PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

I. Use all the phases of the Software Development Life Cycle to build robust software systems
II. Analyze and evaluate problems critically using the theoretical and technical knowledge to develop sustainable solutions and systems
III. Identify the requirements and implement reliable, innovative and appropriate software solutions for the industrial need
IV. Enhance skills through lifelong learning as software professionals to progress in managerial and leadership roles.
V. Work efficiently in multidisciplinary teams with effective communication and follow ethical principles.

PROGRAMME OUTCOMES

1. An ability to independently carry out research/investigation and development work to solve practical problems
2. An ability to write and present a substantial technical report/document
   Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program
3. Collect requirements from the stakeholders and design software engineering applications with deep understanding of best software principles and practices.
4. Apply software testing techniques to produce error free and reliable software and ensure quality.
5. Manage software project with state of the art approaches to ensure balance in all project areas like time, cost, quality, risk and human resource.
ANNA UNIVERSITY, CHENNAI
NON - AUTONOMOUS COLLEGES AFFILIATED ANNA UNIVERSITY
M.E. SOFTWARE ENGINEERING
REGULATIONS – 2021
CHOICE BASED CREDIT SYSTEM
I TO IV SEMESTERS CURRICULA AND 1st SEMESTER SYLLABI

SEMESTER I

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**TOTAL NO. OF CREDITS: 75**

### PROFESSIONAL ELECTIVES

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### AUDIT COURSES (AC)

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### SUMMARY

**NAME OF THE PROGRAMME: M.E. SOFTWARE ENGINEERING**

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<tr>
<th>Sl. No.</th>
<th>SUBJECT AREA</th>
<th>CREDITS PER SEMESTER</th>
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<td>8.</td>
<td>TOTAL CREDIT</td>
<td>23</td>
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</table>
COURSE OBJECTIVES:
This course will help the students to

- acquire the knowledge of solving system of linear equations using an appropriate numerical methods.
- approximate the functions using polynomial interpolation numerical differentiation and integration using interpolating polynomials.
- acquire the knowledge of numerical solution of ordinary differential equation by single and multi step methods.
- obtain the solution of boundary value problems in partial differential equations using finite differences.
- study simulation and Monte-Carlo methods and their applications.

UNIT I  MATRICES AND LINEAR SYSTEMS OF EQUATIONS  12

UNIT II  INTERPOLATION, DIFFERENTIATION AND INTEGRATION  12

UNIT III  DIFFERENTIAL EQUATIONS  12

UNIT IV  PARTIAL DIFFERENTIAL EQUATIONS  12
Classification of second order PDE’s - Finite difference approximations to partial derivatives - Elliptic equations : Solution of Laplace and Poisson equations - One dimensional parabolic equation - Bender Schmidt method - Hyperbolic equation : One dimensional wave equation.

UNIT V  SIMULATION AND MONTE CARLO METHODS  12

COURSE OUTCOMES:
At the end of the course, students will be able to

- solve an algebraic or transcendental equation and linear system of equations using an appropriate numerical method.
- approximation of functions using polynomial interpolation, numerical differentiation and integration using interpolating polynomials.
- numerical solution of differential equations by single and multistep methods.

TOTAL: 60 PERIODS
solution of boundary value problems and initial boundary value problems in partial differential equations using finite differences.

simulation and Monte-Carlo methods and their applications.

REFERENCES:


RM4151 RESEARCH METHODOLOGY AND IPR L T P C
2 0 0 2

UNIT I RESEARCH DESIGN
Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II DATA COLLECTION AND SOURCES
Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods.
Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING
Overview of Multivariate analysis, Hypotheses testing and Measures of Association.
Presenting Insights and findings using written reports and oral presentation.

UNIT IV INTELLECTUAL PROPERTY RIGHTS

UNIT V PATENTS

TOTAL: 30 PERIODS
REFERENCES:

CP4151 ADVANCED DATA STRUCTURES AND ALGORITHMS

COURSE OBJECTIVES:
- To understand the usage of algorithms in computing
- To learn and use hierarchical data structures and its operations
- To learn the usage of graphs and its applications
- To select and design data structures and algorithms that is appropriate for problems
- To study about NP Completeness of problems.

UNIT I ROLE OF ALGORITHMS IN COMPUTING & COMPLEXITY 9
ANALYSIS
Algorithms – Algorithms as a Technology -Time and Space complexity of algorithms- Asymptotic analysis-Average and worst-case analysis-Asymptotic notation-Importance of efficient algorithms-
Program performance measurement - Recurrences: The Substitution Method – The Recursion-
Tree Method - Data structures and algorithms.

UNIT II HIERARCHICAL DATA STRUCTURES 9

UNIT III GRAPHS 9

UNIT IV ALGORITHM DESIGN TECHNIQUES 9
UNIT V NP COMPLETE AND NP HARD


TOTAL: 45 PERIODS

SUGGESTED ACTIVITIES:
1. Write an algorithm for Towers of Hanoi problem using recursion and analyze the complexity (No of disc-4)
2. Write any one real time application of hierarchical data structure
3. Write a program to implement Make_Set, Find_Set and Union functions for Disjoint Set Data Structure for a given undirected graph G(V,E) using the linked list representation with simple implementation of Union operation
4. Find the minimum cost to reach last cell of the matrix from its first cell
5. Discuss about any NP completeness problem

COURSE OUTCOMES:
CO1: Design data structures and algorithms to solve computing problems.
CO2: Choose and implement efficient data structures and apply them to solve problems.
CO3: Design algorithms using graph structure and various string-matching algorithms to solve real-life problems.
CO4: Design one’s own algorithm for an unknown problem.
CO5: Apply suitable design strategy for problem solving.

REFERENCES

CP4152 DATABASE PRACTICES

COURSE OBJECTIVES:
- Describe the fundamental elements of relational database management systems
- Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
- Understand query processing in a distributed database system
- Understand the basics of XML and create well-formed and valid XML documents.
- Distinguish the different types of NoSQL databases
- To understand the different models involved in database security and their applications in real time world to protect the database and information associated with them.
UNIT I  RELATIONAL DATA MODEL

Suggested Activities:
Data Definition Language
- Create, Alter and Drop
- Enforce Primary Key, Foreign Key, Check, Unique and Not Null Constraints
- Creating Views

Data Manipulation Language
- Insert, Delete, Update
- Cartesian Product, Equi Join, Left Outer Join, Right Outer Join and Full Outer Join
- Aggregate Functions
- Set Operations
- Nested Queries

Transaction Control Language
- Commit, Rollback and Save Points

UNIT II  DISTRIBUTED DATABASES, ACTIVE DATABASES AND OPEN DATABASE CONNECTIVITY

Suggested Activities:
- Distributed Database Design and Implementation
- Row Level and Statement Level Triggers
- Accessing a Relational Database using PHP, Python and R

UNIT III  XML DATABASES

Suggested Activities:
- Creating XML Documents, Document Type Definition and XML Schema
- Using a Relational Database to store the XML documents as text
- Using a Relational Database to store the XML documents as data elements
- Creating or publishing customized XML documents from pre-existing relational databases
- Extracting XML Documents from Relational Databases
- XML Querying

UNIT IV  NOSQL DATABASES AND BIG DATA STORAGE SYSTEMS
Distributed System Concepts – NoSQL Graph Databases and Neo4j – Cypher Query Language of Neo4j – Big Data – MapReduce – Hadoop – YARN.

Suggested Activities:
- Creating Databases using MongoDB, DynamoDB, Voldemort Key-Value Distributed Data Store Hbase and Neo4j.
- Writing simple queries to access databases created using MongoDB, DynamoDB, Voldemort Key-Value Distributed Data Store Hbase and Neo4j.

UNIT V DATABASE SECURITY 15

Suggested Activities:
Implementing Access Control in Relational Databases

TOTAL: 75 PERIODS

COURSE OUTCOMES:
At the end of the course, the students will be able to
- Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
- Understand and write well-formed XML documents
- Be able to apply methods and techniques for distributed query processing.
- Design and Implement secure database systems.
- Use the data control, definition, and manipulation languages of the NoSQL databases

REFERENCES:
COURSE OBJECTIVES:

- To understand the rationale for software development process models
- To understand why the architectural design of software is important;
- To understand the five important dimensions of dependability, namely, availability, reliability, safety, security, and resilience.
- To understand the basic notions of a web service, web service standards, and service-oriented architecture;
- To understand the different stages of testing from testing during development of a software system

UNIT I SOFTWARE PROCESS & MODELING

UNIT II SOFTWARE DESIGN

UNIT III SYSTEM DEPENDABILITY AND SECURITY

UNIT IV SERVICE-ORIENTED SOFTWARE ENGINEERING, SYSTEMS ENGINEERING AND REAL-TIME SOFTWARE ENGINEERING

UNIT V SOFTWARE TESTING AND SOFTWARE CONFIGURATION MANAGEMENT

SUGGESTED ACTIVITIES
1. Comparatively analyzing different Agile methodologies.
2. Describing the scenarios where ‘Scrum’ and ‘Kanban’ are used.
3. Mapping the data flow into suitable software architecture.
4. Developing behavioural representations for a class or component.
5. Implementing simple applications as RESTful service.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
The Students will be able to
CO1: Identify appropriate process models based on the Project requirements
CO2: Understand the importance of having a good Software Architecture.
CO3: Understand the five important dimensions of dependability, namely, availability, reliability, safety, security, and resilience.
CO4: Understand the basic notions of a web service, web service standards, and service-oriented architecture;
CO5: Be familiar with various levels of Software testing

REFERENCES:

SE4101 SOFTWARE ARCHITECTURE L T P C
3 0 0 3

COURSE OBJECTIVES
- Understand the fundamentals of software architecture.
- Study the various software modeling techniques.
- Understand software implementation and deployment.
- Learn the architecture of different applications.
- Relate software architecture and software quality.

UNIT I BASIC CONCEPTS, DESIGNING ARCHITECTURES 9

Suggested Activities
1. Identifying the pitfalls that are likely to occur for software architecture teams
2. Discussing about the role of Software architects as Cost estimators

UNIT II CONNECTORS, MODELING 9
Connectors in Action: A Motivating Example, Connector Foundations, Connector Roles, Connector Types and Their Variation Dimensions, Example Connectors, Modeling Concepts, Ambiguity,
Accuracy, and Precision, Complex Modeling: Mixed Content and Multiple Views, Evaluating Modeling Techniques, Specific Modeling Techniques

1. Identifying a few commercial products which are infrastructure components that provide asynchronous messaging service.
2. Finding out the different possibilities of splitting the system into a number of computationally independent execution structures.

UNIT III ANALYSIS, IMPLEMENTATION AND DEPLOYMENT

Concepts, Existing Frameworks, Software Architecture and Deployment, Software Architecture and Mobility, Pipes and Filters, Event-based, Implicit Invocation, Layered systems, Repositories, Interpreters, Process control

Suggested Activities
1. Identifying the type of a given architectural pattern.
2. Representing software using pipe-filter architecture.

UNIT IV APPLIED ARCHITECTURES AND STYLES

Distributed and Networked Architectures, Architectures for Network-Based Applications, Decentralized Architectures, Service-Oriented Architectures and Web Services, Efficiency, Complexity, Scalability and Heterogeneity, Adaptability, Dependability.

Suggested Activities
1. Identifying functional aspects of a service oriented architecture.
2. Discussing the pros and cons of implementing a middle ware to deal with architectural issues.

UNIT V IMPLEMENTATION

Understanding quality attributes- Availability- Deployability- Working with Other Quality Attributes-Virtualization- the Cloud and Distributed Computing- Architecturally Significant Requirements-Designing an Architecture

Suggested Activity
1. Identifying the cost of modifications in projects that measure deployment separately.
2. "Using the cloud assumes your application is service oriented.” Find some examples that would support that statement and, if it is not universally true, find some that would falsify it.

TOTAL :45 PERIODS

Suggested Activity:

Students may be given problem domain that they may be encouraged to come out with multiple solution domains by applying some pattern. The best solution would be selected and presented.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to
- Develop Software applications starting from software architecture and design.
- Apply different types of systems analysis techniques and software design strategies.
- Learn to implement and deploy software applications.
- Evaluate and implement different types of design patterns based on the requirement and functionality.
• Evaluate the quality attributes for software architecture

REFERENCES:

CP4161 ADVANCED DATA STRUCTURES AND ALGORITHMS L T P C
LABORATORY 0 0 4 2

COURSE OBJECTIVES:
• To acquire the knowledge of using advanced tree structures
• To learn the usage of heap structures
• To understand the usage of graph structures and spanning trees
• To understand the problems such as matrix chain multiplication, activity selection and Huffman coding
• To understand the necessary mathematical abstraction to solve problems.

LIST OF EXPERIMENTS:
1: Implementation of recursive function for tree traversal and Fibonacci
2: Implementation of iteration function for tree traversal and Fibonacci
3: Implementation of Merge Sort and Quick Sort
4: Implementation of a Binary Search Tree
5: Red-Black Tree Implementation
6: Heap Implementation
7: Fibonacci Heap Implementation
8: Graph Traversals
9: Spanning Tree Implementation
10: Shortest Path Algorithms (Dijkstra’s algorithm, Bellman Ford Algorithm)
11: Implementation of Matrix Chain Multiplication
12: Activity Selection and Huffman Coding Implementation

HARDWARE/SOFTWARE REQUIREMENTS
1: 64-bit Open source Linux or its derivative
2: Open Source C++ Programming tool like G++/GCC

COURSE OUTCOMES:
CO1: Design and implement basic and advanced data structures extensively
CO2: Design algorithms using graph structures
CO3: Design and develop efficient algorithms with minimum complexity using design
techniques

**CO4:** Develop programs using various algorithms.

**CO5:** Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.

### REFERENCES


### SE4111 ADVANCED SOFTWARE TOOLS LABORATORY

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#### COURSE OBJECTIVES

- To understand the software development process, methodologies and work flow
- To be familiar with all the UML notations and understand how it supports the entire software development process
- To understand how to map a design to code and code to a good design.
- To apply Black box and White box strategies to design test cases.
- To be familiar with the modern Computer aided Software Engineering tools

Identify ambiguities, inconsistencies and incompleteness from a requirements specification and state functional and non-functional requirement

Identify different actors and use cases from a given problem statement and draw use case diagram to associate use cases with different types of relationship

Draw a class diagram after identifying classes and association among them

Graphically represent various UML diagrams, and associations among them and identify the logical sequence of activities undergoing in a system, and represent them pictorially

Able to use modern engineering tools for specification, design, implementation and testing

3. Model Entity Relationship Diagram and Map the Entity Relationship Diagram to Relations.

#### Using an UML Tool Perform the Following:

1. Model a Class Diagram and Map the Class Diagram to Code.
2. Model Use Case Diagrams and Sequence Diagrams.
3. Model a State Transition Diagram.
4. Model an Activity diagram
5. Model a Collaboration Diagram
6. Model a Component diagram
7. Model a Deployment Diagram
8. Generating Code from UML Models (Forward Engineering )
9. Generating UML Models from Code (Reverse Engineering)
10. Version Control configuration and use.
11. Designing Test Suites.
12. Estimation of Test Coverage Metrics and Structural Complexity
13. Unit testing using JUnit.
14. Web Application testing using Selenium
15. Test management using any open source tool
16. Mini project strictly following a Software Development Life Cycle

TOTAL: 60 PERIODS

COURSE OUTCOMES
Upon completion of course, students will be able to
- Identify ambiguities, inconsistencies and incompleteness from a requirements specification and state functional and non-functional requirement
- Identify different actors and use cases from a given problem statement and draw use case diagram to associate use cases with different types of relationship
- Graphically represent various UML diagrams, and associations among them and identify the logical sequence of activities undergoing in a system, and represent them pictorially
- Design test cases using Black box and White box testing strategies.
- Use modern CASE tools for designing and testing Software applications.

SE4201 SOFTWARE REQUIREMENTS ENGINEERING

COURSE OBJECTIVES:
The student should be able to
- Understand the basics of requirements engineering
- Learn different techniques used for requirements elicitation
- Know the role played by requirements analysis in requirement integration
- Appreciate the use of various methodologies for requirements development
- Study the current trends in requirements prioritization and validation.

UNIT I INTRODUCTION

UNIT II REQUIREMENTS ELICITATION

18
UNIT III  REQUIREMENTS ANALYSIS  9

UNIT IV  REQUIREMENTS DEVELOPMENT  9

UNIT V  REQUIREMENTS VALIDATION  9

TOTAL: 45 PERIODS

SUGGEST ACTIVITY:
• Students would be asked to identify a problem and frame the problem statement.
• Identify functional/non-functional requirements, domain requirements, and user and system requirements and analyze the feasibility.
• Give a presentation on the work done.

COURSE OUTCOMES
At the end of this course, the students should be able to:
CO1: Prepare SRS including the details of requirements engineering
CO2: Describe the stages of requirements elicitation.
CO3: Analyze software requirements gathering.
CO4: Use various methodologies for requirements development.
CO5: Perform requirements validation.

REFERENCES:
5. Aybüke Aurum · Claes Wohlin (Eds.-Engineering and managing software requirements), Springer-Verlag Berlin Heidelberg 2005
COURSE OBJECTIVES
The student should be able to:

- Understand the fundamentals of object modeling.
- Learn the unified process phases.
- Prepare the requirements for various case studies.
- Appreciate the idea behind Design Patterns in handling common problems faced during building an application.
- To practice object modeling using UML

UNIT I INTRODUCTION
Introduction to OOAD; typical activities / workflows / disciplines in OOAD, Introduction to iterative development and the Unified Process, Introduction to UML; mapping disciplines to UML artifacts, Introduction to Design Patterns – goals of a good design, Introducing a case study & MVC architecture.

UNIT II INCEPTION
Artifacts in inception, Understanding requirements – the FURPS model, Understanding Use case model – introduction, use case types and formats, Writing use cases – goals and scope of a use case, elements / sections of a use case, Use case diagrams, Use cases in the UP context and UP artifacts, Identifying additional requirements, Writing requirements for the case study in the use case model.

UNIT III ELABORATION
System sequence diagrams for use case model, Domain model : identifying concepts, adding associations, adding attributes, Interaction Diagrams, Introduction to GRASP design Patterns, Design Model: Use case realizations with GRASP patterns, Design Class diagrams in each MVC layer Mapping Design to Code, Design class diagrams for case study and skeleton code

UNIT IV DESIGN PATTERNS
Fabrication, Indirection, Singleton, Factory, Facade, Publish-Subscribe

UNIT V UML DIAGRAMS

TOTAL : 45 PERIODS

COURSE OUTCOMES
Upon completion of the course, the students will be able to

CO1: Use UML notations Apply UML Use case Notations to applications.
CO2: Can apply unified process in software development
CO3: Understand the best use of Object-Oriented concepts for creating truly OOP programs
CO4: Use design patterns for better class and object composition.
CO5: Understand the concepts of Model refinement and diagrams.

REFERENCES
1. ‘Applying UML and patterns’ by Craig Larman, Pearson, 2005
SE4203 SOFTWARE TESTING

COURSE OBJECTIVES
The student should be able to

- Understand the basics of software testing
- Appreciate the different aspects of testing techniques
- Understand the testing process management
- Know the testing tools and test automation
- Learn the testing of various applications

UNIT I INTRODUCTION

UNIT II TESTING TECHNIQUES

UNIT III MANAGING THE TESTING PROCESS

UNIT IV BUILDING AGILITY & TOOL SUPPORT
Building Agility into the Testing Process- Using Agile Methods to Improve Software Testing — Tool Support For Testing

UNIT V TEST AUTOMATION & TESTING THE APPLICATIONS

TOTAL : 45 PERIODS

Activity:
Develop small applications; create test scenarios and carry out different types of testing.
COURSE OUTCOMES:
At the end of this course, the students should be able to:
CO1: Comprehend a range of testing techniques
CO2: Select an appropriate testing strategy
CO3: Manage the testing process
CO4: Use different tools for testing
CO5: Understand automation testing and test various applications

REFERENCES:

SE4204 INTEGRATED SOFTWARE PROJECT MANAGEMENT

COURSE OBJECTIVES
The student should be able to
- Understand the basic concept of project management.
- Learn the various costing and life cycle management.
- Understand the role played by risk in software project.
- Appreciate the use of metrics for software project management.
- Know the challenges in people management.

UNIT I PROJECT MANAGEMENT & COSTING

UNIT II PROCESS MODELS & LIFECYCLE MANAGEMENT
SLIM (Software Life cycle Management) – PLM (Product Lifecycle Management) – PDM (Product Data Management) - PLM, PDM Applications – Pre-PLM Environment – Change Management.

UNIT III RISK MANAGEMENT
Perspectives of Risk Management - Risk Definition – Risk Categories – Risk Assessment: Approaches, techniques and good practices – Risk Identification / Analysis / Prioritization – Risk

UNIT IV METRICS

UNIT V PEOPLE MANAGEMENT

TOTAL : 45 PERIODS

Activity:
A mini-project can be given to the students and use it as a context for the tutorials

COURSE OUTCOMES
At the end of this course, the students should be able to:
CO1: Identify the various elements of software management process framework
CO2: Use available open source estimation tools for cost estimation
CO3: Identify existing risk and perform risk assessment
CO4: Design a software metric for software project management
CO5: Learn and assess the practices of people management

REFERENCES:

SE4211 TERM PAPER WRITING AND SEMINAR
In this course, students will develop their scientific and technical reading and writing skills that they need to understand and construct research articles. A term paper requires a student to obtain information from a variety of sources (i.e., Journals, dictionaries, reference books) and then place it in logically developed ideas. The work involves the following steps:

1. Selecting a subject, narrowing the subject into a topic
2. Stating an objective.
3. Collecting the relevant bibliography (atleast 15 journal papers)
4. Preparing a working outline.
5. Studying the papers and understanding the authors contributions and critically analysing each paper.
6. Preparing a working outline
7. Linking the papers and preparing a draft of the paper.
8. Preparing conclusions based on the reading of all the papers.
9. Writing the Final Paper and giving final Presentation

Please keep a file where the work carried out by you is maintained.

Activities to be carried out

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<th>Activity</th>
<th>Instructions</th>
<th>Submission week</th>
<th>Evaluation</th>
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<td>Selection of area of interest and Topic</td>
<td>You are requested to select an area of interest, topic and state an objective</td>
<td>2nd week</td>
<td>3% Based on clarity of thought, current relevance and clarity in writing</td>
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<tr>
<td>Stating an Objective</td>
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| Collecting Information about your area & topic      | 1. List 1 Special Interest Groups or professional society  
2. List 2 journals  
3. List 2 conferences, symposia or workshops  
4. List 1 thesis title  
5. List 3 web presences (mailing lists, forums, news sites)  
6. List 3 authors who publish regularly in your area  
7. Attach a call for papers (CFP) from your area. | 3rd week         | 3% (the selected information must be area specific and of international and national standard)                                                   |
| Collection of Journal papers in the topic in the context of the objective – collect 20 & then filter | • You have to provide a complete list of references you will be using-Search various digital libraries and Google Scholar  
• When picking papers to read - try to:  
• Pick papers that are related to each other in some ways and/or that are in the same field so that you can write a meaningful survey out of them,  
• Favour papers from well-known journals and conferences,  
• Favour “first” or “foundational” papers in the field (as indicated in other people’s survey paper),  
• Favour more recent papers,  
• Pick a recent survey of the field so you can quickly gain an overview, | 4th week         | 6% (the list of standard papers and reason for selection)                                                                                         |
- Find relationships with respect to each other and to your topic area (classification scheme/category)
- Mark in the hard copy of papers whether complete work or section/sections of the paper are being considered

### Reading and notes for first 5 papers

**Reading Paper Process**
- For each paper form a Table answering the following questions:
  - What is the main topic of the article?
  - What was/were the main issue(s) the author said they want to discuss?
  - Why did the author claim it was important?
  - How does the work build on other’s work, in the author’s opinion?
  - What simplifying assumptions does the author claim to be making?
  - What did the author do?
  - How did the author claim they were going to evaluate their work and compare it to others?
  - What did the author say were the limitations of their research?
  - What did the author say were the important directions for future research?

Conclude with limitations/issues not addressed by the paper (from the perspective of your survey)

5th week | 8%  
--- | ---  
( the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)

### Reading and notes for next 5 papers

**Repeat Reading Paper Process**

6th week | 8%  
--- | ---  
( the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)
### Reading and notes for final 5 papers
- **Repeat Reading Paper Process**
  - 7th week
  - 8%
  - (the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)

### Draft outline 1 and Linking papers
- **Prepare a draft Outline, your survey goals, along with a classification / categorization diagram**
  - 8th week
  - 8%
  - (this component will be evaluated based on the linking and classification among the papers)

### Abstract
- **Prepare a draft abstract and give a presentation**
  - 9th week
  - 6%
  - (Clarity, purpose and conclusion)
  - 6% Presentation & Viva Voce

### Introduction Background
- **Write an introduction and background sections**
  - 10th week
  - 5%
  - (clarity)

### Sections of the paper
- **Write the sections of your paper based on the classification / categorization diagram in keeping with the goals of your survey**
  - 11th week
  - 10%
  - (this component will be evaluated based on the linking and classification among the papers)

### Your conclusions
- **Write your conclusions and future work**
  - 12th week
  - 5%
  - (conclusions – clarity and your ideas)

### Final Draft
- **Complete the final draft of your paper**
  - 13th week
  - 10%
  - (formatting, English, Clarity and linking)
  - 4% Plagiarism Check Report

### Seminar
- **A brief 15 slides on your paper**
  - 14th & 15th week
  - 10%
  - (based on presentation and Viva-voce)

**TOTAL: 30 PERIODS**

**SE4212 SOFTWARE DEVELOPMENT LABORATORY**

**COURSE OBJECTIVES:**

The student should be able to:

- learn the stages of software development
- know about preparing software project documentation
- learn various testing mechanisms
- gain practical experience in applying agile methodology
• understand the principles of DevOps

LIST OF EXERCISES:
Choose any application and apply the phases of Software Development Life Cycle

1. Project Planning
   Thorough study of the problem by reviewing the literature – Identify project scope, Objectives, Infrastructure. – PROJECT PLAN DOCUMENTATION
2. Software requirement Analysis
   Classify the functional and non-functional requirements - Describe the individual Phases / Modules of the project, Identify deliverables. – SRS DOCUMENTATION
3. Software Design/Modeling
   Prepare high-level and low-level designs
   Use work products – Data dictionary, Use case diagrams and activity diagrams, build and test class diagrams, Sequence diagrams, add interface to class diagrams. – DESIGN DOCUMENTATION
4. Software Development and Debugging
   Use technology of your choice to develop and debug the application– CODE DOCUMENTATION
5. Software Testing
   Perform validation testing, Coverage analysis, memory leaks, develop test case hierarchy and Site monitor. – TEST CASE DOCUMENTATION

6. Develop any software application using agile method.

7. Develop any software application using DevOps.

SUGGESTED LIST OF APPLICATIONS:
1. Student Marks Analyzing System.
2. Quiz System.
3. Online Ticket Reservation System
4. Payroll System
5. Course Registration System
8. Inventory system
9. Online Payment system
10. Hotel management system

TOTAL:60 PERIODS

COURSE OUTCOMES:
At the end the student will be able to:
CO1:Formulate project plan and SRS
CO2:Prepare design and code documents at appropriate stages of software development
CO3:Test the software product
CO4:Develop a flexible software product using agile.
CO5:Implement DevOps principles to produce high-quality software
COURSE OBJECTIVES
The student should be able to
- Introduce the basics of software reliability
- Understand the various reliable modeling techniques
- Explore the different software reliable models
- Test the product for quality
- Monitor and comply against the defined standards

UNIT I INTRODUCTION TO SOFTWARE RELIABILITY
Defining failure – choosing a common measure – System and software failure intensity objectives – software reliability strategies - Failures, Faults and Errors – Availability – system and component reliabilities – basic failure intensity - Need for reliable software – concepts - The Dependability Concept - Failure Behavior of an X-ware System

UNIT II SOFTWARE RELIABILITY MODELING

UNIT III COMPARISON OF SOFTWARE RELIABILITY MODELS

UNIT IV SOFTWARE QUALITY ASSURANCE
Software Quality - Quality Principles - Quality Factors: Product operation, revision and transition; Components of SQA: System and architecture; Pre-Project Components; Contract Review; Development and Quality Plans; SQA Components in Project Life Cycle: SQA defect removal policies; Reviews; Project progress control; Costs; Quality Management Standards; Project Process Standards; Management and its Role in SQA; SQA Unit.

UNIT V SQA IN PROJECT MANAGEMENT
Project progress control – costs – quality management standards – project process standards – management and its role in SQA – SQA unit

TOTAL : 45 PERIODS

Activities:
Give a presentation about a software reliability tool of students’ choice.
Create an SQA Management Plan.

COURSE OUTCOMES:
At the end of this course, the students should be able to:
CO1: Perform some simple statistical analysis relevant to software measurement data
CO2: Compare and pick out the right reliability model
CO3: Evaluate the reliability of any given software product
CO4: Develop Quality plans and use SQA components in project life cycle
CO5: Assess Quality standards of various software products
REFERENCES:

SE4071 AGILE METHODOLOGIES L T P C
3 0 0 3

COURSE OBJECTIVES:
- To learn the fundamental principles and practices associated with each of the agile development methods
- To apply the principles and practices of agile software development on a project of interest and relevance to the student.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of Agile development and testing techniques.
- To understand Agile development and testing.

UNIT I AGILE SOFTWARE DEVELOPMENT
Basics and Fundamentals of Agile Process Methods, Values of Agile, Principles of Agile, stakeholders, Challenges . Lean Approach: Waste Management, Kaizen and Kanban, add process and products add value. Roles related to the lifecycle, differences between Agile and traditional plans, differences between Agile plans at different lifecycle phases. Testing plan links between testing, roles and key techniques, principles, understand as a means of assessing the initial status of a project/ How Agile helps to build quality

UNIT II AGILE AND SCRUM PRINCIPLES

UNIT III AGILE PRODUCT MANAGEMENT
Communication, Planning, Estimation Managing the Agile approach Monitoring progress, Targeting and motivating the team, Managing business involvement, Escalating issue. Quality, Risk, Metrics and Measurements, Managing the Agile approach Monitoring progress, Targeting and motivating the team, Managing business involvement and Escalating issue
UNIT IV  AGILE REQUIREMENTS AND AGILE TESTING

UNIT V  AGILE REVIEW AND SCALING AGILE FOR LARGE PROJECTS

COURSE OUTCOMES:
CO1: Analyze existing problems with the team, development process and wider organization
CO2: Apply a thorough understanding of Agile principles and specific practices
CO3: Select the most appropriate way to improve results for a specific circumstance or need
CO4: Judge and craft appropriate adaptations to existing practices or processes depending upon analysis of typical problems
CO5: Evaluate likely successes and formulate plans to manage likely risks or problems

REFERENCES

TOTAL: 45 PERIODS

IF4095  SOCIAL NETWORK ANALYSIS  L T P C
            3 0 0 3

COURSE OBJECTIVES:
- Formalise different types of entities and relationships as nodes and edges and represent this information as relational data.
- Understand the fundamental concepts in analyzing the large-scale data that are derived from social networks
- Understand the basic concepts and principles of different theoretical models of social networks analysis.
- Transform data for analysis using graph-based and statistics-based social network
measures

- Choose among social network designs based on research goals

UNIT I  GRAPH THEORY AND STRUCTURE  10


UNIT II  SOCIAL NETWORK GRAPH ANALYSIS  9

Social network exploration/processing and properties: Finding overlapping communities, similarity between graph nodes, counting triangles in graphs, neighborhood properties of graphs. Pregel paradigm and Apache Giraph graph processing system.

UNIT III  INFORMATION DIFFUSION IN SOCIAL NETWORKS  9


UNIT IV  CASCADING IN SOCIAL NETWORKS  8


UNIT V  LINK ANALYSIS & COMMUNITY DETECTION  9


SUGGESTED ACTIVITIES:
1: Twitter Intelligence project performs tracking and analysis of the Twitter
2: Large-Scale Network Embedding as Sparse Matrix Factorization
3: Implement how Information Propagation on Twitter
4: Social Network Analysis and Visualization software application.
5: Implement the Structure of Links in Networks

COURSE OUTCOMES:
CO1: Plan and execute network analytical computations.
CO2: Implement mining algorithms for social networks
CO3: Analyze and evaluate social communities.
CO4: Use social network analysis in behavior analytics
CO5: Perform mining on large social networks and illustrate the results.
REFERENCES

1. Practical Social Network Analysis with Python, Krishna Raj P. M. Ankith Mohan and K. G. Srinivasa. Springer, 2018
2. SOCIAL NETWORK ANALYSIS: METHODS AND APPLICATIONS, STANLEY WASSERMAN, and KATHERINE F’ AUST. CAMBRIDGE UNIVERSITY PRESS, 2012

BC4152 CYBER FORENSICS AND INVESTIGATION L T P C
3 0 0 3

COURSE OBJECTIVES:
- To gain a comprehensive understanding of cyber forensic principles and the collection, preservation, and analysis of digital evidence
- To combine both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
- To understand the different applications and methods for conducting network and digital forensic acquisition and analysis
- To learn the E-evidence collection and preservation, investigating operating systems and file systems, network, cloud and mobile device forensics
- To gain knowledge on digital forensics legislations, digital crime, forensic processes and procedures.

UNIT I CYBER FORENSICS SCIENCE
Cyber Forensics Science: Forensics Science, Forensics Fundamentals, Computer Forensics, and Digital Forensics.
Cyber Crime: Criminalistics as it relates to the Investigative Process, Analysis of Cyber Criminalistics Area, Holistic Approach to Cyber-forensics, Computer Forensics and Law Enforcement- Indian Cyber Forensic - Forensics Services, Professional Forensics Methodology- Types of Forensics Technology

UNIT II NETWORK SECURITY FORENSICS SYSTEM AND SERVICES
Forensics system and Services : Forensics on - Internet Usage – Intrusion - Firewall and Storage Area Network; Occurrence of Cyber-crimes- Cyber Detectives- Fighting Cyber Crimes- Forensic Process
Open-source Security Tools for Network Forensic Analysis, Requirements for Preservation of Network Data
Computer Forensics - Data Backup and Recovery - Test Disk Suite.

UNIT III DIGITAL FORENSICS PRESERVATION AND FORENSIC DATA ANALYSIS
Forensic Scenario – Email Analysis – File Signature Analysis – Hash Analysis – Forensic Examination of log files
Data-Recovery Solution, Hiding and Recovering Hidden Data, Evidence Collection and Data Seizure

UNIT IV CLOUD, NETWORK AND MOBILE FORENSICS
Working with the cloud vendor, obtaining evidence, reviewing logs and APIs
Mobile Forensics techniques, Mobile Forensics Tools - Android Device – Analysis- Android Malware – iOS Forensic Analysis – SIM Forensic Analysis – Case study
Recent trends in Mobile Forensic Technique and methods to Search and Seize Electronic Evidence

UNIT V LEGAL ASPECTS OF DIGITAL FORENSICS
Current Cyber Forensic Tools: Overview of different software packages – Encase-Autopsy-Magnet – Wireshark - Mobile Forensic Tools – SQLite

TOTAL : 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Understand the responsibilities and liabilities of a computer forensic investigator
CO2: Identify potential sources of electronic evidence.
CO3: Understand the importance of maintaining the integrity of digital evidence.
CO4: Demonstrate the ability to perform basic forensic data acquisition and analysis using computer and network based applications and utilities.
CO5: Understand relevant legislation and codes of ethics.

REFERENCES:
COURSE OBJECTIVES:

- To gain expertise in Virtualization, Virtual Machines and deploy practical virtualization solution
- To understand the architecture, infrastructure and delivery models of cloud computing.
- To explore the roster of AWS services and illustrate the way to make applications in AWS
- To gain knowledge in the working of Windows Azure and Storage services offered by Windows Azure
- To develop the cloud application using various programming model of Hadoop and Aneka

UNIT I VIRTUALIZATION AND VIRTUALIZATION INFRASTRUCTURE
6

UNIT II CLOUD PLATFORM ARCHITECTURE
12

UNIT III AWS CLOUD PLATFORM - IaaS
9

UNIT IV PAAS CLOUD PLATFORM
9

UNIT V PROGRAMMING MODEL
9
Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job –Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster- Aneka: Cloud Application Platform, Thread Programming, Task Programming and Map-Reduce Programming in Aneka

COURSE OUTCOMES:

CO1: Employ the concepts of virtualization in the cloud computing
CO2: Identify the architecture, infrastructure and delivery models of cloud computing
CO3: Develop the Cloud Application in AWS platform
CO4: Apply the concepts of Windows Azure to design Cloud Application
CO5: Develop services using various Cloud computing programming models.

TOTAL : 45 PERIODS

REFERENCES

SE4072 IMAGE PROCESSING

COURSE OBJECTIVES:
- To study fundamental concepts of digital image processing.
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- To become familiar with image compression
- To study the image segmentation and Morphological Processing.
- To expose student’s in recognition methods.

UNIT I INTRODUCTION
Examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system. Digital Image Fundamentals: A simple image formation model, image sampling and quantization, basic relationships between pixels. Color Image Processing: Color fundamentals, color models, pseudo color image processing, basics of full–color image processing, color transforms, smoothing and sharpening, color segmentation.

UNIT II IMAGE ENHANCEMENT

UNIT III WAVELETS AND IMAGE COMPRESSION
Wavelets and Multiresolution Processing. Fundamentals, image compression models, error-free
compression, lossy predictive coding, image compression standards

UNIT IV IMAGE SEGMENTATION
Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds, The Use of Motion in Segmentation Morphological Image Processing: Preliminaries, dilation, erosion, open and closing, hit or miss transformation, basic morphologic algorithms.

UNIT V REPRESENTATION AND OBJECT RECOGNITION
Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description. Object Recognition: Patterns and patterns classes, recognition based on decision–theoretic methods, matching, optimum statistical classifiers, neural networks, structural methods – matching shape numbers, string matching.

COURSE OUTCOMES:
CO1: Apply knowledge of mathematics for image understanding and analysis.
CO2: Design and analysis of techniques / processes for image Enhancement.
CO3: Design and analysis of techniques / processes for image compression.
CO4: Able to expose to current trends in field of image segmentation.
CO5: Design, realize and troubleshoot various algorithms for image processing case studies.

REFERENCES
3. Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology, 2021

CP4093 INFORMATION RETRIEVAL TECHNIQUES

COURSE OBJECTIVES:
• To understand the basics of information retrieval with pertinence to modeling, query operations and indexing
• To get an understanding of machine learning techniques for text classification and clustering.
• To understand the various applications of information retrieval giving emphasis to multimedia IR, web search
• To get an understanding of machine learning techniques for text classification and clustering.
• To understand the concepts of digital libraries

TOTAL : 45 PERIODS
UNIT I  INTRODUCTION: MOTIVATION  9

UNIT II  MODELING  9

UNIT III  INDEXING  9

UNIT IV  EVALUATION AND PARALLEL INFORMATION RETRIEVAL  9

UNIT V  SEARCHING THE WEB  9

TOTAL : 45 PERIODS

COURSE OUTCOMES:
CO1: Build an Information Retrieval system using the available tools.
CO2: Identify and design the various components of an Information Retrieval system.
CO3: Categorize the different types of IR Models.
CO4: Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.
CO5: Design an efficient search engine and analyze the Web content structure.

REFERENCES
COURSE OBJECTIVES:

- To familiarize Use the Innovation Canvas to justify potentially successful products.
- To learn various ways in which to develop a product idea.
- To understand about how Big Data can play vital role in Cognitive Computing
- To know about the business applications of Cognitive Computing
- To get into all applications of Cognitive Computing

UNIT I  FOUNDATION OF COGNITIVE COMPUTING

Foundation of Cognitive Computing: cognitive computing as a new generation, the uses of cognitive systems, system cognitive, gaining insights from data, Artificial Intelligence as the foundation of cognitive computing, understanding cognition Design Principles for Cognitive Systems: Components of a cognitive system, building the corpus, bringing data into cognitive system, machine learning, hypotheses generation and scoring, presentation, and visualization services

UNIT II  NATURAL LANGUAGE PROCESSING IN COGNITIVE SYSTEMS

Natural Language Processing in support of a Cognitive System: Role of NLP in a cognitive system, semantic web, Applying Natural language technologies to Business problems Representing knowledge in Taxonomies and Ontologies: Representing knowledge, Defining Taxonomies and Ontologies, knowledge representation, models for knowledge representation, implementation considerations

UNIT III  BIG DATA AND COGNITIVE COMPUTING

Relationship between Big Data and Cognitive Computing: Dealing with human-generated data, defining big data, architectural foundation, analytical data warehouses, Hadoop, data in motion and streaming data, integration of big data with traditional data Applying Advanced Analytics to cognitive computing: Advanced analytics is on a path to cognitive computing, Key capabilities in advanced analytics, using advanced analytics to create value, Impact of open source tools on advanced analytics

UNIT IV  BUSINESS IMPLICATIONS OF COGNITIVE COMPUTING

Preparing for change, advantages of new disruptive models, knowledge meaning to business, difference with a cognitive systems approach, meshing data together differently, using business knowledge to plan for the future, answering business questions in new ways, building business specific solutions, making cognitive computing a reality, cognitive application changing the market The process of building a cognitive application: Emerging cognitive platform, defining the objective, defining the domain, understanding the intended users and their attributes, questions and exploring insights, training and testing

UNIT V  APPLICATION OF COGNITIVE COMPUTING

Building a cognitive health care application: Foundations of cognitive computing for healthcare, constituents in healthcare ecosystem, learning from patterns in healthcare Data, Building on a foundation of big data analytics, cognitive applications across the health care eco system, starting with a cognitive application for healthcare, using cognitive applications to improve health and wellness, using a cognitive application to enhance the electronic medical record Using cognitive
application to improve clinical teaching

**COURSE OUTCOMES:**

**CO1:** Explain applications in Cognitive Computing.

**CO2:** Describe Natural language processor role in Cognitive computing.

**CO3:** Explain future directions of Cognitive Computing

**CO4:** Evaluate the process of taking a product to market

**CO5:** Comprehend the applications involved in this domain.

**TOTAL :45 PERIODS**

**REFERENCES**


**IF4094**

**PATTERN RECOGNITION**

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**COURSE OBJECTIVES:**

- Understand the in-depth concept of Pattern Recognition
- Implement Bayes Decision Theory
- Understand the in-depth concept of Perception and related Concepts
- Understand the concept of ML Pattern Classification
- Understand the concept of DL Pattern Recognition

**UNIT I**

**PATTERN RECOGNITION**


**UNIT II**

**STATISTICAL PATTERN RECOGNITION**


**UNIT III**

**BAYES DECISION THEORY CLASSIFIERS**

UNIT IV  LINEAR DISCRIMINANT FUNCTIONS

UNIT V  NONLINEAR CLASSIFIERS

SUGGESTED ACTIVITIES:
1: Car Sales Pattern Classification using Support Vector Classifier
2: Avocado Sales Pattern Recognition using Linear regression
3: Tracking Movements by implementing Pattern Recognition
4: Detecting Lanes by implementing Pattern Recognition
5: Pattern Detection in SAR Images

TOTAL:45 PERIODS

COURSE OUTCOMES:
CO1: Discover imaging, and interpretation of temporal patterns
CO2: Identify Structural Data Patterns
CO3: Implement Pattern Classification using Machine Learning Classifiers
CO4: Implement Pattern Recognition using Deep Learning Models
CO5: Implement Image Pattern Recognition

REFERENCES
2. Pattern Recognition, Jürgen Beyrer, Matthias Richter, and Matthias Nagel. 2018

BD4251  BIG DATA MINING AND ANALYTICS  L T P C
3 0 0 3

COURSE OBJECTIVES:
- To understand the computational approaches to Modeling, Feature Extraction
- To understand the need and application of Map Reduce
- To understand the various search algorithms applicable to Big Data
- To analyse and interpret streaming data
To learn how to handle large data sets in main memory and learn the various clustering techniques applicable to Big Data

UNIT I  DATA MINING AND LARGE SCALE FILES  9

UNIT II  SIMILAR ITEMS  9

UNIT III  MINING DATA STREAMS  9

UNIT IV  LINK ANALYSIS AND FREQUENT ITEMSETS  9

UNIT V  CLUSTERING  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to

CO1: Design algorithms by employing Map Reduce technique for solving Big Data problems.

CO2: Design algorithms for Big Data by deciding on the apt Features set.

CO3: Design algorithms for handling petabytes of datasets.

CO4: Design algorithms and propose solutions for Big Data by optimizing main memory consumption.

CO5: Design solutions for problems in Big Data by suggesting appropriate clustering techniques.

REFERENCES:

WEB REFERENCES:
1. https://swayam.gov.in/nd2_arp19_ap60/preview
ONLINE RESOURCES:
1. https://examupdates.in/big-data-analytics/

BD4151 FOUNDATIONS OF DATA SCIENCE L T P C
3 0 0 3

COURSE OBJECTIVES:
- To apply fundamental algorithms to process data.
- Learn to apply hypotheses and data into actionable predictions.
- Document and transfer the results and effectively communicate the findings using visualization techniques.
- To learn statistical methods and machine learning algorithms required for Data Science.
- To develop the fundamental knowledge and understand concepts to become a data science professional.

UNIT I INTRODUCTION TO DATA SCIENCE 9
Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation – introduction to NoSQL.

UNIT II MODELING METHODS 9

UNIT III INTRODUCTION TO R 9

UNIT IV MAP REDUCE 9
Introduction – distributed file system – algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce – Hadoop - Understanding the Map Reduce architecture - Writing Hadoop MapReduce Programs - Loading data into HDFS - Executing the Map phase - Shuffling and sorting - Reducing phase execution.

UNIT V DATA VISUALIZATION 9

TOTAL : 45 PERIODS

COURSE OUTCOMES:
CO1: Obtain, clean/process and transform data.
CO2: Analyze and interpret data using an ethically responsible approach.
CO3: Use appropriate models of analysis, assess the quality of input, derive insight from results, and investigate potential issues.
**CO4:** Apply computing theory, languages and algorithms, as well as mathematical and statistical models, and the principles of optimization to appropriately formulate and use data analyses.

**CO5:** Formulate and use appropriate models of data analysis to solve business-related challenges.

**REFERENCES**


**IF4072 DESIGN THINKING**

<table>
<thead>
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<th>COURSE OBJECTIVES:</th>
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<tr>
<td>To provide a sound knowledge in UI &amp; UX</td>
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<td>To understand the need for UI and UX</td>
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<td>Research Methods used in Design</td>
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<td>Tools used in UI &amp; UX</td>
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<td>Creating a wireframe and prototype</td>
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**UNIT I UX LIFECYCLE TEMPLATE**


**UNIT II CONTEXTUAL INQUIRY**


**UNIT III DESIGN THINKING, IDEATION, AND SKETCHING**

UNIT IV  UX GOALS, METRICS, AND TARGETS


UNIT V  ANALYSING USER EXPERIENCE


SUGGESTED ACTIVITIES:
1: Hands on Design Thinking process for a product
2: Defining the Look and Feel of any new Project
3: Create a Sample Pattern Library for that product (Mood board, Fonts, Colors based on UI principles)
4: Identify a customer problem to solve.
5: Conduct end-to-end user research - User research, creating personas, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Build UI for user Applications
CO2: Use the UI Interaction behaviors and principles
CO3: Evaluate UX design of any product or application
CO4: Demonstrate UX Skills in product development
CO5: Implement Sketching principles

REFERENCES
4. Lean UX: Designing Great Products with Agile Teams, Gothelf, Jeff, Seiden, and Josh. O'Reilly Media, 2016
5. Designing UX: Prototyping: Because Modern Design is Never Static, Ben Coleman, and Dan Goodwin. SitePoint, 2017
COURSE OBJECTIVES:
- To understand the basics of GPU architectures
- To understand CPU GPU Program Partitioning
- To write programs for massively parallel processors
- To understand the issues in mapping algorithms for GPUs
- To introduce different GPU programming models

UNIT I    GPU ARCHITECTURE
Evolution of GPU architectures - Understanding Parallelism with GPU – Typical GPU Architecture - CUDA Hardware Overview - Threads, Blocks, Grids, Warps, Scheduling - Memory Handling with CUDA: Shared Memory, Global Memory, Constant Memory and Texture Memory.

UNIT II    CUDA PROGRAMMING
Using CUDA - Multi GPU - Multi GPU Solutions - Optimizing CUDA Applications: Problem Decomposition, Memory Considerations, Transfers, Thread Usage, Resource Contentions.

UNIT III    PROGRAMMING ISSUES

UNIT IV    OPENCL BASICS

UNIT V    ALGORITHMS ON GPU
Parallel Patterns: Convolution, Prefix Sum, Sparse Matrix - Matrix Multiplication - Programming Heterogeneous Cluster.

SUGGESTED ACTIVITIES:
1. Debugging Lab
2. Performance Lab
3. Launching Nsight
4. Running Performance Analysis
5. Understanding Metrics
6. NVIDIA Visual Profiler
7. Matrix Transpose Optimization
8. Reduction Optimization

TOTAL : 45 PERIODS

COURSE OUTCOMES:
CO1: Describe GPU Architecture
CO2: Write programs using CUDA, identify issues and debug them
CO3: Implement efficient algorithms in GPUs for common application kernels, such as matrix multiplication
CO4: Write simple programs using OpenCL
CO5: Identify efficient parallel programming patterns to solve problems
REFERENCES

MP4094 WEB SERVICES AND API DESIGN L T P C 3 0 0 3

COURSE OBJECTIVES:
- To learn the basics of Web service.
- To become familiar with the Web Services building blocks
- To learn to work with RESTful web services.
- To implement the RESTful web services.
- To understand resource oriented Architecture.

UNIT I INTRODUCTION TO WEB SERVICE 9

UNIT II WEB SERVICE BUILDING BLOCKS 9
Introduction to SOAP: SOAP Syntax - Sending SOAP Messages - SOAP Implementations - Introduction to WSDL: WSDL Syntax - SOAP Binding - WSDL Implementations - Introduction to UDDI: The UDDI API - Implementations - The Future of UDDI

UNIT III RESTFUL WEB SERVICES 9

UNIT IV IMPLEMENTATION OF RESTFUL WEB SERVICES 9
UNIT V RESOURCE ORIENTED ARCHITECTURE

Resource- URIs - Addressability - Statelessness - Representations - Links and Connectedness - The Uniform Interface- Designing Read-Only Resource-Oriented Services : Resource Design - Turning Requirements Into Read-Only Resources - Figure Out the Data Set- Split the Data Set into Resources- Name the Resources - Design Representation- Link the Resources to Each Other- The HTTP Response

TOTAL : 45 PERIODS

COURSE OUTCOMES:
CO1: Explain how to write XML documents.
CO2: Apply the web service building blocks such as SOAP, WSDL and UDDI
CO3: Describe the RESTful web services.
CO4: Implement the RESTful web service web service with Spring Boot MVC
CO5: Discuss Resource-oriented Architecture.

REFERENCES
1. Leonard Richardson and Sam Ruby, RESTful Web Services, O'Reilly Media, 2007
3. Lindsay Bassett, Introduction to JavaScript Object Notation, O'Reilly Media, 2015

IF4073 DEVOPS AND MICROSERVICES

COURSE OBJECTIVES:
- To learn the basic concepts and terminology of DevOps
- To gain knowledge on DevOps platform
- To understand building and deployment of code
- To be familiar with DevOps automation tools
- To learn basics of MLOps

UNIT I INTRODUCTION
Software Engineering - traditional and Agile process models - DevOps -Definition - Practices - DevOps life cycle process - need for DevOps –Barriers

UNIT II DEVOPS PLATFORM AND SERVICES
UNIT III BUILDING, TESTING AND DEPLOYMENT 9+6
Microservices architecture - coordination model - building and testing - Deployment pipeline - Development and Pre-commit Testing - Build and Integration Testing - continuous integration - monitoring - security - Resources to Be Protected - Identity Management

UNIT IV DEVOPS AUTOMATION TOOLS 9+6

UNIT V MLOPS 9+6
MLOps - Definition - Challenges - Developing Models - Deploying to production - Model Governance - Real world examples

SUGGESTED ACTIVITIES:
1: Creating a new Git repository, cloning existing repository, Checking changes into a Git repository, Pushing changes to a Git remote, Creating a Git branch
2: Installing Docker container on windows/Linux, issuing docker commands
3: Building Docker Images for Python Application
4: Setting up Docker and Maven in Jenkins and First Pipeline Run
5: Running Unit Tests and Integration Tests in Jenkins Pipelines

TOTAL: 75 PERIODS

COURSE OUTCOMES:
CO1: Implement modern software Engineering process
CO2: work with DevOps platform
CO3: build, test and deploy code
CO4: Explore DevOps tools
CO5: Correlate MLOps concepts with real time examples

REFERENCES
4. Mark Treveil, and the Dataiku Team - "Introducing MLOps" - O’Reilly Media- 2020

IF4071 DEEP LEARNING L T P C
3 0 2 4

COURSE OBJECTIVES:
- Develop and Train Deep Neural Networks.
- Develop a CNN, R-CNN, Fast R-CNN, Faster-R-CNN, Mask-RCNN for detection and recognition
- Build and train RNNs, work with NLP and Word Embeddings
- The internal structure of LSTM and GRU and the differences between them
- The Auto Encoders for Image Processing
UNIT I  DEEP LEARNING CONCEPTS  6

UNIT II  NEURAL NETWORKS  9

UNIT III  CONVOLUTIONAL NEURAL NETWORK  10

UNIT VI  NATURAL LANGUAGE PROCESSING USING RNN  10

UNIT V  DEEP REINFORCEMENT & UNSUPERVISED LEARNING  10

LIST OF EXPERIMENTS  30
1: Feature Selection from Video and Image Data
2: Image and video recognition
3: Image Colorization
4: Aspect Oriented Topic Detection & Sentiment Analysis
5: Object Detection using Autoencoder

COURSE OUTCOMES:
CO1: Feature Extraction from Image and Video Data
CO2: Implement Image Segmentation and Instance Segmentation in Images
CO3: Implement image recognition and image classification using a pretrained network (Transfer Learning)
CO4: Traffic Information analysis using Twitter Data
CO5: Autoencoder for Classification & Feature Extraction

TOTAL: 45+30=75 PERIODS

REFERENCES
1. Deep Learning A Practitioner's Approach Josh Patterson and Adam Gibson O'Reilly Media, Inc.2017
2. Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress,2018
4. Deep Learning with Python, FRANÇOIS CHOLLET, MANNING SHELTER ISLAND,2017

CP4072 BLOCKCHAIN TECHNOLOGIES L T P C
3 0 2 4

COURSE OBJECTIVES:
- This course is intended to study the basics of Blockchain technology.
- During this course the learner will explore various aspects of Blockchain technology like application in various domains.
- By implementing, learners will have idea about private and public Blockchain, and smart contract.

UNIT I INTRODUCTION OF CRYPTOGRAPHY AND BLOCKCHAIN 9
Introduction to Blockchain, Blockchain Technology Mechanisms & Networks, Blockchain Origins, Objective of Blockchain, Blockchain Challenges, Transactions and Blocks, P2P Systems, Keys as Identity, Digital Signatures, Hashing, and public key cryptosystems, private vs. public Blockchain.

UNIT II BITCOIN AND CRYPTOCURRENCY 9

UNIT III INTRODUCTION TO ETHEREUM 9
Introduction to Ethereum, Consensus Mechanisms, Metamask Setup, Ethereum Accounts, , Transactions, Receiving Ethers, Smart Contracts.

UNIT-IV INTRODUCTION TO HYPERLEDGER AND SOLIDITY PROGRAMMING 10

UNIT V BLOCKCHAIN APPLICATIONS 8
Internet of Things, Medical Record Management System, Domain Name Service and Future of Blockchain, Alt Coins.

TOTAL: 45 PERIODS
LIST OF EXPERIMENTS:
1. Create a Simple Blockchain in any suitable programming language.
2. Use Geth to Implement Private Ethereum Block Chain.
4. Build Hyperledger Fabric with Smart Contract.
5. Create Case study of Block Chain being used in illegal activities in real world.
6. Using Python Libraries to develop Block Chain Application.

TOTAL: 30 PERIODS

SUPPLEMENTARY RESOURCES:
• NPTEL online course: https://nptel.ac.in/courses/106/104/106104220/
• Udemy: https://www.udemy.com/course/build-your-blockchain-az/
• EDUXLABS Online training: https://eduxlabs.com/courses/blockchain-technology-training/?tab=tab-curriculum

TOTAL: 75 PERIODS

COURSE OUTCOMES:
After the completion of this course, student will be able to
CO1: Understand and explore the working of Blockchain technology
CO2: Analyze the working of Smart Contracts
CO3: Understand and analyze the working of Hyperledger
CO4: Apply the learning of solidity to build de-centralized apps on Ethereum
CO5: Develop applications on Blockchain

REFERENCES:

IF 4291 FULL STACK WEB APPLICATION DEVELOPMENT

COURSE OBJECTIVES:
• Develop TypeScript Application
• Develop Single Page Application (SPA)
• Able to communicate with a server over the HTTP protocol
• Learning all the tools need to start building applications with Node.js
• Implement the Full Stack Development using MEAN Stack
UNIT I  FUNDAMENTALS & TYPESCRIPT LANGUAGE  10

UNIT II  ANGULAR  10

UNIT III  NODE.Js  10

UNIT IV  EXPRESS.Js  7

UNIT V  MONGODB  8

LIST OF EXPERIMENTS  30
1: Accessing the Weather API from Angular
2: Accessing the Stock Market API from Angular
3: Call the Web Services of Express.js From Angular
4: Read the data in Node.js from MongoDB
5: CRUD operation in MongoDB using Angular

COURSE OUTCOMES:
CO1: Develop basic programming skills using Javascript
CO2: Implement a front-end web application using Angular.
CO3: Will be able to create modules to organise the server
CO4: Build RESTful APIs with Node, Express and MongoDB with confidence.
CO5: Will learn to Store complex, relational data in MongoDB using Mongoose

TOTAL: 45 + 30 = 75 PERIODS

REFERENCES
1. Adam Freeman, Essential TypeScript, Apress, 2019
2. Mark Clow, Angular Projects, Apress, 2018
3. Alex R. Young, Marc Harter, Node.js in Practice, Manning Publication, 2014

SE4073 EMBEDDED SOFTWARE DEVELOPMENT
L T P C
3 0 2 4

COURSE OBJECTIVES:
- To understand the architecture of embedded processor, microcontroller, and peripheral devices.
- To interface memory and peripherals with embedded systems.
- To study the embedded network environment.
- To understand challenges in Real time operating systems.
- To study, analyze and design applications on embedded systems.

UNIT I EMBEDDED PROCESSORS 9+6

UNIT II EMBEDDED COMPUTING PLATFORM 9+6

UNIT III EMBEDDED NETWORK ENVIRONMENT 9+6

UNIT IV REAL-TIME CHARACTERISTICS 9+6
UNIT V  SYSTEM DESIGN TECHNIQUES


SUGGESTED ACTIVITIES:
1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing EPROM and interrupt.
8. Interrupt performance characteristics of ARM and FPGA.
9. Flashing of LEDs.
10. Interfacing stepper motor and temperature sensor.

COURSE OUTCOMES:
CO1: Understand different architectures of embedded processor, microcontroller and peripheral devices. Interface memory and peripherals with embedded systems.
CO2: Interface memory and peripherals with embedded systems.
CO3: Work with embedded network environment.
CO4: Understand challenges in Real time operating systems.
CO5: Design and analyze applications on embedded systems.

TOTAL:45+30=75 PERIODS

REFERENCES
COURSE OBJECTIVES:

- Learn Depth Concept of GO Programming
- How to develop Smart Contracts
- How to Deploy Smart Contracts
- Front end Development using Angular
- Implementing Bitcoin Network

UNIT I GETTING STARTED WITH GO PROGRAMMING 8

UNIT II BUILDING DISTRIBUTED APPLICATIONS IN GIN 8

UNIT III SMART CONTRACTS USING SOLIDITY & GO 10

UNIT IV DEVELOPING DAPPS 9

UNIT V BITCOIN NETWORK 10
LIST OF EXPERIMENTS
1: Developing Purchase Order DApp
2: Designing a Voting DApp
3: Designing and Deploying Vaccine Production using DApp
4: Developing Auction DApp
5: Developing Property Registration DApp

COURSE OUTCOMES:
CO1: Learn How to Compile and Deploy Solidity
CO2: Use Golang to Connect to Ethereum
CO3: Deploy Ethereum Smart Contracts Using Golang
CO4: Develop DApp using Angular
CO5: Develop Bitcoin Application

TOTAL: 45+30 = 75 PERIODS

REFERENCES

INTERNET OF THINGS

COURSE OBJECTIVES:
• To Understand the Architectural Overview of IoT
• To Understand the IoT Reference Architecture and Real World Design Constraints
• To Understand the various IoT levels
• To understand the basics of cloud architecture
• To gain experience in Raspberry PI and experiment simple IoT application on it

UNIT I INTRODUCTION
Internet of Things- Domain Specific IoTs - IoT and M2M-Sensors for IoT Applications–Structure of IoT– IoT Map Device- IoT System Management with NETCONF-YANG

UNIT II IoT ARCHITECTURE, GENERATIONS AND PROTOCOLS

UNIT III IoT PROTOCOLS AND TECHNOLOGY
UNIT IV  CLOUD ARCHITECTURE BASICS  9+6
The Cloud types; IaaS, PaaS, SaaS.- Development environments for service development; Amazon, Azure, Google Appcloud platform in industry

UNIT V  IOT PROJECTS ON RASPBERRY PI  9+6
Building IOT with RASPBERRY PI- Creating the sensor project - Preparing Raspberry Pi - Clayster libraries – Hardware Interacting with the hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data - External representation of sensor values - Exporting sensor data

SUGGESTED ACTIVITIES:
1. Develop an application for LED Blink and Pattern using arduino or Raspberry Pi
2. Develop an application for LED Pattern with Push Button Control using arduino or Raspberry Pi
3. Develop an application for LM35 Temperature Sensor to display temperature values using arduino or Raspberry Pi
4. Develop an application for Forest fire detection end node using Raspberry Pi device and sensor
5. Develop an application for home intrusion detection web application
6. Develop an application for Smart parking application using python and Django for web application

COURSE OUTCOMES:
CO1: Understand the various concept of the IoT and their technologies
CO2: Develop the IoT application using different hardware platforms
CO3: Implement the various IoT Protocols
CO4: Understand the basic principles of cloud computing
CO5: Develop and deploy the IoT application into cloud environment

TOTAL: 75 PERIODS

REFERENCES:
COURSE OBJECTIVES:

- To study about Fundamental Concept and Components of Virtual Reality
- To study about Interactive Techniques in Virtual Reality
- To study about Visual Computation in Virtual Reality
- To study about Augmented and Mixed Reality and Its Applications
- To know about I/O Interfaces and its functions.

UNIT I  INTRODUCTION TO VIRTUAL REALITY  9

Suggested Activities:
- Flipped classroom on uses of MR applications.
- Videos – Experience the virtual reality effect.
- Assignment on comparison of VR with traditional multimedia applications.

Suggested Evaluation Methods:
- Tutorial – Applications of MR.
- Quizzes on the displayed video and the special effects

UNIT II  INTERACTIVE TECHNIQUES IN VIRTUAL REALITY  9

Suggested Activities:
- Flipped classroom on modeling three dimensional objects.
- External learning – Collision detection algorithms.
- Practical – Creating three dimensional models.

Suggested Evaluation Methods:
- Tutorial – Three dimensional modeling techniques.
- Brainstorming session on collision detection algorithms.
- Demonstration of three dimensional scene creation.

UNIT III  VISUAL COMPUTATION IN VIRTUAL REALITY  9

Suggested Activities:
• External learning – Different types of programming toolkits and Learn different types of available VR applications.
• Practical – Create VR scenes using any toolkit and develop applications.

Suggested Evaluation Methods:
• Tutorial – VR tool comparison.
• Brainstorming session on tools and technologies used in VR.
• Demonstration of the created VR applications.

UNIT IV AUGMENTED AND MIXED REALITY
9
Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

Suggested Activities:
• External learning - AR Systems

Suggested Evaluation Methods:
• Brainstorming session different AR systems and environments.

UNIT V I/O INTERFACE IN VR & APPLICATION OF VR
9
Human factors: Introduction, the eye, the ear, the somatic senses. VR Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. VR Software: Introduction, Modeling virtual world, Physical simulation, VR toolkits, Introduction to VRML, Input -- Tracker, Sensor, Digitalglobe, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual /Auditory / Haptic Devices. VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.

Suggested Activities:
• External learning – Different types of sensing and tracking devices for creating mixed reality environments.
• Practical – Create MR scenes using any toolkit and develop applications.

Suggested Evaluation Methods:
• Tutorial – Mobile Interface Design.
• Brainstorming session on wearable computing devices and games design.
• Demonstration and evaluation of the developed MR application.

TOTAL: 45 PERIODS

PRACTICALS:
1. Study of tools like Unity, Maya, 3DS MAX, AR toolkit, Vuforia and Blender.
2. Use the primitive objects and apply various projection methods by handling the camera.
3. Download objects from asset stores and apply various lighting and shading effects.
4. Model three dimensional objects using various modeling techniques and apply textures over them.
5. Create three dimensional realistic scenes and develop simple virtual reality enabled mobile applications which have limited interactivity.
6. Add audio and text special effects to the developed application.
7. Develop VR enabled applications using motion trackers and sensors incorporating full haptic interactivity.
8. Develop AR enabled applications with interactivity like E learning environment, Virtual walkthroughs and visualization of historic places.
10. Develop simple MR enabled gaming applications.

TOTAL: 45+30=75 PERIODS

COURSE OUTCOMES:
CO1: Understand the Fundamental Concept and Components of Virtual Reality
CO2: Able to know the Interactive Techniques in Virtual Reality
CO3: Can know about Visual Computation in Virtual Reality
CO4: Able to know the concepts of Augmented and Mixed Reality and Its Applications
CO5: Know about I/O Interfaces and its functions.

REFERENCES

AUDIT COURSES

AX4091 ENGLISH FOR RESEARCH PAPER WRITING L T P C

2 0 0 0

COURSE OBJECTIVES:
- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS
UNIT III  TITLE WRITING SKILLS  6
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV  RESULT WRITING SKILLS  6
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V  VERIFICATION SKILLS  6
Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first-time submission

TOTAL: 30 PERIODS

COURSE OUTCOMES:
CO1 – Understand that how to improve your writing skills and level of readability
CO2 – Learn about what to write in each section
CO3 – Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission

REFERENCES:

AX4092  DISASTER MANAGEMENT  L T P C
2 0 0 0

COURSE OBJECTIVES:
- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I  INTRODUCTION  6
Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II  REPERCUSSIONS OF DISASTERS AND HAZARDS  6
Economic Damage, Loss of Human and Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines,
Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III DISASTER PRONE AREAS IN INDIA
Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT
Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V RISK ASSESSMENT
Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People’s Participation in Risk Assessment. Strategies for Survival

TOTAL: 30 PERIODS

COURSE OUTCOMES:
CO1: Ability to summarize basics of disaster
CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO5: Ability to develop the strengths and weaknesses of disaster management approaches

REFERENCES:

AX4093 CONSTITUTION OF INDIA

COURSE OBJECTIVES:
Students will be able to:
- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional
- Role and entitlement to civil and economic rights as well as the emergence nation hood in
the early years of Indian nationalism.

- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT I HISTORY OF MAKING OF THE INDIAN CONSTITUTION
History, Drafting Committee, (Composition & Working)

UNIT II PHILOSOPHY OF THE INDIAN CONSTITUTION
Preamble, Salient Features

UNIT III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES

UNIT IV ORGANS OF GOVERNANCE
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V LOCAL ADMINISTRATION

UNIT VI ELECTION COMMISSION
Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

COURSE OUTCOMES:
Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

SUGGESTED READING
1. The Constitution of India, 1950 (Bare Act), Government Publication.
UNIT I

1. சங்க இலக்கியம்
   - நூற்றாண்டு நூல் பத்தாண்டு
   2. அத்தமதம (82)
   3. தொன்றுப்படுத்து மூலகற்பாகம்
   4. புரட்சம (95,195)

UNIT II

1. அறநநறி குறிப்பிட்டு
   - சுருளும் விளக்கம், அன்பு தக்காண்டு, அளவுகளும் பொழுதுபோதும், பெரும்பகுதிகள்
   2. பின்னணிக்குரிய மூலகற்பாகம்
   - கோடை, பிரம்மாண்டம், சிகிச்சை, அன்புக்காண்டு (சுருளும் விளக்கம் பெரும்பகுதிகள்)

UNIT III

1. சிறுகாப்பியம் பாடல்
   - கிருமூர்த்தி காந்தி காலத்திகள்
   2. குளிர்கால சிறுகாப்பியம் மணிதூண்டல்
   - கிருமூர்த்தி அற்பாலம்பாலாம் காலத்திகள்

UNIT IV

1. அருள்நநறி குறிப்பிட்டு
   - பாடல் விளக்கம் / விளக்கம், பாடல் மூலகற்பாகம் / குறிப்பிட்டு, அருள்நநறி விளக்கம் / விளக்கம்
   - சுருளும் விளக்கம், அன்பு தக்காண்டு
   2. குரோமியம்
   - பொருள்விளக்கம் (617, 618)
   3. காப்பியங்கள் (11)
   4. புரட்சப்பாகம் / விளக்கம், பத்தாண்டு
   5. புரட்சம (11)
   - பொருள்விளக்கம், பத்தாண்டு, பொருள்விளக்கம்

AX4094

தமிழில் இலக்கியம்

UNIT I

1. சங்க இலக்கியம்
   - நூற்றாண்டு நூல் பத்தாண்டு
   2. அத்தமதம (82)
   3. தொன்றுப்படுத்து மூலகற்பாகம்
   4. புரட்சம (95,195)

UNIT II

1. அறநநறி குறிப்பிட்டு
   - சுருளும் விளக்கம், அன்பு தக்காண்டு, அளவுகளும் பொழுதுபோதும், பெரும்பகுதிகள்
   2. பின்னணிக்குரிய மூலகற்பாகம்
   - கோடை, பிரம்மாண்டம், சிகிச்சை, அன்புக்காண்டு (சுருளும் விளக்கம் பெரும்பகுதிகள்)

UNIT III

1. சிறுகாப்பியம் பாடல்
   - கிருமூர்த்தி காந்தி காலத்திகள்
   2. குளிர்கால சிறுகாப்பியம் மணிதூண்டல்
   - கிருமூர்த்தி அற்பாலம்பாலாம் காலத்திகள்

UNIT IV

1. அருள்நநறி குறிப்பிட்டு
   - பாடல் விளக்கம் / விளக்கம், பாடல் மூலகற்பாகம் / குறிப்பிட்டு, அருள்நநறி விளக்கம் / விளக்கம்
   - சுருளும் விளக்கம், அன்பு தக்காண்டு
   2. குரோமியம்
   - பொருள்விளக்கம் (617, 618)
   3. காப்பியங்கள் (11)
   4. புரட்சப்பாகம் / விளக்கம், பத்தாண்டு
   5. புரட்சம (11)
   - பொருள்விளக்கம், பத்தாண்டு, பொருள்விளக்கம்

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UNIT V

தொண்டன தமிழ் தொகுப்பு

1. சிறைச்சிதை தமிழ்
   - கணியில் புத்தகம்
   - கணியில் முதல் கிமுகக்
   - கணியில் முன் தோர்கள்
   - பட்டம் தொகுப்பு
   - இரண்டாம்

2. தமிழ் விடுதலை வர்த்தகங்களும் தமிழ் தொகுப்பு
3. குழுக்கால் விடுதலை தமிழ் தொகுப்பு
4. பயண விடுதலை விடுதலை விளையாடினார் வர்த்தகங்களும் தமிழ் தொகுப்பு
5. அறிவியல் தமிழ்
6. இகணய தமிழ்
7. சுற்றுச்சூழல் விளையாடினார் தமிழ் தொகுப்பு

TOTAL : 30 PERIODS

தமிழ் தொகுப்பு வேளாண்மை / புத்தகங்கள்

1. தமிழ் விடுதலை வர்த்தரிக்கும் (Tamil Virtual University)
   - www.tamilvu.org
2. தமிழ் விக்கிப்பீடியல் (Tamil Wikipedia)
   - https://ta.wikipedia.org
3. வூர் அறிவியல் வகுப்பு
4. பயண விளையாடும் கட்டறிச்சூடு
   - கணியம் பயணக் கட்டறிச்சூடு
5. கணியில் விளையாடும் கட்டறிச்சூடு
   - கணியம் விளையாடும் கட்டறிச்சூடு (thamilvalarchithurai.com)
6. அறிவியல் கட்டறிச்சூடு
   - கணியம் பயணக் கட்டறிச்சூடு