

2024-2028

1st YEAR

| SE M- 1 | TYPE OF COURSE | COURSE CODE | COURSE NAME | **OFFERING DEPARTMENT | *COURSE NATURE(NEP) | L | T | P | CONTACT HOURS | NO. OF CREDITS |
|---------------|----------------|------------------------------|---|-----------------------|---------------------|---|---|---|---------------|----------------|
| | BSC | MAH101C | CALCULUS & LINEAR ALGEBRA | MA | MULTIDISCIPLINARY | 3 | 1 | 0 | 4 | 4 |
| | ESC | CSH101C | PROGRAMMING FOR PROBLEM SOLVING USING C | CS | MULTIDISCIPLINARY | 2 | 0 | 0 | 2 | 4 |
| | | CSH102C | PROGRAMMING FOR PROBLEM SOLVING USING C LAB | | | 0 | 0 | 4 | 4 | |
| | BSC | CHS103C | ENVIRONMENTAL SCIENCES | CHEM | MANDATORY COURSES | 2 | 0 | 0 | 2 | 0 |
| | HSMC | HLS101C | PROFESSIONAL ENGLISH | ED | AEC/SEC | 1 | 0 | 0 | 1 | 2 |
| | | | PROFESSIONAL ENGLISH LAB | | | 0 | 0 | 2 | 2 | |
| | BSC | PHH101C | QUANTUM MECHANICS FOR ENGINEERS | PHY | MULTIDISCIPLINARY | 3 | 0 | 0 | 3 | 4 |
| | | PHH102C | QUANTUM MECHANICS FOR ENGINEERS LAB | | | 0 | 0 | 2 | 2 | |
| | PCC | CSW103C | WEB DESIGNING-I | CS | CORE | 0 | 0 | 2 | 2 | 1 |
| ESC | MEW104C | COMPUTER AIDED DRAFTING | ME | MULTIDISCIPLINARY | 0 | 0 | 2 | 2 | 1 | |
| HSMC | CDO103B | PROFESSIONAL COMMUNICATION-I | CDC | AEC/SEC | 2 | 0 | 0 | 2 | 1 | |
| ESC | RDO101B | ENGINEERING EXPLORATION -I | MRIIF | | 0 | 0 | 2 | 2 | 1 | |

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|--|--|--|--------------|--|--|----------------|----------|----------------|-----------|-----------|
| | | | Total | | | 1 3 | 1 | 1 8 | 28 | 18 |
|--|--|--|--------------|--|--|----------------|----------|----------------|-----------|-----------|

| SPECIALIZATIONS BASKET | | | | | | | | | | | |
|------------------------|---------|-------------|--|--|--------|----------|----------------|----------|----------------|----------------|----------------|
| AI ML | PC C | CSS10 4C | DATA MODELLING | | C S | CO RE | 1 | 0 | 0 | 1 | 2 |
| | | | DATA MODELLING LAB | | | | 0 | 0 | 2 | 2 | |
| FSD | PC C | CSS10 5C | DIGITAL TRANSFORMATION & AGILE DEVELOPMENT | | C S | CO RE | 1 | 0 | 0 | 1 | 2 |
| | | | DIGITAL TRANSFORMATION & AGILE DEVELOPMENT LAB | | | | 0 | 0 | 2 | 2 | |
| CST I | PC C | CSS10 6C | INTRODUCTION TO INFORMATION SECURITY | | C S | CO RE | 2 | 0 | 0 | 2 | 3 |
| | | | INTRODUCTION TO INFORMATION SECURITY LAB | | | | 0 | 0 | 2 | 2 | |
| Total AIML | | | | | | | 1 4 | 1 | 1 8 | 2 9 | 1 9 |
| Total FSD | | | | | | | 1 4 | 1 | 1 8 | 2 9 | 1 9 |
| Total CSTI | | | | | | | 1 5 | 1 | 1 8 | 3 0 | 2 0 |

| | TYPE OF COURSE | COURSE CODE | COURSE NAME | **OFFERING DEPARTMENT | *COURSE NATURE(NEP) | L | T | P | CONTACT HOURS | NO. OF CREDITS | |
|--------------|----------------|-------------|--|-----------------------|---------------------|------|---|---|---------------|----------------|---|
| SEM-2 | ESC | ECH103C | FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING | EC | MULTIDISCIPLINARY | 3 | 0 | 0 | 3 | 4 | |
| | | ECH104C | FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING LAB | | | 0 | 0 | 2 | 2 | | |
| | BSC | MAH104C | PROBABILITY & STATISTICS | MA | MULTIDISCIPLINARY | 3 | 1 | 0 | 4 | 4 | |
| | PCC | CSH107C | DATA STRUCTURES | | CS | CORE | 3 | 1 | 0 | 4 | 5 |
| | | | CSH108C | DATA STRUCTURES LAB | | | 0 | 0 | 2 | 2 | |
| | PCC | CSH109C | PYTHON PROGRAMMING | | CS | CORE | 3 | 0 | 0 | 3 | 4 |

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|------------------------------|---|-------------|---|-------|-----------------------|-----------|----------|-----------|-----------------------|-----------|
| | | CSH1 10C | PYTHON PROGRAMMING LAB | | | 0 | 0 | 2 | 2 | |
| | BSC | CHH1 01C | CHEMISTRY-I | CHEM | MULTIDISCIP LINARY | 3 | 0 | 0 | 3 | 4 |
| | | CHH1 02C | CHEMISTRY-I LAB | | | 0 | 0 | 2 | 2 | |
| | HSM C | CDO1 04B | PROFESSIONAL COMMUNICATION- II | CDC | AEC/SEC | 2 | 0 | 0 | 2 | 1 |
| | ESC | RDO1 02B | ENGINEERING EXPLORATION-II | MRIIF | | 0 | 0 | 2 | 2 | 1 |
| | | | TOTAL | | | 17 | 2 | 10 | 29 | 23 |
| | EEC | | Post 2nd Sem Project/Project for Exit Students | | | | | | | 1 |
| Exit Outc ome | UG Certificate in Computer Science (1 year) (Programmer/Website Developer) | | | | | | | | | |
| | | | | | | | | | Year Total | 42 |

| SPECIALIZATIONS BASKET | | | | | | | | | | |
|-------------------------------|-----|-------------|--|----|------|-----------|----------|----------|-----------|----------|
| | | | DATA VISUALIZATION | | | 1 | 0 | 0 | 1 | |
| AIML | PCC | CSS112C | DATA VISUALIZATION LAB | CS | CORE | 0 | 0 | 2 | 2 | 2 |
| FSD | PCC | | USER INTERFACE-ADVANCED | | | 2 | 0 | 0 | 2 | |
| | | CSS113C | USER INTERFACE-ADVANCED LAB | CS | CORE | 0 | 0 | 2 | 2 | 3 |
| CSTI | PCC | CSH114 C | INTRODUCTION TO STANDARDS,FRAMEWORKS AND KEY TECHNOLOGY CONCEPTS | CS | CORE | 3 | 0 | 0 | 3 | 3 |
| | | | Total AIML | | | 18 | 2 | 0 | 30 | 4 |
| | | | Total FSD | | | 19 | 2 | 0 | 11 | 5 |
| | | | Total CSTI | | | 20 | 2 | 0 | 32 | 5 |

| | TYPE OF COURSE | COURSE CODE | COURSE NAME | **OFFERING DEPARTMENT | *COURSE NATURE(NEP) | L | T | P | CONTACT HOURS | NO. OF CREDITS |
|--------------|----------------|--------------|---------------------------------------|-----------------------|---------------------|----------|-----------|-----------|---------------|----------------|
| SEM-3 | PCC | CSH201C | ANALYSIS & DESIGN OF ALGORITHMS | CS | CORE | 3 | 0 | 0 | 3 | 4 |
| | | CSH202C | ANALYSIS & DESIGN OF ALGORITHMS LAB | | | 0 | 0 | 2 | 2 | |
| | PCC | CSH203C | DATABASE MANAGEMENT SYSTEMS | CS | CORE | 3 | 0 | 0 | 3 | 4 |
| | | CSH204C | DATABASE MANAGEMENT SYSTEMS LAB | | | 0 | 0 | 2 | 2 | |
| | PCC | CSH205C | OOPS USING JAVA | CS | CORE | 3 | 0 | 0 | 3 | 4 |
| | | CSH206C | OOPS USING JAVA LAB | | | 0 | 0 | 2 | 2 | |
| | PCC | CSH207C | ARTIFICIAL INTELLIGENCE | CS | CORE | 3 | 0 | 0 | 3 | 4 |
| | | CSH208C | ARTIFICIAL INTELLIGENCE LAB | | | 0 | 0 | 2 | 2 | |
| | BSC | MAH204C | DISCRETE MATHS | MA | MULTIDISCIPLINARY | 3 | 1 | 0 | 4 | 4 |
| | PCC | CSW209C | WEB DESIGNING-II | CS | CORE | 0 | 0 | 2 | 2 | 1 |
| | HSMC | CDO231 | PROFESSIONAL COMPETENCY ENHANCEMENT-I | CDC | AEC/SEC | 4 | 0 | 0 | 4 | 1 |
| | MC | | UHV /UHV II | NIL | MANDATORY COURSES | 3 | 0 | 0 | 3 | 3 |
| | | TOTAL | | | 22 | 1 | 10 | 33 | 25 | |
| AIML | PCC | CSS210C | ADVANCED PYTHON FOR AI | CS | CORE | 1 | 0 | 0 | 1 | 2 |
| | | | ADVANCED PYTHON FOR AI LAB | | | 0 | 0 | 2 | 2 | |
| FSD | PCC | CSS211C | BACKEND DEVELOPMENT | CS | CORE | 2 | 0 | 0 | 2 | 3 |

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|-------------|-----|---------|--------------------------------------|----|------|----------|----------|----------|----------|-----------|
| | | | T WITH NODE JS | | | | | | | |
| | | | BACKEND DEVELOPMENT WITH NODE JS LAB | | | 0 | 0 | 2 | 2 | |
| CSTI | PCC | CSW212C | LINUX | CS | CORE | 0 | 0 | 4 | 4 | 2 |
| | | | Total AIML | | | 2 | 3 | 1 | 0 | 34 |
| | | | Total FSD | | | 2 | 4 | 1 | 0 | 35 |
| | | | Total CSTI | | | 2 | 2 | 1 | 4 | 37 |

| | TYPE OF COURSE | COURSE CODE | COURSE NAME | **OFFERING DEPARTMENT | *COURSE NATURE(NEP) | L | T | P | CONTACT HOURS | NO. OF CREDITS |
|--------------|----------------|-------------------------|-------------------------|-----------------------|---------------------|---|---|---|---------------|----------------|
| SEM-4 | PCC | CSH213C | SOFTWARE ENGINEERING | CS | CORE | 3 | 1 | 0 | 4 | 4 |
| | PCC | CSH214C | COMPUTER NETWORKS | CS | CORE | 3 | 0 | 0 | 3 | 4 |
| | | CSH215C | COMPUTER NETWORKS LAB | | | 0 | 0 | 2 | 2 | |
| | PCC | CSH216C | MACHINE LEARNING | CS | CORE | 3 | 0 | 0 | 3 | 4 |
| | | CSH217C | MACHINE LEARNING LAB | CS | CORE | 0 | 0 | 2 | 2 | |
| | ESC | ECH108C | DIGITAL ELECTRONICS | ECE | MULTIDISCIPLINARY | 3 | 0 | 0 | 3 | 4 |
| | | ECH109C | DIGITAL ELECTRONICS LAB | | | 0 | 0 | 2 | 2 | |
| | PCC | CSW218C | MOBILE APP DEVELOPMENT | CS | CORE | 0 | 0 | 4 | 4 | 2 |
| | MC | LWS101C | INDIAN CONSTITUTION | LAW | Mandatory Courses | 1 | 0 | 0 | 1 | 1 |
| | HSMC | | Research & Innovation-I | CS | AEC/SEC | 1 | 0 | 0 | 1 | 1 |
| HSMC | | PROFESSIONAL COMPETENCY | CDC | AEC/SEC | 4 | 0 | 0 | 4 | 1 | |

Syllabus

| | |
|-------------------------|--|
| Course Title | Calculus & Linear Algebra(MAH101C) |
| Course Type | Core (Allied) |
| Course Nature | Hard |
| L-T-P structure | (3-1-0) |
| Credits | 4 |
| Course Objective | The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines |

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| Course Outcome |
| CO1: Apply the concept of differentiation, partial differentiation, curvature and solve the problems |
| CO2 Apply the concepts of integral and multiple integral and find the area and volume of the problems arising in different engineering problems |
| CO3: Describe the vector spaces and different types of vector spaces, geometrical representation and construction of new vector space. |
| CO4: Apply the concept of eigenvalues and eigenvectors, inner product and Gram Schmidt theorem in solving the real-world problem. |
| CO5: Solve mathematical problems using software (Octave/MATLAB). |

Section A

Calculus: Curvature (Cartesian, Parametric and Polar coordinates), Curvature at origin, Centre of curvature,

Section B

Applications of definite integrals to evaluate surface areas and volumes of revolutions, Double integration, properties of double integration, Evaluation of double integral (Cartesian and Polar coordinates), Change of variables, change of order, Area and volume.

Section C

Vector spaces- 1: Inverse of a matrix (Gauss elimination and Gauss-Jordan elimination), rank of a matrix,

., Vector Space, linear dependence and independence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank nullity theorem, composition of linear maps, Matrix associated with a linear map.

Section D

Vector spaces-2: Eigenvalues, eigenvectors, symmetric, skew-symmetric and orthogonal Matrices, Eigen bases. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Suggested Text/Reference Books

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated EastWest press, Reprint 2005.

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|-----------------------|--|----------------------------------|
| Course Title/Code | Programming for Problem solving using C(CSH101C) | |
| CCourse Type | Core | |
| L-T-P Structure | 2-0-0 | |
| Credits | 2 | |
| Prerequisites | NIL | |
| Course Objective | The students (A) will be able to apply C programming concepts (B) using programming skills (C) to design solutions to solve elementary problems (D). | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Demonstrate foundational skills to solve simple programming problems. | Employability |
| CO2 | Build modular code and manage data efficiently using sequential structures. | Employability |
| CO3 | Apply programming skills to manage and search memory efficiently. | Employability/ Skill Development |
| CO4 | Solve simple problems of organizing, storing and retrieving data using files. | Employability/ Skill Development |

SECTION-A

Introduction: History, Compilation, and Execution, Hierarchy and Associativity of Operations, data types, constants, and variables, Statements, Expressions, Structured Programming.

The Decision Control Structure: Conditions, Relational Operators, Logical Connectives, if statement, if-else statement, switch statement.

SECTION-B

Loops: The while Loop, for Loop, nesting of Loops. Odd Loop, break and continue, The do-while Loop, Use of Logical Operators, infinite loop.

Functions: Modular programming, functions, importance of functions, passing values between functions, scope rule, calling convention, function call, function declaration and prototypes, call by value and call by reference, Standard Library of C functions, return type, recursion.

Arrays: What are Arrays, initialization, passing Array Elements to a Function, Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Null terminated strings as array of characters, Pointers and Arrays, Memory Map of a 2-Dimensional Array.

SECTION-C

Pointers: An Introduction to Pointers, pointer Notation, Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, back to Function Calls, recursion, Call by Reference, functions and pointers, Arrays and Pointers, pointer arrays, pointers and structures, dynamic memory allocation.

Searching: Linear, binary search.

Strings: Introduction, pre-defined Standard library string functions.

SECTION-D

Structures:

Use, Declaring a Structure, Structure variables, initialization, structure assignment, Accessing Structure Elements, How Structure Elements are Stored, Array of Structures, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions, Break, Continue and Goto, Type Conversion; Enumerations; Macros.

File Handling: Pointers to a file, Opening a file, modes for opening the file, reading and writing from a file, writing structures in a file, functions for seeking and moving in the file.

Text Books:

1. E. Balagurusamy, "Programming in ANSI C", McGraw Hill Education, 7th Edition, 2017.
2. Byron Gottfried, "Programming with C", Schaum's Outlines, 3rd Edition, 2017.

Reference Books:

1. Herbert Schildt, "C: The Complete Reference", McGraw Hill Education, 4th Edition, 2000.
2. Yashavant Kanetkar, "Let Us C", BPB Publications, 16th Edition, 2017.
3. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Prentice Hall, 2nd Edition, 1988.

CO-PO Mapping

| Course Outcomes | Programme Outcomes | | | | | | | | | | | PSO 1 | PSO 2 |
|--|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-------|-------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | | |
| CO1: Demonstrate foundational skills to solve simple programming problems. | 3 | - | - | - | 3 | - | - | - | - | - | 2 | 2 | 2 |
| CO2: Build modular code and manage data efficiently using sequential structures. | 3 | 2 | 2 | - | 3 | - | - | - | - | - | 2 | 2 | 2 |
| CO3: Apply programming skills to manage and search memory efficiently. | 3 | 2 | 2 | - | 3 | - | - | - | - | - | 2 | 3 | 2 |
| CO4: Solve simple problems of organizing, | 3 | 2 | 2 | | 3 | | | 1 | - | - | 3 | 2 | 2 |

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|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| storing and retrieving data using files. | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

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|-----------------------|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|
| Course Title/Code | Programming for Problem solving using C(CSH102C) | | | | | | | | | | | | |
| Course Type | Core | | | | | | | | | | | | |
| L-T-P Structure | 0-0-4 | | | | | | | | | | | | |
| Credits | 2 | | | | | | | | | | | | |
| Prerequisites | NIL | | | | | | | | | | | | |
| Course Objective | The students (A) will be able to apply C programming concepts (B) using programming skills (C) to design solutions to solve elementary problems (D). | | | | | | | | | | | | |
| Course Outcomes (COs) | | | | | | | | | | | | Mapping | |
| CO1 | To demonstrate programming skills for solving elementary problems. | | | | | | | | | | | Skill Development | |
| CO2 | To implement procedural programming to solve data organization and management problems. | | | | | | | | | | | Skill Development | |

LIST OF PROGRAMS

1. Basic programs in C, use of if-else construct and switch-case construct.
2. Programs on loops (for, while, do-while) and use of break and continue statements.
3. Programs on functions: call by value, call by reference, recursion.
4. Programs on 1D arrays.
5. Programs on strings and use of standard string library functions.
6. Programs on pointers and pointer arithmetic.
7. Programs using functions and pointers together (e.g., call by reference).
8. Programs on arrays of structures and nested structures.
9. Programs on linear search techniques.
10. Programs on file handling: reading from and writing to files.

CO-PO Mapping for Lab

| Course Outcomes | Programme Outcomes | | | | | | | | | | | PSO 1 | PSO 2 |
|---|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-------|-------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | | |
| CO1: To demonstrate programming skills for solving elementary problems. | 3 | 2 | 2 | - | 3 | - | - | - | - | - | 2 | 2 | 2 |

| | | | | | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO2: To implement procedural programming to solve data organization and management problems. | 3 | 2 | 2 | - | 3 | - | - | 1 | - | - | 3 | 2 | 2 |
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|-------------------------------|---|
| Course Title/ Code | Environmental Sciences (CHS103C) |
| Course Type | Core |
| Course Nature | Hard |
| L-T-P-O Structure | (2-0-0-0) |
| credits | 2 |
| Objectives | Students (A) would be able to apply (B) basics of Environmental Science (C) to Identify areas of environmental degradation (D) and would be able to suggest possible solutions to control or to prevent the same. |

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| Course Outcome |
| CO1: Explain the multidisciplinary dimension of environmental issues |
| CO2 Explain the environmental issues and demonstrate potential solutions |
| CO3: Present the various types of organisms and draw inferences about their interactions in different environmental settings |
| CO4: Explain the principles governing the interactions between social and environmental factors |
| CO5: Create an environmental awareness event/article/campaign/eco-friendly product |

Section-A

Unit 1: Multidisciplinary Nature of Environmental Studies

Definition, scope and importance. Need for public awareness.

Unit 2: Renewable and Non-Renewable Resources

Forest resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources. Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Case studies related to resources.

Section B

Unit 3: Ecosystems

Concept of an ecosystem: Structure and function of an ecosystem - producers, consumers and decomposers, energy flow in the ecosystem. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Ecological succession: Lithosere & hydrosere.

Unit 4: Biodiversity and its conservation

Introduction: Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Hot-spots of biodiversity Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels; India as a mega-diversity nation; Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.

Section C

Unit 5: Environmental Pollution

Definition, cause, effects and control measures of: air pollution, water pollution, noise pollution, thermal pollution. Soil, marine pollution & nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Disaster management: floods, earthquake. Cyclone and landslides. Role of an individual in prevention of pollution. Pollution case studies.

Unit 6: Social Issues and the Environment

From unsustainable to sustainable development, urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental laws: Air (Prevention and Control of Pollution) Act; Water (Prevention and control of Pollution) Act, Climate change, global warming, acid rain, ozone layer depletion. Wasteland reclamation; consumerism and waste products; environmental ethics: Issues and possible solutions; nuclear accidents and holocaust. Case Studies.

Environment Protection Act; Wildlife Protection Act; Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

Section D

Unit 7: Human Population and the Environment

Population growth, variation among nations, Population explosion; Value Education. Family Welfare Programme, Environment and human health; Human Rights; HIV/AIDS; Women and Child Welfare; Role of Information Technology in Environment and human health.

Field work

- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
 - Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
 - Study of common plants, insects, birds.
 - Study of simple ecosystems-pond, river, hill slopes, etc.
- Any socially relevant problem identification and proposing its possible solution

Text Books

1. Perspectives in Environmental Studies, Kaushik and Kaushik, New Age Publishers
2. Comprehensive Environmental Studies, JP Sharma, University Press
3. Environmental Studies for Undergraduate Courses, Prof. Erach Bharucha, UGC

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|--------------------------|--|
| Course Title/Code | Professional English (HLS101C) |
| Course Type | Core |
| L-T-P Structure | (1-0-2) |
| Credits | 2 |
| Course Objective | To articulate communication skills and develop talent for increased understanding of corporate requirements. |

| Course Outcomes (COs) | |
|-------------------------------|--|
| CO1 | To enhance the knowledge of using grammar correctly. |
| CO2 | To develop the ability for conveying ideas, emotions, and information through articulation. |
| CO3 | To showcase the skills necessary for effective presentation with clarity in the professional life. |
| CO4 | To exhibit the substantive writing skills. |
| Prerequisites (if any) | Basic understanding of English Language & grammar |

Section – A

Grammar: Tenses, Sentence: Kinds & Parts, The Phrase, The Clause; Simple, Complex and Compound Sentences, Active & Passive Voices, Direct & Indirect Narration.

Section – B

Oral Communication: Importance of Speech Sounds, Organs of Speech, Vowel Sounds, Consonant Sounds, IPA Symbols, Phonetic Transcription, Stress & Intonation

Section – C

Communication & Self-Disclosure: Effective Self-Disclosure, Openness, Communication and Feedback for Self-Development, Perception & Attitudes, Values & Beliefs, Goal Setting, Career Planning, Self-Esteem, Managing Time, Rapid Reading, Taking Notes, Problem Solving, Creativity.

Section – D

Technical Writing & Editing: Technical Writing, Editing- Technical Writing Process, Writing Drafts and Revising, Collaborative Writing, Creative Indexes, Technical Writing Style and Language. Introduction to Advanced Technical Communication, Usability, Human Factors, Managing Verbal & Non-Verbal Communication.

Lab Activities:

1. **Extempore**
2. **Comprehension**
3. **Essay**
4. **Paraphrasing**
5. **Telephonic Conversation**
6. **Sentence Analysis**
7. **Group Discussion**
8. **Organs of Speech**
9. **Phonetic Transcription**
10. **Job Application & CV**
11. **Draft Writing**
12. **Presentation**
13. **Mock Interview**
14. **Debate**

Suggested Text Book Reading:

CIEFL, Hyderabad. *Exercises in Spoken English Parts I-III*. Oxford University Press.
Gangal, J K. *A Practical Course for Developing Writing Skills in English*. PHI Learning Pvt.

Koneru, Aruna *Professional Communication*. McGraw Hills Education Pvt. Ltd.
Kumar, Sanjay and Pushpa Lata. Oxford University Press, 2011. Print.
Lyons, Liz Hamp and Ben Hearsly. *Study Writing*. Cambridge University Press. 2006. Print.
Pink, M.A. and A.C.

Thomas *English Grammar, Competition and Correspondence*. S. Chand and Co.

Rizvi, M Ashraf. *Effective Technical Communication*. McGraw Hill Education, Chennai, 2018.

Swan, Michael. *Practical English Usage*. OUP, 2014. Print.
Subhrmania, T. Bala. *A Textbook of English Phonetics for Indian Students.*: Macmillan.
Wood, F T. *Remedial English Grammar*. Macmillan, 2007. Print.
Wren and Martin: *High School English Grammar and Composition A Text Book for Indian Students*. S.Chand and Co. ed. Paperback 2018.

Zinsser, William. *On Writing Well*. Harper Resource Book, 2006. Print.

| | |
|-----------------------|---|
| Course Title/Code | QUANTUM MECHANICS FOR ENGINEERS (PHH101C) |
| Course Type | Core |
| Course Nature | Hard |
| L-T-P Structure | 3-0-0 |
| Credits | 03 |
| Course Objectives | To equip students with a foundational understanding of quantum mechanics, and explore its connections for advancements in quantum computing. |
| Course Outcomes (COs) | |
| CO1 | Understand fundamental phenomena like photoelectric effect and Compton effect that demonstrated particle nature of light. Explain how these observations led to the development of Quantum Mechanics. |
| CO2 | Analyze systems in different potential fields using Schrödinger's wave equation. |
| CO3 | Apply the abstract formalism of quantum mechanics to solve simple problems in quantum mechanics. |
| CO4 | Understand the basics of quantum computing. |

SYLLABUS:

Section A: Introduction to Quantum mechanics

Qualitative description of black body radiation; Photo-electric effect and Compton effect; Wave nature of matter: de Broglie hypothesis; Born interpretation; Normalized wave functions, Probability current; Phase and group velocity; Heisenberg's uncertainty principle and its applications; Time dependent Schrödinger equation; Time independent Schrödinger equation(10 lectures)

Section B: Applications of Schrödinger equation for stationary state solutions

Numerical solution of stationary state Schrödinger equation for different potentials: Free particle, Particle in a one-dimensional box (extension to three dimensions), One-dimensional harmonic oscillator potential, Particle in attractive delta function potential; Scattering from a

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| Course Title/Code | QUANTUM MECHANICS FOR ENGINEERS LAB (PHH102C) |
| Course Type | Core |
| Course Nature | Hard |
| L-T-P Structure | 0-0-2 |
| Credits | 01 |
| Course Objectives | To enable students to work collaboratively and communicate effectively in a scientific setting by designing and conducting experiments, analyzing data, and presenting findings. |
| Course Outcomes (COs) | |
| CO1 | Students will be able to conduct experiments to investigate various scientific phenomena, analyze the resulting data, draw valid conclusions, and effectively communicate their findings, while collaborating effectively in a team. |

SYLLABUS:

The following experiments need to be performed:

1. To determine the Planck's constant and work function of cathode material.
2. To determine the work function of cathode using Thyatron valve.
3. To determine the energy band gap of a PN junction diode.
4. To determine the Hall coefficient and hence carrier concentration of a material.
5. To study the variation of magnetic field along the axis of a current carrying coil and hence to estimate the radius of the coil.
6. To study the V-I characteristics of a solar cell hence to find the fill factor.
7. To determine the wavelength of laser light using plane transmission diffraction grating.
8. To find the ionization potential and to verify the quantization of energy values using Franck and Hertz Experiment.

Suggested reference books:

- (i) Singh Harnam, Hemne P.S., B.Sc. Practical Physics, Publisher: S Chand & Company; New edition (2000)
- (ii) C. S. Robinson, Dr. Ruby Das, A Textbook of Engineering Physics Practical, Publisher: Laxmi Publications Pvt. Ltd.; II edition (2016)
- (iii) Practical Physics by S.L. Gupta and V. Kumar

CO – PO Mapping

| Course Outcome | Program Outcomes (POs) | | | | | | | | | | | PSOs | |
|-------------------|------------------------|---|---|---|---|---|---|---|---|----|----|------|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 1 | 2 |
| CO1 | - | - | - | 3 | - | - | - | 1 | 1 | - | - | - | - |

| | |
|-------------------------------|---|
| Course Title/ Code | WEB DESIGNING-I (CSW103C) |
| Course Type: | CORE |
| Course Nature: | Workshop |
| L-T-P-O Structure | (0-0-2-0) |
| Credits | 1 |
| Objectives | <ul style="list-style-type: none"> • To introduce students to scripting languages. • To teach students how to create simple web pages using HTML, how to use HTML tags, attributes and different types of HTML elements. • To teach students how to use inline CSS to style their web pages • To familiarize students with the Java script concept. |

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| Course Outcome |
| CO1: Demonstrates the fundamentals of HTML,CSS and JavaScript to create web pages (Knowledge) |
| CO2: Design static web pages layouts with a good aesthetic sense of HTML and CSS structure and semantic components(Comprehension & Applications) |
| CO3: Develop interactive web pages using the JavaScript components (Application) |
| CO4: Apply the concepts to design websites/portfolios using HTML, CSS, and JavaScript for a real world problem majorly focused on SDGs (Application) |

Section-A

INTRODUCTION TO SCRIPTING LANGUAGES: HTML, PHP, PERL, PYTHON etc...

Section-B

INTRODUCTORY CONCEPTS: What Is HTML5, Structure of a Web Page: HTML5 DOCTYPE, Page Encoding, HTML5 Markup, New And Updated Elements, Structural Elements(html, head, body, div, br, hr, p, text formatting, text styles, layouts, marquee, lists: ordered, unordered and definition lists, New Attributes, Deprecated Elements And Attributes.

HTML 5.0 Form, Graphics & Media: HTML5 DOM, Form: new input types & attributes, form validation, HTML canvas and SVG: Drawing shapes, Text & images, working with pixels,

Embedding media: Audio and Video based On Plug-in, New Audio/Video Markup, Attributes and Methods, Audio/Video Events & Controls, Plug-ins in HTML inserting YouTube videos.

Section-C

CSS & CSS3: Introduction to CSS, Syntax, Selectors, Pseudo classes, Applying CSS to backgrounds, Text, Fonts, Links, Lists, Tables, Box Model: Border, Margin, Padding, Dimension, Display, Positioning, Align, CSS to Images and image Opacity, CSS Media Types, CSS Attr Selectors.

CSS3: Introduction, Rounded Corners, Border Images, Backgrounds, Colors, Gradients, Shadows, Fonts and text effects, 2D transforms, 3D Transforms, Transitions & Animations.

Section-D

JAVASCRIPT: JavaScript, Importance, What can JavaScript Do?, Need of JavaScript, JavaScript with HTML Content, Advantages of JavaScript; Attaching an External JavaScript File, Working with Data Types and Variables, operators and expressions; arrays. Functions in JavaScript: Creating & Calling Functions, Sending Parameters to a Function; condition checking, loops, If Structure, If Else Structure, For Loop, While Loop, dialogue boxes.

Mini project: Create a simple to-do list using JavaScript and Create a simple calculator using JavaScript.

List of labs:

1. HTML5.0 Basic Tags
2. HTML5.0: DOM & Forms
3. HTML5.0: Canvas &SVG
4. HTML5.0: Plugins
5. CSS
6. CSS
7. CSS
8. Javascript
9. Javascript
10. Javascript
11. Minor Project

Text Books:

1. Pro HTML5 and CSS3 Design Patterns Paperback – 2012 by Dionysios Synodinos, Michael Bowers, Victor Sumner
2. “Programming JavaScript Applications: Robust Web Architecture with Node, HTML5, and Moderns JS Libraries”
3. Dive into HTML5 by Mark Pilgrim.

Reference Book:

1. “JavaScript for Kids: A Playful Introduction to Programming” by Nick Morgan,.
2. HTML5 Guidelines for Web Developers by Klaus Föster.

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|---------------------------|--|
| Course Title/ Code | COMPUTER AIDED DRAFTING/MEW101C |
| Course Type: | Core |
| Course Nature: | Workshop |
| L-T-P Structure | (0-0-2) |
| Credit | 1 |

| Course Outcome | Mapping |
|---|----------------------------------|
| CO1: Describe the fundamentals of engineering drawing and drafting and can Enhance visualization skill using projections of point and lines. | Employability |
| CO2: Students will be able to understand and perform the 2D drawing on AutoCAD. | Employability/Skill 1 |
| CO3: Students will be able to apply different types of 2D commands of AutoCad and can prepare neat drawings. | Employability/Skill 1 |
| CO4: Students will be able to apply different types of 3D commands of AutoCad. | Employability/Skill 1 |

Section-A

Introduction of Engineering Graphics: Drawing instruments and their uses, Orthographic Projections: Planes of projection–Projection of points in different quadrants. Orthographic Projection of Straight Line parallel to one plane and inclined to the other plane–Straight Line inclined to both the planes–True Length and inclination of lines with reference planes.

Section-B

Introduction: Introduction to Computer Aided Drafting (CAD), Reasons for implementing CAD, Applications of CAD, Benefits/limitations of CAD, Hardware of CAD system, Types of CAD software. Introduction to other drafting software such as Mechanical Desktop and Auto Cad Electrical Introduction to Auto CAD: Starting AutoCAD, AutoCAD screen components, creating a drawing on AutoCAD, invoking different commands, Dialog boxes, Coordinate Systems, Exercises on Drawing of Line, Circle, Arc, Ellipse, Polygon, etc.

Section-C

Drawing Aids and Editing Commands: Layers, Drafting Settings, Object Snaps, Function and Control keys, various Editing Commands, Editing the Objects with Grips, Grip Types. Creating Text, Dimensions and Tolerances in AutoCAD: Creating Text, Editing Text, Styles of Dimensioning, Dimensioning System Variables, Editing/Updating Dimensions, Adding Tolerances.

Section-D

Introduction to 3D modelling tools on AutoCad. 3D viewing techniques, working with simple and composite solids, Creating complex solids and surfaces, Modifying objects in 3D space, editing solids, creating 2D drawings from 3D models, working with the User Coordinate System.

Suggested Text/Reference Books:

- (i) Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
- (ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
- (iii) Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
- (iv) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
- (v) Corresponding set of CAD Software Theory and User Manual.

CO-PO Mapping

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | |
|-----------------|------------------|------|------|------|------|------|------|------|------|-------|-------|-------|---------------------------|-------|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 |
| CO1 | - | - | - | - | 1 | - | - | - | -- | - | - | 3 | 2 | - |
| CO2 | - | - | - | - | 2 | - | - | - | 2 | - | - | 3 | 2 | - |
| CO3 | - | - | - | - | 3 | - | - | - | - | - | 1 | 3 | 2 | - |
| CO4 | - | - | - | - | 3 | - | - | - | - | 1 | 1 | 3 | 2 | - |

| | |
|--------------------------|--|
| Course Title Code | Professional Communication-I (CDO105) |
| Course Type | Core |
| Course Nature | Soft |
| L-T-P Structure | (2-0-0) |
| Credits | 1 |
| Objectives | <ol style="list-style-type: none"> 1. Students will be able to give presentations confidently and also speak fluently in vario public speaking platforms like debate, declamation, and extempore. They will learn to effective use of body language. 2. Students will be skilled in fluent reading 3. Students would be able to understand how they have to be professional in their grooming a attitude 4. Students will be able to write effective letters/ application for professional purposes. |

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| Course Outcome |
| CO1: Develop all-round personality by mastering interpersonal skills |
| CO2: Apply effective communication through grammatically correct language. |
| CO3: Demonstrate effective listening and speaking skills in real life scenarios. |

Syllabus

Unit 1: Attitudinal Communication

- 1.1 Attitude and its Impact on Communication
- 1.2 Courtesy & Politeness in Communication
- 1.3 Diversity & Inclusion – Bullying, Cultural Sensitivity, Stereotypes, Sexual Harassment, LGBTQ, Respect, Chivalry, Racial & Gender Discrimination, Disability Harassment, Inclusion.

Unit 2: Syntactical Communication - I

- 2.1 Common errors in communication
- 2.2 Identification of word class
- 2.3 Errors & rectifications in
 - 2.3.1 Article usage
 - 2.3.2. Tenses usage - Present Perfect vs. Past Simple vs. Past Perfect
 - 2.3.2 Subject Verb Agreement

Unit 3: Phonetics

- 3.1 Impact of First Language Influence
- 3.2 Tone
- 3.3 Intonation
- 3.4 Rate of Speech
- 3.5 Pronunciation: Vowels & Consonant sounds

Unit 4: Developing Communication Skills -I (Listening & Speaking)

- 4.1 Concept of LSRW: Importance of LSRW in communication.
- 4.2 Listening Skills : Real Life challenges, Barriers to Listening
- 4.3 Speaking : Self Introduction, Extempore

Recommended Texts and Readings:

1. Diversity and Inclusion: The Big Six Formula for Success by D.A. Abrams
2. Wren and Martin English Grammar and Composition, S. Chand & Company Pvt. Ltd.
3. Word Power Made Easy by Norman Lewis, Penguin Random House Pvt. Ltd.
4. Soft Skills for the Rigid Worker by Chris Estrada
- 5 . Mastering Soft Skills by Julian Vynner

Assessment Tools:

- Continuous Assessment: Assignments/ Activities/ Quiz
- Mid Term examination
- Term-end examination (Practical)

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

| | |
|-------------------|-----------------------|
| Course Title/Code | Data Modelling |
|-------------------|-----------------------|

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|-----------------------|---|----------------------------------|
| Course Type | Core | |
| L-T-P Structure | 1-0-0 | |
| Credits | 1 | |
| Prerequisites | NA | |
| Course Objective | This course aims to provide a foundational understanding of data, its classification, storage mechanisms, and its role in Artificial Intelligence and Machine Learning. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Demonstrate an understanding of data sources, types, and their significance in the context of real-world applications. | Employability |
| CO2 | Implement strategies for handling and processing each data type effectively. | Employability |
| CO3 | Analyse the role of structured, unstructured, and semi-structured data in machine learning applications. | Employability/ Skill Development |

SECTION-A

Data is everywhere, Different sources of data, Types of data, Data explosion, what has led to data explosion? Increase in Storage Capacities, Data Processing Abilities, Emerging Data Formats and Data Availability, of Data Explosion.

SECTION-B

Data Classification, Organization of structured data, Examples of structured data, How Structured Data expands? Advantages and Disadvantages of Structured Data, what is unstructured data? Examples of Unstructured Data, Advantages and Disadvantages of Unstructured Data, What is Semi-structured data?, Examples of semi-structured data, Advantages and disadvantages of semi-structured data, Comparison of structured, unstructured and semi-structured data.

SECTION-C

Data Storage - An Introduction, Mechanisms of data storage, Introduction to Databases, Database Architecture, Common Database Types, Tabular databases, Advantages and Limitations of tabular databases Entity Relationships and Tables, Characteristics of NoSQL databases, Types of NoSQL Datastores, Advantages and disadvantages of NoSQL, Know the history, How Big is Data? Sources of Data, Characteristics of Data

SECTION-D

Introduction and history of AI, Sources of Data, Introduction to AI, A Brief History of Data Science, Introduction to Machine Learning, History of AI, categories of ML systems, An Introduction to AI, ML and AI Overlap with Each Other? Applications of ML, Types of Data, Organization of Structured Data, Examples of Structured Data, Expansion of Structured Data, what is Semi-structured Data?

Textbooks: Reference Materials:

- (i) **"Database Systems: The Complete Book"** – Hector Garcia-Molina, Jeffrey D. Ullman & Jennifer Widom
- (ii) **"Unstructured Data Analytics"** – Jean Paul Isson & Jesse Harriott

Reference Books:

- (i) **"Data Modeling Essentials"** – Graeme Simsion & Graham Witt

(ii) "Data Modeling Made Simple" – Steve Hoberman

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 |
|-------------|---------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| | DATA MODELING | CO1 | 2 | 1 | - | - | - | - | - | - | - | - | - | 3 | 2 |
| | | CO2 | 1 | 2 | - | 2 | 1 | - | - | - | - | - | - | 3 | 2 |
| | | CO3 | 3 | 1 | 1 | 3 | - | - | - | - | 1 | 1 | - | 3 | 2 |

| | | |
|-----------------------|---|----------------------------------|
| Course Title/Code | Digital Transformation & Agile Development | |
| Course Type | Core | |
| L-T-P Structure | 1-0-0 | |
| Credits | 1 | |
| Prerequisites | NA | |
| Course Objective | To provide a comprehensive understanding of digital transformation, product management, agile methodologies, Scrum, and Kanban principles to enhance efficiency in modern business and software development environments. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Explain the concepts of digital transformation, design thinking, and their impact on modern business models. | Employability |
| CO2 | Analyze product management strategies, agile methodologies, and their role in business and software development. | Employability |
| CO3 | Apply Scrum and Kanban methodologies to improve workflow, project management, and software delivery efficiency. | Employability/ Skill Development |

SECTION-A: Introduction to Digital Transformation

Introduction, Challenges of Traditional Business Model, Why Digital Transformation, Design Thinking, Different Phases of Design Thinking, Divergence, Emergence and Convergence of Design Thinking, Design Thinking vs. Agile vs. Lean, Agile Practices, Design Sprint and its Phases, Design Thinking vs Design Spirit.

SECTION-B:

Introduction to Product Management & Service Mindset, Product Manager, Building Products and services, Product lifecycle and phases, product development & Methodology; systems thinking, value chain, Introduction of Capability Optimization and Capability Maturity Model, Business Integration methods, Agile methodology, Product Marketing; User Experience Design

SECTION-C

Agile Methodology, Software, History of Software Engineering and Software, Development Methodologies, Traditional Software Development Models, Waterfall Model, Classical Waterfall Model, Traditional IT Organizations, Developers vs IT Operations Conflict, Birth of Agile, Four Values of the Agile Manifesto, Agile and Lean

SECTION-D

Scrum, Scrum Theory, Scrum Values, Scrum Roles, Scrum Master Scrum Sprints, Benefits of Scrum, Planning and Estimation, Agile Planning, Levels of Agile Planning, Conditions of Satisfaction, Velocity, Estimating Techniques, Soft Skills in Agile, Kanban Model.

SECTION-E

Kanban Principle, Kanban Board, Kanban Core Practices, Make work visible, Limit work in progress (WiP), Manage flow, Make progress policies explicit, Implement feedback mechanisms, Improve collaboratively (using methods and models)

Textbooks: Reference Materials:

(i) Digital Transformation: Survive and Thrive in an Era of Mass Extinction by Tom Siebel

(ii) Designed for Digital: How to Architect Your Business for Sustained Success by Jeanne Ross, Martin Mocker and Cynthia Beath

Reference Books:

(i) The Economics of Data, Analytics, and Digital Transformation by Bill Schmarzo

(ii) Driving Digital Strategy: A Guide to Reimagining Your Business by Sunil Gupta

CO-PO Mapping

| Co e Co | Course | Course Outcom es | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PSO 1 | PS O2 |
|---------------|--|------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|
| | Digital Transformati on & Agile Developmen t | CO1 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 2 | 2 |
| | | CO2 | 2 | 2 | 1 | 1 | - | - | - | 2 | - | 2 | 2 | 2 | 3 |
| | | CO3 | 2 | 2 | 1 | 1 | 2 | - | - | - | - | 2 | 2 | 2 | 3 |

| | | |
|-----------------------|---|----------------------|
| Course Title/Code | Digital Transformation & Agile Development Lab | |
| Course Type | Core | |
| L-T-P Structure | 0-0-2 | |
| Credits | 1 | |
| Pre-requisitie s | NA | |
| Course Objective | To develop hands-on expertise in digital transformation methodologies, agile practices, Scrum, and Kanban through practical implementation and real-world case studies. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Implement agile methodologies, Scrum frameworks, and Kanban principles using industry-standard tools to optimize project workflows and product development. | Skill Development |

LIST OF EXPERIMENTS

- Analyze a real-world business that has undergone digital transformation.

- Apply design thinking principles to solve a business challenge.
- Conduct a mini design sprint focusing on a specific problem.
- Map out the lifecycle of a chosen product and identify key phases.
- Implement an agile product development plan for a case study.
- Evaluate and improve the UX design of a given application.
- Develop a project plan using both Waterfall and Agile methodologies.
- Conduct a group activity to demonstrate Agile principles.
- Set up and manage a Scrum workflow using Jira or Trello.
- Conduct a sprint planning session and track progress.
- Create a Kanban board and implement work-in-progress (WiP) limits.
- Analyze an existing workflow and optimize it using Kanban principles.

CO-PO Mapping

| Course Code | Course | Course Outcomes | P O1 | P O2 | P O3 | P O4 | P O5 | P O6 | P O7 | P O8 | P O9 | PO 10 | PO 11 | PS O1 | PS O2 |
|-------------|--|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| | Digital Transformation & Agile Development Lab | CO1 | 2 | 1 | 1 | - | - | - | - | - | - | 2 | 2 | 2 | 2 |

| | |
|------------------------|---|
| Course Code | Title/ Introduction to Information Security (CSS106C) |
| Course Type | Core |
| L-T-P Structure | (2-0-2) |
| Credits | 3 |
| Objectives | Students are able to understand the fundamentals of Information Security and Infrastructure |

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| Course Outcome |
| CO1: To impart understanding of basic terminologies of information security and pillars of cybersecurity. |
| CO2: To analyze and learn the cyber ethics, laws and understanding the growth of career with responsibility. |
| CO3: To analyze the cyber jargons and learning the perspectives of cyber criminals. |
| CO4: To implement the access control measure to implement security. |

Section-A

What is Information Security, Goals of Information Security: Integrity Models, Availability Models, and Security is not just VAPT, Security Models: Security Model Work, Confidentiality, Integrity, and Availability (CIA) Triad, Parkerian hexad, Real World Examples, Examples of Breach Incidents

Section-B

Domains of Cyber Security, Morals and Ethics, Cyber Law and Cyber Security: IT Act 2000 and Amendments, Cybercrime Motives, Psychological Profiling, Sociology of Cyber Criminals, Social Engineering, Cyber Stalking, Botnets
Attack Vector, Real World Cases, Career in Information Security: Roles and Responsibilities, Entry Level Positions in Cyber Security, Current & Expected Growth in Cyber Security Industry

Section-C

Information Security Jargons: Jargon for Businesspeople, Countering Cyber Criminals, knowing your Adversaries: Taking an Enemy Perspective, adopting "Inside-Out" Security, SECURE CODING/SECURE

Section-D

Access Control: Access control is a method of guaranteeing that users are who they say they are and that they have the appropriate access to company data, Discretionary Access Control (DAC): Discretionary Access Control (DAC) is a type of access control in which a user has complete control over all the programs it owns and executes, and also determines the permissions other users have those files and programs. , Mandatory Access Control (MAC): MAC criteria are defined by the system administrator, strictly enforced by the operating system (OS) or security kernel, and are unable to be altered by end users, Role-based Access Control (RBAC): Role-based access control (RBAC) restricts network access based on a person's role within an organization and has become one of the main methods for advanced access control.

LIST OF EXPERIMENTS:

1. Lab Setup and Installation of Virtual Machine
 - Different types of Virtual Machines: VirtualBox and Vmware
 - Different types of OS file installation: Linux, Windows (ova/ovf/iso image)
2. Practice on following concepts
 - Confidentiality (Encryption, Steganography)
 - Integrity (Hash, Checksum etc.)
 - Availability (Backups)
 - Bash commands
3. Various Case Studies on Cyber Crimes and IT Act.

Books

1. Information Security: The Complete Reference by Mark Rhodes-Ousley
2. Computer Networking with Internet Protocols and Technology by William Stallings
3. Getting an Information Security Job for Dummies by Peter H. Gregory

Help Pages

1. Breaking into InfoSec: A beginner's guide to all things Cyber Security

Wikipedia Pages

1. Information Security: https://en.wikipedia.org/wiki/Information_security

Tool Web Sites

1. Vmware: <https://www.vmware.com/in.html>
2. VirtualBox: <https://www.virtualbox.org/>
3. Kali: <https://www.kali.org/downloads/>

Web Tutorials

0. SANS: <https://www.sans.org/information-security/>
0. Geeksforgeeks: <https://www.geeksforgeeks.org/what-is-information-security/>

0. Info-Guard:

<https://www.infoguardsecurity.com/what-is-information-security-definition-principles-and-policies/>

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|---------------------------|---|
| Course Title/ Code | Fundamentals of Electrical and Electronics Engineering(ECH103C)& (ECH104C) |
| Course Type | Core (Departmental) |
| Course Nature | Hard |
| L-T-P-O Structure | (3-0-2-0) |
| Credits | 4 |
| Objectives | This course covers fundamental electrical and electronics engineering principles, including circuit analysis, network theorems, AC/DC behavior, semiconductor devices, and sensor technologies, equipping students with essential knowledge and practical skills. |

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| Course Outcome |
| CO1: Implement the fundamental concepts of Basic Electrical circuits. |
| CO2:Comprehend AC circuits, and gain basic knowledge of DC machines including stepper and servo motors. |
| CO3: Apply the concepts and working principles of Diodes for its various applications |
| CO4: Analyze the principles, types, and operation of various sensors and apply techniques for sensor data acquisition, processing, and interpretation. |

Section-A: Basic Electrical Concepts

Basic Electrical Quantities: Voltage, current, power, energy. Ohm's Law: Resistance, conductance, and applications. Kirchhoff's Laws: DC Circuits-Series and Parallel Circuits, Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL). Mesh and Nodal Analysis. Network Theorems: Thevenin's and Norton's theorems, Superposition theorem. Capacitors and Inductors: Basic concepts, charging and discharging, time constants.

Section-B AC Circuits

AC Fundamentals: Sinusoidal waveforms, frequency, phase, RMS values. RL, RC circuits, Reactance and Impedance: Capacitive and inductive reactance, impedance in AC circuits- Power in AC Circuits: Real power, reactive power, apparent power, power factor. -Introduction to DC machines (DC Machine, Stepper Motor, servo Motor).

Section-C Semiconductor Devices

Diodes: Types, characteristics, and Diode as rectifier, Zener Diodes: Voltage regulation and applications Light Emitting Diodes: Characteristics, uses, and significance in electronics. Light Dependent Resistors: Properties and applications in light sensing. Transistors: Bipolar Junction Transistors (BJTs)-Characteristics-transistor as switch and amplifier.

Section-D Sensors in Electronics

Introduction to Sensors, Definition and Types, Principles of Operation, Temperature Sensors (Thermistor, RTD, Thermocouple), Motion Sensors (PIR, Ultrasonic sensor)- Environmental Sensors (Humidity, Gas sensor)- Data Acquisition and Processing: Techniques for sensor data acquisition, processing, and interpretation.

References

1. P. Prasad, Fundamentals of Electrical Engineering, PHI Learning Pvt. Ltd., 2014.
2. M. E. Van Valkenburg, Network Analysis, Prentice Hall, 1995.
3. K. S. Suresh Kumar, Electric Circuits and Networks, Pearson Education India, 2013.
4. B. S. Nair, Solid State Electronic Devices, Tata McGraw-Hill Education, 2011.
5. K. Lal Kishore, Electronic Devices and Circuits, Pearson Education India, 2011.
6. D. Patranabis, Sensors and Transducers, Prentice Hall, 2010.

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|------------------------|---|
| Course Title | Probability & Statistics (MAH104C) |
| Course Type | Core (Allied) |
| Course Nature | Hard |
| L-T-P structure | (3-1-0) |
| Credits | 4 |
| Objectives | Students would be able to understand and apply concepts of probability and statistics to solve related mathematical problems. |

| Course Outcome |
|---|
| CO1: Understand and apply fundamental concepts of probability, including probability spaces, conditional probability, and independence.(BT2) |
| CO2: Develop a comprehensive understanding of continuous probability distributions, including normal, exponential, and gamma, as well as bivariate distributions.(BT3) |
| CO3: Evaluate statistical parameters and measures of central tendency for binomial, Poisson, and normal distributions, and perform correlation and regression analysis.(BT3) |
| CO4: Conduct applied statistical analyses including curve fitting, and perform hypothesis testing for large and small samples using various tests like Chi-square for goodness of fit and independence. (BT4) |

Section A

Basic Probability: Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

Section B

Continuous Probability Distributions: Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

Bivariate Distributions: (Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes rule.

| | | | | | | | | | | | | | |
|--|---|---|--|--|--|--|--|--|--|--|--|--|--|
| <p>CO3 Evaluate statistical parameters and measures of central tendency for binomial, Poisson, and normal distributions, and perform correlation and regression analysis.</p> | 3 | 2 | | | | | | | | | | | |
| <p>CO4 Conduct applied statistical analyses including curve fitting, and perform hypothesis testing for large and small samples using various tests like Chi-square for goodness of fit and independence.</p> | 2 | 2 | | | | | | | | | | | |

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|---------------------------|--|
| Course Title/ Code | Data Structures |
| Course Type: | Core |
| L-T-P Structure | (3-0-0) |
| Credits | 3 |
| Objectives | The course should assess how the choice of data structures and algorithm design methods impacts the performance of programs and choose the appropriate data structure and algorithm design method for a specified application. |

| |
|--|
| Course Outcomes (Cos) |
| CSH107C.1: Understand the concept of linear and non-linear data structures using Static and dynamic memory allocation. |
| CSH107C.2: Demonstrate the various operations of linear and non-linear data structures. |
| CSH107C.3: Apply the suitable data structures for problem solving. |
| CSH107C.4: Analyze the operations of linear data structures |

Section-A

Data structures and Algorithms: Introduction to Data structure: Concept of data structure, choice of right data structures, types of data structures, Abstract Data types, Introduction to algorithms, how to design and develop an algorithm: stepwise refinement, algorithm analysis, complexity of algorithms

Arrays: Introduction, One Dimensional Arrays, two-dimensional array, Multidimensional arrays, address calculation of a location in arrays operations defined: traversal, selection, searching, insertion, deletion, and sorting.

Searching: linear search, binary search, Sorting: selection sort, bubble sort, insertion sort, merge sort, quick sort.

Section-B

Pointers: Introduction to pointers, Pointer variables, Pointer and arrays, array of pointers, pointers and structures, Dynamic allocation. Linked Lists: Concept of a linked list, circular linked list, doubly linked list, operations on linked lists: traversal, selection, searching, insertion, deletion, and sorting, concepts of header linked lists. Applications of linked lists.

Section-C

Stacks: Introduction to Stacks, array representation of stack, operations on stack: PUSH, POP, Evaluation of Expression: Concept of precedence and associativity in expressions, difficulties in dealing with infix expressions, resolving precedence of operators and association of operands, postfix & prefix expressions, conversion of expression from one form to other form using stack (with & without parenthesis), Evaluation of expression in infix, postfix & prefix forms using stack. Recursion, Linked list representation of stack, Applications of stacks.

Queues: Queues, Circular queues, array representation of Queues, priority queues, dequeue, circular queue, operations on queue: insertion and deletion, Applications of Queues.

Section-D

Non-Linear Structures: Trees definition, characteristics concept of child, sibling, parent child relationship etc., binary tree: different types of binary trees based on distribution of nodes: complete binary tree, binary tree (threaded and unthreaded), operation on binary tree: insertion, deletion, searching and traversal of binary trees, traversing: Preorder, Postorder and Inorder, Introduction to binary search tree, operations and Time complexity on BST: insertion, deletion, searching, Introduction to AVL tree: Concept of balanced trees, balance factor in AVL trees, insertion into and deletion from AVL tree, balancing AVL tree after insertion and deletion, in B trees, Application of trees.

Graphs: Definition, Relation between tree & graph, directed and undirected graph, connected and disconnected graph, Representation of graphs using adjacency matrix and list, Depth first and breadth first traversal of graphs, Applications of Graph.

Text Books:

1. Data Structures with C by Seymour Lipschutz ,McGraw Hill Education(India) Private Limited.
2. Data Structures using C by A. K. Sharma, Pearson Publication.
3. Data Structures using C-Yashwant Kanetkar Publication.

Reference Books/ Sites:

1. By NPTEL
2. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.
3. Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman Publisher.

Online Resources:

1. IIT Virtual Lab <https://ds1-iiith.vlabs.ac.in/>
2. HackerRank <https://www.hackerrank.com/domains/data-structures>
3. Strivers A2Z
<https://takeuforward.org/strivers-a2z-dsa-course/strivers-a2z-dsa-course-sheet-2>
4. NPTEL <https://nptel.ac.in/courses/106102064>
5. LinkedIn Course-
<https://www.linkedin.com/learning/programming-foundations-data-structures-2019>

CO-PO-PSO Mapping Matrix:

| Course Outcomes (Theory) | Program Outcomes | | | | | | | | | | | Program Specific Outcomes | |
|-----------------------------|------------------|------|------|------|------|------|------|------|------|------|------|---------------------------|-------|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PSO 1 | PSO 2 |
| CO1 | 2 | - | - | - | 1 | - | - | - | - | - | 3 | - | 2 |
| CO2 | 2 | - | - | - | 3 | - | - | - | - | - | 3 | - | 2 |
| CO3 | - | 3 | 2 | - | 3 | - | - | 2 | - | - | 3 | 2 | 2 |
| CO4 | - | 2 | 3 | - | 3 | - | - | 2 | - | - | 3 | 2 | 2 |

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| | | |
|-----------------------|---|-------------------|
| Course Title/Code | DATA STRUCTURES LAB | |
| Course Type | Core | |
| L-T-P Structure | 0-0-2 | |
| Credits | 1 | |
| Course Objective | The students ^(a) will be able to apply Data structures Principles and Concepts ^(b) to design software catering to real world resemblance ^{c)} for implementation of solutions to the given programming problems ^(d) . | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Implement the abstract properties and operations of linear data structures using static and dynamic memory allocation. | Skill Development |
| CO2 | Implement the abstract properties and operations of non-linear data structures using static and dynamic Memory allocation. | Skill Development |

List of Experiments:

1. To implement and analyse basic concepts (functions) of C programming
2. To implement the operations of One-Dimensional Array
3. To implement the operations of Two-Dimensional Array
4. To implement the concepts of Sorting (Insertion, Bubble, Selection) & Searching (Linear & Binary)
5. To implement the concepts of Sorting (Quick & Merge)
6. To implement the operations in a Singly Linked List
7. To implement the operations in a Circular & Doubly Linked List
8. To implement the operations in a Stack
9. To convert infix expression to postfix/prefix and evaluate it, using a Stack
10. To implement operations in a queue and a circular queue, using static & dynamic memory allocation
11. To implement operations in a priority queue using static memory allocation
12. To create and traverse binary tree using dynamic memory allocation
13. To implement BFS & DFS traversal of a graph

| Course Outcomes (LAB) | Program Outcomes | | | | | | | | | | | Program Specific Outcomes | |
|-----------------------|------------------|------|------|------|------|------|------|------|------|-------|-------|---------------------------|-------|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PSO 1 | PSO 2 |
| CO1 | 2 | 2 | 2 | - | 3 | - | - | 2 | - | - | 3 | - | 3 |
| CO2 | 2 | 2 | 2 | - | 3 | - | - | 2 | - | - | 3 | - | 2 |

| | |
|-------------------|---------------------------|
| Course Title/Code | Python Programming |
|-------------------|---------------------------|

| | |
|------------------|---|
| Course Type | Core |
| L-T-P Structure | 3-0-0 |
| Credits | 3 |
| Prerequisites | NIL |
| Course Objective | Students can build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions. |

| CO | CO statement | Mapping |
|-----|--|-----------------------------------|
| CO1 | Demonstrate the installation of Python, and describe its fundamentals. | Employability & Skill development |
| CO2 | To enable the student to demonstrate given program scenario and apply different programming constructs | Employability & Skill development |
| CO3 | Implement data pre-processing using Python | Employability & Skill development |
| CO4 | Analyse data using statistical modelling in Python | Employability & Skill development |

Section- A Introduction

Introduction to Python, Development environment setup, Installing Python, Anaconda, Jupyter Notebook, Spyder, Components and Versions of Python, Difference between Python 2 and Python 3, Python Distributions Understanding the Python shell, writing a simple program, Concept of module and packages,

Basic Operators – Arithmetic, Relational, Assignment, Logical, Membership and Identity operators, Variables and Data Types, Understanding Mutable and Immutable types, Working with various type – None, Boolean(True/False), Numeric(int, float, long), Sequence(String, List & Tuple), Mapping(Dictionary) Understanding the concept of header & suites in the language construct, Conditionals and inline syntax, Multiple assignments in variables, Working with data type conversion, Working with Loops – While & For Effects of break, continue, pass & else statement in various construct.

Section- B Programming with Python

Implementing custom functions, Variable scope – Global vs. Local, dealing with various function arguments –, Understanding the concept of pass by value and pass by reference, Returning multiple values from a function, Anonymous & Recursive function, lambda functions

Understanding Strings in Python & different type of its delimiter, working with special string operators & formatted strings, exploring some useful built in string methods, Working with Date & Time,

Section-C Data Preprocessing

Introduction, Introduction to Pandas and Basic Concepts of Pandas, Data Cleaning and Preparation, Handling Missing Data, filtering out Missing Data, Filling in Missing Data, Data Transformation, Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Renaming

Axis Indexes, Discretization and Binning, Detecting and Filtering Outliers, Permutation and Random Sampling, String Manipulation, Feature Engineering

Section-D Statistical Modelling

Derived Variables, Basic Exploratory Data Analysis, Methods for EDA and Examples, Statistical Modelling, Curve Fitting: Linear Regression, Nonlinear Regression

Text Books:

1. Dave Kuhlman, “A Python Book: Beginning Python, Advanced Python, and Python Exercises”, December 2013.
2. Mark Lutz’s, “Learning Python”, O’Reilly, 2001

Reference Books:

1. Sahana Kumaraswamy, Roy Antony Arnoid G, “Assignment for Object Oriented Programming using Python”, Infosys, Dec 2015.
2. Lutz, Mark, and Mark Lutz. Programming python. Vol. 8. O’Reilly, 1996.
3. Sommerville, “Software Engineering”, Addison Wesley, 1999.

| Course Outcome | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | |
|----------------|------------------|------|------|------|------|------|------|------|------|-------|-------|-------|---------------------------|-------|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO1 1 | PO1 2 | PSO 1 | PSO 2 |
| CO1 | - | - | - | - | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 |
| CO2 | - | - | - | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 |
| CO3 | 3 | 3 | - | - | 1 | - | - | - | 2 | 2 | 1 | 1 | 1 | 2 |
| CO4 | 3 | 3 | - | 3 | - | 2 | - | - | 2 | 3 | 1 | 1 | 1 | 2 |

| | |
|-------------------|-------------------------------|
| Course Title/Code | Python Programming Lab |
|-------------------|-------------------------------|

| | |
|------------------|---|
| Course Type | Core |
| L-T-P Structure | 0-0-2 |
| Credits | 2 |
| Prerequisites | NIL |
| Course Objective | Students can build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions. |

| CO | CO statement | Mapping |
|-----|---|-----------------------------------|
| CO1 | Demonstrate the use of Python IDEs and apply programming constructs to implement basic functional programs. | Employability & Skill development |
| CO2 | Implement data preprocessing techniques and perform statistical analysis using Python libraries. | Employability & Skill development |

Python Programming Lab

List of Programs

1. Setting up the Python Environment using Anaconda IDE: Know Jupyter & Spyder
2. Write a program to perform Functions in Python
3. Write a program in Python First Class Functions & Immutable Data
4. Write a program in Python exploring String
5. Write a program in Python exploring Tuple
6. Work in Python using Collections
7. Write a program in Python to perform Dictionary
8. Write a program in Python to perform Sets
9. Write a program in Python to perform File Operation in Python
10. Write a program in Python to perform Data Preprocessing
11. Write a program in Python to perform Exploratory Data Analysis
12. Write a program in Python to actuate Curve Fitting.

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | - | - | - | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 |
| CO2 | 3 | 3 | - | 3 | 3 | 2 | - | - | 2 | 2 | 1 | 1 | 1 | 2 |

| | | |
|------------------------------|--|--------------------------|
| Course Title/Code | CHEMISTRY-I (CHH101C) | |
| Course Type | Core | |
| L-T-P Structure | 3-0-2 | |
| Credits | 4 | |
| Course Objective | To familiarize students with Green Chemistry and basic spectroscopy | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Understand and explain the 12 Principles of Green Chemistry, including their application in reducing environmental impact and enhancing sustainability in chemical processes. | Skill Development |
| CO2 | Learn the structure-property relationship of polymers & mechanism of polymerization; how it influences their applications in various industries. | Skill Development |
| CO3 | Comprehend the fundamental principles, scope and applications of spectroscopy & nanotechnology in various scientific and engineering fields. | Skill Development |
| CO4 | Study the important applications of both batteries and fuel cells in real-world scenarios, including their use in portable electronics, electric vehicles, and renewable energy systems. | Skill Development |
| Prerequisites | | |

SECTION A

Green Chemistry and Sustainable Technology

12 Principles of Green Chemistry with their explanation & examples; prevention of waste/byproducts, atom economy, prevention/ minimization of hazardous toxic products, designing safer chemicals, selection of safer solvents and auxiliaries, design for energy efficiency (Use of

| | | | | | | | | | | | | | |
|-------------------------|-------------------------|------------|----------|----------|----------|--|--|--|----------|--|--|--|----------|
| 6.0CH01E00 1 | CHEMISTRY- I | CO1 | 1 | 1 | | | | | 2 | | | | |
| | | CO2 | 1 | 1 | | | | | 1 | | | | |
| | | CO3 | 1 | | 1 | | | | 1 | | | | |
| | | CO4 | 1 | | | | | | 1 | | | | 1 |
| | | CO5 | 1 | | | | | | 2 | | | | 1 |

| | |
|--------------------------|----------------------------------|
| Course Title/Code | Chemistry-I Lab (CHH102C) |
| Course Type | Core |
| L-T-P Structure | 3-0-2 |
| Credits | 4 |

| | | |
|------------------------------|--|--------------------------|
| Course Objective | To familiarize students with Green Chemistry and engineering materials | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Understand and explain the 12 Principles of Green Chemistry, including their application in reducing environmental impact and enhancing sustainability in chemical processes. | Skill Development |
| CO2 | Learn the structure-property relationship of polymers & mechanism of polymerization; how it influences their applications in various industries. | Skill Development |
| CO3 | Comprehend the fundamental principles, scope and applications of spectroscopy & nanotechnology in various scientific and engineering fields. | Skill Development |
| CO4 | Study the important applications of both batteries and fuel cells in real-world scenarios, including their use in portable electronics, electric vehicles, and renewable energy systems. | Skill Development |
| Prerequisites | | |

List of Experiments

Lab 1: To determine the alkalinity of given water sample.

Lab 2: To determine temporary permanent and total Hardness of given water sample.

Lab 3: To determine total dissolved oxygen in a given sample of water

Lab 4: To determine Viscosity Index of given lubricant using Redwood Viscometer No.1.

Lab 5: To determine the flash point and fire point of lubricating oil by Penske's marten's apparatus.

Lab 6: To prepare (a) Urea-formaldehyde resin

(b) Phenol-formaldehyde resin

Lab 7: To determine concentration of given KMnO₄ solution using a digital photo colorimeter.

Lab 8: To determine total residual chlorine in water sample

Lab 9: To determine free carbon dioxide in a given water sample.

Lab 10: To analyse the TDS and TSS in a given sample of water.

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | |
|-----------------|---|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|---|
| 6.0CH07E10 1 | Green Chemistry and Engineering Materials | CO1 | 1 | 1 | | | | | 2 | | | | | |
| | | CO2 | 1 | 1 | | | | | 1 | | | | | |
| | | CO3 | 1 | | 1 | | | | | 1 | | | | |
| | | CO4 | 1 | | | | | | | 1 | | | | 1 |
| | | CO5 | 1 | | | | | | | 2 | | | | 1 |

| | |
|-------------------|---------------------------------------|
| Course Title Code | Professional Communication-I (CDO106) |
| Course Type | AEC/SEC |
| Course Nature | Soft |
| L-T-P Structure | (2-0-0) |
| Credits | 1 |

Course Outcomes: The students will be able to:

CO 1: exhibit effective reading and writing skills in the workplace.

CO 2: learn grammatically correct formal writing skills.

CO 3: enhance their skills to effectively deliver formal and informal presentations

Unit 1: Developing Communication Skills- II (Reading & Writing)

1.1 Reading Comprehension

- 1.2 Writing Skills: Introduction to Writing: Organizing Principles of Paragraph, Precise Writing, Punctuations
- 1.3 Report Writing
- 1.4 Note Taking

Unit 2: Syntactical English II

- 2.1 Conditionals
- 2.2 Preposition of Time & Place

Unit 3: Effective Communication

- 3.1 Concepts of Chronemics: Interpretation of time with business environment
- 3.2 Monochronic vs. Polychronic Cultures
- 3.3 Non- Verbal Communication: Kinesics & Proxemics

Unit 4: Presentation Skills

- 4.1 Opening & closing of Presentations
- 4.2 Audience Analysis
- 4.3 Structuring the Presentation
- 4.4 Best Practice in Presentations

Recommended Texts and Readings:

1. Wren and Martin English Grammar and Composition, S. Chand & Company Pvt. Ltd.
2. Word Power Made Easy by Norman Lewis, Penguin Random House Pvt. Ltd.
3. Talk like Ted by Carmine Gallo
4. Public Speaking by Peter Pearson

Assessment Tools:

- Continuous Assessment: Assignments/ Activities/ Quiz
- Mid Term examination
- Term-end examination (Practical)

Internal Marks Distribution:

| | |
|-----------------------|----------|
| Mid Term examination | 30 marks |
| Continuous assessment | 20 marks |

Course Articulation Matrix:

| | | | | | | | | | | | | | | | |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|-----|-----|-----|-----|-----|
| COPO, PSO | | | | | | | | | | | P01 | P01 | P01 | PSO | PSO |
| | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | | 0 | 1 | 2 | 1 | 2 |

| | | | | | | | | | | | | | | |
|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C01 | - | - | - | - | - | - | - | - | 2 | 3 | 2 | 2 | - | - |
| C02 | - | - | - | - | - | - | - | - | - | 3 | 2 | 2 | - | - |
| C03 | - | - | - | - | - | - | - | - | 2 | 3 | 2 | 2 | - | - |

| | |
|-------------------------------|-------------------------------------|
| Course Title/ Code | Data Visualization (CSS112C) |
| Course Type | Core (Domain) |
| Course Nature | Hard |
| L-T-P-O Structure | (1-0-2-0) |
| Credits | 2 |

| | |
|-------------------|---|
| Objectives | Students will be able to design and develop data visualizations and interactive dashboards, apply modern tools and techniques to analyze complex datasets, and effectively communicate insights, while ensuring ethical practices in data representation. |
|-------------------|---|

| | |
|---|--------------------------|
| Course Outcome | |
| CO1: Employ basic and advanced data visualization techniques to represent data effectively | Employability |
| CO2: Prepare and transform datasets through cleaning, feature engineering, and normalization for accurate visualization. | Employability |
| CO3: Design interactive dashboards and reports using advanced tools and techniques, incorporating interactivity and analytical features. | Skill Enhancement |
| CO4: Apply data visualization techniques in real-world scenarios while adhering to ethical practices and addressing business challenges. | Employability |

Section-A

Introduction to Visualization

Visualization, History and Evolution of Visualization, Need of Visualization. Data, types of data and their representations. Effectiveness of Dataset in Visualization, Visualization Principles, Scope of Data Visualization in Business, Data Visualization Use Cases, Tools for Data Visualization.

Section-B

Data Visualization Techniques

Basic Data Visualization Techniques: Bar charts and column charts, Line charts, Pie charts, Histograms and Density plots, Scatter plots. Advanced Data Visualization Techniques: Heatmaps, Box plots, Treemaps, Geospatial visualization. Advanced Visualization features: Customizing visualization- colors, labels, interaction. Implementing slicers and filters for interactivity. Introduction to DAX, Aggregation Functions, Logical Functions, Variables in DAX, Advanced Analytics, Creating Forecasting and Trend Analysis.

Section-C

Data Preparation and Transformation Techniques

Data cleaning, Feature engineering: Feature extraction, deriving new features, finding relationships between features, data normalization, data merging & appending.

Section-D

Interactive Data Visualization

Understanding Dashboards, Creating Simple Dashboard, creating simple storyboards, working with real world data, Building interactive dashboards and reports. Ethical considerations in Data Visualization.

LIST OF EXPERIMENTS:

1. Collect a dataset and apply various data preparation and transformation techniques.
2. Apply various basic Data Visualization Techniques on a dataset.
3. Apply various advanced Data Visualization Techniques on a dataset.
4. Create a dashboard using a data visualization tool.

5. Create a story using a data visualization tool.
6. Load and explore datasets to identify data types and structures for visualization.
7. Perform data cleaning by handling missing values, outliers, and duplicates.
8. Create histograms and density plots to visualize and analyze data distribution.
9. Develop scatter plots and calculate correlations to study variable relationships.
10. Generate heatmaps and treemaps to represent hierarchical and spatial data.
11. Customize visualizations with colors, labels, and interactive features.
12. Design a basic dashboard showcasing key metrics and data insights.
13. Use DAX to create calculated fields and perform advanced trend analysis.
14. Build an interactive dashboard with slicers, filters, and drill-down capabilities.
15. Analyze and redesign misleading visualizations with ethical considerations.

Text Books:

1. JUUSO KOPONEN, JONALTAN HILDEN, "Data Visualization Handbook": Aalto ARTS Books.
2. "Storytelling with Data" by Cole Nussbaumer Knaflic – Practical guide for creating impactful visualizations.
3. "The Visual Display of Quantitative Information" by Edward R. Tufte – Classic principles of visualization design.
4. "Data Visualization: A Practical Introduction" by Kieran Healy

Reference Books:

1. WARD, GRINSTEIN, KEIM, "Interactive Data visualization: Foundations, Techniques and Applications", Natick: A K Peters Ltd. E. Tufte, The visual display of Quantitative information, Graphics Press.
2. "Data Visualization: Charts, Maps, and Interactive Graphics" by Andy Kirk – Explores diverse visualization tools and techniques.
3. "Tableau Your Data!" by Daniel G. Murray – Comprehensive guide to using Tableau for data visualization.
4. "Data Science for Business" by Foster Provost and Tom Fawcett – Covers visualization's role in business analytics.
5. "Information Dashboard Design" by Stephen Few – Focuses on creating effective and intuitive dashboards.
6. "Design for Information" by Isabel Meirelles – Theories and best practices for designing information visualizations.

| Course Outcomes | Program Outcomes | | | | | | | | | | | | |
|-------------------|--------------------|-----|-----|-----|-----|-----|------|------|-----|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7. | PO8. | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| CO1. | 3 | 2 | 3 | | 3 | | | | | | | 2 | 2 |
| CO2 | 3 | 3 | 3 | | 3 | | | | | | | 3 | 2 |
| CO3: | | 3 | 3 | | 3 | | - | 3 | | 3 | | 3 | 3 |
| CO4. | | 3 | 3 | | | 3 | 3 | | | | | 3 | 3 |
| Course Title/Code | UI Advanced | | | | | | | | | | | | |
| Course Type | Core | | | | | | | | | | | | |
| L-T-P Structure | 2-0-0 | | | | | | | | | | | | |
| Credits | 2 | | | | | | | | | | | | |
| Prerequisites | NA | | | | | | | | | | | | |

| | | |
|-----------------------|--|-------------------------------------|
| Course Objective | To provide a comprehensive understanding of web development fundamentals using HTML, CSS, and JavaScript, enabling students to design interactive and responsive web applications. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Explain the fundamental concepts of HTML, CSS, and JavaScript for web development. | Employability |
| CO2 | Develop structured and well-formatted web pages using HTML5 and CSS3 with responsive design techniques. | Employability |
| CO3 | Implement JavaScript programming concepts, including event handling, functions, and object-oriented features, to enhance web interactivity. | Employability/ Skill Development |
| CO4 | Apply JavaScript arrays, methods, and DOM manipulation techniques to create dynamic and user-friendly web applications. | Employability/ Skill Development |

SECTION-A

Introduction, Need of HTML, HTML Tags, HTML Elements, Formatting Text in HTML, Headings, HTML Paragraphs, Identifying HTML Elements, HTML Basics & Attributes, HTML Links, Lists, Colors, Tables, Symbols, Attributes, Overview of Attributes, Core Attributes, Styles, Class Attribute, Generic Attributes

SECTION-B

HTML5 introduced features, HTML5 form validate/no validate, HTML5 canvas, embedding audio, and video in a webpage, drag and drop, HTML5 Local Storage, HTML5 web workers and server sent events, HTML Attributes, Forms, Form Validation, Validation to HTML Page, CSS Semantics, CSS Selectors CSS Styling, CSS Color, CSS Backgrounds, Borders, Margins, Padding, Box Model, Height width, Tables, Selectors, Display, CSS Buttons, CSS Animation, CSS Display, CSS Float & Clear, CSS Overflow, CSS Align- Horizontal & Center Responsive Web Design, View Port, Grid View, Media Queries, Flex Box

SECTION-C

JavaScript, importance, What can JavaScript Do, Need of JavaScript, JavaScript with HTML Content, HTML Attributes, HTML DOM Elements JavaScript with CSS, HTML Nodes, Syntax, Rules, Writing JavaScript, Tags, Programming Errors, Syntax Error, Runtime Error, Logical Errors, Data Types, Non-primitive, JavaScript Data Types, Objects in JavaScript, Events in JavaScript Objects, Changing HTML Styles, Events, Event Handler Attributes, Adding Event Handlers, Using Element Attribute directly, Using Event Attribute, Using HTML DOM, Reacting to Events

SECTION-D

Introduction, Execution of Functions, Invoking Functions, As methods, As constructor, call(), arguments, apply(), bind(), Nesting Functions & Closure, Objects, Primitive Values, Strings & Objects, Creating JS Object, Literal Syntax, New Keyword, Adding Methods to Object.

SECTION-E

Creating arrays, elements in array access, changing array elements, objects vs Arrays, recognizing Arrays, Looping Array, Array Methods, Adding Array Elements using Array Methods, Removing Last Array Elements, Converting Array into Strings, Converting and Joining Array into Strings with special separator, Array Methods & Manipulations, Sorting Array Methods, Iteration Methods, The Map()

Textbooks: Reference Materials:

- . Refactoring UI by Adam Wathan & Steve Schoger.
- i. Practical UI by Adham Dannaway.

Reference Books:

(i) How to Design Better UI Components 3.0 by Adrian Kuleszo

(ii) Better Web Typography for a Better Web by Matej Latin

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | |
|-------------|-------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|---|
| | UI Advanced | CO1 | 3 | - | 1 | - | - | - | - | - | - | - | - | 2 | 3 | 2 |
| | | CO2 | 3 | - | 2 | - | 2 | - | - | - | - | - | - | 2 | 3 | 3 |
| | | CO3 | 3 | - | 3 | - | 2 | - | - | - | - | - | - | 2 | 3 | 3 |
| | | CO4 | 3 | 1 | 3 | - | 2 | - | - | 2 | - | - | - | 1 | 3 | 2 |

| | | |
|-----------------------|---|-------------------|
| Course Title/Code | UI Advanced Lab | |
| Course Type | Core | |
| L-T-P Structure | 0-0-2 | |
| Credits | 1 | |
| Pre-requisites | NA | |
| Course Objective | To equip students with practical skills in front-end web development by implementing HTML, CSS, and JavaScript concepts through hands-on exercises and real-world applications. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Design and develop interactive and visually appealing web pages using HTML5, CSS3, and responsive design principles. | Skill Development |
| CO2 | Implement JavaScript functionalities, including event handling, form validation, and dynamic content updates, to enhance web applications. | Skill Development |

LIST OF EXPERIMENTS

- Design a basic HTML webpage with headings, paragraphs, and links.
- Implement ordered/unordered lists and structured tables with attributes.
- Create a form with input fields, radio buttons, checkboxes, and submit functionality.

- Add audio, video, and canvas elements to an HTML5 page.
- Implement margins, padding, borders, and positioning using CSS.
- Build a responsive webpage using media queries and Flexbox/Grid layout.
- Implement client-side form validation using JavaScript.
- Develop an interactive web page using event listeners and handlers.
- Modify HTML content and styles dynamically using JavaScript and the DOM.
- Define and manipulate objects using constructors and methods.
- Implement functions with call(), apply(), and bind() methods.
- Perform array operations like sorting, mapping, and filtering elements.

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PSO 1 | PS O2 |
|-------------|-----------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| | UI Advanced LAB | CO1 | 3 | - | 2 | - | 3 | - | - | - | - | - | 2 | 3 | 3 |
| | | CO2 | 3 | - | 2 | - | 3 | - | - | - | - | - | 3 | 3 | 3 |

| | |
|-------------------------------|---|
| Course Title/ Code | Introduction to Standards, Frameworks and Key Technology Concepts |
| Course Type: | CORE(QHA) |
| Course Nature: | Hard |
| L-T-P-O Structure | (3-0-0-0) |
| Credit | 3 |
| Objectives | Students will have the understanding of Basic Standards, Framework and Guidelines |

| |
|---|
| Course Outcome |
| CO1: On completion of this course, students should have gained a good understanding of the concepts and foundations of computer security. |
| CO2: On completion of this course, students can identify vulnerabilities of IT systems. |
| CO3: The students will learn to use basic security tools to enhance system security |
| CO4: The student will learn to control appropriate access to company data. |

Section-A

Introduction to Cyber Security Standards, Framework Basics and Guidelines Covered, Baseline IT Security Policy, IT Security Guidelines, Practice Guide for Security Risk Assessment & Audit, Practice Guide for Information Security Incident Handling, ISO 27000 Series, IT Act, Copyright Act, Patent Law, ISO 27001, IPR, CoBit: What is The COBIT Framework? Planning & Organization, Delivering and Support, Acquiring & Implementation, Monitoring & Evaluating, Various Components of Cobit: Framework, Process Descriptions, Control Objectives, Maturity Model, Management Guidelines, COBIT 5.0 the Most Celebrated Version

Section-B

PCI DSS: What is Payment Card Industries, Defining PCI-DSS, How does taking credit cards by phone work with PCI?, PCI DSS Compliance levels, PCI DSS requirements, PCI compliance, Getting started with PCI DSS, Business Continuity Plan: Open discussion on BCP, Business Continuity Plans, Key to Cybersecurity, Ways to get started, Cybersecurity and Business Continuity Are Co-dependent, Integrating Cybersecurity Practices with Business Continuity Management Strategies, Differences in Roles between Business Continuity Management and Disaster Recovery Teams.

Section-C

Risk Management Standards: Introduction to various risk management standards, ISO Risk management standard and process, evaluating the risk management framework, Risks affecting organizations, RiskAssessment Techniques, Standard Deviations: A Risk Practitioner Guide to ISO, Why Use Risk Management Standards, and Standards as Risk Management Tools.

Section-D

Access Control: Basic concepts in access control, Security/Emerging issues in Access Control, Network Security: Basic concepts in network security, Network Security Technology, Software Development Security: Basic concepts in software development security, Emerging issues in software development security, Cryptography: Basic concepts in cryptography, Emerging issues in cryptography, Physical and Environment Security, Basic concepts in physical and Environment Security, Emerging issues in Basic concepts in physical and Environment Security.

LIST OF EXPERIMENTS:

1. Development and Preparation of ISO 27001 checklist for Audit
2. ISO 27001 – Understanding all policy documents
3. Practical's on OSI 7 Layers (Common Network Protocols)
4. Practicals on Security Protocols

Books

1. Information Security Policies, Procedures, and Standards: A Practitioner's Reference by Douglas J. Landoll
2. Getting an Information Security Job for Dummies by Peter H. Gregory

Help Pages

1. <https://www.iso27001security.com/html/27001.html>

Wikipedia Pages

1. ISO/IEC 27001: https://en.wikipedia.org/wiki/ISO/IEC_27001
2. PCI DSS: https://en.wikipedia.org/wiki/Payment_Card_Industry_Data_Security_Standard
3. COBIT: <https://en.wikipedia.org/wiki/COBIT>
4. Information Technology Act, 2000: https://en.wikipedia.org/wiki/Information_Technology_Act,_2000

Tool Web Sites

1. ISO/IEC 27001: <https://www.iso.org/isoiec-27001-information-security.html>
2. PCI DSS: https://www.pcisecuritystandards.org/pci_security/
3. COBIT: <https://www.isaca.org/resources/cobit>
4. Ministry of Electronics & Information Technology: <https://meity.gov.in/content/information-technology-act-2000>

Web tutorials

1. Tutorials Point: https://www.tutorialspoint.com/auditing/auditing_internal_audit.htm
2. SANS: <https://www.sans.org/reading-room/whitepapers/leadership/paper/33169>
3. IT GOVERNANCE: <https://www.itgovernance.co.uk/cyber-security-audit>

2nd Year

Detailed Syllabus-3RD Sem

| | | |
|-----------------------|---|---------|
| Course Title/Code | Analysis and Design of Algorithms-CSH201C | |
| Course Type | Core | |
| L-T-P Structure | 3-1-0 | |
| Credits | 4 | |
| Prerequisites | Data Structure | |
| Course Objective | Students would be able to apply existing approaches and techniques to solve real world problems and analyze algorithms in context of time and space complexities. | |
| Course Outcomes (COs) | | Mapping |

| | | |
|-----|--|----------------------------------|
| CO1 | Acquire knowledge of different Algorithm design strategies | Employability |
| CO2 | Demonstrate the understanding of time and space complexity of algorithms of different design strategies through examples | Employability |
| CO3 | Apply appropriate algorithmic design paradigm to solve real life problems | Employability/ Skill Development |
| CO4 | Analyze solvable and unsolvable real world problems . | Employability/ Skill Development |

Section-A

INTRODUCTORY CONCEPTS: Growth of Functions, Summations, Algorithm Design Paradigms, Characteristics of Algorithm, Comparing the performance of different algorithms for the same problem, asymptotic notation. Polynomial vs. Exponential running time. Disjoint Set operations, Linked List representation of disjoint sets, disjoint set forests.

Section-B

Divide and Conquer method: Recurrence relations: Solving Recurrence by substitution method, recurrence tree ,master method; Binary search algorithm and its analysis. Sorting algorithms such as Merge sort, Quick sort, Heap sort, Radix Sort, Counting Sort, Bucket Sort and Bubble sort with analysis of their running times .Strassen's matrix multiplication

Section-C

Greedy Method: Activity Selection Problem, knapsack problem, job sequencing with deadlines, minimum spanning trees, single source shortest paths, all pairs shortest path. Dynamic Programming: General method, optimal binary search trees, O/I knapsack, the traveling salesperson problem, Matrix chain multiplication, Longest common Subsequence and their analysis.

Section-D

Backtracking and Branch & Bound: General method, 8 queen's problem, graph coloring, Hamiltonian cycles, Vertex Cover Problem, analysis of these problems. Branch and Bound: Method, O/I knapsack and traveling salesperson problem, efficiency considerations, NP hard and NP Complete: NP Hard graph Problems.

Text Books:

- Fundamental of Computer algorithms, Ellis Horowitz and SartajSahni, 1978, Galgotia Publ.,
- Introduction To Algorithms, Thomas H Cormen, Charles E Leiserson And Ronald L Rivest: 1990, TMH

Reference Books:

1. The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., 1974, Addison Wesley.
2. Algorithms-The Construction, Proof and Analysis of Programs, Berlion, P.Bizard, P., 1986.

Johan Wiley & Sons,
 Writing Efficient Programs, Bentley, J.L., PHI

- 3. Introduction to Design and Analysis of Algorithm, Goodman, S.E. & Hedetnieni, 1997, MGH.

Reference Websites:

IIT Virtual Lab <https://ds1-iiith.vlabs.ac.in/>

Hackerrank <https://www.hackerrank.com/domains/algorithmsStrivers>

Nptel https://onlinecourses.nptel.ac.in/noc19_cs47/preview

CO-PO Mapping

| Course Outcomes | | | | | | | | | | | | PS O1 | PS O2 | |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-------|-------|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | | | |
| CSH204.1: Acquire knowledge of different Algorithm design strategies | 2 | 2 | 3 | | | | | | | | | | | |
| CSH204.2: Demonstrate the Understanding of time and space complexity of algorithms of different design strategies through examples | 3 | 3 | | | 2 | | | | | | | | | |
| CSH204.3: Apply appropriate algorithmic design paradigm to solve real life problems | 3 | 3 | 2 | | 2 | | | 2 | 3 | | 3 | | | 3 |
| CSH204.4: Analyze solvable and unsolvable real world problems . | | 3 | | | | 2 | | | 3 | | 3 | | | 3 |

| | | | | | | | | | | | | | |
|-----------------------|---|--|--|--|--|--|--|--|--|--|--|---------|--|
| Course Title/Code | Analysis and Design of Algorithms Lab –CSH202C | | | | | | | | | | | | |
| Course Type | Core | | | | | | | | | | | | |
| L-T-P Structure | 0-0-2 | | | | | | | | | | | | |
| Credits | 1 | | | | | | | | | | | | |
| Pre-requisites | Data Structure Lab | | | | | | | | | | | | |
| Course Objective | Students would be able to apply and implement existing approaches and techniques to solve real world problems and analyze algorithms in context of time and space complexities. | | | | | | | | | | | | |
| Course Outcomes (COs) | | | | | | | | | | | | Mapping | |

| | | |
|-----|--|-------------------|
| CO1 | Apply computational problem-solving techniques to design, implement efficient solutions for various real-world challenges | Skill Development |
| CO2 | Analyze and optimize solutions to complex problems by exploring different paradigms and approaches, focusing on performance and applicability. | Skill Development |

LIST OF EXPERIMENTS-

1. Implement and analyse recursive binary search and linear search and determine the time required to search an element.
2. Implement recursive linear search and determine the time required to search an element.
3. Write a Program and analyse to Sort a given set of elements using bubble sort method and determine the time required to sort the elements
4. Write a Program to Sort a given set of elements using selection sort method and determine the time required to sort the elements.
5. Write a Program and analyse to Sort a given set of elements using insertion sort method and determine the time required to sort the elements
6. Write a Program and analyse to Sort a given set of elements using quick sort method and determine the time required to sort the elements.
7. Write a Program and analyse to Sort a given set of elements using merge sort method and determine the time required to sort the elements.
8. Implement and analyse Fractional Knapsack Problem through greedy strategy.
9. We are given a set of 'n' jobs. Associated with each job there is a integer dead line $d_i \geq 0$ and a profit $p_i > 0$. For any job i the profit p_i is earned if and only if the job is completed by its dead line. To complete a job one has to process the job on a machine for one unit of time. Only one machine is available for processing the jobs. A feasible solution for the problem will be a subset 'j' of jobs such that each job in this subset can be completed by its deadline. The value of a feasible solution 'j' is the sine of the profits of the jobs in 'j'. An optimum solution is a feasible solution with maximum value. The problem involves identification of a subset of jobs which can be completed by its deadline. Implement the above problem and print the optimal sequence.
10. Implement and analyse 0/1 Knapsack using Dynamic Approach and print the optimal solution
11. Implement and analyse the algorithm using Dynamic Approach to solve travelling salesman problem and print the optimal solution
12. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
13. Find Minimum Cost Spanning Tree of a given undirected graph using Krystal's algorithm.
14. Print all the nodes reachable from a given starting node in a digraph using BFS method.
15. Check whether a given graph is connected or not using DFS method.
16. Find a subset of a given set $S = \{s_1, s_2, \dots, s_n\}$ of n positive integers whose sum is equal to a given positive integer d. For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$ there are two solutions $\{1, 2, 6\}$ and $\{1, 8\}$.
17. A suitable message is to be displayed if the given problem instance doesn't have a solution.

18. Implement and analyse any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using approximation algorithm and determine the error in the approximation.

CO-PO Mapping

| Course Outcome | CO Statement | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PSO1 | PSO2 |
|----------------|--|------|------|------|------|------|------|------|------|------|------|------|------|------|
| CSH204B-P.1 | Apply computational problem-solving techniques to design, implement efficient solutions for various real-world challenges. | | 3 | 3 | - | 3 | - | - | - | 2 | - | | - | 3 |
| CSH204B-P.2 | Analyze and optimize solutions to complex problems by exploring different paradigms and approaches, focusing on performance and applicability. | | 3 | 3 | 3 | 3 | | 3 | 3 | 3 | | 3 | | 3 |

| | | |
|-----------------------|---|----------------------------------|
| Course Title/Code | DATABASE MANAGEMENT SYSTEM (CSH203C) | |
| Course Type | Core | |
| L-T-P Structure | 3-0-2 | |
| Credits | 4 | |
| Prerequisites | NA | |
| Course Objective | The students (A) will be able to apply relational database principles and concepts (B) to create efficient, real-world database solutions(C) for managing and solving moderately complex database problems (D). | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Demonstrate knowledge of fundamental concepts and applications of database systems. | Employability/ Skill Development |

| | | |
|-----|---|----------------------------------|
| CO2 | Apply Structured Query Language to find solutions to a broad range of queries. | Employability/ Skill Development |
| CO3 | Analyze database systems to ensure efficiency, through effective transaction management, concurrency control, recovery mechanisms, and normalization practice | Employability/ Skill Development |
| CO4 | Design a conceptual model and effectively map the model a well-structured relational schema. | Employability/ Skill Development |

SECTION-A

File system & Introduction to DBMS: File, operations on files, file header, Different file organizations - serial, sequential, indexed sequential, direct/hash, Indexing – primary, secondary, single level, multi-level, clustered, Introduction to DBMS – comparison with conventional file processing, ANSI SPARC three level DBMS architecture, data independence, data abstraction, different users of DBMS, Applications of DBMS, SQL (Introduction, Data Types, Constraints, Creation of Tables)

SECTION-B

Relational model and Algebra: Introduction to SQL (Insertion of Data, updating in the data, Alteration in the Schema, Data Fetching, Functions), Relational model – Mathematical formulation, Relation and its properties, domain compatibility, Relational algebra – set operations (union, intersect, difference, cross product), relational operations (select, project, division, joins-cross, inner/outer, theta, natural, equivalence), group operations.

SECTION-C

Relational Database design: SQL (Set Operations, group by, order by, Joins), Relational Database Design and ER Model (Entity, Relationship, Strong Entity, Weak Entity, Type of Attributes, and their representation), EER (Generalized and Specialization), Functional dependency, Armstrong inference axioms, Closure and its algorithm, Minimal set of Functional Dependencies and its algorithm, Keys – super key, minimal super key, candidate keys, primary key, foreign key, Algorithm to find primary key.

Good decomposition properties – dependency preservation and loss less join, Algorithm for checking loss less join decomposition, Synthesis Approach, Anomalies – insertion, deletion and updating, 1 NF, 2 NF, 3 NF, BCNF, Multi - valued dependency, 4 NF, Join dependency, 5 NF.

SECTION-D

Transaction processing, Concurrency control & recovery: SQL(Sub queries, View, Sequence, DCL(Roll back, commit)), Introduction to transaction, properties of transaction and life cycle of transaction, Schedule – serial, non-serial, serializable (result, conflict and view), strict schedule, Concurrency and problems related, Concurrency control techniques – Locking, two phase locking, strict, rigorous 2PL, Recovery System, Basic Concepts of Recovery, Database Update(update in place, Deferred Update), Undo-Redo Algorithm, No Undo-Redo Algorithm, Undo-No Redo Algorithm, Shadow Paging Technique.

Text Books:

1. Fundamentals of Database Systems by R. Elmasri and S.B. Navathe,6th edition, 2013, Addison -Wesley, Low Priced Edition
2. Database system concepts, 6th Edition, McGraw-Hill, Avi Silberschatz, Henry F. Korth, S. Sudarshan

Reference Book:

1. An Introduction to database systems by Bipin C. Desai, Galgolia Publications.

2. Modern Database Management by Feffray A. Iofffer, Mary B. Prescottl, Fred R Mefadden, 6th edition. Pearson Education

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PS O1 | PS O2 |
|---------------|----------------------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| CSH226 B-T | DATABASE MANAGEMENT SYSTEM | CO1 | 3 | 2 | - | - | 3 | - | - | - | - | - | 3 | 2 | 2 |
| | | CO2 | 3 | 3 | - | - | 3 | - | - | - | - | - | 3 | 3 | 2 |
| | | CO3 | 3 | 3 | - | - | 3 | - | - | 2 | 1 | - | 3 | 3 | 3 |
| | | CO4 | 3 | 3 | - | - | 3 | - | - | 2 | 1 | - | 3 | 3 | 3 |

| | | |
|-----------------------|---|---------|
| Course Title/Code | DATABASE MANAGEMENT SYSTEM LAB(CSH204C) | |
| Course Type | Core | |
| L-T-P Structure | 0-0-2 | |
| Credits | 1 | |
| Prerequisites | NA | |
| Course Objective | The students ^o will be able to apply relational database principles and concepts ^o to create efficient, real-world database solutions ^o for managing and solving moderately complex database problems ^o . | |
| Course Outcomes (COs) | | Mapping |

| | | |
|-----|--|---------------------------------|
| CO1 | To apply the knowledge of SQL to create, retrieve, manipulate, and manage data in relational databases effectively. | Skill Development/Employability |
| CO2 | To Create efficient and effective database schemas to solve real world problems | Skill Development/Employability |

LIST OF EXPERIMENTS

- Introduction to SQL
- Creation of Tables
- Insertion & Updation of records in Tables
- Retrieval of records from single table.
- Alter Tables and Constraints
- Relational algebraic operations using SQL
- Aggregate, group by and outer join operations using SQL
- Nested SQL query
- Nested co related query and views and Inner/Natural/Outer/Cross Join
- Manage database in MS Access
- Develop Mini Project

CO-PO Mapping

| Course Code | Course | Course Outcomes | P O 1 | P O 2 | P O 3 | P O 4 | P O 5 | P O 6 | P O 7 | P O 8 | P O 9 | PO 10 | PO 11 | PS O1 | PS O2 |
|-------------|----------------------------|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| CSH226 B-P | DATABASE MANAGEMENT SYSTEM | CO1 | 3 | 2 | - | - | 3 | - | - | - | - | - | 3 | 3 | 2 |
| | | CO2 | 3 | 3 | 2 | - | 3 | - | - | 2 | 1 | - | 3 | 3 | 3 |

| | | |
|-----------------------|--|---------------|
| Course Title/Code | OOPS USING JAVA(CSH205C) | |
| Course Type | Core | |
| L-T-P Structure | 3-0-2 | |
| Credits | 4 | |
| Prerequisites | NIL | |
| Course Objective | The students(A) will be able to understand and apply the concepts of Object Oriented Programming(B) for solving the real world problems(C) accurately(D) | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Demonstrate the key concepts of Object Oriented programming using Java language. | Employability |
| CO2 | Apply Java programming features to solve the given set of problems. | Employability |

| | | |
|-----|---|----------------------------------|
| CO3 | Develop the intermediate level programs using complex features such as interfaces, file handling, threading and exception handling. | Employability/ Skill Development |
|-----|---|----------------------------------|

SECTION-A

Introduction to OOPS: Paradigms of Programming Languages - Basic concepts of Object Oriented Programming, Differences between Procedure Oriented Programming and Object Oriented Programming, Objects and Classes, Data abstraction and Encapsulation, Inheritance, Polymorphism, Dynamic binding, Message communication, Benefits of OOP, Application of OOPs.

Introduction to Java: History of Java, Java features, Java Environment: JDK API. Types of java program, Creating and Executing a Java program, Java Tokens: Keywords, Character set, Identifiers, Literals, Separator, Java Virtual Machine (JVM), Comments in Java program, Command line input and Arguments, Data Types, Variables, Operators, Control Statements, Arrays, String handling, Scanner Class.

Class and objects: Defining a class, Methods, Creating objects, Accessing class members. Constructors, Method overloading, constructor overloading, this keyword.

SECTION-B

Inheritance: Defining a subclass, Deriving a subclass, Single Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Overriding methods, super keyword, Final variables and methods, Final classes, Final methods, Abstract methods and classes, Visibility Control, Public access, Private access, protected. Interfaces: Defining interface, Extending interface, Implementing Interface, Accessing interface variables, Static members, Nesting of Methods

Packages: Java API Packages: System Packages, Naming Conventions, Creating & Accessing a Package, Adding Class to a Package, Hiding Classes

SECTION-C

Code Design: Basic concepts of design patterns and preliminaries of its categories. SOLID Design Principles.

Exception Handling: Exception Handling Mechanism, using try and catch blocks, nesting try Statements, Multiple catch Block, Collection Framework, Throwing Exceptions,using finally clause, creating a Custom Exception.

SECTION-D

Multithreading: Getting the main thread, naming a Thread, Pausing a thread, Creating a Thread with the Runnable Interface, Creating a Thread with Thread Class, Creating Multiple Threads, Waiting for (joining) Threads, Checking whether thread is alive, Setting Thread Priority and Stopping Threads, Thread Synchronization, Suspending and Resuming Threads.

I/O Streams: I/O Basics Reading Console Input Writing Console Output, Using the File Class, InputStream, OutputStream, FileInputStream, FileOutputStream, Buffered Input Stream, Buffered Output Stream, Random Access File, File Reader, File Writer, Buffered Reader, Buffered Writer, Serialization.

Text Books:

1. Programming with Java Primer by E Balagurusamy TMH Publication
2. Java; the complete reference, 7th edition, Herbert Schildt, TMH.

3. H. M. Deitel and P. J. Deitel, Java How to Program, Prentice Hall, 7th Edition, 2007
4. Head First Design Patterns: A Brain-Friendly Guide 1st Edition, by Eric Freeman, Bert Bates, Kathy Sierra, Elisabeth Robson

Reference Books:

1. Java2 Programming Black Book, Steven Holzner (no. of copies: 23)
2. C. S. Horstmann and G. Cornell, Core Java 2 (Volume I-Fundamentals), Prentice Hall, 7th Edition
3. Head First Java By Kathy Sierra

CO-PO Mapping

| Course Outcomes | Programme Outcomes | | | | | | | | | | | PSO1 | PSO2 |
|--|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | | |
| CO1: Demonstrate the key concepts of Object Oriented programming using Java language. | 3 | 2 | - | - | 3 | - | - | - | - | - | 3 | - | 2 |
| CO2: Apply Java programming features to solve the given set of problems. | 3 | 2 | - | - | 3 | - | - | - | 2 | 1 | 2 | - | 2 |
| CO3: Develop the intermediate level programs using complex features such as interfaces, file handling, threading and exception handling. | 3 | 2 | - | - | 3 | - | - | - | 2 | 1 | 2 | - | 2 |

| | | | | | | | | | | | | | |
|-----------------------|--|--|--|--|--|--|--|--|--|--|--|---------|--|
| Course Title/Code | OOPS USING JAVA LAB(CSH206C) | | | | | | | | | | | | |
| Course Type | Core | | | | | | | | | | | | |
| L-T-P Structure | 0-0-2 | | | | | | | | | | | | |
| Credits | 1 | | | | | | | | | | | | |
| Pre-Requisites | NIL | | | | | | | | | | | | |
| Course Objective | The students(A) will be able to understand and apply the concepts of Object Oriented Programming(B) for solving the real world problems(C) accurately(D) | | | | | | | | | | | | |
| Course Outcomes (COs) | | | | | | | | | | | | Mapping | |

| | | |
|-----|---|-------------------|
| CO1 | Apply the concepts of Object Oriented Programming using Java language. | Skill Development |
| CO2 | Implement the solutions to the real world problems. | Skill Development |

LIST OF PROGRAMS

1. Basic programs in java, use of if else construct and switch construct.
2. Programs on Loops and Arrays.
3. Programs on Strings and classes creation in java.
4. Programs on constructors and use of keyword this keyword, static keyword, final keyword, finalize method.
5. Programs on single inheritance,
6. Programs on multilevel inheritance, Hierarchical inheritance.
7. Programs on method overriding, super keyword and final method.
8. Programs on interfaces
9. Programs on SOLID design principles.
10. Programs on Packages
11. Programs Exception Handling
12. Programs on threads
13. Programs on File Handling
14. Mini-Project

CO-PO Mapping for Lab

| Course Outcomes | Programme Outcomes | | | | | | | | | | | PSO 1 | PSO 2 |
|-----------------|--------------------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | | |
| CO1: | 3 | 2 | - | - | 3 | - | - | - | - | - | 3 | - | 2 |
| CO2: | 3 | 2 | - | - | 3 | - | - | - | 2 | 1 | 2 | - | 2 |

| | |
|-----------------------|--|
| Course Title/ Code | Artificial Intelligence (CSH207C) |
| Course Type: | Core (Departmental) |
| L-T-P Structure | (3-1-0) |
| Credits | 4 |
| Objectives | The student will be able to solve computationally complex problems using artificial intelligence techniques. |

| | |
|-----------------------|----------------|
| Course Outcome | Mapping |
|-----------------------|----------------|

| | |
|--|-----------------------------------|
| CO1: Acquire and remember knowledge of basic Prolog Concepts. | Employability |
| CO2: Understand AI techniques and apply solutions to AI problems. | Employability |
| CO3: Learn and apply searching algorithms. | Employability & Skill Development |
| CO4: Learn and apply techniques of representing knowledge. | Employability & Skill development |
| CO5: Understand techniques of reasoning, planning and learning. | Employability |
| CO6: Analyze the role of AI techniques in applications and current trends of AI. | Employability & Skill development |

Section-A

Intelligent agents and AI Problems: Introduction to AI, Foundation and History of AI, Turing Test, Intelligent Agents: Architectures, Types: reactive, deliberative, goal-driven, utility-driven, and learning agents, Applications and Current Trends of AI: Generative AI, Ethics in AI, Responsible AI, Future of AI: Artificial General Intelligence, Artificial Super Intelligence.

Problem Representation in AI, State Space Representation and Problem Reduction, Production Systems: Inference Engine, Working Memory, Knowledgebase and Control Strategy using Water Jug Problem and n-Queens Problem.

Section-B

Search Strategies and Knowledge Representation: Search Strategies: Uninformed Search Strategies, Informed Search strategies (Heuristic Search): Generate and Test, Hill Climbing, Best First Search, A*algorithm, AO*Algorithm, Constraint Satisfaction, Means End Analysis.
Game Playing: Minmax Strategy, Alpha-beta Pruning.

Introduction to Knowledge, Types of Knowledge, Issues in Knowledge Representation, Approaches to Knowledge Representation: Logic, Semantic Nets, Partitioned Semantic Nets, Frames and its types, Conceptual Dependency.

Section-C

Knowledge Representation Techniques: Logical agents: Propositional logic, Inferences, First-order Predicate Logic, Inferences in First-order Predicate Logic, Forward Chaining, Backward chaining, Unification, Resolution.

Reasoning, Planning and Learning: Reasoning under Uncertainty: Monotonic and Non-Monotonic Reasoning, Statistical Reasoning: Review of probability: Axioms of probability, Probabilistic inference, Probabilistic Reasoning (Bayes Theorem), Bayesian Networks, Inferences in Bayesian networks, Temporal and Spatial Reasoning, Dempster-Shafer Theory, Fuzzy Reasoning, Hidden Markov models. Planning with state-space search, partial-order planning, planning graphs.

Learning from observation, Inductive learning, Deductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Machine Learning and its types: Supervised, Unsupervised and Reinforcement Learning, Natural Language Understanding, Overview of Natural Language Understanding and Deep Learning.

Section-D

Advanced Topics and Applications of AI: Expert Systems: Architecture, Characteristics, Types, Advantages and Drawbacks, Knowledge Acquisition Principles, Overview of Knowledge Discovery from Databases.

AI applications: Language Models, Information Retrieval, Information Extraction, Natural Language Processing, Machine Translation, Speech Processing, Robotics: Hardware, Perception, Planning, Moving, Face Recognition, Gesture Recognition, Computer Vision.

Text Books:

- Artificial Intelligence, Elaine Rich, Kevin Knight, Shivashankar B. Nair, Third Edition, TMH.
- S. Russel and P. Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education.
- Hands on Machine-Learning with Scikit by O'Reilly - Aurelien Geron, Powered by Jupyter, Tensorflow2.

Reference Books:

G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem solving”, Pearson Education.
 J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers, 1998
 Simon Haykin, “Neural Networks”, Pearson Education, Second Edition.
 Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, Eastern Economy Edition, PHI
 Gerhard Weiss, —Multi Agent Systems, Second Edition, MIT Press, 2013
 David L. Poole and Alan K. Mackworth, —Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010

| | | |
|-----------------|------------------|---------------------------|
| Course Outcomes | Program Outcomes | Program Specific Outcomes |
|-----------------|------------------|---------------------------|

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 |
|-----|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|
| CO1 | 3 | | | 2 | 2 | | | | | | | | 2 | |
| CO2 | 3 | 3 | 2 | 2 | 2 | | | | | | | 3 | | |
| CO3 | 3 | | 3 | | | | | | | 3 | | 2 | 2 | 2 |
| CO4 | 2 | | 2 | | | | | | | 2 | | | | 3 |
| CO5 | 3 | 2 | | | | | | | | 3 | | | | 3 |
| CO6 | 2 | | | | | 2 | 2 | 3 | 3 | | 2 | 2 | 2 | |

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|--------------------|--|
| Course Title/ Code | Artificial Intelligence Lab(CSH-208C) |
| Course Type: | Core (Departmental) |
| L-T-P Structure | (0-0-2) |
| Credits | 1 |
| Objectives | The student will be able to solve computationally complex problems using artificial intelligence techniques. |

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| Course Outcome | Mapping |
| CO1: Acquire and remember knowledge of basic Prolog Concepts. | Employability |

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|--|-----------------------------------|
| CO2: Learn and apply techniques of representing knowledge. | Employability & Skill development |
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List of experiments:-

1. Study of PROLOG.
2. Implementation of facts and rules with family tree.
3. Representing and solving AI problem by performing exercises on lists using PROLOG.
4. Representing and solving AI problem by performing exercises on Arithmetic and Relational operations using PROLOG.
5. Representing and solving AI problem by performing exercises on Strings using standard String Predicates in PROLOG.
6. Representing and solving AI/Gaming problem using searching algorithm in PROLOG.
7. Representing and solving AI problem by using sorting techniques in PROLOG.
8. Write a program to solve the problem of Tower of Hanoi.
9. Write a program to implement Water Jug problem.
10. Write a program to solve 8 queens problem.
11. Solve traveling salesman problem.
12. Solve monkey banana problem
13. Solve the classical Missionary Cannibals problem of AI.
14. Write a program to implement an Expert System.

| Course Outcome | Programme Outcome | | | | | | | | | | | | Prog Specific Outcome | |
|----------------|-------------------|------|------|------|------|------|------|------|------|-------|-------|-------|-----------------------|-------|
| | P O1 | P O2 | P O3 | P O4 | P O5 | P O6 | P O7 | P O8 | P O9 | PO 10 | PO 11 | P01 2 | PS0 1 | PS0 2 |
| CO1 | 1 | 2 | 3 | 2 | 2 | | | | | 2 | | 2 | 3 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | | | 1 | 2 | 3 | 3 | 2 |

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|-----------------|--|
| Course Title | Discrete Mathematics (MAH204C) |
| Course Type | Core (Allied) |
| L-T-P structure | 3-1-0 |
| Credits | 4 |
| Objective | To equip the students with the concepts of counting, permutation and combination, Recurrence relations and graph theory required for solving the mathematical problems and their applications. |

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| | Mapping |
|--|---------|

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| Course Outcome | |
| CO1: Understanding and application of set theory, relations, functions, and logical reasoning, with the ability to solve problems using these foundational concepts. | Skill development |
| CO2: Analyzing and applying concepts related to partially ordered sets (POSETs), lattices, and various types of orderings, including their properties and practical uses. | Employability |
| CO3: Use counting techniques (like inclusion-exclusion and the pigeonhole principle), mathematical induction, recursion, and number theory methods, including the Euclidean algorithm and prime factorization. | Employability |
| CO4: Solving problems involving graphs and trees (such as paths, cycles, and connectivity), as well as understanding and working with algebraic structures including groups, rings, and fields. | Skill development |

Section – A

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation
 POSET and Lattices; Partial orderings, POSETS, Totally Ordered Set, Dual Order, Hasse Diagram, Lexicographic Ordering, Well-Ordering Theorem, Lattices and their properties, Bounded Lattices, Sub Lattices, Direct Products.

Section – B

Counting Techniques: Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic. Basic counting techniques-inclusion and exclusion, pigeon-hole principle.
 Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers.

Section – C

Boolean algebra: Introduction to Boolean algebra and Boolean functions, Different representations of Boolean functions, Application of Boolean functions to synthesis of circuits. Karnaugh maps.
 Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields (Definition and examples only)

Section – D

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Coloring, Coloring maps and Planar Graphs, Coloring Vertices, Coloring Edges, List Coloring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

Text books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications, 4th edition, Wadsworth Publishing Co. Inc.
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics: A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.
4. M.K. Sen (Author), D.S. Malik (Author), Discrete Mathematics: Theory and Applications, Cengage.

Reference books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and Its Application to Computer Science”, TMG Edition, Tata McGraw-Hill
2. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press. Schum’s Outlines Series, Seymour Lipchitz, Marc Lipson, Discrete Mathematics, Tata McGraw – Hill

| Course Outcomes | Program Outcomes | | | | | | | | | | | | |
|-----------------|------------------|------|------|------|------|------|------|------|------|-------|-------|-------|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | |
| CO1 | 3 | 2 | | | | | | | | | | 1 | |
| CO2 | 3 | 2 | | | | | | | | | | 1 | |
| CO3 | 3 | 2 | | | | | | | | | | 1 | 1 |
| CO4 | 3 | 2 | | | | | | | | | | 1 | 1 |

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|-----------------------|---|---------|
| Course Title/Code | WEB DESIGNING-II(CSW209C) | |
| Course Type | Core | |
| L-T-P Structure | (0-0-2-0) | |
| Credits | 1 | |
| Prerequisites | WD-I (Basic HTML,CSS) | |
| Course Objective | Student will be able to design and develop a dynamic Website, with deployment on local host | |
| Course Outcomes (COs) | | Mapping |

| | | |
|-----|--|----------------------------------|
| CO1 | demonstrate the basic building blocks of scalable web development | Employability |
| CO2 | design and develop dynamic web pages with good aesthetic sense of designing by applying Bootstrap | Employability |
| CO3 | Learn modern tools, frameworks and Database Connectivity to web applications and analyze client-side web UI frameworks | Employability/ Skill Development |
| CO4 | deploy a complete professional website using NODE.js. | Employability/ Skill Development |

SECTION-A

HTML5 & CSS: Concepts of HTML, CSS: CSS Box model, Form designs, creating portfolio using HTML and CSS.

JavaScript: Introduction to JavaScript, JS Forms, JS Form Validation, JS Classes, JS Objects, JS HTML DOM, JavaScript events, introduction to Typescript.

Bootstrap 5: Bootstrap Containers, Basic Structure of a Bootstrap Grid, Bootstrap Text/Typography, Colors, Tables, Images, Alerts, Buttons, Badges, Progress Bars, Pagination, Dropdowns, Nav Menus, Navbars, Forms

SECTION-B

Web designing: Introduction to modern web designing tools. Creating webpages using WordPress, Dreamweaver, Canva. SEO: Introduction to Search Engine Optimization, Google Ads Keyword Planner

SECTION-C

Client server architecture: Introduction to client server architecture, Types of servers, Server Environment. Node.js: HTTP Modules, File system, URL Module, Events, NPM, Upload files, Email, Node.js - Express Framework

SECTION-D

MySQL/NOSQL: Introduction to databases, NOSQL databases, MySQL Create Database, Create Table, Insert Into table, MySQL Select From a table, select with a Filter, Sort the Result with Order By, Delete Record, Drop Table, Update Table, Limit the Result, Join Two or More Tables.

Text Books:

- Pro HTML5 and CSS3 Design Patterns Paperback – 2012 by Dionysios Synodinos, Michael Bowers, Victor Sumner
- Murach's HTML5 and CSS3 Paperback – 2012 by [Zak Ruvalcaba](#)

- “Programming JavaScript Applications: Robust Web Architecture with Node, HTML5, and Moderns JS Libraries”
- Dive Into HTML5 by Mark Pilgrim

Reference Books:

- Hello! HTML5 & CSS3: A user-friendly reference guide Paperback by [Rob Crowther](#).
- “JavaScript for Kids: A Playful Introduction to Programming” by Nick Morgan.
- HTML5 Guidelines for Web Developers by Klaus Föster

CO-PO Mapping

| Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 |
|-------------------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|
| WEB DESIGNING-II | CO1 | 3 | | 3 | | 3 | | | | 1 | | | | 3 | |
| | CO2 | 3 | | 3 | | 3 | | | | 1 | | | 1 | 3 | |
| | CO3 | 3 | | 3 | | 3 | | | | 3 | 1 | 2 | 2 | 2 | 3 |
| | CO4 | 3 | | 3 | | | | 3 | | 3 | 3 | 2 | 3 | 2 | 3 |

| | |
|--------------------------|--|
| Course Title Code | Professional Competency Enhancement – I(CDO231) |
| Course Type | Core |
| Course Nature | Soft |
| L-T-P Structure | (1-0-0) |
| Credits | 1 |

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|------------------------|---|
| Course Outcomes | CO1: Solve problems based on the number system, Average & Progression. CO2: Solve problems based on verbal reasoning & simplification. CO3: Exhibit impactful soft skills pertaining to the industry requirement. CO4: Plan their careers meticulously by setting their time oriented goals. |
|------------------------|---|

Part A

Unit 1: Number System

1. Vedic Mathematics
2. Simplification
3. Numbers - Divisibility Rule
 - 3.3 HCF & LCM
 - 3.4 Factors and Multiples
 - 3.5 Unit Digits & Cyclicity
 - 3.6 Remainders
 - 3.7 Factorials

Unit 2: Arithmetic 1

- 2.1 Averages
- 2.2 Progressions
- 2.3 Logarithm

Unit 3: Logical Reasoning 1

- 3.1 Direction Sense Test
- 3.2 Blood Relation Test
- 3.3 Ranking

Part B

Unit 4: Career Planning

- 4.1 Career planning Process - Self Assessment, Decision Making
- 4.2 Goal Setting: Relevance, SMART goals, The Dos & Don'ts

Unit 5: Personality Enhancement

- 5.1 Stress Management: Concept of stress, Types of Stress, Stress Response Example, Vulnerability to Stress,
Stress Warning Symbols, Suggestions for Reducing Stress,
- 5.2 Time Management: Setting Priorities, Managing Time, Four Quadrants of Time Management

Unit 6: Effective Communication

- 6.1 Situational English: Role Plays, Greetings & Introduction, Making Requests, Asking for & giving permission, Telephone Communications.
- 6.2 Art of Small Talk

Unit 7: Interpersonal Skills

7.1 Team Building: Characteristics of effective Teams, Collaboration, Supportive Environment, Designing the Team, Identifying Roles and Responsibilities

7.2 Conflict Management: Understanding & Resolution

7.3 Crisis Management Skills

Recommended Texts and Readings:

1 Quantitative Aptitude for Competitive Examinations by R S Aggarwal, S. Chand & Company Pvt. Ltd.

2. How to Prepare for Logical Reasoning for CAT by Arun Sharma, TMH

3. Management by Stephen P. Robbins

4. How to Win Friends and Influence People by Dale Carnegie

5. Elevate your Team by Robert Glazer

Assessment Tools:

- Continuous Assessment: Assignments/ Activities/ Quiz
- Mid Term examination
- Term-end examination (Practical)

Course Articulation Matrix:

| CO/P O, PSO | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | P01 0 | P01 1 | P01 2 | PSO 1 | PSO 2 |
|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|----------|----------|----------|----------|
| C01 | 3 | 3 | 2 | - | 3 | - | - | - | - | - | - | 2 | - | - |
| C02 | 3 | 3 | 2 | - | 3 | - | - | - | - | - | - | 2 | - | - |
| C03 | - | - | - | - | - | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 |
| C04 | - | - | - | - | - | - | - | - | - | 2 | 3 | 3 | - | - |

| | |
|-------------------|---------------------------------------|
| Course Title/Code | Advance Python for AI(CSH210C) |
| Course Type | Core |
| L-T-P Structure | 1-0-0 |
| Credits | 1 |
| Prerequisites | NA |

| | | |
|-----------------------|---|----------------------------------|
| Course Objective | To equip students with advanced Python programming skills, including object-oriented programming, data processing, and statistical modelling, enabling them to write efficient, clean, and maintainable code for real-world applications. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Demonstrate proficiency in advanced Python concepts, including generators, decorators, file handling, serialization, and best coding practices to write efficient and maintainable code. | Employability |
| CO2 | Apply object-oriented programming principles such as encapsulation, inheritance, and polymorphism to develop well-structured and reusable software solutions. | Employability |
| CO3 | Utilize the Pandas library for data processing, cleaning, transformation, and feature engineering to prepare datasets for analysis. | Employability/ Skill Development |
| CO4 | Perform exploratory data analysis (EDA) and statistical modelling, including curve fitting with linear and nonlinear regression, to derive insights from data. | Employability/ Skill Development |

SECTION-A

Generators & Decorators, Itertools Module, Exception handling, Files and File Paths, types of files, relative vs absolute path, Reading and writing on text Files, Binary Files, pickle module, serialization and deserialization, Reading and writing on csv Files, Best Practices and Clean Coding

SECTION-B

Procedural vs Object Oriented programming, Classes and objects, OOPs concepts – abstraction, encapsulation, polymorphism, inheritance, Special Functions, Lambda, First-class function, Higher order functions, Pure functions, Functions as first-class Objects, Higher-order Function, Writing Clean Classes

SECTION-C

Introduction to Data Processing, Introduction to Pandas and Basic Concepts of Pandas, Data Cleaning and Preparation, Handling Missing Data, filtering out Missing Data, Filling in Missing Data, Data Transformation, Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Renaming Axis Indexes, Discretization and Binning, Detecting and Filtering Outliers, Permutation and Random Sampling, String Manipulation, Feature Engineering

SECTION-D

Derived Variables, Basic Exploratory Data Analysis, Methods for EDA and Examples, Statistical Modeling, Curve Fitting: Linear Regression, Nonlinear Regression

Textbooks: Reference Materials:

- (i) Python Programming: An Introduction to Computer Science (4th Edition)
- (ii) Learn Python the Hard Way: 3rd Edition
- (iii) Python Crash Course: A Hands-On, Project-Based Introduction to Programming (2nd Edition)
- (iv) Head-First Python: A Brain-Friendly Guide (2nd Edition)

Reference Books:

- (i) Python Cookbook: Recipes for Mastering Python 3 (3rd Edition)

(ii) Introduction to Machine Learning with Python: A Guide for Data Scientists (1st Edition)

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 |
|-------------|-----------------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| | ADVANCE PYTHON FOR AI | CO1 | 3 | - | - | - | 3 | - | - | - | - | - | 2 | 3 | 2 |
| | | CO2 | 3 | - | - | - | 3 | - | - | - | - | - | - | 3 | 2 |
| | | CO3 | 3 | 2 | 2 | - | 3 | - | - | - | - | - | 3 | 3 | 2 |
| | | CO4 | 3 | 2 | 2 | 3 | 3 | - | - | 1 | - | - | 2 | 3 | 3 |

| | |
|-------------------|------------------------------------|
| Course Title/Code | Advance Python for AI Lab(CSH201C) |
| Course Type | Core |
| L-T-P Structure | 0-0-2 |
| Credits | 1 |

| | | |
|-----------------------|---|-------------------|
| Pre-requisites | NA | |
| Course Objective | To develop proficiency in Python programming with a focus on advanced concepts, object-oriented programming, data processing, and statistical modelling, enabling students to build efficient, clean, and data-driven applications. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | To apply advanced Python programming techniques, including OOP, functional programming, file handling, data processing, and statistical modelling, to develop optimized and maintainable software solutions. | Skill Development |

LIST OF EXPERIMENTS

- Implement a Python generator to yield even numbers up to a given limit.
- Demonstrate the use of itertools functions like count(), cycle(), combinations(), and permutations().
- Write a Python program to read and write text files, binary files, and CSV files.
- Write a Python program that reads a file and handles exceptions like FileNotFoundError, IOError, and ValueError.
- Implement a Student Management System demonstrating abstraction, encapsulation, inheritance, and polymorphism.
- Use lambda functions for sorting lists and filtering data.
- Demonstrate higher-order functions by passing a function as an argument.
- Load a dataset using Pandas and clean missing values using different techniques like dropping, filling, and interpolation.
- Apply feature engineering techniques like binning, mapping, replacing values, and renaming columns to transform data.
- Perform basic EDA using Pandas, Matplotlib, and Seaborn to visualize distributions, correlations, and outliers.
- Implement linear and nonlinear regression models using scikit-learn and evaluate their performance with R² score and MSE.

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PS O1 | PS O2 |
|-------------|---------------------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| | ADVANCE PYTHON FOR AI LAB | CO1 | 3 | 2 | 3 | 2 | 3 | - | - | 2 | - | - | 2 | 3 | 3 |

| | |
|-------------------|---|
| Course Title/Code | Backend Development with NODE JS |
| Course Type | Core |
| L-T-P Structure | 2-0-0 |
| Credits | 2 |
| Prerequisites | NA |

| | | |
|-----------------------|---|----------------------------------|
| Course Objective | To provide students with a strong foundation in Node.js, covering its architecture, modules, buffers, and REST API development, enabling them to build scalable and efficient server-side applications. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Explain the architecture, working, and features of Node.js and its role in modern web development. | Employability |
| CO2 | Utilize Node.js modules, including file system operations and event handling, to manage server-side functionality. | Employability |
| CO3 | Implement buffer operations and stream handling for efficient data processing in Node.js applications. | Employability/ Skill Development |
| CO4 | Develop and deploy RESTful APIs using Node.js and Express to facilitate client-server communication. | Employability/ Skill Development |

SECTION-A

What is Node.js, History of Node.js, Why Node.js, Node.js Architecture, Working and Features, Installation and Setup, Installing Node.js, Launching REPL, Environment, Installing Visual Studio, Code Editor, Components of Node.js

SECTION-B

Module Exports, Export Object, Export Functions, Export Functions as Class, loading module from, Separate Folder, Modules, File System Module, Reading and Writing into, Files, Appending and Opening Files, Events and Event Emitters, Handling Events, Customized Class for Handling Events, In-built Modules File Systems, Operating System

SECTION-C

Writing to Buffers, Reading from Buffers, Concatenating Buffers, Copying Buffers, Slicing Buffers, The Stream Module, Reading from Stream, Writing to Stream, Pipes, Pipe Chaining

SECTION-D

Explain REST API, Describe Node.js express, Discuss the importance of express, Explain the installing process of express, Learn express request and response, Describe routing, REST API: Intro to API, History of API Development, Development of AJAX, CRUD

Textbooks: Reference Materials:

- . Refactoring UI by Adam Wathan & Steve Schoger.
- i. Practical UI by Adham Dannaway.

Reference Books:

- (i) How to Design Better UI Components 3.0 by Adrian Kuleszo
- (ii) Better Web Typography for a Better Web by Matej Latin

CO-PO Mapping

| Co e Co | Course | Course Outcom es | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PSO 1 | PSO 2 |
|---------------|--|------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|
| | Backend Developme nt with Node JS | CO1 | 3 | - | - | - | - | - | - | - | - | - | 1 | 3 | 2 |
| | | CO2 | 3 | - | 2 | 1 | 3 | - | - | - | - | - | 1 | 3 | 3 |
| | | CO3 | 3 | - | 3 | - | 3 | - | - | - | - | - | 2 | 3 | 3 |
| | | CO4 | 3 | - | 3 | - | 3 | - | - | 2 | - | - | 3 | 3 | 3 |

| | | |
|-----------------------|--|----------------------|
| Course Title/Code | Backend Development with Node JS Lab | |
| Course Type | Core | |
| L-T-P Structure | 0-0-2 | |
| Credits | 1 | |
| Pre-requisit ies | NA | |
| Course Objective | To provide hands-on experience in using Node.js for building server-side applications, managing modules, handling data streams, and developing RESTful APIs. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Develop and manage Node.js applications using built-in modules, file handling, and event-driven programming. | Skill Development |
| CO2 | Design and implement RESTful APIs using Node.js and Express for efficient client-server interactions. | Skill Development |

LIST OF EXPERIMENTS

- Exporting an object from a module using exports Object
- Exporting nested objects and function from Module using exports Object
- Writing to the server using request-response statements as a callback in createServer() function
- Reading into a file asynchronously and writing code for handling error if file not found to read
- Reading a text file on the server using http and fs module
- Firing two events simultaneously simulating connection and receiving information from any database or server
- Embed JavaScript functions as an expression inside the curly brackets {} for use in JSX
- Using String Literal as JSX attribute with nesting elements
- Designing a clock showing current time Input Code and Resulting Output

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PS O1 | PS O2 |
|-------------|--------------------------------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| | Backend Development with Node JS LAB | CO1 | 3 | - | 3 | 2 | 3 | - | - | 2 | - | - | 2 | 3 | 3 |
| | | CO2 | 3 | - | 3 | - | 3 | - | - | - | - | - | 3 | 3 | 3 |

| | |
|-------------------|--|
| Course Title/Code | Linux (CSW212C) |
| Course Type | Core |
| L-T-P Structure | 0-0-4 |
| Credits | 2 |
| Prerequisites | Basic understanding of computer systems and operating systems. |

| | | |
|-----------------------|---|----------------------------------|
| Course Objective | Students will have the understanding of Linux through Kali Linux. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Comprehension: Explain the Linux design philosophy and its implications for system administration. | Employability |
| CO2 | Apply expertise in partitioning, logical volumes, and file system management techniques to solve storage-related issues in Linux environments. | Employability |
| CO3 | Analyse system performance metrics to troubleshoot CPU and memory issues effectively in Linux environments. | Employability/ Skill Development |
| CO4 | Evaluate the effectiveness of cybersecurity measures and access management methods in protecting Linux systems. | Employability/ Skill Development |

SECTION-A

Performing Basic Linux Tasks: Identify the Linux Design Philosophy, Enter Shell Commands, and Get Help with Linux.

Managing Users and Groups: Assume Superuser Privileges, Create, Modify, and Delete Users, Create, Modify, and Delete Groups, Query Users and Groups and Configure Account Profiles.

Managing Permissions and Ownership: Modify File and Directory Permissions, Modify File and Directory Ownership, Configure Special Permissions and Attributes and Troubleshoot Permissions Issues.

SECTION-B

Managing Storage: Create Partitions, Manage Logical Volumes, Mount File Systems, Manage File Systems, Navigate the Linux Directory Structure and Troubleshoot Storage Issues.

Managing Files and Directories: Create and Edit Text Files, Search for Files, Perform Operations on Files and Directories, Process Text Files and Manipulate File Output.

Managing Kernel Modules: Explore the Linux Kernel, Install and Configure Kernel Modules and Monitor Kernel Modules

Managing the Linux Boot Process: Configure Linux Boot Components and Configure GRUB 2

SECTION-C

Managing System Components: Configure Localization Options, Configure GUIs, Manage Services, Troubleshoot Process Issues and Troubleshoot CPU and Memory Issues.

Managing Devices: Identify the Types of Linux Devices, Configure Devices, Monitor Devices and Troubleshoot Hardware Issues.

Managing Networking: Identify TCP/IP Fundamentals, Identify Linux Server Roles, Connect to a Network, Configure DHCP and DNS Client Services, Configure Cloud and Virtualization Technologies and Troubleshoot Networking Issues

Managing Packages and Software: Identify Package Managers, Manage RPM Packages with YUM, Manage Debian Packages with APT, Configure Repositories, Acquire Software, Build Software from Source Code and Troubleshoot Software Dependency Issues.

SECTION-D

Securing Linux Systems: Implement Cybersecurity Best Practices, Implement Identity and Access Management Methods, Configure SELinux or AppArmor, Configure Firewalls, Implement Logging Services and Back Up, Restore, and Verify Data.

Working with Bash Scripts: Customize the Bash Shell Environment, Identify Scripting and Programming Fundamentals, Write and Execute a Simple Bash Script and Incorporate Control Statements in Bash Scripts.

Automating Tasks: Schedule Jobs, Implement Version Control Using Git and Identify Orchestration Concepts.

Installing Linux: Prepare for Linux Installation and Perform the Installation.

LIST OF EXPERIMENTS

1. Managing Users and Groups
2. Managing Permissions and Ownership
3. Managing Storage
4. Managing Files and Directories
5. Managing Kernel Modules
6. Managing the Linux Boot Process
7. Managing System Components
8. Managing Devices
9. Managing Networking
10. Managing Packages and Software
11. Configure a Firewall
12. Back Up, Restore, and Verify Data
13. Automating Tasks
14. Linux Installation using ISO image

Text Books:

(i) Kali Linux: Kali Linux Made Easy For Beginners and Intermediates Step By Step with Hands On Projects (Including Hacking and Cybersecurity Basics with Kali Linux) Kindle Edition by Craig Berg

Reference Books:

(i) RHCSA Red Hat Enterprise Linux 8: Training and Exam Preparation Guide (EX200), First Edition Kindle Edition by Asghar Ghori

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 |
|-------------|--------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|
| CSS350 B-P | Linux | CO1 | 3 | 3 | - | - | 3 | - | - | - | - | 2 | - | 3 | 3 | - |
| | | CO2 | 3 | 3 | - | 3 | 3 | - | - | - | - | 2 | - | 3 | 3 | 3 |

| | | | | | | | | | | | | | | | | |
|--|--|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CO3 | 3 | 3 | - | - | 3 | - | 2 | 2 | - | 2 | - | 3 | 3 | 3 |
| | | CO4 | 3 | 3 | - | - | 3 | - | 2 | 2 | - | 2 | - | 3 | 3 | 3 |

Detailed Syllabus
4th Semester

| | |
|--------------------|--------------------------------------|
| Course Title/ Code | SOFTWARE ENGINEERING(CSH213C) |
| Course Type: | Core |
| L-T-P Structure | (3-1-0) |
| Credits | 4 |

| | |
|------------|--|
| Objectives | Student will be able to study software development principles and to focus on the fundamentals of modeling aspects of software project for solving real life problems effectively. |
|------------|--|

| Course Outcome | Mapping |
|--|-----------------------------------|
| CO1: Understand and demonstrate basic principles and models in software engineering. | Employability & Skill development |
| CO2: Identify requirements and analyze them for the real life application. | Employability & Skill development |
| CO3: Design solutions with proper analysis for the real life application. | Employability & Skill development |
| CO4: Develop the software requirement specifications documents. | Employability & Skill development |

Section-A

Introduction: Evolving role of software, Software Characteristics, Software crisis, Silver bullet, Software myths, Software process, Personal Software Process (PSP), Team Software Process (TSP), emergence of software engineering, project and product

Software Development Life-cycle: Software life cycle models: Build and fix, Waterfall, incremental and evolutionary process, model, spiral model, agile methodology, and selection of a life cycle model.

Section-B

Software Requirement Analysis and Specifications: Problem Analysis, Requirements engineering: Requirement elicitation, Requirement Analysis, Requirement documentation, Requirement Review, Types of requirements, Behavioral and non-behavioral requirement, feasibility study, Requirement elicitation: Interviews, Brainstorming, FAST, QFD, Use case Approach; Requirement analysis: DFDs, E-R diagram; Requirement documentation: Software Requirement Specification.

Software Project Planning: Project management concepts, planning the software project, Size Estimation—LOC based, FP based, COCOMO- A Heuristic estimation techniques, staffing level estimation, Putnam Resource Allocation model, risk analysis and management

Section-C

Software Design: Design concepts and principles: the design process, Modularity: Cohesion, Coupling, Strategies of design: bottom up, top down, hybrid design, User interface design, Object Oriented design: Class Diagrams, Interaction Diagrams-State chart Diagrams-Activity Diagrams

Software Metrics: Token Count, Data Structure Metrics, Information Flow Metrics.

Modern Agile Practices: Introducing frameworks like Scrum and Kanban, along with agile ceremonies (sprint planning, retrospectives), would help students align with current industry methodologies.

Project Management Tools: Basic exposure to tools such as JIRA or Trello would familiarize students with requirement tracking and sprint management, which are widely used in software teams.

Section-D

Software Testing: Software process, Functional testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing: Path testing, Data flow and mutation testing, unit testing, integration and system testing, Debugging, Testing Tools & Standards.

Software Maintenance: Management of Maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation

TEXT BOOKS:

1. R. S. Pressman, “Software Engineering – A practitioner’s approach”, 3rded., McGraw Hill Int. Ed., 1992.
2. K.K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International, 2001

REFERENCE BOOKS:

1. R. Fairley, “Software Engineering Concepts”, Tata McGraw Hill, 1997.
2. P. Jalote, “An Integrated approach to Software Engineering”, Narosa, 1991.
3. James Peter, W Pedrycz, “Software Engineering”, John Wiley & Sons
4. Sommerville, “Software Engineering”, Addison Wesley, 1999.

CO-PO-PSO MAPPING MATRIX

“-“ :No Mapping 1: Low Mapping 2: Medium Mapping 3: High Mapping

| CO/PO-PSO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PSO 1 | PSO 2 |
|--|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| CO1: Understand and demonstrate basic principles and models in software engineering. | - | - | 2 | - | | 2 | - | - | - | - | - | - | 2 |
| CO2: Identify requirements and analyze them for the real life application. | - | - | 3 | - | | 3 | - | - | - | - | - | - | 2 |
| CO3: Design solutions with proper analysis | - | - | 3 | - | | 3 | - | - | - | - | - | - | 2 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|--|---|---|---|---|---|---|---|---|
| for the real life application. | | | | | | | | | | | | | |
| CO4: Develop the software requirement specifications and the SRS documents. | - | - | 3 | - | | 3 | - | - | - | - | - | - | 2 |

| | |
|-------------------|----------------------------|
| Course Title/Code | Computer Networks –CSH214C |
| Course Type | Core |
| L-T-P Structure | 3-1-0 |
| Credits | 4 |
| Prerequisites | NA |

| | | |
|-----------------------|---|----------------------------------|
| Course Objective | Students ^(A) will be able to understand and apply ^(B) concepts of the computer network, its applications, understand protocols and algorithms and design simulator ^(C) as defined by the scope of given problem statement ^(D) | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Define knowledge of various transmission media, their components and devices | Employability |
| CO2 | Describe the various networks and access techniques at data link layer level | Employability |
| CO3 | Describe the IP addressing and various networks at the network layer level | Employability/ Skill Development |
| CO4 | Analyze the various protocols and congestion control at the transport layer level | Employability/ Skill Development |
| CO5 | Demonstrate the various network models at the application layer level | Employability/ Skill Development |

Section-A

DATA COMMUNICATION: Components –Transmission Modes, Synchronous and Asynchronous transmission – networks – Components and Categories – types of Connections – Topologies –Protocols and Standards – ISO / OSI model – TCP/IP Model

PHYSICAL LAYER: Transmission Media – Line Configuration – Line Coding – Modem – Interconnection devices: Hub, Repeater, Switch, Bridges, Router, and Gateway

Section-B

DATA LINK LAYER& LOCAL AREA NETWORK: Framing – Error – detection and correction, Window based – Flow Control and Error control – stop and wait –sliding window- go back-N ARQ – selective repeat ARQ. –Access Techniques: STDM, FDMA, TDMA, Spread Spectrum techniques, and CDMA, DSSS, FHSSS – Media Access Control: Aloha. Pure Aloha, Slotted Aloha, Polling, CSMA, CSMA/CD – IEEE 802 Standards –LAN – Ethernet IEEE 802.3 – IEEE 802.5 – IEEE 802.6 – IEEE 802.11 – FDDI–X.25 – HDLC – Frame Relay – ATM – SONET/SDH

Section-C

NETWORK LAYER: Internetworks Switching: Circuit Switching, Packet Switching, Virtual Circuit and PVC, Message Switching, Cell Switching – IP addressing – Subnetting–classful and classless– Routing Algorithms – Distance Vector Routing – Link State Routing, Path Vector Routing – Error control and congestion control—ARP, RARP, ICMP, DHCP –IPV4 and IPV6 – NAT – Mobile IP

Section-D

TRANSPORT LAYER: Duties of transport layer – Multiplexing – Demultiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QOS).

APPLICATION LAYER: Client Server model – Network File System – Remote Login- TELNET, FTP – EMAIL SYSTEM: SMTP, POP3, IMAP4 – DNS, DNS Server – HTTP – SNMP, Network

Security. Firewalls – Proxy Servers – VLAN–VPN – NETWORK Simulator case Study—Cisco Packet Tracer.

Data Communications and Networking by ForouzanBehrouz A., TMH Publications
 Computer Networks (3rd edition), Tanenbaum Andrew S., International edition, 1996
 Reference Books:

Data Communications, Computer Networks and Open Systems (4th edition), Halsall Fred, 2000, Addison Wesley, Low Price Edition. -
 Computer Networks – A System Approach, Larry L. Peterson & Bruce S. Davie, 2nd Edition
 Computer Networking – ED Tittel , 2002, T.M.H.

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PS O1 | PS O2 | |
|---------------|-------------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|---|
| CSH22 7B-T | COMPUTER NETWORKS | CO1 | 3 | 3 | | | | - | - | - | - | - | | | | |
| | | CO2 | | 3 | 3 | 3 | 3 | | - | - | - | - | | | 3 | 3 |
| | | CO3 | 3 | 3 | 3 | 3 | 3 | | - | - | - | - | | 3 | 3 | 2 |
| | | CO4 | 3 | 3 | 3 | 3 | 3 | | - | - | - | - | | | 3 | 3 |
| | | CO5 | 3 | 3 | 3 | 3 | 3 | | | | | | | 3 | 3 | 3 |

| | |
|-------------------|-------------------------------|
| Course Title/Code | Computer Networks Lab-CSH215C |
| Course Type | Core |
| L-T-P Structure | 0-0-2 |
| Credits | 1 |

| | | |
|-----------------------|---|-------------------|
| Prerequisites | NA | |
| Course Objective | Students ^(A) will be able to understand and apply ^(B) concepts of the computer network, its applications, understand protocols and algorithms and design simulator ^(C) as defined by the scope of given problem statement ^(D) | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Describe the electrical properties and characteristics of various materials, used in the electrical appliances , devices , instruments | Skill Development |
| CO2 | Design circuits using diodes and transistors | Skill Development |
| CO3 | Realize circuits using opamps | Skill Development |

LIST OF EXPERIMENTS

- Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
- Working of Network Devices in Detail.
- Sharing of Drive or folder over the Network
- Sharing of printer over the network.
- Study of basic network command and Network configuration commands i.e. attributes like ipconfig, ping, Tracert, Pathping, Netstat, Arp, Netstate
- Find the IPAddress using getHostAddress, getByName.
- Configure a Network topology using packet tracer software.
- Track the network using a network management and monitoring tool
- Connect the computers in Local Area Network using hub.
- Find the MAC address using packet tracer software.
- LAN-to-LAN Connections.
- Advanced LAN Switching Configuration – VLANs
- Building Inter-VLAN Network with a Router and Layer-3 Switch
- Basic Router Configuration
- RIP Version 2 and Debugging
- Configure a Network using Distance Vector Routing protocol.
- Configure Network using Link State Vector Routing protocol.

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PS O1 | PS O2 |
|---------------|-------------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| CSH22 7B-P | COMPUTER NETWORKS | CO1 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | 3 | 3 | 3 |
| | | CO2 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| | | CO3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| | | CO4 | 3 | 3 | 3 | 3 | 3 | | | | | | 3 | 3 | 3 |

| | |
|-------------------------------|----------------------------------|
| Course Title/ Code | MACHINE LEARNING(CSH216C) |
| Course Type: | Core |
| L-T-P Structure | 3-0-0 |
| Credits | 3 |
| Prerequisites | NA |

| | |
|--------------------------|---|
| Course Objectives | To learn the concept of how to learn patterns and concepts from data To design and analyze various machine learning algorithms and techniques Explore supervised and unsupervised learning paradigms of machine learning To explore Deep learning technique and various feature extraction strategies. |
|--------------------------|---|

| Course Outcomes (Cos) | | Mapping |
|------------------------------|---|-----------------------------------|
| CO1 | Describe the basics of Machine Learning Algorithms. | Employability |
| CO2 | Demonstrate the concepts of exploratory Data Analytics. | Employability |
| CO3 | Apply machine learning techniques to perform predictive analytics | Employability & Skill development |
| CO4 | Develop solutions to real life problems using ML Techniques. | Employability & Skill development |

S

ection A
Unsupe
rvised
Learnin
g

Clustering: K-means/Kernel K-means, Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models)

S

ection B

Supervised Learning
(Regression/Classification)

Basic methods: Distance-based methods, Nearest-Neighbors, Decision Trees, © Bayes, Linear models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Nonlinearity and Kernel Methods, Beyond Binary Classification: Multi-class/Structured Outputs, Ranking, ANOVA

Section C

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, and Random Forests). Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

Section D

Scalable Machine Learning (Online and Distributed Learning)

A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference.

Text Books:

- Tom M Mitchell, Machine Learning, McGraw Hill Education
- i. Bishop, C. (2006). Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.
- ii. Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: WileyInterscience, 2000. ISBN: 9780471056690.
- iii. Tom M. Mitchell, Machine learning .ISBN – 9781259096952, McGraw-Hill Series, Edition – First

Reference Books:

- . Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995. ISBN: 9780198538646.
- i. Introduction to Machine Learning – Ethem Alpaydin, MIT Press, Prentice hall of India.

CO-PO Mapping

| Course Code | Course | Course Outcomes | POs and PSOs | | | | | | | | | | | | |
|-------------|------------------|-----------------|--------------|------|------|------|------|------|------|------|------|------|------|-------|-------|
| | | | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PSO 1 | PSO 2 |
| CSH216C | Machine Learning | CO1 | 1 | 2 | 2 | 2 | 3 | - | - | 1 | 1 | 1 | 3 | 3 | - |
| | | CO2 | 1 | 1 | - | 3 | 2 | 1 | - | 1 | 1 | 1 | 3 | 3 | 1 |
| | | CO3 | 3 | 2 | 3 | 1 | 3 | 3 | - | 3 | 2 | 2 | 3 | 3 | 2 |
| | | CO4 | 2 | 3 | 2 | - | 2 | 2 | - | 2 | 3 | 3 | 3 | 3 | 3 |

| | | |
|-----------------------|---|-----------------------------------|
| Course Title/Code | MACHINE LEARNING LAB (CSH217C)(CSH217C) | |
| Course Type | Core | |
| L-T-P Structure | 0-0-2 | |
| Credits | 1 | |
| Pre-requisites | NA | |
| Course Objective | Understand the concepts of various Machine Learning techniques and implement their logic. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Implement unsupervised and supervised ML techniques. | Skill Development |
| CO2 | Perform feature engineering. | Skill Development |
| CO3 | Develop solutions to real life problems using ML Techniques. | Employability & Skill development |

LIST OF EXPERIMENTS

- Study and Implement various types of Regression
- Study and Implement k-means clustering
- Study and Implement k-nearest neighbor classification
- Study and Implement the Bayes learner
- Study and Implement the Decision Tree learners
- Study and implement the Ada boost algorithm
- Study and Implement PCA
- A minor project based on Pattern Recognition.

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PS O1 | PS O2 |
|-------------|----------------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| CSH217C | MACHINE LEARNING LAB | CO1 | 1 | 2 | 2 | 2 | 3 | - | - | 1 | 1 | 1 | 3 | 3 | - |
| | | CO2 | 1 | 2 | 2 | 2 | 3 | - | - | 1 | 1 | 1 | 3 | 3 | - |
| | | CO3 | 2 | 3 | 2 | - | 2 | 2 | - | 2 | 3 | 3 | 3 | 3 | 3 |

| | |
|-------------------|--|
| Course Title/Code | MOBILE APP DEVELOPMENT(CSH218C) |
| Course Type | Core |
| L-T-P Structure | 0-0-4 |
| Credits | 2 |
| Pre-requisites | Basic computer skills, Basic math skills, basic understanding of the Java programming language |

| | | |
|-----------------------|--|-----------------------------------|
| | | |
| Course Objective | To make the student understand the basic concepts of mobile application development, be aware of Characteristics of mobile applications, User-interface design, basics of graphics and Publishing of Android application | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Understand the fundamentals of the Kotlin programming language and how to build Android apps in Kotlin | Skill Development |
| CO2 | Build user interfaces with Jetpack Compose, including layouts with text, images, and buttons. | Skill Development |
| CO3 | Develop a prototype that can be evaluated with a specified user group and illustrate the deployment of app on various mobile API level. | Employability / Skill Development |

Section A

Introduction to Kotlin, Set up Android Studio, Build a basic layout, Kotlin fundamentals, Add a button to an app, Interact with UI and state

Section B

Overview of Android Ecosystem, Introduction to Android SDK, Android application building block, features of Android Studio, Android Platform Architecture, Challenges in development, Environment setup & Installation of Android Studio, AVD Setup.

Section C

Design Criteria for Android Application including scrollable list, interactive apps, Architecture Components, Navigation in Jetpack Compose, Adapt for different screen sizes, Get data from the internet, Load and display images from the internet

Section D

Schedule tasks with Work Manager, Android Views and Compose in Views, Understand the View-based UI toolkit. Graphics and Animation: Custom views, Canvas, animation APIs, Multimedia: Audio, Video. Permission, performance and Security. Firebase feature and App publish

Text Books:

1. Jerome DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition

Reference Books:

1. Dawn Griffiths, David Griffiths, "Head First Android Development: A Brain-Friendly Guide", 2017.
0. Neil Smyth, "Android Studio 3.0 Development Essentials: Android", 8th Edition.

Software / Learning Website

[Android Basics with Compose](https://developer.android.com/courses/android-basics-compose/course)
<https://developer.android.com/courses/android-basics-compose/course>

<https://flutter.dev/>

LIST OF EXPERIMENTS

The course consists of eight units. Each unit is organized into learning pathways that include videos, code labs, articles, practice sets, projects, and quizzes, from which learners can earn digital badges upon completion. These badges can be added to their [Google Developer Profile](#) and can be shared on social media.

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PS O1 | PS O2 |
|-------------|-------------------------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| | MOBILE APP DEVELOPMENT | CO1 | 3 | - | - | - | - | - | - | - | - | - | - | - | 3 |
| | | CO2 | 3 | - | 3 | - | 3 | - | - | - | - | - | - | 3 | - |
| | | CO3 | 3 | - | 3 | - | 3 | - | - | 3 | - | - | - | 3 | - |

| | |
|-------------------|---|
| Course Title Code | Indian Constitution (LWS324) |
| Course Type: | Audit (Allied) |
| L-T-P Structure | 2-0-0 |
| Credits | 0 |
| Objectives | The objective of this paper is to orient the students about the Basic features and fundamental principles on the Constitution of India. |

| Course Outcome | Mapping |
|--|-----------------------------------|
| CO1: Explain the historical perspective and salient features of constitution of India | Employability & Skill development |
| CO2: Distinguish between the fundamental rights, directive principles of state policies and fundamental duties | Employability & Skill development |
| CO3: Describe the governance system, roles and responsibilities of the State | Employability & Skill development |
| CO4: Explain the amendment and emergency provisions applicable in India | Employability & Skill development |

SECTION-A

Meaning of the constitution law and constitutionalism
Historical perspective of the Constitution of India
Salient features and characteristics of the Constitution of India

SECTION-B

Scheme of the fundamental rights
The scheme of the Fundamental Duties and its legal status
The Directive Principles of State Policy – Its importance and implementation

SECTION-C

Federal structure and distribution of legislative and financial powers between the Union and the States
Parliamentary Form of Government in India – The constitution powers and status of the President of India
Local Self Government – Constitutional Scheme in India

SECTION-D

Amendment of the Constitutional Powers and Procedure
The historical perspectives of the constitutional amendments in India
Emergency Provisions: National Emergency, President Rule, Financial Emergency

| Course Outcomes | Program Outcomes | | | | | | | | | | | | Program Specific Outcomes | |
|-----------------|------------------|------|------|------|------|------|------|------|------|------|------|------|---------------------------|------|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | | | | 1 | | 3 | 1 | 3 | | | | 1 | | |
| CO2 | | | | 1 | | 3 | 2 | 3 | | | | 1 | | |
| CO3 | | | | 1 | | 3 | 2 | 3 | | | | 1 | | |
| CO4 | | | | 1 | | 3 | 1 | 3 | | | | 1 | | |

Professional Competency Enhancement - II
Subject Code - CDO232

Course Outcomes: The students will be able to:

CO 1: recognize & solve problems based on non-verbal reasoning.

- CO 2:** solve complex problems based on Syllogism with mathematical operations
- CO 3:** apply short tricks on complex problems of Percentage, Ratio & interest & Interest
- CO 4:** develop their leadership competencies and demonstrate personal effectiveness
- CO 5:** develop their problem-solving and critical-thinking skills.

PART – A

Unit 1: Arithmetic II

- 1.1 Percentages
- 1.2 Ratio & Proportion: Proportionality, Variations, Partnership, Problem on Ages & Numbers
- 1.3 Profit & Loss: Basic Terminology & Formulae, Error in Weights, Marked Price and Discounts
- 1.4 Mixtures & Allegations
- 1.5 Interest: Simple Interest, Compound Interest, Relation between SI & CI

Unit 2: Logical Reasoning II

- 2.1 Syllogism
- 2.2 Logical Deductions
- 2.3 Inequalities and Mathematical Operations

Unit 3: Non Verbal Reasoning

- 3.1 Pictorial Series
- 3.2 Missing Values
- 3.3 Analogy and Images

Part B

Unit 4: Leadership and Entrepreneurship Skills

- 4.1 Defining Leadership
- 4.2 Ethics & Values
- 4.3 Emotional Intelligence
- 4.4 Holistic Well Being and Work Life Balance

Unit 5 : Personal Effectiveness

- 5.1 Building Your Self Esteem and Assertiveness Skills
- 5.2 Accountability, Adaptability/ Flexibility for Success
- 5.3 Public Speaking

Unit 6: Problem Solving and Critical Thinking

- 6.1 Problem Solving skills: Defining Problem, Generating alternative solutions and root cause analysis
- 6.2 Critical thinking process and components.
- 6.3 Decision-making - Process and components

Recommended Texts and Readings:

1. Quantitative Aptitude for Competitive Examination by R S Aggarwal, S. Chand & Company Pvt. Ltd.
2. How to Prepare for Logical Reasoning for CAT by Arun Sharma, TMH
3. Primal Leadership by Daniel Goleman

4. In a Perfect World by Pat Hirst
5. Emotional Intelligence by Daniel Goleman
6. The Art of Public Speaking by Dale Carnegie

Assessment Tools:

- Continuous Assessment: Assignments/ Activities/ Quiz
- Mid Term examination
- Term-end examination (Practical)

Course Articulation Matrix:

| CO\P | P0 | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P0 | P1 | P2 | P3 | P4 |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| CO1 | 3 | 3 | 2 | - | 3 | - | - | - | - | - | - | - | 2 | - | - |
| CO2 | 3 | 3 | 2 | - | 3 | - | - | - | - | - | - | - | 2 | - | - |
| CO3 | 2 | 3 | 2 | - | 3 | - | - | - | - | - | - | - | 2 | - | - |
| CO4 | - | - | - | - | - | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 2 | - | 3 | - | - | - | 2 | - | 2 | 3 | 3 | 3 | 3 |

| | |
|-------------------|---------------------------------|
| Course Title/Code | Advanced Neural Networks |
| Course Type | Core |
| L-T-P Structure | 3-1-0 |
| Credits | 4 |

| | | |
|-----------------------|--|----------------------------------|
| Prerequisites | NA | |
| Course Objective | To provide students with a deep understanding of Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), advanced neural network architectures, and modern statistical concepts, enabling them to develop and optimize deep learning models for real-world applications. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Demonstrate an understanding of image processing concepts and the working principles of Convolutional Neural Networks (CNNs), including convolution, pooling, and backpropagation. | Employability |
| CO2 | Explain the architecture and functionality of Recurrent Neural Networks (RNNs) and Long Short-Term Memory (LSTM) networks, including their advantages, limitations, and applications in sequence prediction. | Employability |
| CO3 | Compare and implement various neural network architectures, such as GRU, bidirectional RNNs, and Hopfield networks, and apply gradient descent optimization techniques. | Employability/ Skill Development |
| CO4 | Apply modern statistical concepts, including confidence intervals, jackknife regression, and probabilistic graphical models, to evaluate and enhance neural network performance. | Employability/ Skill Development |

SECTION-A

Understanding Images, Need of Convolution Neural Network Convolution, Neural Network Working, Working of CNN with Kernel, Understanding Convolution Mathematically, An Example of CNN, Convolution of Images, Convolution Neurons Visualization, Parameters for Feature Maps, Activation Function in Convolution Neural Network, Pooling Step, Advantages of Pooling, Batch Normalization, Typical Convolution Neural Network, Training CNN using Backpropagation, Steps for CNN Backpropagation, Example of Convolution Neural Network Architecture, Visualization of Convolutional Neural Networks

SECTION-B

Using MLP instead of RNN, Recurrent Neural Network (RNN), Steps in Recurrent Neuron, RNN Mathematically, Example of Forward Propagation for RNN, Back Propagation in Recurrent Neural Network, Steps for Back Propagation, Applications of RNN, Limitations of RNN, LSTM Conveyor Belt Analogy, Architecture of LSTM, Gates in LSTM, Forget Gate, Input Gate, Output Gate

SECTION-C

Gradient Descents, Gradient Descent Terminologies, Types of Gradient Descents, Recurrent Neural Network, Using MLP instead of RNN, Long Short Term Memory(LSTM), Predicting the next character using RNNs, Hopfield Network, Gated Recurrent Unit (GRU), GRU Reset Gate, Bidirectional RNN

SECTION-D

Model Free Confidence Intervals, Confidence Interval Data Requirements, construct confidence interval, Jackknife Regression, Hidden Decision Trees, learn about confidence intervals, define jackknife regression, Probabilistic Graphical Models (PGM), Bayesian Network (BN), Inference in Bayesian Network, explain graphical models, Describe better goodness of fit and yield metrics

Textbooks: Reference Materials:

- (i) Deep Learning from Scratch: Building with Python from First Principles by Seth Weidman
- (ii) Neural Networks and Deep Learning by Michael Nielsen

(iii) Hands-on Machine learning with Scikit-Learn, Keras, and TensorFlow by Aurelion Geron

(iv) TensorFlow 1.x Deep Learning Cookbook

Reference Books:

(i) Deep Learning: A Practitioner’s Approach, by Adam Gibson and Josh Patterson

(ii) Hands-On Deep Learning Algorithms with Python by Sudharsan Ravichandran

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PSO 1 | PSO 2 | |
|-------------|-------------------------|-----------------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|---|
| | Advanced Neural Network | CO1 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 3 | 3 | 2 |
| | | CO2 | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | 3 | 3 | 2 |
| | | CO3 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 3 | 3 | 3 |
| | | CO4 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 3 | 3 | 3 |

| | |
|-------------------|------------------------------|
| Course Title/Code | Advanced Neural Networks Lab |
| Course Type | Core |
| L-T-P Structure | 0-0-2 |

| | | |
|-----------------------|---|-------------------|
| Credits | 2 | |
| Pre-requisites | NA | |
| Course Objective | To equip students with a strong foundation in deep learning concepts, focusing on Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), advanced neural network architectures, and modern statistical methods for developing efficient AI models. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Implement and analyze Convolutional Neural Networks (CNNs), understanding key operations such as convolution, pooling, activation functions, and backpropagation. | Skill Development |
| CO2 | Develop and evaluate Recurrent Neural Networks (RNNs), Long Short-Term Memory (LSTM) networks, and Gated Recurrent Units (GRU) for sequential data processing. | Skill Development |
| CO3 | Apply modern statistical techniques, including confidence intervals, probabilistic graphical models, and jackknife regression, to improve neural network performance and interpretability. | Skill Development |

LIST OF EXPERIMENTS

- Load an image dataset, apply grayscale conversion, normalization, and augmentation techniques.
- Implement a 3x3 kernel convolution on an image and visualize feature maps.
- Train a CNN on the MNIST dataset and evaluate its performance.
- Implement and compare max pooling, average pooling, and global pooling in CNNs.
- Train a CNN using backpropagation and analyze its learning process.
- Train an RNN model to predict the next word in a sentence.
- Implement forward and backward propagation for a simple RNN manually.
- Train an LSTM model on stock market data for trend prediction.
- Implement and compare RNN, LSTM, and GRU on the same dataset.
- Train an RNN to generate text character by character (e.g., Shakespeare text generation).
- Implement confidence interval estimation for CNN/RNN model predictions.
- Build a simple Bayesian Network using the pgmpy library and infer relationships between variables.

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 |
|-------------|------------------------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| | Advanced Neural Networks LAB | CO1 | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 2 | 3 | 3 |
| | | CO2 | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 2 | 3 | 3 |

| | | | | | | | | | | | | | | | |
|--|--|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CO3 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | 2 | 3 | 3 |
|--|--|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | |
|-------------------|---|
| Course Title/Code | Database Engineering with Mongo DB |
| Course Type | Core |
| L-T-P Structure | 2-0-0 |
| Credits | 2 |

| | | |
|-----------------------|---|----------------------------------|
| Prerequisites | NA | |
| Course Objective | To provide a strong foundation in modern data storage techniques, NoSQL databases, sharding strategies, and MongoDB operations, enabling students to manage and query large-scale distributed data efficiently. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Explain file system terminologies, metadata, and the hierarchy of traditional file storage. | Employability |
| CO2 | Describe NoSQL database types, advantages, and how they differ from traditional relational databases. | Employability |
| CO3 | Implement sharding and replication strategies for managing NoSQL databases at scale. | Employability/ Skill Development |
| CO4 | Perform CRUD operations, advanced queries, indexing, and data modeling using MongoDB. | Employability/ Skill Development |

SECTION-A

Introduction to Data Storage, Types of Data Storage Media, Traditional Storage Devices, The File System Namespace – an Introduction, File Systems, File System Terminologies, Extents and Attributes, File Metadata, Directories, Some Basic Filesystem Operations, File System Hierarchy, Common File Systems, Limitations of Traditional File Systems

SECTION-B

What is the NoSQL approach? Why Use the NoSQL Approach? Benefits of NoSQL, Types of Databases, Key-Value Stores, Wide-column Stores/ Columnar Databases, Document/Document-store/Document-oriented Databases, Graph-based Databases

SECTION-C

Managing Database for Availability and Performance, Database Scaling, Database Distribution Models, Database Replication, Types of Database Replication, Master-Slave Replication, Peer-to-Peer Replication, Advantages and Disadvantages of Peer-to-Peer Replication, Introduction to Sharding, Why Sharding, The Lookup Strategy, The Range Strategy, The Hash Strategy, When to Shard?, Sharding Challenges, Combining Sharding and Replication, Scaling of NoSQL Databases with Sharding, Algorithmic Sharding, Dynamic Sharding, Entity Groups, Hierarchical keys and Column-Oriented Databases

SECTION-D

Introduction to MongoDB, CAP Theorem, Collections & documents, understanding data types in MongoDB, Features of MongoDB Module, Overview of MongoDB, Principles & Design Goals for MongoDB Server and Database, MongoDB tools, MongoDB Installation on Windows, and Cloud, CRUD operations, Basic MongoDB Commands

SECTION-E

Importing data, Nested documents, Arrays in MongoDB, Sorting Documents, Mongo Shell / Driver, Query Comparison Operators, Nested Documents, Matching an embedded document, Query on Nested Field, Setting up filters using query operators, Arrays in MongoDB, Querying on Array, Querying the array for an Element, Querying for an Element, using operator, Querying to meet multiple criteria. Nested Arrays in MongoDB, Querying on Nested Arrays, Querying on Array of Embedded Documents, querying with multiple conditions on nested Fields, Projections Operations, Working with Indexes

SECTION-F

Discuss the concepts of modelling database, Array Updates (\$push and \$pull) Aggregation, The aggregation pipeline, The map-reduce function 12 The single purpose aggregation methods

Textbooks: Reference Materials:

- . Data modeling for MONGO DB by Steve Hoberman.
- i. MONGO DB Basics by Peter Membrey

Reference Books:

- (i) Mongo DB Fundamentals by Amit Phaltankar
- (ii) Mongo DB by Shannon Bradshaw

CO-PO Mapping

| Co e Co | Course | Course Outcom es | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PSO 1 | PSO 2 |
|---------------|---|------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|
| | Database Engineeri ng with Mongo DB | CO1 | 2 | - | - | - | - | - | - | - | - | - | 1 | 3 | 2 |
| | | CO2 | 3 | - | - | - | 2 | - | - | - | - | - | 2 | 3 | 3 |
| | | CO3 | 3 | - | 3 | - | 3 | - | - | 1 | - | - | 3 | 3 | 3 |
| | | CO4 | 3 | 1 | 3 | 1 | 3 | - | - | 2 | - | - | 3 | 3 | 3 |

| | |
|----------------------|--|
| Course Title/Code | Database Engineering with Mongo DB Lab |
| Course Type | Core |
| L-T-P Structure | 0-0-2 |

| | | |
|-----------------------|--|-------------------|
| Credits | 1 | |
| Pre-requisites | NA | |
| Course Objective | To provide hands-on experience in NoSQL database management using MongoDB, including data storage, retrieval, and optimization techniques. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Implement CRUD operations, indexing, and query optimizations in MongoDB. | Skill Development |
| CO2 | Develop scalable NoSQL database solutions using replication, sharding, and aggregation techniques. | Skill Development |

LIST OF EXPERIMENTS

- Installation of MongoDB
- Creating & Deleting a Database in MongoDB
- Creating & Deleting a Collection & Capped Collection
- Inserting documents in the collection using different methods
- Creating a Sample Database in MongoDB with Single Collection by inserting records as multiple documents and showcasing how to retrieve them
- Using Logical Operators to query data in MongoDB
- Using Element Operators to query data in MongoDB
- Referring to the sample database created in previous update the database by adding a field, updating documents along with deleting some of the records.
- Finding a document from embedded documents using query filter and operators.
- Creating a collection with embedded Arrays and performing multiple queries
- Appending and slicing the array elements along with sorting the results in a database
- Joining two Collections in a database having arrays using \$lookup

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PS O1 | PS O2 |
|-------------|---------------------------------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| | Database Engineering with MongoDB Lab | CO1 | 3 | - | 2 | - | 3 | - | - | - | - | - | 2 | 3 | 1 |
| | | CO2 | 3 | 3 | 3 | 1 | 3 | - | - | 2 | - | - | 2 | 3 | 3 |

| | |
|-------------------|--------------------------------------|
| Course Title/Code | Digital Forensics (CSH214B-T) |
| Course Type | Core |
| L-T-P Structure | 1-0-4 |

| | | |
|-----------------------|--|----------------------------------|
| Credits | 1 | |
| Prerequisites | Basic understanding of computer systems, operating systems, and file structures, along with fundamental knowledge of data storage and security concepts. | |
| Course Objective | Students will have the understanding implementation of forensics and investigation techniques. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Recall key Digital Forensics concepts, including its uses, expert skills, Locard's exchange principle, storage types, disk structure, and file system details. | Employability |
| CO2 | Demonstrate digital evidence acquisition, including identifying evidence locations, understanding acquisition methods, and ensuring chain of custody and evidence integrity. | Employability |
| CO3 | Apply skills in analysing digital evidence, including logical and deleted data, the acquisition cycle, and registry forensics using tools like FTK Imager. | Employability/ Skill Development |
| CO4 | Analyse Windows artifacts and USB forensics, including registry structure, system artifacts, and data recovery from USB drives. | Employability/ Skill Development |

SECTION-A

Introduction to Digital Forensics, What is Digital Forensics, Uses of Digital Forensics, What skills should a computer forensic expert have, Locard's exchange principle, Key Technical Concepts, Storage Types, Hard Disk Structure, File System overview, Allocated, Unallocated Space, Slack Space, Free Space, etc., File f. Deleted vs. Wiped

SECTION-B

Digital Evidence Acquisition Essentials: Identifying Disk Regions That May Contain Evidence, Potential Limitations of Sifting Collectors, Digital Forensics of Different services, Digital Forensics analysis, what is an Image, Evidence Acquisition Basics, Acquisition Types and Methods: Forensic acquisition methods for various platforms, Chain of Custody, Evidence Handling, and Evidence Integrity?

SECTION-C

Digital Forensics Analysis Process: Analysis of Digital Evidence, Scope of Analysis, Logical and/or Deleted Data, Acquisition to Reporting Cycle, Registry Forensics: Registry File Acquisition, Access Data FTK Imager, Registry Structure, Issues in Registry Analysis

SECTION-D

Windows Artifacts Analysis: Windows registry structure, Registry Hive vs Supportive Hive, Registry Files, Windows System Artifacts, USB Device Forensics: USB Flash Drives, Flash Drives Store Data, USB Flash Drive Forensics, Recovering Data from Broken or Destroyed USB Flash Drives, Retrieving Data from Monolithic USB Flash Drives

Text Books:

- (i) Windows Forensic Analysis Toolkit by Harlan Carvey
- (ii) The Basics of Digital Forensics by John Sammons

Reference Books:

- (i) Windows Registry Forensics: Advanced Digital Forensic Analysis of the Windows Registry by Harlan Carvey

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 |
|---------------|-------------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|
| CSH214 B-T | Digital Forensics | CO1 | 3 | 2 | - | - | - | 2 | - | 2 | - | - | - | 3 | 2 | 3 |
| | | CO2 | 2 | 3 | 2 | 3 | 2 | 2 | - | 3 | 2 | 2 | - | 2 | 3 | 2 |
| | | CO3 | 3 | 3 | - | 3 | 3 | 2 | - | 3 | 2 | 2 | - | 2 | 3 | 3 |
| | | CO4 | 2 | 3 | 2 | 3 | 3 | - | - | 2 | - | 2 | - | 2 | 3 | 3 |

| | |
|-------------------|--------------------------------------|
| Course Title/Code | Digital Forensics (CSH214B-T) |
| Course Type | Core |
| L-T-P Structure | 1-0-4 |

| | | |
|-----------------------|--|-------------------|
| Credits | 2 | |
| Prerequisites | Basic understanding of computer systems, operating systems, and file structures, along with fundamental knowledge of data storage and security concepts. | |
| Course Objective | Students will have the understanding implementation of forensics and investigation techniques. | |
| Course Outcomes (COs) | | Mapping |
| CO1 | Analyse Digital Forensics concepts, including storage types, disk structure, and file system differences. | Skill Development |
| CO2 | Apply digital evidence acquisition techniques, including identifying evidence regions, acquisition methods, and managing chain of custody. | Skill Development |
| CO3 | Evaluate digital evidence analysis, including data acquisition, deleted data analysis, and registry forensics using tools like FTK Imager. | Skill Development |
| CO4 | Create strategies for analysing Windows artifacts, USB forensics, and data recovery from damaged USB drives. | Skill Development |

LIST OF EXPERIMENTS

- 1) Installation of various tools used in Digital Forensics
- 2) Practical reconnaissance
- 3) Practical Related to File System
- 4) Practical related to evidence acquisition
- 5) Practice of extraction of information from a forensic image.
- 6) Practical related to evidence acquisition type and methods.
- 7) Practical related to Evidence handling and integrity.
- 8) Network forensics
- 9) Practical related to Data
- 10) Practice CTF challenges for forensic investigations.
- 11) Practical related to Registry
- 12) Practical related to Encase Image and analysis
- 13) Practical related to FTK imager
- 14) Solve challenges related to registry analysis

CO-PO Mapping

| Course Code | Course | Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 |
|-------------|-------------------|-----------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|
| CSH214 B-P | Digital Forensics | CO1 | 3 | 2 | - | 2 | 2 | - | - | 2 | - | - | - | 2 | 2 | - |
| | | CO2 | 2 | 3 | 2 | 3 | 3 | 2 | - | 3 | 2 | 2 | - | 2 | 2 | 2 |

| | | | | | | | | | | | | | | | | |
|--|--|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CO3 | 3 | 3 | - | 3 | 3 | 2 | - | 3 | 2 | 2 | - | 2 | 3 | 3 |
| | | CO4 | 2 | 3 | 2 | 3 | 3 | - | - | 2 | - | 2 | - | 2 | 3 | 3 |