ANNA UNIVERSITY, CHENNAI
NON - AUTONOMOUS COLLEGES AFFILIATED ANNA UNIVERSITY
M.E. SOFTWARE ENGINEERING
REGULATIONS – 2021
CHOICE BASED CREDIT SYSTEM

1. **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.

2. **PROGRAM SPECIFIC OUTCOMES (PSOs) :**

1. Collect requirements from the stakeholders and design software engineering applications with deep understanding of best software principles and practices.
2. Apply software testing techniques to produce error free and reliable software and ensure quality.
3. Manage software project with state of the art approaches to ensure balance in all project areas like time, cost, quality, risk, human resource etc.,

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

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA4157	Mathematical Modeling and Simulation	FC	4	0	0	4	4
2.	RM4151	Research Methodology and IPR	RMC	2	0	0	2	2
3.	CP4151	Advanced Data Structures and Algorithms	PCC	3	0	0	3	3
4.	CP4152	Database Practices	PCC	3	0	2	5	4
5.	SE4151	Advanced Software Engineering	PCC	3	0	0	3	3
6.	SE4101	Software Architecture	PCC	3	0	0	3	3
7.		Audit Course – I*	AC	2	0	0	2	0
PRACTICALS								
8.	CP4161	Advanced Data Structures and Algorithms Laboratory	PCC	0	0	4	4	2
9.	SE4111	Advanced Software Tools Laboratory	PCC	0	0	4	4	2
			TOTAL	**20**	**0**	**10**	**30**	**23**

*Audit course is optional

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	SE4201	Software Requirements Engineering	PCC	3	0	0	3	3
2.	SE4202	Software System Design	PCC	3	0	0	3	3
3.	SE4203	Software Testing	PCC	3	0	0	3	3
4.	SE4204	Integrated Software Project Management	PCC	3	0	0	3	3
5.		Professional Elective I	PEC	3	0	0	3	3
6.		Professional Elective II	PEC	3	0	0	3	3
7.		Audit Course – II*	AC	2	0	0	2	0
PRACTICALS								
8.	SE4211	Term Paper and seminar	EEC	0	0	2	2	1
9.	SE4212	Software Development Laboratory	PCC	0	0	4	4	2
			TOTAL	**20**	**0**	**6**	**26**	**21**

*Audit course is optional

SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	SE4301	Software Reliability and Quality	PCC	3	0	0	3	3
2.		Professional Elective III	PEC	3	0	0	3	3
3.		Professional Elective IV	PEC	3	0	2	5	4
4.		Open Elective	OEC	3	0	0	3	3
PRACTICALS								
5.	SE4311	Project Work I	EEC	0	0	12	12	6
			TOTAL	**12**	**0**	**14**	**26**	**19**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
6.	SE4411	Project Work II	EEC	0	0	24	24	12
			TOTAL	**0**	**0**	**24**	**24**	**12**

TOTAL NO. OF CREDITS: 75

PROFESSIONAL ELECTIVES
SEMESTER II, ELECTIVE I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	SE4071	Agile Methodologies	PEC	3	0	0	3	3
2.	IF4079	Social Network Analysis	PEC	3	0	0	3	3
3.	BC4152	Cyber Forensics and Investigation	PEC	3	0	0	3	3
4.	MP4253	Cloud Computing Technologies	PEC	3	0	0	3	3

SEMESTER II, ELECTIVE II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	SE4073	Image Processing	PEC	3	0	0	3	3
2.	CP4076	Information Retrieval Techniques	PEC	3	0	0	3	3
3.	MP4071	Cognitive Computing	PEC	3	0	0	3	3
4.	IF4078	Pattern Recognition	PEC	3	0	0	3	3
5.	BD4251	Big Data Mining and Analytics	PEC	3	0	0	3	3
6.	BD4151	Foundations of Data Science	PEC	3	0	0	3	3

SEMESTER III, ELECTIVE III

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	IF4074	Design Thinking	PEC	3	0	0	3	3
2.	IF4077	GPU Computing	PEC	3	0	0	3	3
3.	MP4075	Web Services and API Design	PEC	3	0	0	3	3

SEMESTER III, ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	IF4075	Devops and Microservices	PEC	3	0	2	5	4
2.	IF4073	Deep Learning	PEC	3	0	2	5	4
3.	CP4073	Blockchain Technologies	PEC	3	0	2	5	4
4.	IF4251	Full Stack Web Application Development	PEC	3	0	2	5	4
5.	SE4072	Embedded Software Development	PEC	3	0	2	5	4
6.	IF4076	Distributed and Scalable architecture	PEC	3	0	2	5	4
7.	CP4251	Internet of Things	PEC	3	0	2	5	4
8.	MU4253	Mixed Reality	PEC	3	0	2	5	4

AUDIT COURSES (AC)

Registration for any of these courses is optional to students

SL. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS
			L	T	P	
1.	AX4091	English for Research Paper Writing	2	0	0	0
2.	AX4092	Disaster Management	2	0	0	0
3.	AX4093	Constitution of India	2	0	0	0
4.	AX4094	நற்றமிழ் இலக்கியம்	2	0	0	0

MA4157 **MATHEMATICAL MODELING AND SIMULATION** **L T P C**
4 0 0 4

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 step0 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**

Solution of Linear Systems : Cramer's Rule - Gaussian elimination and Gauss Jordon methods - Cholesky decomposition method – Gauss Seidel iteration method - Eigenvalue problems : Power method with deflation for both symmetric and non symmetric matrices and Jacobi method for symmetric matrices.

UNIT II INTERPOLATION, DIFFERENTIATION AND INTEGRATION **12**

Lagrange's interpolation - Newton's divided differences - Hermite's interpolation – Newton's forward and backward differences – Numerical differentiation – Numerical integration : Trapezoidal and Simpson's $\frac{1}{3}$ rules - Gaussian quadrature : 2 and 3 point rules.

UNIT III DIFFERENTIAL EQUATIONS **12**

Initial value problems for first and second order ODEs : Single step methods - Taylor's series method – Euler's and modified Euler's methods - Runge - Kutta method of fourth order - Multi step methods : Milne's and Adam Bashforth methods - Boundary value problems : Finite difference approximations to derivatives - Finite difference method of solving second order ODEs .

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**

Random numbers : Random number algorithms and generators – Estimation of areas and volumes by Monte Carlo techniques - Numerical integration - Computing volumes – Simulation : Loaded Die Problem - Birthday problem - Buffon's needle problem - Two dice problem and Neutron shielding problem.

TOTAL: 60 PERIODS

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.
- 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 :

1. Burden, R.L. and Faires, J.D. "Numerical Analysis", 9th Edition, Cengage Learning, Delhi, 2016.
2. Cheney, W and Kincaid D., "Numerical Mathematics and Computing", 7th Edition, Cengage Learning , Delhi, 2014.
3. Jain, M.K., Iyengar, S.R.K. and Jain R.K. "Numerical Methods for Scientific and Engineering Computation", 6th Edition, New Age International Pvt. Ltd., Delhi, 2014.
4. Landau, D.P. and Binder, K., "A Guide to Monte - Carlo Simulations in Statistical Physics", 3rd Edition, Cambridge University Press, Cambridge, 2009.
5. Maki, D P and Thompson, M., "Mathematical Modelling with Computer Simulation", Cengage Learning, Delhi , 2011.
6. Sastry, S.S., "Introductory Methods of Numerical Analysis", 5th Edition, PHI Learning Pvt. Ltd., Delhi, 2012.
7. Taha, H.A. "Operations Research", 10th Edition, Pearson Education India, Delhi, 2018.

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

UNIT I RESEARCH DESIGN 6

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 6

Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING 6

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 6

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Bio diversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT V PATENTS 6

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filling, Examination of patent, Grant of patent,

Revocation, Equitable Assignments, Licences, Licensing of related patents, patent agents, Registration of patent agents.

TOTAL: 30 PERIODS

REFERENCES:

1. Cooper Donald R, Schindler Pamela S and Sharma JK, “Business Research Methods”, Tata McGraw Hill Education, 11e (2012).
2. Catherine J. Holland, “Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets”, Entrepreneur Press, 2007.
3. David Hunt, Long Nguyen, Matthew Rodgers, “Patent searching: tools & techniques”, Wiley, 2007.
4. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, “Professional Programme Intellectual Property Rights, Law and practice”, September 2013.

CP4151 ADVANCED DATA STRUCTURES AND ALGORITHMS L T P C
3 0 0 3

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 ANALYSIS 9

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

Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion -B-Trees: Definition of B - trees – Basic operations on B-Trees – Deleting a key from a B-Tree- Heap – Heap Implementation – Disjoint Sets - Fibonacci Heaps: structure – Mergeable-heap operations- Decreasing a key and deleting a node-Bounding the maximum degree.

UNIT III GRAPHS 9

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra‘s Algorithm; Dynamic Programming - All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm

UNIT IV ALGORITHM DESIGN TECHNIQUES 9

Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming –

Longest Common Subsequence- Greedy Algorithms: – Elements of the Greedy Strategy- An Activity-Selection Problem - Huffman Coding.

UNIT V NP COMPLETE AND NP HARD **9**

NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP- Completeness and Reducibility – NP-Completeness Proofs – NP-Complete Problems.

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

1. S.Sridhar," Design and Analysis of Algorithms", Oxford University Press, 1st Edition, 2014.
2. Adam Drozdex, "Data Structures and algorithms in C++", Cengage Learning, 4th Edition, 2013.
3. T.H. Cormen, C.E.Leiserson, R.L. Rivest and C.Stein, "Introduction to Algorithms", Prentice Hall of India, 3rd Edition, 2012.
4. Mark Allen Weiss, "Data Structures and Algorithms in C++", Pearson Education, 3rd Edition, 2009.
5. E. Horowitz, S. Sahni and S. Rajasekaran, "Fundamentals of Computer Algorithms", University Press, 2nd Edition, 2008.
6. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.

CP4152 DATABASE PRACTICES **L T P C**
3 0 2 4

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 12

Entity Relationship Model – Relational Data Model – Mapping Entity Relationship Model to Relational Model – Relational Algebra – Structured Query Language – Database Normalization.

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 12

Distributed Database Architecture – Distributed Data Storage – Distributed Transactions – Distributed Query Processing – Distributed Transaction Management – Event Condition Action Model – Design and Implementation Issues for Active Databases – 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 12

Structured, Semi structured, and Unstructured Data – XML Hierarchical Data Model – XML Documents – Document Type Definition – XML Schema – XML Documents and Databases – XML Querying – XPath – XQuery

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 12

NoSQL – Categories of NoSQL Systems – CAP Theorem – Document-Based NoSQL Systems and MongoDB – MongoDB Data Model – MongoDB Distributed Systems Characteristics – NoSQL

Key-Value Stores – DynamoDB Overview – Voldemort Key-Value Distributed Data Store – Wide Column NoSQL Systems – Hbase Data Model – Hbase Crud Operations – Hbase Storage and 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 12

Database Security Issues – Discretionary Access Control Based on Granting and Revoking Privileges – Mandatory Access Control and Role-Based Access Control for Multilevel Security – SQL Injection – Statistical Database Security – Flow Control – Encryption and Public Key Infrastructures – Preserving Data Privacy – Challenges to Maintaining Database Security – Database Survivability – Oracle Label-Based Security.

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:

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education 2016.
2. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Seventh Edition, McGraw Hill, 2019.
3. C.J.Date, A.Kannan, S.Swamynathan, —An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006
4. Raghu Ramakrishnan , Johannes Gehrke “Database Management Systems”, Fourth Edition, McGraw Hill Education, 2015.
5. Harrison, Guy, “Next Generation Databases, NoSQL and Big Data” , First Edition, Apress publishers, 2015
6. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, Sixth Edition, Pearson Education, 2015

SE4151 **ADVANCED SOFTWARE ENGINEERING** **L T P C**

3 0 0 3

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 9

Prescriptive Process Models – Agility and Process – Scrum – XP – Kanban – DevOps – Prototype Construction – Prototype Evaluation – Prototype Evolution – Modeling – Principles – Requirements Engineering – Scenario-based Modeling – Class-based Modeling – Functional Modeling – Behavioral Modeling.

UNIT II SOFTWARE DESIGN 9

Design Concepts – Design Model – Software Architecture – Architectural Styles – Architectural Design – Component-Level Design – User Experience Design – Design for Mobility – Pattern-Based Design.

UNIT III SYSTEM DEPENDABILITY AND SECURITY 9

Dependable Systems – Dependability Properties – Sociotechnical Systems – Redundancy and Diversity – Dependable Processes – Formal Methods and Dependability – Reliability Engineering – Availability and Reliability – Reliability Requirements – Fault-tolerant Architectures – Programming for Reliability – Reliability Measurement – Safety Engineering – Safety-critical Systems – Safety Requirements – Safety Engineering Processes – Safety Cases – Security Engineering – Security and Dependability – Safety and Organizations – Security Requirements – Secure System Design – Security Testing and Assurance – Resilience Engineering – Cybersecurity – Sociotechnical Resilience – Resilient Systems Design.

UNIT IV SERVICE-ORIENTED SOFTWARE ENGINEERING, SYSTEMS ENGINEERING AND REAL-TIME SOFTWARE ENGINEERING 9

Service-oriented Architecture – RESTful Services – Service Engineering – Service Composition – Systems Engineering – Sociotechnical Systems – Conceptual Design – System Procurement – System Development – System Operation and Evolution – Real-time Software Engineering – Embedded System Design – Architectural Patterns for Real-time Software – Timing Analysis – Real-time Operating Systems.

UNIT V SOFTWARE TESTING AND SOFTWARE CONFIGURATION MANAGEMENT 9

Software Testing Strategy – Unit Testing – Integration Testing – Validation Testing – System Testing – Debugging – White-Box Testing – Basis Path Testing – Control Structure Testing – Black-Box Testing – Software Configuration Management (SCM) – SCM Repository – SCM Process – Configuration Management for Web and Mobile Apps.

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

1. Identify appropriate process models based on the Project requirements
2. Understand the importance of having a good Software Architecture.
3. Understand the five important dimensions of dependability, namely, availability, reliability, safety, security, and resilience.
4. Understand the basic notions of a web service, web service standards, and service-oriented architecture;
5. Be familiar with various levels of Software testing

REFERENCES:

1. Software Engineering: A Practitioner's Approach, 9th Edition. Roger Pressman and Bruce Maxim, McGraw-Hill 2019.
2. Software Engineering, 10th Edition, Ian Somerville, Pearson Education Asia 2016.
3. Software Architecture In Practice, 3rd Edition, Len Bass, Paul Clements and Rick Kazman, Pearson India 2018
4. An integrated approach to Software Engineering, 3rd Edition, Pankaj Jalote, Narosa Publishing House, 2018
5. Fundamentals of Software Engineering, 5th Edition, Rajib Mall, PHI Learning Private Ltd, 2018

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

Understanding Software Architecture-Concepts of Software Architecture, Models, Processes, Stakeholders, the Design Process, Architectural Conception, Refined Experience in Action: Styles and Architectural Patterns, Architectural Conception in Absence of Experience

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 9

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 9

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 9

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

REFERENCES:

1. Richard N. Taylor, NenadMedvidovic, Eric Dashofy, Software Architecture: Foundations, Theory, and Practice, 2009.
2. Steven John Metsker, “Design Pattern Jav3a Workbook”, Addison Wesley Workbook”, 2002
3. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, Pearson, 4th Edition, 2021.
4. M. Shaw and D Garlan : Software Architecture Perspectives on an Emerging Discipline, Prentice- Hall. Digitized version 2007
5. Mark Richards, Neal Ford, “ Fundamentals of Software Architecture, An Engineering Approach”, O'Reilly Media 2020

CP4161	ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY	L T P C 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.

TOTAL: 60 PERIODS

REFERENCES

1. Lipschutz Seymour, “Data Structures Schaum's Outlines Series”, Tata McGraw Hill, 3rd Edition, 2014.
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
3. http://www.coursera.org/specializations/data-structures-algorithms
4. http://www.tutorialspoint.com/data_structures_algorithms
5. http://www.geeksforgeeks.org/data-structures/

SE4111 ADVANCED SOFTWARE TOOLS LABORATORY L T P C
0 0 4 2

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

1. Prepare Software Requirements Specification Document.
2. Map the Software Requirements Specification Document to Design Document.
3. Model Entity Relationship Diagram and Map the Entity Relationship Diagram to Relations.
4. Model Data Flow Diagram and Map the Data Flow Diagram to Modular Design.

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.

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 6

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 6

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

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:

1. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
2. Day R How to Write and Publish a Scientific Paper, Cambridge University Press 2006
3. Goldbort R Writing for Science, Yale University Press (available on Google Books) 2006
4. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 1998.

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 6

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 6

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 6

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:

1. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep& Deep Publication Pvt. Ltd., New Delhi,2009.
2. NishithaRai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'NewRoyal book Company,2007.
3. Sahni, PardeepEt.Al. ," Disaster Mitigation Experiences And Reflections", Prentice Hall OfIndia, New Delhi,2001.

AX4093 CONSTITUTION OF INDIA L T P C
2 0 0 0

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 Revolutionin1917and 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

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental 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

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy(Different departments), Village level:Role of Elected and Appointed officials, Importance of grass root democracy.

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.
2. Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015.
3. M.P. Jain, Indian Constitution Law, 7thEdn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

AX4094 நற்றமிழ் இலக்கியம் L T P C

2 0 0 0

UNIT I சங்க இலக்கியம் 6

1. தமிழின் துவக்க நூல் தொல்காப்பியம் – எழுத்து, சொல், பொருள்
2. அகநானூறு (82) - இயற்கை இன்னிசை அரங்கம்
3. குறிஞ்சிப் பாட்டின் மலர்க்காட்சி
4. புறநானூறு (95,195) - போரை நிறுத்திய ஔவையார்

UNIT II அறநெறித் தமிழ் 6

1. அறநெறி வகுத்த திருவள்ளுவர் - அறம் வலியுறுத்தல், அன்புடைமை, ஒப்புறவு அறிதல், ஈகை, புகழ்
2. பிற அறநூல்கள் - இலக்கிய மருந்து

– ஏலாதி, சிறுபஞ்சமூலம், திரிகடுகம், ஆசாரக்கோவை (தூய்மையை வலியுறுத்தும் நூல்)

UNIT III **இரட்டைக் காப்பியங்கள்** **6**

1. கண்ணகியின் புரட்சி
   - சிலப்பதிகார வழக்குரை காதை
2. சமூகசேவை இலக்கியம் மணிமேகலை
   - சிறைக்கோட்டம் அறக்கோட்டமாகிய காதை

UNIT IV **அருள்நெறித் தமிழ்** **6**

1. சிறுபாணாற்றுப்படை
   - பாரி முல்லைக்குத் தேர் கொடுத்தது, பேகன் மயிலுக்குப் போர்வை கொடுத்தது, அதியமான் ஔவைக்கு நெல்லிக்கனி கொடுத்தது, அரசர் பண்புகள்
2. நற்றிணை
   - அன்னைக்குரிய புன்னை சிறப்பு
3. திருமந்திரம் (617, 618)
   - இயமம் நியமம் விதிகள்
4. தர்மச்சாலையை நிறுவிய வள்ளலார்
5. புறநானூறு
   - சிறுவனே வள்ளலானான்
6. அகநானூறு (4) - வண்டு
   நற்றிணை (11) - நண்டு
   கலித்தொகை (11) - யானை, புறா
   ஐந்தினை 50 (27) - மான்

ஆகியவை பற்றிய செய்திகள்

UNIT V **நவீன தமிழ் இலக்கியம்** **6**

1. உரைநடைத் தமிழ்,
   - தமிழின் முதல் புதினம்,
   - தமிழின் முதல் சிறுகதை,
   - கட்டுரை இலக்கியம்,
   - பயண இலக்கியம்,
   - நாடகம்,
2. நாட்டு விடுதலை போராட்டமும் தமிழ் இலக்கியமும்,
3. சமுதாய விடுதலையும் தமிழ் இலக்கியமும்,
4. பெண் விடுதலையும் விளிம்பு நிலையினரின் மேம்பாட்டில் தமிழ் இலக்கியமும்,
5. அறிவியல் தமிழ்,
6. இணையத்தில் தமிழ்,
7. சுற்றுச்சூழல் மேம்பாட்டில் தமிழ் இலக்கியம்.

TOTAL : 30 PERIODS

தமிழ் இலக்கிய வெளியீடுகள் / புத்தகங்கள்

1. தமிழ் இணைய கல்விக்கழகம் (Tamil Virtual University)
   - www.tamilvu.org
2. தமிழ் விக்கிப்பீடியா (Tamil Wikipedia)
   -https://ta.wikipedia.org
3. தர்மபுர ஆதின வெளியீடு
4. வாழ்வியல் களஞ்சியம்
   - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்
5. தமிழ்கலைக் களஞ்சியம்
   - தமிழ் வளர்ச்சித் துறை (thamilvalarchithurai.com)
6. அறிவியல் களஞ்சியம்
   - தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்