | |
|---|---|
| Evaluate | 05 |
| Create | - |

**Suggested Learning Resources:**

**Text Books:**

1. William Stallings "Network Security Essentials Applications and Standards",2nd ed.,Pearson Education, 2009.
2. William Stallings, "Cryptography and Network security", 8th ed., Pearson Education,Reprint: 2022.

**Reference Books:**

1. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2017
2. Data and Computer Communication,WilliamStallings,10thEdition,PearsonEducation,2014
3. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.
4. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.sss
5. Wayne Tomasi: Introduction to Data Communications and Networking, Pearson Education, 2005.

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

1. https://www.cisecurity.org/
2. https://www.sans.org/network-security/
3. https://thehackernews.com/
4. https://www.theregister.co.uk/
5. https://www.darkreading.com

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Demonstration of various Classical Encryption techniques.
- Demonstration of DES, AES and RSA algorithms.
- Demonstration of MD5 and SHA.
- Video demonstration of latest trends in Network Security.
- Contents related activities (Activity-based discussions)
  - For active participation ofstudents, instruct the students to prepare Flowcharts and Handouts
  - Organizing Group wise discussions on issues
  - Seminars

| SOCIAL CONNECT & RESPONSIBILITY | | | |
|---|---|---|---|
| **Course Code** | **21ISK65** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **02** | **Total Marks** | **100** |
| **Credits** | **01** | **Exam Hours** | **02** |

**Course outcomes:**

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

| | |
|---|---|
| **21ISK65**.1 | Realize social responsibility through societal activities |
| **21ISK65**.2 | Review the history and culture of city through community interaction |
| **21ISK65**.3 | Develop responsible connection for societal benefits |
| **21ISK65**.4 | Cultivate the best practices for diverse scenarios |
| **21ISK65**.5 | Build planning and organizational skills |
| **21ISK65**.6 | Develop deep drive into societal challenges being addressed by NGO(s), social enterprises & the Government |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **21ISK65**.1 | - | - | - | - | - | 3 | 2 | 2 | 3 | 2 | - | 1 | - | - |
| **21ISK65**.2 | - | - | - | - | - | 3 | 2 | 2 | 3 | 2 | - | 1 | - | - |
| **21ISK65**.3 | - | - | - | - | - | 3 | 2 | 2 | 3 | 2 | - | 1 | - | - |
| **21ISK65**.4 | - | - | - | - | - | 3 | 2 | 2 | 3 | 2 | - | 1 | - | - |
| **21ISK65**.5 | - | - | - | - | - | 3 | 2 | 2 | 3 | 2 | - | 1 | - | - |
| **21ISK65**.6 | - | - | - | - | - | 3 | 2 | 2 | 3 | 2 | - | 1 | - | - |

| **MODULE-1** | **PLANTATION AND ADOPTION OF A TREE** | **21ISK65.1, 21ISK65.2** | **3 Hours** |
|---|---|---|---|

Plantation of a tree that will be adopted for four years by a group of B.E students. They will also execute a documentary or a photoblog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature.

| | |
|---|---|
| Self-study / Case Study / Applications | Department Specific Self-study / Case Study / Applications can be added. |

| **MODULE-2** | **HERITAGE WALK AND CRAFTS CORNER** | **21ISK65.1, 21ISK65.2, 21ISK65.3** | **3 Hours** |
|---|---|---|---|

Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photoblog and documentary on evolution and practice of various craft forms.

| | |
|---|---|
| Self-study / Case Study / Applications | Department Specific Self-study / Case Study / Applications can be added. |

| **MODULE-3** | **ORGANIC FARMING AND WASTE MANAGEMENT** | **21ISK65.4, 21ISK65.5** | **3 Hours** |
|---|---|---|---|

Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus

| | |
|---|---|
| Self-study / Case Study / Applications | Department Specific Self-study / Case Study / Applications can be added. |

| **MODULE-4** | **WATER CONSERVATION** | **21ISK65.4,** | **3 Hours** |
|---|---|---|---|

| | | | |
|---|---|---|---|
| | | **21ISK65.5, 21ISK65.6** | |
| Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices. | | | |
| Self-study / Case Study / Applications | Department Specific Self-study / Case Study / Applications can be added. | | |
| **MODULE-5** | **FOOD WALK** | **21ISK65.3, 21ISK65.4** | **3 Hours** |
| City's culinary practices, food lore, and indigenous materials of the region used in cooking. | | | |
| Self-study / Case Study / Applications | Department Specific Self-study / Case Study / Applications can be added. | | |

**CIE Assessment Pattern (50 Marks – Activity based) –**

- **Each module is evaluatedfor50 Marks and average of all the five modules will be the final marks.**

| CIE component for each module | Marks |
|---|---|
| Planning and scheduling the social connect | 15 |
| Information/Data collected during the social connect | 15 |
| Analysis of the information/data and report writing | 20 |
| **Total (each module)** | **50** |

**SEE Assessment Pattern (50 Marks – Activity based)**

| SEE | Marks |
|---|---|
| Presentation | 20 |
| Jamming session / Open Mic | 15 |
| Group discussion / debate | 15 |
| **Total** | **50** |

**Activity-Based Learning / Practical Based learning**

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

**Pedagogy:**

- 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)
- 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.
- Studentsshouldpresenttheprogressoftheactivitiesasperthescheduleintheprescribedpracticalsessioninthefield.
- There should be positive progress in the vertical order for the benefit of society in general through activities.

**Plan of Action:**

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

- Practice Session Description:
    - Lecture session in field to start activities
    - Students Presentation on Ideas
    - Commencement of activity and its progress
    - Execution of Activity
    - Case study-based Assessment, Individual performance
    - Sector/ Teamwise study and its consolidation
    - Videobasedseminarfor10minutes by each student at the end of semester with Report.

| **Module Name** | **Group Size** | **Location** | **Magnitude** | **Activity** | **Reporting** |
|---|---|---|---|---|---|
| Plantation and adoption of a tree | 03–05 | Farmers Land or Roadside or Community area or institution's campus, anyone location to be selected. | Students must monitor till end of B Tech degree | Site selection<br>Select suitable species in consultation with horticulture, forest or agriculture department.<br>Interact with NGO/Industry and community to plant Tag the plant for continuous monitoring | Report shall behand written with paintings, sketches, poster, video and/or photograph with Geotag. |
| Heritage walk and crafts corner | 03-05 | Preferably Within the city where institution is located or home town of the student group | One or two: One can be a structure or a heritage building the other can be heritage custom or practice | Survey in the form of questioner by connecting to the people and asking.<br>No standard questioner to be given by faculty and has to be evolved involving students.<br>Questions during survey can be asked in local language but report language is English. | |
| Waste management | 03-05 More than one group Can be assigned one task based on magnitude of task. | Preferably in the near by villages and within the campus. | One | Report on importance and benefits of Waste management.<br>Report on segregation, collection, transportation and disposal. Suggestion for composting.<br>Visit near by village/location to sensitize farmers and public about waste management and also document | |
| Water Conservation | 03–05 | Rain water harvesting demonstration available in the campus or surroundings | One | Visit lakes/pond/river/drywell to involve on rejuvenation activity.<br>Or<br>Assessment of Water budget in the campus / village<br>Report on traditional water conservation practices(to | |

| | | | | | |
|---|---|---|---|---|---|
| | | | | minimize wastage) | |
| Food Walk | 03-05 | Within the city where institution is located<br><br>Food culture of student's resident region | One | Survey local food centers and identify the specialty<br>Identify and study the food ingredients<br>Report on the regional foods<br>Report on Medicinals values of the local food grains, and plants. | |

| **Innovation/ Entrepreneurship/ Societal Internship** | | | |
|---|---|---|---|
| **Course Code** | **21ISE66** | **CIE Marks** | **50** |
| **L: T:P: S** | **0:0:3:0** | **SEE Marks** | **50** |
| **Teaching Hrs/Week** | **40** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| **21ISE66.1** | Acquire expertise in employing industry-specific tools, software, and methods, showcasing adeptness in executing technical tasks relevant to the field or industry |
| **21ISE66.2** | Develop problem-solving abilities within the technical domain, including the capacity to identify, analyze, and resolve technical issues or challenges efficiently and effectively |
| **21ISE66.3** | Gain practical, hands-on experience by applying theoretical knowledge in real-world scenarios, projects, or tasks relevant to the technical field |
| **21ISE66.4** | Learn to critically analyze technical information, data, or systems to assess their efficiency, accuracy, and applicability, contributing to improved processes or innovations |
| **21ISE66.5** | Cultivate skills in working collaboratively within a team, demonstrating effective communication, sharing knowledge, and contributing towards common technical objectives or projects |
| **21ISE66.6** | Enhance professional skills such as time management, adaptability, and attention to detail within a technical setting, preparing for the demands and expectations of a professional career |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO 2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **21ISE66.1** | - | - | - | - | 3 | 3 | 2 | 2 | 3 | 2 | - | 1 | - | 2 |
| **21ISE66.2** | - | - | - | - | 3 | 3 | 2 | 2 | 3 | 2 | - | 1 | - | 2 |
| **21ISE66.3** | - | - | - | - | 3 | 3 | 2 | 2 | 3 | 2 | - | 1 | - | 2 |
| **21ISE66.4** | - | - | - | - | 3 | 3 | 2 | 2 | 3 | 2 | - | 1 | - | 2 |
| **21ISE66.5** | - | - | - | - | 3 | 3 | 2 | 2 | 3 | 2 | - | 1 | - | 2 |
| **21ISE66.6** | - | - | - | - | 3 | 3 | 2 | 2 | 3 | 2 | - | 1 | - | 2 |

**Mandatory Internship Guidelines**
**(For 2021 -22 Scheme)**

## Introduction

The rise in global competition has prompted organizations to devise strategies to have a talented and innovative workforce to gain a competitive edge. Developing an internship policy is an impactful strategy for creating a future talent pool for the industry. The internship (a form of experiential learning) program helps fresh pass–outs in gaining professional know-how and benefits corporate sectors. The internship also enhances thestudent's employability skills passing out from Technical Institutions. [AICTE Internship Policy.pdf page 4]

The following list provides a brief illustrative overview of the knowledge, skills, work habits, and character traits commonly associated with 21st-century skills and to be acquired by graduates:

1. Critical thinking, problem-solving, reasoning, analysis, interpretation, synthesizing information.
2. Scientific literacy and reasoning, the scientific method.
3. Research skills and practices, interrogative questioning.
4. Creativity, artistry, curiosity, imagination, innovation, personal expression.
5. Information and communication technology (ICT) literacy, media and internet literacy, data interpretation, and analysis, computer programming.
6. Oral and written communication, public speaking and presenting, listening.
7. Economic and financial literacy, entrepreneurialism.
8. Global awareness, multicultural literacy, humanitarianism.
9. Environmental and conservation literacy, ecosystems understanding.
10. Civic, ethical, and social-justice literacy.
11. Leadership, teamwork, collaboration, cooperation, facility in using virtualworkspaces.
12. Perseverance, self-direction, planning, self-discipline, adaptability, initiative.
13. Health and wellness literacy, including nutrition, diet, exercise, and publichealth and safety.

The internship experience will augment the outcome-based learning process andinculcate various attributes mentioned above in a student in line with the graduate attributes defined by the NBA and NEP 2020.

Following are the intended objectives of internship training;

**(i)** Expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence create competent professionals in the industry.

**(ii)** Provide possible opportunities to learn, understand and sharpen the real-time technical/managerial skills required at the job.

**(iii)** Get exposed to the current technological developments relevant to the subject area of training.

**(iv)** Use the experience gained from the industrial internship in discussions held in the classrooms.

**(v)** Create conditions conducive to the quest for knowledge and its applicability on the job.

**(vi)** Learn to apply Technical knowledge in real industrial situations.

**(vii)** Gain experience in writing reports in Technical works/projects.

**(viii)** Expose students to the engineer's responsibilities and ethics.

**(ix)** Familiarize with various materials, processes, products, and applications along with relevant aspects of quality control and safety measures.

**(x)** Promote academic, career, and/or personal development.

**(xi)** Expose the students to future employers.

**(xii)** Make students available to industry for employment.

**(xiii)** Understand the psychology of the workers and their habits, attitudes, and approach to problem-solving.

**(xiv)** Understand the social, economic, and administrative considerations that influence the working environment of industrial organizations.

Internship training helps the institute to:

**(a)** Build and enhance industrial relations.

**(b)** Make the placement process easier.

**(c)** Improve institutional credibility & branding.

**(d)** Improve the teaching-learning process.

**(e)** Expose of Staff to Industrial process.

**(f)** Serve humankind.

**Internship - II involving Innovation/ Societal /Entrepreneurship**

**Scheduled during the intervening period of IV and V semester**

During the intervening period of IV and V semesters, students shall be ready for industrial experience. Therefore, they shall choose to undergo an Internship involving Innovation / Entrepreneurship related activities. Students may choose to work on innovation or entrepreneurial activities or both resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry. In case students want to undergo an internship at his/her family business, he /she shall be permitted provided, a declaration by a parent is submitted directly to the Principal of the institution. [AICTE Internship Policy, Pdf page 8]

With the consent of the internship guide and Principal of the institution, students shall be allowed to carry out the internship at their hometown (within and outside the state), provided favorable facilities are available. [Report and Recommendation of Task Force on Internship in Engineering and Diploma, Task Force Chair Prof Karisiddappa, Hon'bleVice-Chancellorr, VTU, Belagavi]

In case, students wish to take both Innovations, and Entrepreneurship internships, they shall be permitted to take up both. Internship – II period, in such cases, can extend marginally by a few days, provided it will not interfere with the academic calendar ofthe higher semester.

**Innovation**

Innovation refers to a new or improved product or process or a combination there of that differs marginally or significantly from the unit's previous product.

An innovation center is a place where students are encouraged to implement the innovative ideas formed through imagination, brainstorming sessions, design thinking and associated activities to bring them to reality. It is a place, where creative minds are shaped.

**Entrepreneurship**

Entrepreneurship refers to setting up a new business or business, taking on financial risks in the hope of profit. It involves investment to undertake production along with arranging inputs like land, labor, material and capital, introducing new techniques and products, identifying new sources for the enterprise, etc.

**Incubation Center:**

An organized unit designed for innovation as well as to accelerate the growth andsuccess of new entrepreneurial companies through mentorship and an array of businesssupport resources and services that could include physical space, capital, coaching, common services, and networking connections.

**Startup**

An entity that develops a business model based on either product innovation or service innovation and makes it scalable, replicable, and self-reliant. [Gazette Notification No. G.S.R. 127(E)dated February 19, 2019]

An entity shall be considered as a Startup,

- **(i)** Up to a period of ten years from the date of incorporation/ registration, if it is incorporated as a private limited company (as defined in the Companies Act, 2013) or registered as a partnership firm (registered under section 59 of the Partnership Act, 1932) or a limited liability partnership (under the Limited Liability Partnership Act, 2008) in India.
- **(ii)** Turnover of the entity for any of the financial years since incorporation/ registration has not exceeded one hundred crore rupees.
- **(iii)** Entity is working towards innovation, development or improvement of productsor processes or services, or if it is a scalable business model witha high potential of employment generation or wealth creation.

Provided that an entity formed by splitting up or reconstruction of an existing business shall not be considered a Startup. [startup_policy_2019.pdf 10]

**Places of Innovation/Entrepreneurial Activities**

Students shall carry out Innovation or Entrepreneurial activities or both at the IncubationCenter and Entrepreneurship Cell of the parent institution or elsewhere such as ATAL Incubation Centers [A flagship of Atal Innovation Mission (AIM), NITI Aayog for promoting the culture of innovation and entrepreneurship in India], institutes of national importance, public sector units, IT companies, government organizations, and non-governmental organizations, industries including MSME, etc.

Institutes should deter students to opt for internships at places established for commercial benefits.

**Assessment Rubrics for Innovation / Entrepreneurship Activities**

Once the internship begins, the students are required to maintain diary/journal and submit a report every week to the guide. These reports (which can also be submitted by email) should summarize the activities in which the student was involved during the previous week period. At the end of the internship, each student is required to submit the hard copy of the consolidated diary/journal and report for evaluation. The report should clearly indicate the learning and achievements of the internship.

| **MINI PROJECT** | | | |
|---|---|---|---|
| **Course Code** | **21ISE67** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **01** | **Exam Hours** | **03** |

**Course outcomes:**

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

| | |
|---|---|
| **21ISE67.1** | Analyze the Real-world problem through survey of existing problems |
| **21ISE67.2** | Design the modules for solving the problems identified |
| **21ISE67.3** | Implement the design modules with suitable programming language |
| **21ISE67.4** | Test the working modules at different levels |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **21ISE67.1** | 3 | 3 | 3 | 2 | 3 | - | 1 | 1 | 3 | 1 | 3 | 2 |
| **21ISE67.2** | 3 | 3 | 3 | 2 | 3 | - | 1 | 1 | 3 | 1 | 3 | 2 |
| **21ISE67.3** | 3 | 3 | 3 | 2 | 3 | - | 1 | 1 | 3 | 1 | 3 | 2 |
| **21ISE67.4** | 3 | 3 | 3 | 2 | 3 | - | 2 | 1 | 3 | 1 | 3 | 2 |

**Mapping of Course Outcomes to Program Specific Outcomes:**

Use C,C++,Java, C#, PHP, Python, or any other similar front-end tool. All applications must be demonstrated ondesktop/laptop as a stand-alone or web based application.

**Note :**

- Every student should do mini project in a team consists of maximum 2 members in the areas suggested by the department expert committee
- Minimum 2 reviews will be conducted by the department expert committee to know the progress of themini project work
- In each review student should give presentation on the work carried out and show the relevant models/output
- A mini project report should be submitted to the department at the end of the mini project work
- Plagiarism check for the report : Similarity index of the report should not exceed more than 30%.

**CIE - Continuous Internal Evaluation (50 Marks)**

| **Bloom's Category** | **Tests (50 Marks)** |
|---|---|
| Remember | - |
| Understand | - |
| Apply | - |
| Analyze | - |
| Evaluate | 25 |
| Create | 25 |

**SEE – Semester End Examination (50 Marks)**

| Bloom's Taxonomy | Marks |
|---|---|
| Remember | - |
| Understand | - |
| Apply | - |
| Analyze | - |
| Evaluate | 25 |
| Create | 25 |

| NATIONAL SERVICE SCHEME (NSS) | | | |
|---|---|---|---|
| **Course Code** | **21NSS84** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **00** | **Exam Hours** | **2** |

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

| | |
|---|---|
| 21NSS84.1 | Understand the importance of his / her responsibilities towards society |
| 21NSS84.2 | Analyze the environmental and societal problems/issues and will be able to design solutions for the same. |
| 21NSS84.3 | Evaluate the existing system and to propose practical solutions for the same for sustainable development. |
| 21NSS84.4 | Implement government or self-driven projects effectively in the field. |

**Mapping of Course Outcomes to Program Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21NSS84.1 | - | - | - | - | - | 3 | 1 | 1 | 3 | 2 | 2 | 1 |
| 21NSS84.2 | - | - | - | - | - | 3 | 1 | 1 | 3 | 2 | 2 | 1 |
| 21NSS84.3 | - | - | - | - | - | 3 | 1 | 1 | 3 | 2 | 2 | 1 |
| 21NSS84.4 | - | - | - | - | - | 3 | 1 | 1 | 3 | 2 | **2** | 1 |

| Semester | CONTENT | HOURS |
|---|---|---|
| 5th to 8th | **PART A**<br>ONENSS–CAMP @College/University/State or Central Govt Level/ NGO's/General Social Camps<br>**PART B**<br>**1.** Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing<br>**2.** Waste management–Public, Private and Govtorganization,5R's.<br>**3.** Setting of the information imparting club for women leading to contribution in social and economic issues.<br>**4.** Water conservation techniques–Role of different stakeholders–Implementation.<br>**5.** Preparing an actionable business proposal for enhancing the village income and approach for implementation.<br>**6.** Helping local schools to achieve good results and enhance their enrolment in Higher/technical/vocational education.<br>**7.** Developing Sustainable Water management system for rural areas and implementation approaches. | Total 32 Hrs/ Semester<br><br>2 Hrs/week |
| | **8.** Contribution to any national level initiative of Government of India. For. eg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.<br>**9.** Spreading public awareness under rural outreach programs. (minimum5programs).<br>**10.** Organize National integration and social harmony events/workshops / Seminars. (Minimum02programs).<br>**11.** Govt. school Rejuvenation and helping them to achieve good infrastructure. | |

**CIE Assessment Pattern (50 Marks – Practical) –**

1. **PART A:** Compulsorily students have to attend one camp.
2. **PART B:** Students have to take up anyone activity on the above said topics and have to prepare content for awareness and technical contents for implementation of the projects and have to present strategies for implementation of the same.
3. CIE will be evaluated based on their presentation, approach and implementation strategies.

| CIE Components | Marks |
|---|---|
| Presentation1-Selection of topic-(phase1) | 10 |
| Experiential Learning Presentation 2 (phase2) | 10 |
| Case Study-based Teaching-Learning | 10 |
| Sector-wise study & consolidation | 10 |
| Video based seminar (4-5 minutes per student) | 10 |
| **Total** | **50** |

**SEE Assessment Pattern (50 Marks – Practical)**

- Implementation strategies of the project with report duly signed by the Dept's Coordinator, HoD and Principal.
- At last it should be evaluated by the NSS Coordinator.
- Finally consolidated report should be sent to the University.

**Suggested Learning Resources:**

**Reference Books:**

1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.

**Pre-requisites to take this Course:**

1. Students should have a service-oriented mindset and social concern.
2. Students should have dedication to work at any remote place, anytime with available resources and proper time management for the other works.
3. Students should be ready to sacrifice some of the time and wishes to achieve service-oriented targets on time.

| PHYSICAL EDUCATION (PE) (SPORTS AND ATHLETICS) | | | |
|---|---|---|---|
| **Course Code** | **21PES84** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **00** | **Exam Hours** | **02** |

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

| | |
|---|---|
| 21PES84.1 | Demonstrate the starting and finishing positions of different track and jump events. |
| 21PES84.2 | Demonstrate the holding and releasing stances in various throwing events, and takeoff and landing position in various jumping events of Athletics. |
| 21PES84.3 | Demonstrate the specific skills and techniques of the selected game/event. |
| 21PES84.4 | Demonstrate and describe the rules and regulations of specific games. |

**Mapping of Course Outcomes to Program Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21PES84.1 | - | - | - | - | - | - | - | 1 | 2 | - | - | 1 |
| 21PES84.2 | - | - | - | - | - | - | - | 1 | 2 | - | - | 1 |
| 21PES84.3 | - | - | - | - | - | - | - | 1 | 2 | - | - | 1 |
| 21PES84.4 | - | - | - | - | - | - | - | 1 | 2 | - | - | 1 |

| Semester | CONTENT | HOURS |
|---|---|---|
| 5th | **Fitness Components:** Meaning and Importance, Fit India Movement, Definition of fitness, Components of fitness, Benefits of fitness, Types of fitness and Fitness tips.<br>**Practical Components:** Speed, Strength, Endurance, Flexibility, and Agility<br>**Athletics**:<br>1. Track -Sprints:<br>• Starting Techniques: Standing start and Crouch start(its variations)use of Starting Block.<br>• Acceleration with proper running techniques.<br>• Finishing technique: Run Through, Forward Lunging and Shoulder Shrug.<br>2. Jumps- Long Jump: Approach Run, Take-off, Flight in the air (Hang Style/Hitch Kick)and Landing<br>3. Throws- Shot Put: Holding the Shot, Placement, Initial Stance, Glide, Delivery Stance and Recovery (Perry O'Brien Technique)<br><br>**Kabaddi OR Kho-Kho**<br>**Kabaddi:**<br>A. Fundamental skills<br>1. Skills in Raiding: Touching with hands, Use of leg-toe touch, squat leg thrust, side kick, mule kick, arrow fly kick, crossing of baulk line. Crossing of Bonus line.<br>2. Skills of holding the raider: Various formations, catching from particular position, different catches, catching formation and techniques.<br>3. Additional skills in raiding: Escaping from various holds, techniques of escaping from chain formation, offense and defense.<br>4. Game practice with application of Rules and Regulations.<br><br>B. Rules and their interpretations and duties of the officials.<br><br>**Kho-Kho:**<br>A Fundamental skills<br>1. Skills in Chasing: Sit on the box (Parallel &Bullet toe method),Getup from the box(Proximal & Distal foot method),Give Kho(Simple, Early, Late& | Total 32 Hrs/ Semester<br><br>2 Hrs/week |

| | | |
|---|---|---|
| | Judgment),Pole Turn, Pole Dive, Tapping, Hammering, Rectification of foul.<br>2. Skills in running: Chain Play, Ring play and Chain & Ring mixed play.<br>3. Game practice with application of Rules and Regulations.<br><br>B. Rules and their interpretations and duties of the officials**.** | |
| **6th** | **Athletics**:<br>1. Track -110 Mtrs and 400Mtrs:<br>• Hurdling Technique: Lead leg Technique, Trail leg Technique, Side Hurdling, Over the Hurdles<br>• Crouch start (its variations)use of Starting Block.<br>• Approach to First Hurdles, In Between Hurdles, Last Hurdles to Finishing.<br>2. Jumps- High jump: Approach Run, Take-off, Bar Clearance (Straddle) and Landing.<br>3. Throws- Discus Throw: Holding the Discus, Initial Stance Primary Swing, Turn, Release and Recovery (Rotation in the circle).<br><br>**Volleyball OR Throw Ball**<br>**Volleyball:**<br>A. Fundamental skills<br>1. Service: Under arm service, Side arm service, Tennis service, Floating service.<br>2. Pass: Under arm pass, Over-head pass.<br>3. Spiking and Blocking.<br>4. Game practice with application of Rules and Regulations<br><br>B. Rules and their interpretation and duties of officials.<br><br>**Throw Ball:**<br>A. Fundamental skills:<br>Over hand service, Side arm service, two hand catching, one hand over head return, side arm return.<br>B. Rules and their interpretations and duties of officials<br><br>**Football OR Hockey**<br>**Football:**<br>A. Fundamental Skills<br>1. Kicking: Kicking the ball with inside of the foot, Kicking the ball with Full Instep of the foot, Kicking the ball with Inner Instep of the foot, Kicking the ball with Outer Instep of the foot and Lofted Kick.<br>2. Trapping: Trapping- the Rolling ball, and the Bouncing ball with sole of the foot.<br>3. Dribbling: Dribbling the ball with Instep of the foot, Dribbling the ball with Inner and Outer Instep of the foot.<br>4. Heading: In standing, running and jumping condition.<br>5. Throw-in: Standing throw-in and Running throw-in.<br>6. Feinting: With the lower limb and upper part of the body.<br>7. Tackling: Simple Tackling, Slide Tackling.<br>8. Goal Keeping: Collection of Ball, Ball clearance-kicking, throwing and deflecting.<br>9. Game practice with application of Rules and Regulations.<br><br>C. Rules and their interpretation and duties of officials.<br><br>**Hockey:** | |

| | | |
|---|---|---|
| | A. Fundamental Skills<br>1. Passing: Short pass, Longpass, pushpass, hit<br>2. Trapping.<br>3. Dribbling and Dozing<br>4. Penalty stroke practice.<br>5. Penalty corner practice.<br>6. Tackling: Simple Tackling, Slide Tackling.<br>7. Goal Keeping, Ball clearance- kicking, and deflecting.<br>8. Game practice with application of Rules and Regulations.<br>B. Rules and their interpretation and duties of officials. | |
| **7th** | **Athletics**:<br>1. Track -Relay Race:<br>• Starting, Baton Holding/Carrying, Baton Exchange in between zone, and Finishing<br>• Crouch start (its variations) use of Starting Block.<br>• Approach to First Hurdles, In Between Hurdles, Last Hurdles to Finishing.<br>2. Jumps- Triple Jump: Approach Run, Take-off, Flight in the Hop, Step, Jump and Landing<br>3. Throws- Javelin Throw: Grip, Carry, and Recovery (3/5 Impulse stride). Release<br>**Cricket OR Baseball**<br>**Cricket:**<br>A. Fundamental skills<br>1. Batting- Forward Defense Stroke, Backward Defense Stroke, OffDrive, On Drive, Straight Drive, Cover Drive, Square Cut.<br>2. Bowling-Out-swing, In-swing Off Break, Leg Break and Googly.<br>3. Fielding: Catching - The High Catch, The Skim Catch, The Close Catch and throwing at the stumps from different angles. Long Barrier and Throw, Short Throw, Long Throw, Throwing on the Turn.<br>4. Wicket Keeping<br>B. Rules and their interpretation and duties of officials.<br><br>**Baseball:**<br>A. Fundamental skills:<br>1. Player Stances – walking, extending walking, L stance, cat stance Grip – standard grip, choke grip<br>2. Batting – swing and bunt.<br>3. Pitching<br>4. Baseball: slider, fast pitch, curve ball, drop ball, rise ball, change up, knuckle ball, screw ball<br>B. Rules and their interpretations and duties of officials<br><br>**Basketball OR Net Ball**<br>**Basketball:**<br>A. Fundamental Skills<br>1. Passing: Two hand Chest Pass, Two hands Bounce Pass, One hand Baseball Pass, Side arm Pass, Overhead Pass, Hook Pass.<br>2. Receiving: Two hand receiving, One hand receiving, Receiving in stationary position, Receiving while Jumping and Receiving while Running.<br>3. Dribbling: How to start dribble, drop dribble, High Dribble, Low Dribble, Reverse Dribble, Rolling Dribble.<br>4. Shooting: Lay-up shot and its variations, One hand set shot, Two hands jump shot, Hook shot, Free Throw.<br>5. Rebounding: Defensive rebound and Offensive rebound. | |

| | | |
|---|---|---|
| | 6. Individual Defence: Guarding the player with the ball and without the ball, Pivoting.<br>7. Game practice with application of Rules and Regulations.<br><br>**Netball:**<br>A. Fundamental Skills<br>1. Catching: one handed, two handed, with feet grounded and in flight.<br>2. Throwing (Different passes and their uses): One hand passes (shoulder, high shoulder, underarm, bounce, lob), two hand passes (Push, overhead and bounce).<br>3. Footwork: Landing on one foot, landing on two feet, Pivot, Running pass.<br>4. Shooting: One hand, forward step shot, and backward step shot.<br>5. Techniques of free dodge and sprint, sudden sprint, sprint and stop, sprinting with change at speed.<br>6. Defending: Marking the player, marking the ball, blocking, inside the circle, outside the circle. Defending the circle edge against the passing.<br>7. Intercepting: Pass and shot.<br>8. Game practice with application of Rules and Regulations.<br>B. Rules and their interpretation and duties of officials. | |
| **8th** | **Athletics**:<br>A. Track -Combined Events:<br>a. Heptathlon all the 7 events<br>b. Decathlon: All 10 Events<br>B. Jumps- Pole Vault: Approach Run, Planting the Pole, Take-off, Bar Clearance and Landing.<br>C. Throws- Hammer Throw: Holding the Hammer, Initial Stance Primary Swing, Turn, Release and Recovery (Rotation in the circle).<br>**Shuttle Badminton OR Table Tennis**<br>**Shuttle Badminton:**<br>A. Fundamental skills<br>D. Basic Knowledge: Various parts of the Racket and Grip.<br>E. Service: Short service, Long service, Long-high service.<br>F. Shots: Over head shot, Defensive clear shot, Attacking clear shot, Drop shot, Net shot, Smash.<br>G. Game practice with application of Rules and Regulations.<br>B. Rules and their interpretation and duties of officials.<br><br>**Table Tennis:**<br>A. Fundamental skills:<br>1. Basic Knowledge: Various parts of the Racket and Grip(Shake Hand & PenHold Grip).<br>2. Stance: Alternate & Parallel.<br>3. Push and Service: Backhand &Forehand.<br>4. Chop: Backhand & Forehand.<br>5. Receive: Push and Chop with both Backhand & Forehand.<br>6. Game practice with application of Rules and Regulations.<br>B. Rules and their interpretations and duties of officials<br><br>**Handball OR Ball Badminton**<br>**Handball:**<br>A. Fundamental Skills<br>1. Catching, Throwing and Ball control,<br>2. Goal Throws: Jumpshot, Centershot, Diveshot, Reverseshot.<br>3. Dribbling: High and low.<br>4. Attack and counter attack, simple counter attack, counter attack from two wings and center. | |

| | | |
|---|---|---|
| | 5. Blocking, Goal Keeping and Defensive skills.<br>6. Game practice with application of Rules and Regulations.<br>B. Rules and their interpretations and duties of officials<br><br>**Ball badminton:**<br>A. Fundamental Skills<br>1. Basic Knowledge: Various parts of the Racket and Grip.<br>2. Service: Short service, Long service, Long-high service.<br>3. Shots: Overhead shot, Defensive clearshot, Attacking clearshot, Dropshot, Netshot, Smash.<br>4. Game practice with application of Rules and Regulations.<br>B. Rules and their interpretation and duties of officials. | |

**CIE Assessment Pattern (50 Marks – Practical) –**

CIE to be evaluated every semester end based on practical demonstration of Sports and Athletics activities learnt in the semester.

| CIE | Marks |
|---|---|
| 5th Semester | 10 |
| 6th Semester | 10 |
| 7th Semester | 15 |
| 8th Semester | 15 |
| **Total** | **50** |

**SEE Assessment Pattern (50 Marks – Practical)**

| SEE | Marks |
|---|---|
| Athletics | 20 |
| Kabaddi OR Kho-Kho | 05 |
| Volleyball / Throw ball | 05 |
| Football/Hockey | 05 |
| Netball/Basketball | 05 |
| Shuttle Badminton / Table Tennis | 05 |
| Handball/ Badminton | 05 |
| **Total** | **50** |

**Suggested Learning Resources:**

**Reference Books:**


1. Saha, A.K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
2. Bandopadhyay,K. Sarir Siksha Parichay, Classic Publishers, Kolkata.
3. Petipus, et al. Athlete's Guide to Career Planning, Human Kinetics.
4. Dharma,P.N. Fundamentals of Track and Field, Khel Sahitya Kendra, New Delhi.
5. Jain,R. Play and Learn Cricket, Khel Sahitya Kendra, New Delhi.
6. Vivek Thani, Coaching Cricket ,Khel Sahitya Kendra, New Delhi.
7. Saha, A. K. Sarir Siksher Ritiniti, Rana PublishingHouse, Kalyani.
8. Bandopadhyay,K. Sarir Siksha Parichay, Classic Publishers, Kolkata
9. Naveen Jain, Play and Learn Basketball, Khel Sahitya Kendra, New Delhi.
10. Dubey,H.C. Basketball, Discovery Publishing House, New Delhi.
11. RachanaJain, Teach Yourself Basketball, Sports Publication.
12. JackNagle,Power Pattern Offences for Winning basketball, Parker Publishing Co., New York.
13. RenuJain, Play and Learn Basketball, Khel Sahitya Kendra, New Delhi.
14. SallyKus, Coaching Volleyball Successfully, Human Kinetics.
15. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
16. Bandopadhyay, K.Sarir Siksha Parichay, Classic Publishers, Kolkata

| YOGA | | | |
|---|---|---|---|
| **Course Code** | **21YOG84** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **00** | **Exam Hours** | **02** |

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

| | |
|---|---|
| 21YOG84.1 | Use Yogasana practices in an effective manner |
| 21YOG84.2 | Become familiar with an authentic foundation of Yogic practices |
| 21YOG84.3 | Practice different Yogic methods such as Suryanamaskara, Pranayama and some of the Shat Kriyas |
| 21YOG84.4 | Use the teachings of Patanjali in daily life. |

**Mapping of Course Outcomes to Program Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21YOG84.1 | - | - | - | - | - | 3 | - | - | 2 | - | - | 1 |
| 21YOG84.2 | - | - | - | - | - | 3 | - | - | 2 | - | - | 1 |
| 21YOG84.3 | - | - | - | - | - | 3 | - | - | 2 | - | - | 1 |
| 21YOG84.4 | - | - | - | - | - | 3 | - | - | 2 | - | - | 1 |

| Semester | CONTENT | HOURS |
|---|---|---|
| **5th** | **Introduction of Yoga:** Aim and Objectives of yoga, Prayer: Yoga,its origin ,history and development. Yoga, its meaning, definitions. Different schools of yoga, importance of prayer<br>**Brief introduction of yogic practices for common man:** Yogic practices for common man to promote positive health<br>**Rules and regulations:** Rules to be followed during yogic practices by practitioner<br>**Misconceptions of yoga:** Yoga its misconceptions, Difference between yogic and non-yogic practices.<br>**Suryanamaskara:**<br>1. Suryanamaskar prayer and its meaning, Need, importance and benefits of Suryanamaskar.<br>2. Suryanamaskar 12 count,2rounds<br>**Kapalabhati:**<br>Meaning, importance and benefits of Kapalabhati - 40strokes/min3rounds<br>**Different types of Asanas**:<br>1. Sitting: Padmasana, Vajrasana, Sukhasana<br>2. Standing: Vrikshana, Trikonasana, Ardhakati Chakrasana<br>3. Prone line: Bhujangasana, Shalabhasana<br>4. Supineline: Utthitadvipadasana, Ardhahalasana, Halasana<br>**Patanjali's Ashtanga Yoga**: Yama, Niyama<br>**Pranayama:** Suryanuloma –Viloma, Chandranuloma-Viloma | Total 32 Hrs/ Semester<br><br>2 Hrs/week |
| **6th** | **Suryanamaskara:** Suryanamaskar 12 count,4rounds<br>**Kapalabhati:** Revision of Kapalabhati -60strokes/min3rounds<br>**Different types of Asanas**:<br>1. Sitting: Paschimottanasana, Ardha Ushtrasana, Vakrasana, Aakarna Dhanurasana<br>2. Standing: Parshva Chakrasana, Urdhva Hastothanasana, Hastapadasana<br>3. Prone line: Dhanurasana<br>4. Supine line: Karna Peedasana, Sarvangasana, Chakraasana<br>**Patanjali's Ashtanga Yoga**: Asana, Pranayama<br>**Pranayama:** Chandra Bhedana, Nadishodhana, Surya Bhedana | |
| **7th** | **Suryanamaskara:** Suryanamaskar 12 count,8rounds | |

| | | |
|---|---|---|
| | **Kapalabhati:** Revision of Kapalabhati - 80strokes/min3rounds<br>**Different types of Asanas**:<br>1. Sitting: Yogamudra in Padmasana, Vibhakta Paschimottanasana, Yogamudra in Vajrasana<br>2. Standing: Parivritta Trikonasana, Utkatasana, Parshvakonasana<br>3. Prone line: Padangushtha Dhanurasana, Poorna Bhujangasana / Rajakapotasana<br>4. Supine line: Navasana/Noukasana, Pavanamuktasana, Sarvangasana<br>**Patanjali's Ashtanga Yoga**: Pratyahara, Dharana<br>**Pranayama:** Ujjayi, Sheetali, Sheektari | |
| **8th** | **Suryanamaskara:** Suryanamaskar 12 count,12rounds<br>**Kapalabhati:** Revision of Kapalabhati - 100strokes/min3rounds<br>**Different types of Asanas**:<br>1. Sitting: Bakasana, Hanumanasana, Ekapada Rajakapotasana<br>2. Standing: Parivritta Trikonasana, Utkatasana, Parshvakonasana<br>3. Prone line: Mayurasana<br>4. Supine line: Setubandhasana, Shavasanaa (Relaxation posture)<br>5. Balancing: Sheershasana<br>**Patanjali's AshtangaYoga**: Dhyana (Meditation), Samadhi<br>**Pranayama:** Bhastrika, Bhramari, Ujjai<br>**Shat Kriyas:** Jalaneti and sutraneti, Sheetkarma Kapalabhati | |

**CIE Assessment Pattern (50 Marks – Practical) –**

CIE to be evaluated every semester end based on practical demonstration of Yogasana learnt in the semester.

| CIE | Marks |
|---|---|
| 5th Semester | 10 |
| 6th Semester | 10 |
| 7th Semester | 15 |
| 8th Semester | 15 |
| **Total** | **50** |

**SEE Assessment Pattern (50 Marks – Practical)**

| SEE | Marks |
|---|---|
| Suryanamaskara | 10 |
| Kapalabhati | 10 |
| Asanas | 10 |
| Patanjali's Ashtanga Yoga | 10 |
| Pranayama / Shat Kriyas | 10 |
| **Total** | **50** |

**Suggested Learning Resources:**

**Reference Books:**


2. Swami Kuvulyananda: Asma (Kavalyadhama, Lonavala)
3. Tiwari, O P: Asana Why and How
4. Ajitkumar: Yoga Pravesha (Kannada)
5. Swami Satyananda Saraswati: Asana Pranayama, Mudra, Bandha (Bihar School of yoga, Munger)
6. Swami Satyananda Saraswati: Surya Namaskar (Bihar School of yoga, Munger)
7. Nagendra H R: The art and science of Pranayama
8. Tiruka: Shatkriyegalu (Kannada)
9. Iyengar B K S: Yoga Pradipika (Kannada)
10. Iyengar B K S: Light on Yoga (English)

# APPENDIX A
## Assessment Pattern

1. Assignment
2. Group Discussions
3. Case Studies
4. Practical Orientation on Design Thinking , Creativity & Innovation
5. Participatory & Industry-Integrated Learning
6. Practical activities/Problem Solving exercises
7. Class Presentations
8. Analysis of Industry/Technical/Business Reports
9. Reports on Industrial Visits
10. Industrial/Social/Rural Projects
11. Participation in external Seminars/Workshop
12. Online/Offline Quizzes

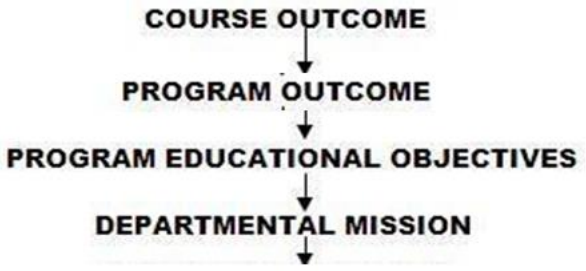
# APPENDIX B

### Outcome Based Education

**Outcome-based education** (OBE) is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience each student should have achieved thegoal. There is no specified style of teaching or assessment in OBE; instead classes, opportunities, and assessments should all help students achieve the specified outcomes. There are three educational Outcomes as defined by the National Board of Accreditation:

**Program Educational Objectives:** The Educational objectives of an engineering degree program are the statements that describe the expected achievements of graduate in their career and also in particular what the graduates are expected to perform and achieve during the first few years after graduation. [nbaindia.org]
**Program Outcomes:** What the student would demonstrate upon graduation. Graduate attributes are separately listed in Appendix C
**Course Outcome:** The specific outcome/s of each course/subject that is a part of the program curriculum.Each subject/course is expected to have a set of Course Outcomes

## Mapping of Outcomes



# APPENDIX C

## The Graduate Attributes of NBA

**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, andan engineering specialization to the solution of complex engineering problems.

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

**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.
**Conduct investigations of complex problems**: The problems that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions that require consideration of appropriate constraints/requirements not explicitly given in the problem statement (like: cost, power requirement, durability, product life, etc.) which need to be defined (modeled) within appropriate mathematical framework that often require use of modern computational concepts and tools.

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

**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.

**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.

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

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

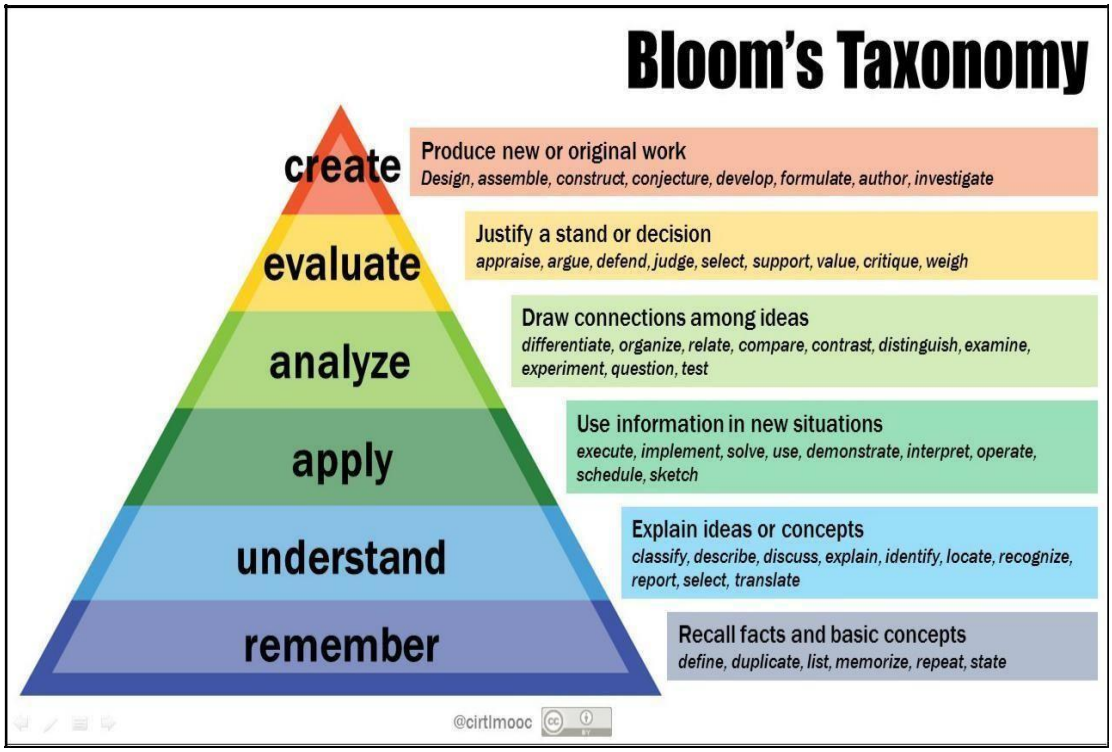
**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
**Project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

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

# APPENDIX D

## BLOOM'S TAXONOMY

**Bloom's taxonomy** is a classification system used to define and distinguish different levels of human cognition—i.e., thinking, learning, and understanding. Educators have typically used Bloom's taxonomy to inform or guide the development of assessments (tests and other evaluations of student learning), curriculum (units, lessons, projects, and other learning activities), and instructional methods such as questioning strategies.



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