**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**(Established by Govt. of A.P., ACT No.30 of 2008)**
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

## M.TECH. IN SOFTWARE ENGINEERING

## COURSE STRUCTURE & SYLLABI

## SEMESTER – I

| S. No. | Course codes | Course Name | Category | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1. | 21D58101 | Advanced Data Structures And Algorithms | PC | 3 | 0 | 0 | 3 |
| 2. | 21D25101 | Advanced Software Quality & Testing | PC | 3 | 0 | 0 | 3 |
| 3. | 21D25102a 21D25102b 21D25102c | **Program Elective - I** Software Reliability Information Retrieval Software Architecture | PE | 3 | 0 | 0 | 3 |
| 4. | 21D58103a 21D58104b 21D25103a | **Program Elective - II** Machine Learning Design Patterns Software Project Planning & Management | PE | 3 | 0 | 0 | 3 |
| 5. | 21D58105 | Advanced Data Structures and Algorithms Laboratory | PC | 0 | 0 | 4 | 2 |
| 6. | 21D25104 | Software Testing Laboratory | PC | 0 | 0 | 4 | 2 |
| 7. | 21DRM101 | Research Methodology and IPR | MC | 2 | 0 | 0 | 2 |
| 8. | 21DAC101a 21DAC101b 21DAC101c | **Audit Course – I** English for Research paper writing Disaster Management Sanskrit for Technical Knowledge | AC | 2 | 0 | 0 | 0 |
| | | **Total** | | | | | 18 |

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## M.TECH. IN SOFTWARE ENGINEERING

## COURSE STRUCTURE & SYLLABI

### SEMESTER – II

| S.No. | Course codes | Course Name | Category | Hours per week | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| 1. | 21D08102c | Cloud Computing | PC | 3 | 0 | 0 | 3 |
| 2. | 21D25201 | Agile Technologies | PC | 3 | 0 | 0 | 3 |
| 3. | 21D25202a 21D25202b 21D25202c | **Program Elective – III** Metrics and Models for Software Engineering Machine Learning Applications for Software Engineering. Computer System Performance & Analysis | PE | 3 | 0 | 0 | 3 |
| 4. | 21D58301c 21D25203a 21D25203b | **Program Elective - IV** Data Analytics Secure Software Engineering Software Agents | PE | 3 | 0 | 0 | 3 |
| 5. | 21D25204 | Database Management Systems Laboratory | PC | 0 | 0 | 4 | 2 |
| 6. | 21D25205 | Cloud Computing lab | PC | 0 | 0 | 4 | 2 |
| 7. | 21D25206 | Technical seminar | PR | 0 | 0 | 4 | 2 |
| 8. | 21DAC201a 21DAC201b 21DAC201c | **Audit Course – II** Pedagogy Studies Stress Management for Yoga Personality Development through Life Enlightenment Skills | AC | 2 | 0 | 0 | 0 |
| **Total** | | | | | | | **18** |

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## COURSE STRUCTURE & SYLLABI

### SEMSTER - III

| S.No. | Course codes | Course Name | Category | Hours per week | | | Credits |
|-------|-------------|-------------|----------|---|---|---|---------|
| | | | | L | T | P | |
| 1. | 21D08203a 21D58203b 21D25301a | **Program Elective Course – V** Mobile Utilities Development Service Oriented Architecture and Micro Services Block Chain Technologies | PE | 3 | 0 | 0 | 3 |
| 2. | 21DOE301b 21DOE301c 21DOE301f | **Open Elective** Industrial Safety Business Analytics Optimization Techniques | OE | 3 | 0 | 0 | 3 |
| 3. | 21D25302 | Dissertation Phase – I | PR | 0 | 0 | 20 | 10 |
| 4. | 21D25303 | Co-curricular Activities | | | | | 2 |
| **Total** | | | | | | | **18** |

### SEMESTER - IV

| S.No. | Course codes | Course Name | Category | Hours per week | | | Credits |
|-------|-------------|-------------|----------|---|---|---|---------|
| | | | | L | T | P | |
| 1. | 21D25401 | Dissertation Phase – II | PR | 0 | 0 | 32 | 16 |
| **Total** | | | | | | | **16** |

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | ADVANCED DATA STRUCTURES AND ALGORITHMS (Common to M.Tech CSE, CN, SE,AI & ML) | L | T | P | C |
|---|---|---|---|---|---|
| 21D58101 | | 3 | 0 | 0 | 3 |
| | **Semester** | **I** | | | |

| | |
|---|---|
| **Course Objectives:** | |

- To understand concepts of dictionaries and hash tables.
- To implement lists and trees.
- To analyze usage of B trees, Splay trees and 2-3 trees.
- To understand the importance of text processing and computational Geometry.

**Course Outcomes (CO):** Student will be able to

- Understand the implementation of symbol table using hashing techniques
- Apply advanced abstract data type (ADT) and data structures in solving real world
- problem
- Effectively combine the fundamental data structures and algorithmic techniques in
- building a solution to a given problem
- Develop algorithms for text processing applications

| **UNIT - I** | | Lecture Hrs: |
|---|---|---|

Dictionaries : Definition, Dictionary Abstract Data Type, Implementation of Dictionaries, Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

| **UNIT - II** | | Lecture Hrs: |
|---|---|---|

Skip Lists : Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists, Trees: Binary Search Trees (BST), AVL Trees, Red Black Trees: Height of a Red Black Tree, Red Black Trees Bottom-Up Insertion, Top-Down Red Black Trees, Top-Down Deletion in Red Black Trees, Analysis of Operations.

| **UNIT - III** | | Lecture Hrs: |
|---|---|---|

2-3 Trees , Advantage of 2-3 trees over Binary Search Trees, Search and Update Operations on 2-3 Trees, Analysis of Operations, B-Trees: Advantage of B- trees over BSTs, Height of B-Tree, Search and Update Operations on 2-3 Trees, Analysis of Operations, Splay Trees: Splaying, Search and Update Operations on Splay Trees, Amortized Analysis of Splaying.

| **UNIT - IV** | | Lecture Hrs: |
|---|---|---|

Text Processing: Sting Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, TheHuffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem

| **UNIT - V** | | Lecture Hrs: |
|---|---|---|

Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.

| **Textbooks:** |
|---|

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, second Edition, Pearson, 2004.
2. T.H. Cormen, C.E. Leiserson, R.L.Rivest, Introduction to Algorithms, Third Edition Prentice Hall, 2009

| **Reference books:** |
|---|

1. Michael T. Goodrich, Roberto Tamassia, Algorithm Design, First Edition, Wiley, 2006.

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | ADVANCED SOFTWARE QUALITY & TESTING | L | T | P | C |
|---|---|---|---|---|---|
| **21D25101** | | **3** | **0** | **0** | **3** |
| | **Semester** | | **I** | | |

**Course Objectives:**
- To understand software testing and quality assurance as a fundamental component of software life cycle
- To define the scope of SW T&QA projects
- To efficiently perform T&QA activities using modern software tools
- To estimate cost of a T&QA project and manage budgets
- To prepare test plans and schedules for a T&QA project
- To develop T&QA project staffing requirements
- To effectively manage a T&QA project

**Course Outcomes (CO):** Student will be able to
- Analyze the importance of software quality assurance & testing in software development.
- Evaluate the concepts of software quality assurance techniques and find their relevance of use.
- Implement the concepts of software testing and appraise the most appropriate testing approaches for a given situation.
- Use the principles of testing and develop the necessary test cases in problem solution.

| UNIT - I | Lecture Hrs:12 |
|---|---|

**Software Quality :**Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors, Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, ISO 9126 Quality Characteristics, ISO 9000:2000 Software Quality Standard, ISO 9000:2000 Fundamentals, ISO 9001:2000 Requirements

**Software Reliability:** What is Reliability?, Fault and Failure, Time, Time Interval between Failures, Counting Failures in Periodic Intervals, Failure Intensity, Definitions of Software Reliability, First Definition of Software Reliability, Second Definition of Software Reliability, Comparing the Definitions of Software Reliability, Factors Influencing Software Reliability, Applications of Software Reliability, Comparison of Software Engineering Technologies, Measuring the Progress of System Testing, Controlling the System in Operation, Better Insight into Software Development Process, Operational Profiles, Operation, Representation of Operational Profile.

| UNIT - II | Lecture Hrs:10 |
|---|---|

**A Perspective on Testing**: Basic Definitions , Test Cases, Insights from a Venn Diagram, Identifying Test Cases , Errors and Fault Taxonomies , Levels of Testing,
**Generalized Pseudocode**, The Triangle Problem , The NextDate Function, The Commission Problem , The SATM System, The Currency Converter, Saturn Windshield Wiper Controller
Boundary Value Testing, Equivalence Class Testing, Decision Table based Testing.

| UNIT - III | Lecture Hrs:10 |
|---|---|

Path Testing , Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations, Data Flow Testing, Define/Use Testing, Slice-Based Testing, Program Slicing Tools
Retrospective on Unit testing, The Test Method Pendulum, Traversing the Pendulum, valuating Test Methods, Insurance Premium Case Study Guidelines.

| UNIT - IV | Lecture Hrs:10 |
|---|---|

Life Cycle Based Traditional Waterfall Testing, Testing in Iterative Life Cycles, Agile Testing, Agile Model–Driven Development
Model-Based testing, Testing Based on Models, Appropriate Models, Commercial Tool Support for

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**COURSE STRUCTURE & SYLLABI**

| |
|---|
| Model-Based Testing |
| Integration Testing, Decomposition-Based Integration, Call Graph–Based Integration, Path-Based Integration, Example: integrationNextDate, Conclusions and Recommendations |
| System Testing, Threads, Basis Concepts for Requirements Specification, Model-Based Threads Use Case–Based Threads, Long versus Short Use Cases, How Many Use Cases?, Coverage Metrics for System Testing, Supplemental Approaches to System Testing, Nonfunctional System Testing Atomic System Function Testing Example. |

| **UNIT - V** | | Lecture Hrs:10 |
|---|---|---|
| Object-Oriented Testing: Issues in Testing Object-Oriented Software, Example: ooNextDate Object-Oriented Unit Testing, Object-Oriented Integration Testing, Object-Oriented System Testing, Software Complexity : Unit-Level Complexity, Integration-Level Complexity, Software Complexity Example, Object-Oriented Complexity, System-Level Complexity Model-Based Testing for Systems of Systems: Characteristics of Systems of Systems Sample Systems of Systems, Software Engineering for Systems of Systems, Communication Primitives for Systems of Systems, Effect of Systems of Systems Levels on Prompts. | | |

| **Textbooks:** | |
|---|---|
| 1 | Software Testing, A Craftsman's Approach, Paul C. Jorgensen: 4th Edition, 2016,Auerbach Publications. |
| 2 | Software Testing and Quality Assurance: Theory and Practice, KsheerasagarNaik and PriyadarshiTripathy, Wiley International, 2010 Edition, ISBN 978-81-265-2593-5. |

| **Reference Books:** | |
|---|---|
| 1 | Introduction To Software Testing, Paul Ammann, Jeff Offutt George, Cambridge University Press;2nd Edition, ISBN 978-1107172012. |
| 2 | Software Testing: Principles and Practices, by SrinivasanDesikan Paperback, 2nd Edition, Pearson.co.in, ISBN-978-81-775-8121-8. |

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## M.TECH. IN SOFTWARE ENGINEERING

## COURSE STRUCTURE & SYLLABI

| Course Code | SOFTWARE RELIABILITY | | L | T | P | C |
|---|---|---|---|---|---|---|
| **21D25102a** | | | **3** | **0** | **0** | **3** |
| | | **Semester** | | **I** | | |

**Course Objectives:**

The objectives of the course are to help engineering students understand:
- To understand concepts of quality & reliability
- To evaluate the overall reliability of a system from component reliability

**Course Outcomes (CO):** Student will be able to
- Model repairable and non-repairable systems and calculate failure rate, repair rate, reliability and availability
- Use various probability density distributions significant to reliability calculations
- Fit a given failure data set of a product into a Weibull distribution and estimate the reliability parameters

| **UNIT - I** | Lecture Hrs:8 |
|---|---|

**Concepts of Product Quality:** Quality Function Deployment / House of Quality,Six Sigma

| **UNIT - II** | Lecture Hrs:8 |
|---|---|

**Concepts of Reliability:** Basic concepts of repairable and non-repairable systems, Reliability, Availability and Maintainability

| **UNIT - III** | Lecture Hrs:8 |
|---|---|

**Failure data analysis:** Fitting discrete and continuous distributions to failure data sets, Weibull analysis, estimation of important reliability parameters

| **UNIT - IV** | Lecture Hrs:8 |
|---|---|

**Calculation of System Reliability from Component reliabilities:** Markov modeling of repairable and non-repairable systems , Reliability Logic Diagrams , Fault-tree analysis

| **UNIT - V** | Lecture Hrs:7 |
|---|---|

**Preventive and Predictive maintenance**: Failure Modes and Effects Analysis.

**Textbooks:**

1. Louis Cohen, Joseph P. Ficalora, Quality Function Deployment and Six Sigma: A QFD Handbook, Prentice Hall, Second Edition, 2009, ISBN: 9780137035441
2. VNA Naikan, Reliability Engineering and Life Testing, PHI Learning, 2010, ISBN: 978-8120335936
3. Singiresu S Rao, Reliability Engineering, Pearson Education, 2014, ISBN: 978-0136015727

**Reference Books:**

1. Patrick O Connor, Practical Reliability Engineering, John Wiley, Student ed., 2009, ISBN:9780470979815 2.
2. B.L. Hansen & P.M. Ghare, Quality Control and Applications, Prentice-Hall, 1997, ISBN: 9780137452255

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## M.TECH. IN SOFTWARE ENGINEERING

## COURSE STRUCTURE & SYLLABI

| Course Code | INFORMATION RETRIEVAL | | | L | T | P | C |
|---|---|---|---|---|---|---|---|
| 21D25102b | (Common to M.Tech. SE,AI & ML) | | | 3 | 0 | 0 | 3 |
| | | | Semester | | I | | |

**Course Objectives:**
- To provide an overview of Information Retrieval
- To introduce students about insights of the several topics of Information retrieval such as – Boolean retrieval model, Vector space model, Latent semantic indexing, XML and Image retrieval model
- To provide comprehensive details about various Evaluation methods
- To provide implementation insight about the topics covered in the course.

**Course Outcomes (CO):** Student will be able to
- Analyze and implement algorithms to extract relevant information from unstructured data using Information retrieval techniques.
- Evaluate information retrieval algorithms for document indexing, relevance ranking, web search, query processing, recommender systems, etc.
- Apply various information retrieval techniques to retrieve information.
- Create information retrieval applications based on various ranking principles and retrieval methods.

| UNIT – I | | Lecture Hrs:8 |
|---|---|---|

**Boolean Retrieval**
An example information retrieval problem, A first take at building an inverted index, Processing Boolean queries, The extended Boolean model versus ranked retrieval.

**The term Vocabulary and Postings Lists**
Document delineation and character sequence decoding, Obtaining the character sequence in a document, Choosing a document unit, Determining the vocabulary of terms, Tokenization, Dropping common terms: stop words, Normalization (equivalence classing of terms), Stemming and lemmatization, Faster postings list intersection via skip pointers, Positional postings and phrase queries, Bi-word indexes, Positional indexes, Combination schemes.

| UNIT - II | | Lecture Hrs:8 |
|---|---|---|

**Dictionaries and tolerant retrieval**
Search structures for dictionaries, Wildcard queries, General wildcard queries, k-gram indexes for wildcard queries, Spelling correction, Implementing spelling correction, Forms of spelling correction, Edit distance, k-gram indexes for spelling correction, Context sensitive spelling correction, Phonetic correction

**Index Construction:** Hardware basics, Blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, Dynamic indexing and Other types of indexes.

| UNIT - III | | Lecture Hrs:8 |
|---|---|---|

**Index compression**
Statistical properties of terms in information retrieval, Heaps' law: Estimating the number of terms, Zipf's law: Modeling the distribution of terms, Dictionary compression, Dictionary as a string, Blocked storage.

**Scoring, term weighting and the vector space model**
Parametric and zone indexes, Weighted zone scoring, Learning weights, The optimal weight *g,* Term frequency and weighting, Inverse document frequency, TF-IDF weighting, The vector space model for scoring, Dot products, Queries as vectors, Computing vector scores.

| UNIT - IV | | Lecture Hrs:8 |
|---|---|---|

## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

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|---|---|
| **Computing scores in a complete search system**<br>Efficient scoring and ranking, Inexact top *K* document retrieval, Index elimination, Champion lists, Static quality scores and ordering, Impact ordering, Cluster pruning, Components of an information retrieval system, Tiered indexes, Query-term proximity, Designing parsing and scoring functions. Putting it all together**.**<br>**Evaluation in information retrieval**<br>Information retrieval system evaluation, Standard test collections, Evaluation of unranked retrieval sets, Evaluation of ranked retrieval results. | |
| **UNIT - V** | Lecture Hrs:7 |
| **XML retrieval:** Basic XML concepts, Challenges in XML retrieval, A vector space model for XML retrieval, Evaluation of XML retrieval, Text-centric vs. data-centric XML retrieval.<br>**Probabilistic information retrieval**<br>Review of basic probability theory, The Probability Ranking Principle, The Binary Independence Model. | |
| **Textbooks:** | |
| 1. An Introduction to Information Retrieval, Christopher D. Manning, PrabhakarRaghavan, HinrichSchütze:, Cambridge University Press, England, 2008, ISBN 13: 9780521865715.<br>2. Statistical Language Models for Information Retrieval, ChengXiangZhai, , Morgan & Claypool Publishers, 2009, ISBN: 9781598295900 | |
| **Reference Books:** | |
| 1. Modern Information Retrieval, Ricardo Baeza-Yates, BerthierRibeiro-Neto, Addison Wesley Longman Publishing Co. Inc, 2009, ISBN-10: 0321416910.<br>2. Information Retrieval Data Structures and Algorithms,William B. Frakes, Ricardo Baeza-Yates, First Edition, Pearson Education Limited,2012, ISBN-9788131716922. | |

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**COURSE STRUCTURE & SYLLABI**

| Course Code | SOFTWARE ARCHITECTURE | | L | T | P | C |
|---|---|---|---|---|---|---|
| 21D25102c | | | 3 | 0 | 0 | 3 |
| | | Semester | | I | | |

**Course Objectives:**
- Design and motivate software architecture for large-scale software systems.
- Recognize major software architectural styles, design patterns, and frameworks.
- Describe a software architecture using various documentation approaches and architectural description languages.
- Use well-understood paradigms for designing new systems.
- Identify and assess the quality attributes of a system at the architectural level.
- Motivate the architectural concerns for designing and evaluating a system's architecture.

**Course Outcomes (CO):** Student will be able to
- Ability to understand the softwarearchitecturalrequirements, driversandtoexplainabouttheinfluenceofsoftwarearchitectureonbusinessandtechnicalactivities.
- Abletoanalyze the quality attribute workshop and to apply the concept to prepare the documentation on quality attribute.
- Abilitytounderstand,identifythekeyarchitecturalstructuresandtousetheviewsto specify architecture.
- Abilitytouse & evaluatethestylestospecifyarchitecture.

| UNIT - I | | Lecture Hrs:8 |
|---|---|---|

**Introduction and architectural drivers:** Introduction–What is software architecture – Standard Definitions –Architectural structures –Influence of software architecture on organization-both business and technical– Architecture Business Cycle- Introduction –Functional requirements–Technical constraints –Quality Attributes

| UNIT - II | | Lecture Hrs:8 |
|---|---|---|

**Quality attribute workshop:** Quality Attribute Workshop–Documenting Quality Attributes– Six part scenarios–Case studies.

| UNIT - III | | Lecture Hrs:8 |
|---|---|---|

**Architectural views:** Introduction– Standard Definitions for views–Structures and views-Representing views-available notations –Standard views–4+1viewofRUP, Siemens4views, SEI'sperspectives and views– Case studies

| UNIT - IV | | Lecture Hrs:8 |
|---|---|---|

**Architectural styles:** Introduction– Dataflowstyles–Call-returnstyles–SharedInformationstyles-Eventstyles– Case studies for each style

| UNIT - V | | Lecture Hrs:7 |
|---|---|---|

**Documenting the architecture:** Good practices – Documenting the Views using UML–Merits and Demerits of using visual languages–Need for formal languages- Architectural Description Languages–ACME– Casestudies. Special topics :SOA and Web services–Cloud Computing– Adaptive structures

**Textbooks:**
1. Software Architectures Principles and Practices", Len Bass, Paul Clements, and Rick Kazman, 2nd Edition, Addison-Wesley, 2003, ISBN : 0321154959
2. Architecting Software Intensive System. A Practitioner's Guide", Anthony J Lattanze, Auerbach Publications, 2010, ISBN: 978-4020-7883-5.

**Reference Books:**
1. Documenting Software Architectures. Views and Beyond", Paul Clements, Felix Bachmann, Len Bass, David Garlan, James Ivers, Reed Little, Paulo Merson, Robert Nord, and Judith Stafford, 2nd

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**COURSE STRUCTURE & SYLLABI**

Edition, Addison- Wesley, 2010. ISBN: 0321552687.
2. Cloud Computing. Principles and Paradigms, Rajkumar Buyya, James Broberg, and Andrzej Goscinski, John Wiley & Sons, 2011,ISBN 978-0-470-88799-8.

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**COURSE STRUCTURE & SYLLABI**

| Course Code | MACHINE LEARNING | L | T | P | C |
|---|---|---|---|---|---|
| 21D58103a | (Common to M.Tech CSE, SE,AI & ML) | 3 | 0 | 0 | 3 |
| | Semester | | | I | |

| | |
|---|---|
| **Course Objectives:** | |

- To understand various key paradigms for machine learning approaches.
- To familiarize with the mathematical and statistical techniques used in machine learning.
- To understand and differentiate among various machine learning techniques.

**Course Outcomes (CO):** Student will be able to

- To formulate a machine learning problem
- Select an appropriate pattern analysis tool for analysing data in a given feature space.
- Apply pattern recognition and machine learning techniques such as classification and feature selection to practical applications and detect patterns in the data.

| **UNIT - I** | | Lecture Hrs: |
|---|---|---|

Introduction: Definitions, Datasets for Machine Learning, Different Paradigms of Machine Learning, Data Normalization, Hypothesis Evaluation, VC-Dimensions and Distribution, Bias-Variance Tradeoff, Regression

| **UNIT - II** | | Lecture Hrs: |
|---|---|---|

Bayes Decision Theory: Bayes decision rule, Minimum error rate classification, Normal density and discriminant functions.
Parameter Estimation: Maximum Likelihood and Bayesian Parameter Estimation

| **UNIT - III** | | Lecture Hrs: |
|---|---|---|

Discriminative Methods: Distance-based methods, Linear Discriminant Functions, Decision Tree, Random Decision Forest and Boosting
Feature Selection and Dimensionality Reduction: PCA, LDA, ICA, SFFS, SBFS

| **UNIT - IV** | | Lecture Hrs: |
|---|---|---|

Learning from unclassified data. Clustering. Hierarchical Agglomerative Clustering. k-means partitional clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM using labelled and unlabelled data.

| UNIT - V | | Lecture Hrs: |
|---|---|---|

Kernel Machines: Kernel Tricks, SVMs (primal and dual forms), K-SVR, K-PCA (6 Lectures) Artificial Neural Networks: MLP, Backprop, and RBF-Net

| **Textbooks:** |
|---|

1. Shalev-Shwartz,S., Ben-David,S., (2014), Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press
2. R. O. Duda, P. E. Hart, D. G. Stork (2000), Pattern Classification, Wiley-Blackwell, 2nd Edition.

| **Reference Books:** |
|---|

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley &amp; Sons Inc.,2001
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | DESIGN PATTERNS | L | T | P | C |
|---|---|---|---|---|---|
| 21D58104b | (Common to M.Tech CSE, CN, SE) | 3 | 0 | 0 | 3 |
| | | **Semester** | | | I |

**Course Objectives:**
- To understand the basic concepts of Design Patterns.
- To implement the document editor process for a considered case study.
- To implement various Structural and Behavioral Patterns.

**Course Outcomes (CO):** Student will be able to
- Identify basic concepts of Design Patterns.
- Design Document editor for a considered application.
- Analyze the structural Patterns.
- Examine the Behavioral Patterns.

| UNIT - I | | Lecture Hrs:9 |
|---|---|---|

Introduction : What Is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

| UNIT - II | | Lecture Hrs:9 |
|---|---|---|

A Case Study : Designing a Document Editor : Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.
Creational Patterns : Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

| UNIT - III | | Lecture Hrs:9 |
|---|---|---|

Structural Pattern Part-I : Adapter, Bridge, Composite.
Structural Pattern Part-II : Decorator, Façade, Flyweight, Proxy.

| UNIT - IV | | Lecture Hrs:9 |
|---|---|---|

Behavioral Patterns Part-I : Chain of Responsibility, Command, Interpreter, Iterator.
Behavioral Patterns Part-II : Mediator, Memento, Observer.

| UNIT - V | | Lecture Hrs:9 |
|---|---|---|

Behavioral Patterns Part-II (cont'd):State, Strategy, Template Method ,Visitor, Discussion of Behavioral Patterns.
What to Expect from Design Patterns, A Brief History, The Pattern Community An Invitation, A Parting Thought.

**Textbooks:**
1. Design Patterns By Erich Gamma, Pearson Education
2. Design Patterns Explained By Alan Shalloway, Pearson Education.

**Reference Books:**
1. Pattern's in JAVA Vol-I By Mark Grand ,Wiley Dream Tech.
2. Pattern's in JAVA Vol-II By Mark Grand ,Wiley Dream Tech.
3. JAVA Enterprise Design Patterns Vol-III By Mark Grand ,Wiley Dream Tech.
4. Head First Design Patterns By Eric Freeman-Oreilly-spd

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**M.TECH. IN SOFTWARE ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | SOFTWARE PROJECT PLANNING & MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| 21D25103a | | 3 | 0 | 0 | 3 |
| | Semester | | | I | |

**Course Objectives:**
- To understand the Software Project Planning and Evaluation techniques.
- To plan and manage projects at each stage of the software development life cycle (SDLC).
- To learn about the activity planning and risk management principles.
- To manage software projects and control software deliverables.
- To develop skills to manage the various phases involved in project management and people management.
- To deliver successful software projects that support organizations strategic goals.

**Course Outcomes (CO):** Student will be able to
- Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities
- Apply risk management analysis techniques that identify the factors that put a project at risk and to quantify the likely effect of risk on project timescales
- Identify the resources required for a project and to produce a work plan and resource schedule
- Monitor the progress of a project and to assess the risk of slippage, revising targets counteract drift
- Use appropriate metrics to management the software development outcome
- Develop research methods and techniques appropriate to defining, planning and carrying out a research project within your chosen specialist area within the management of software projects.

| UNIT – I | | Lecture Hrs:10 |
|---|---|---|

Metrics: Introduction, The Metrics Roadmap, A Typical Metrics Strategy, What Should you Measure?, Understanding and Trying to minimize variability, Act on data, People and Organizational issues in Metrics Programs, Common Pitfalls to watch out for in Metrics Programs, Matrices implementation checklists and tools, Software configuration management, software configuration management in geographically distributed teams, Metrics in software configuration management, software configuration management tools and automation.

| UNIT – II | | Lecture Hrs:10 |
|---|---|---|

Risk Management: Introduction, What is risk management and why is it important, Risk management cycle, Risk identification: common tools and techniques, Risk Quantifications, Risk Monitoring, Risk Mitigation, Risks and Mitigation in the context of global project teams, some practical techniques risk management, Metrics in risk management. Project Planning and Tracking: Part of the Project Management Plan, An Effective Closure Process, Issues that Get Discussed During Closure, Metrics for Project Closure, Interfaces to the Process Database.

| UNIT – III | | Lecture Hrs:10 |
|---|---|---|

Software Requirements gathering, differences for a shrink-wrapped software, challenges during the requirements management phase, Metrics for requirements phase. Estimation. Design and Development Phases, design for maintainability, design for install ability, inter-operability design, challenges during design and development phases, skill sets for design and development, metrics for design and development phases.

| UNIT – IV | | Lecture Hrs:10 |
|---|---|---|

**M.TECH. IN SOFTWARE ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

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| Project management in the testing phase. Project management in the Maintenance Phase: Configuration management during Maintenance Phase, skill sets for people in the maintenance phase, estimating size, effort, and people resources for the maintenance phase, advantages of using geographically distributed teams for the maintenance phase, metrics for the maintenance phase. |

| UNIT – V | | Lecture Hrs:10 |
|---|---|---|
| Globalization issues in project management Impact of the internet on project management: Introduction, the effect of internet on project management, managing projects for the internet, Effect on the project management activities. People focused process models: Growing emphasis on people centric models, people capability maturity model(P-CMM), other people focused models in the literature, how does an organization choose the models to use? | | |

**Textbooks:**

| 1 | Managing Global Projects | Ramesh Gopalaswamy | Tata McGraw Hill | 2013 |
|---|---|---|---|---|

**Reference Books:**

| 1 | Managing the Software Process | Watts Humphrey | Pearson Education | 2000 |
|---|---|---|---|---|
| 2 | Software Project Management in practice, | PankajJalote | Pearson Education | 2002 |

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | ADVANCED DATA STRUCTURES AND ALGORITHMS LAB (Common to M.Tech CSE, CN, SE,AI & ML) | | L | T | P | C |
|---|---|---|---|---|---|---|
| 21D58105 | | | 0 | 0 | 4 | 2 |
| | | Semester | | I | | |

| | |
|---|---|
| **Course Objectives:** | |
| <ul><li>Implement linear and non linear data structures.</li><li>Analyze various algorithms based on their time complexity.</li><li>Choose appropriate data structure and algorithm design method for a specific application.</li><li>Identify suitable data structure to solve various computing problems.</li></ul> | |
| **Course Outcomes (CO):** | |
| <ul><li>Implement divide and conquer techniques to solve a given problem.</li><li>Implement hashing techniques like linear probing, quadratic probing, random probing and double hashing/rehashing.</li><li>Perform Stack operations to convert infix expression into post fix expression and evaluate the post fix expression.</li><li>Differentiate graph traversal techniques Like Depth First Search, Breadth First Search. Identify shortest path to other vertices using various algorithms.</li></ul> | |
| **List of Experiments**: | |
| <ul><li>To implement functions of Dictionary using Hashing (division method, Multiplication method, Universal hashing).</li><li>To perform various operations i.e., insertions and deletions on AVL trees.</li><li>To perform various operations i.e., insertions and deletions on 2-3 trees.</li><li>To implement operations on binary heap.</li><li>To implement operations on graphs</li><li>To implement Depth First Search for a graph non-recursively.</li><li>To implement Breadth First Search for a graph non-recursively.</li><li>To implement Prim's algorithm to generate a min-cost spanning tree.</li><li>To implement Krushkal's algorithm to generate a min-cost spanning tree.</li><li>To implement Dijkstra's algorithm to find shortest path in the graph.</li></ul> | |

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## M.TECH. IN SOFTWARE ENGINEERING

## COURSE STRUCTURE & SYLLABI

| Course Code | SOFTWARE TESTING LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| **21D25104** | | **0** | **0** | **4** | **2** |
| | **Semester** | | **I** | | |
| | | | | | |

**Course Objectives:**
- Work on fundamental concepts in software testing.
- To demonstrate various software testing issues and solutions in software unit test, integration and system testing.
- To expose the advanced software testing techniques, such as object-oriented software testing methods.

**Course Outcomes (CO):**
- Analyze the importance of software quality assurance & testing in software development.
- Evaluate the concepts of software quality assurance techniques and find their relevance of use.
- Implement the concepts of software testing and appraise the most appropriate testing approaches for a given situation.
- Use the principles of testing and develop the necessary test cases in problem solution.

**List of Experiments**:

Students are expected to analyze the following problems with respect to software testing and identify all necessary test cases.

1. Design, develop, code and run the program in any suitable language to solve the **commission problem**. Analyze it from the perspective of dataflow testing, derive at least 10 different test cases, execute these test cases and discuss the test results.

2. Design, develop, code and run the program in any suitable language to solve the **NextDate problem**. Analyze it from the perspective of decision table-based testing, derive at least 10 different test cases, execute these test cases and discuss the test results.

3. Design, develop, code and run the program in any suitable object-oriented language to solve the **calendar problem**. Analyze it from the perspective of OO testing, derive test cases to test the method that increment the date and the method that increments the month., execute these test cases and discuss the test results.

4. Design, develop, code and run the program in any suitable object-oriented language to solve the **currency converter problem**. Analyze it from the perspective of use case-based system testing, derive appropriate system test cases., execute these test cases and discuss the test results.

**5.** Study of any web testing tool (e.g. Selenium) A report of these problem solutions need to be prepared for realizing the importance of software testing.

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**COURSE STRUCTURE & SYLLABI**

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | RESEARCH METHODOLOGY AND IPR (Common to M.Tech CSE, CN, SE,AI & ML) | L | T | P | C |
|---|---|---|---|---|---|
| **21DRM101** | | 2 | 0 | 0 | 2 |
| | **Semester** | | | | I |

| | |
|---|---|
| **Course Objectives:** | |

- Identify an appropriate research problem in their interesting domain.
- Understand ethical issues understand the Preparation of a research project thesis report.
- Understand the Preparation of a research project thesis report
- Understand the law of patent and copyrights.
- Understand the Adequate knowledge on IPR

**Course Outcomes (CO):** Student will be able to

- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

| UNIT - I | | Lecture Hrs: |
|---|---|---|

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, scope, and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

| UNIT - II | | Lecture Hrs: |
|---|---|---|

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

| UNIT - III | | Lecture Hrs: |
|---|---|---|

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

| UNIT - IV | | Lecture Hrs: |
|---|---|---|

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

| UNIT - V | | |
|---|---|---|

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

| | |
|---|---|
| **Textbooks:** | |

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

**Reference Books:**

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1. 1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for
2. beginners"
3. 2. Halbert, "Resisting Intellectual Property", Taylor &amp; Francis Ltd ,2007.
4. 3. Mayall, "Industrial Design", McGraw Hill, 1992.
5. 4. Niebel, "Product Design", McGraw Hill, 1974.
6. 5. Asimov, "Introduction to Design", Prentice Hall, 1962.
7. 6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New
8. Technological Age", 2016.

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | CLOUD COMPUTING | L | T | P | C |
|---|---|---|---|---|---|
| 21D08102c | (Common to M.Tech  CN, SE,) | 3 | 0 | 0 | 3 |
| | Semester | | II | | |

**Course Objectives:**
- Understand the hardware, software concepts and architecture of cloud computing
- Realize the importance of Cloud Virtualization, Abstractions and Enabling Technologies.
- Explore the Programming for Applications on Cloud.
- Apply Map-Reduce concept to applications.

**Course Outcomes (CO):** Student will be able to
- Explain industry relevance of cloud computing and its intricacies, in terms of various challenges, vulnerabilities, SLAs, virtualization, resource management and scheduling, etc.
- Examine some of the application paradigms, and Illustrate security aspects for building cloud-based applications.
- Conduct a research study pertaining to various issues of cloud computing.
- Demonstrate the working of VM and VMM on any cloud platforms (public/private), and run a software service on that.

| UNIT - I | | Lecture Hrs:9 |
|---|---|---|

**Introduction, Cloud Infrastructure**

Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Major challenges faced by cloud computing; Cloud Infrastructure: Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Service- and compliance-level agreements, User experience and software licensing. Exercises and problems

| UNIT - II | | Lecture Hrs:9 |
|---|---|---|

**Cloud Computing: Application Paradigms**

Challenges of cloud computing, Existing Cloud Applications and New Application Opportunities, Workflows: coordination of multiple activities, Coordination based on a state machine model: The ZooKeeper, The MapReduce Programming model, A case study: The Grep TheWeb application, HPC on cloud, Biology research

| UNIT - III | | Lecture Hrs:9 |
|---|---|---|

**Cloud Resource Virtualization.**

Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and para virtualization, Hardware support for virtualization, Case Study: Xen a VMM based para virtualization, Optimization of network virtualization, The darker side of virtualization, Exercises and problems.

| UNIT - IV | | Lecture Hrs:10 |
|---|---|---|

**Cloud Resource Management and Scheduling**

Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers; Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Exercises and problems.

| UNIT - V | | Lecture Hrs:10 |
|---|---|---|

**Cloud Security, Cloud Application Development**

Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual

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**COURSE STRUCTURE & SYLLABI**

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| machine monitor, Amazon web services, Cloud-based simulation of a distributed trust algorithm, A trust management service, A cloud service for adaptive data streaming, Exercises and problems. Amazon Simple Notification services. |
| **Textbooks:** |
| 1.Cloud Computing Theory and Practice. Dan C Marinescu: Elsevier (MK), 1st Edition, 2013, ISBN: 9780124046276.<br>2.Distributed Computing and Cloud Computing, from parallel processing to internet of things. Kai Hwang, GeofferyC.Fox, Jack J Dongarra: Elsevier(MK), 1st Edition, 2012, ISBN: 978-0-12-385880-1 |
| **Reference Books:** |
| 1.Cloud Computing Principles and Paradigms, RajkumarBuyya, James Broberg, AndrzejGoscinski: Willey, 1st Edition, 2014, ISBN: 978-0-470-88799-8.<br>2.Cloud Computing Implementation, Management and Security, John W Rittinghouse, James F Ransome: CRC Press, 1st Edition, 2013, ISBN: 978-1-4398-0680-7 |
| **Online Learning Resources:** |
| **OLI Course:** http://oli.cmu.edu (accessed through https://blackboard.andrew.cmu.edu)<br>**The Project Zone:**https://TheProject.Zone<br>**Piazza:** http://piazza.com/cmu/spring2016/1531915619/home |

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | AGILE TECHNOLOGIES | | L | T | P | C |
|---|---|---|---|---|---|---|
| **21D25201** | | | **3** | **0** | **0** | **3** |
| | | **Semester** | | **II** | | |
| | | | | | | |

**Course Objectives:**
- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- 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 the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing.

**Course Outcomes (CO):** Student will be able to
- Understand The XP Lifecycle, XP Concepts, Adopting XP .
- Work on Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements, Customer Tests.
- Implement Concepts to Eliminate Waste.
- Appreciate and focus on the most important aspects of project development and sprints.

| UNIT - I | | Lecture Hrs:10 |
|---|---|---|

**Why Agile?:**
Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, How to Be Agile?: Agile Methods, Don't Make Your Own Method, The Road to Mastery, Find a Mentor.

| UNIT - II | | Lecture Hrs:10 |
|---|---|---|

**Understanding XP:**
The XP Lifecycle, The XP Team, XP Concepts, Adopting XP: Is XP Right for Us? Go!, Assess Your Agility. **Practicing XP:** Thinking: Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, Collaborating: Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting

| UNIT - III | | Lecture Hrs:10 |
|---|---|---|

**Releasing:**
"Done Done", No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation. **Planning:** Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating. **Developing:** Incremental requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design ,Incremental Design and Architecture, Spike Solutions, Performance Optimization, Exploratory.

| UNIT - IV | | Lecture Hrs:10 |
|---|---|---|

**Mastering Agility Values and Principles:**
Commonalities, About Values, Principles, and Practices, Further Reading, Improve the Process: Understand Your Project, Tune and Adapt, Break the Rules, Rely on People :Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, Eliminate Waste :Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput.

| UNIT - V | | Lecture Hrs:10 |
|---|---|---|

**Deliver Value:**
Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, Seek Technical Excellence :Software Doesn't Exist, Design Is for Understanding, Design

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**COURSE STRUCTURE & SYLLABI**

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| Trade-offs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery. |
| **Textbooks:** |
| 1. The Art of Agile Development (Pragmatic guide to agile software development), James shore, Chromatic, O'Reilly Media, Shroff Publishers & Distributors, 2007 |
| 2. Agile and Iterative Development A Manger's Guide, Craig Larman , First Edition, India, Pearson Education, 2004 |
| **Reference Books:** |
| 1. The Good, the Hype and the Ugly, Meyer, B., Agile!:, 1st Edition, Springer, 2014, ISBN 978-3-319-05155-0 |
| 2. Essential Scrum: A Practical Guide to the Most Popular Agile Process (Addison-Wesley Signature Series (Cohn)), Kenneth S. Rubin , 1stEdition . |

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## M.TECH. IN SOFTWARE ENGINEERING

## COURSE STRUCTURE & SYLLABI

| Course Code | METRICS AND MODELS FOR SOFTWARE ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| 21D25202a | | 3 | 0 | 0 | 3 |
| | **Semester** | | II | | |

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|---|---|
| **Course Objectives:** | |

- To provide a solid background knowledge about software metrics.
- To gain basic knowledge about metrics, measurement theory and related terminologies
- To educate various metrics and models to assess software.
- To provide hands on experience on using and implementing metrics.

**Course Outcomes (CO):** Student will be able to

- Comprehend the need for measurement of software artefacts.
- Apply various software quality metrics in process of software development
- Design and analyze various models for software management.
- Compare and evaluate metrics and various models for assuring software quality.

| UNIT - I | | Lecture Hrs:10 |
|---|---|---|

**Introduction:**
**Introduction: Quality:** Popular views; Quality: Professional views; Software quality; Total quality management.
**Overview of Software Quality Metrics:** Product quality metrics; In-process quality metrics; Metrics for software maintenance; Examples of metrics programs; Collecting software engineering data.

| UNIT - II | | Lecture Hrs:10 |
|---|---|---|

**Applying the 7 Basic Quality Tools in Software Development:**
Ishikawa's seven basic tools; Checklist; Pareto diagram; Histogram; Run charts; Scatter diagram; Control chart; Cause-and-effect diagram; Relations diagram.
**Defect Removal Effectiveness:**
Review; A closer look at defect removal effectiveness; Defect removal effectiveness and quality planning; Cost effectiveness of phase defect removal; Defect removal effectiveness and process maturity level.

| UNIT - III | | Lecture Hrs:10 |
|---|---|---|

**The Rayleigh Model:**
Reliability models; The Rayleigh model; Basic assumptions; Reliability and predictive validity.
**Exponential Distribution and Reliability Growth Models:**
The exponential model; Reliability growth models; Model assumptions; Criteria for model evaluation; Modelling process; Test compression factor; Estimating the distribution of total defects over time.

| UNIT - IV | | Lecture Hrs:10 |
|---|---|---|

**Quality Management Models:**
The Rayleigh model framework; The code integration pattern; The PTR sub model; The PTR arrival / backlog projection model; Reliability growth models; Criteria for model evaluation; In-process metrics and reports; Orthogonal defect classification.
**In-Process Metrics for Software Testing:**
In-process metrics for software testing; In-process metrics and quality management; Possible metrics for acceptance testing to evaluate vendor-developed software; When is the product good enough to ship?

| UNIT - V | | Lecture Hrs:10 |
|---|---|---|

**Metrics and Lessons Learned for Object-Oriented Projects:**
Object-oriented concepts and constructs; Design and complexity metrics; Productivity metrics; Quality and quality management metrics; Lessons learned for OO projects.

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

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| **Availability Metrics:** |
| Definition and measurements of system availability; Reliability, availability, and defect rate; Collecting customer outage data for quality improvement; In-process metrics for outage and availability. |
| **Textbooks:** |
| 1. Metrics and Models in Software Quality Engineering; Stephan H. Kan, 2nd Edition, Pearson, 2015, ISBN-13:9789332551602. <br> 2. Software Metrics: A Rigorous Approach, Fenton N. E., S. L. Pfleeger; 2nd Edition, Thomson, 2003, ISBN-13: 9789812403858. |
| **Reference Books:** |
| 1. Software Quality Engineering:, Jeff Tian; John Wiley and Sons Inc., 2014, ISBN-13:9788126508051. <br> 2. Metrics-driven Enterprise Software Development; Sdatta ,Cengage Learning India Pvt.ltd; 2014, ISBN-13:9788131522370. |

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## M.TECH. IN SOFTWARE ENGINEERING

## COURSE STRUCTURE & SYLLABI

| Course Code | MACHINE LEARNING APPLICATIONS FOR | L | T | P | C |
|---|---|---|---|---|---|
| 21D25202b | SOFTWARE ENGINEERING | 3 | 0 | 0 | 3 |
| | Semester | | II | | |

**Course Objectives:**
- To learn the purpose of ML in Software Engineering.
- To understand the role of ML in prediction and Estimation.
- To recognize the ML applications in Property and Model Discovery.
- To intricate the Usage of ML in Requirements Acquisition and development of Knowledge.

**Course Outcomes (CO):** Student will be able to
- Understand the purpose of ML in Software Engineering.
- Identify the role of ML in prediction and Estimation.
- Recognize the ML applications in Property and Model Discovery.
- Usage of ML in Requirements Acquisition and development of Knowledge.

| UNIT - I | | Lecture Hrs:10 |
|---|---|---|

INTRODUCTION TO ML AND SOFTWARE ENGINEERING: Overview of ML, Learning approaches, SE tasks for ML applications, State of the practice in ML and SE, Property and model discovery, Transformation, Generation and synthesis, Reuse library construction and maintenance, Requirement acquisition, Capture development knowledge

| UNIT - II | | Lecture Hrs:10 |
|---|---|---|

Machine Learning applications in Prediction and Estimation:Bayesian Analysis of Empirical Software Engineering Cost Models, Machine Learning Approaches to Estimating Software Development Effort, Estimating Software Project Effort Using Analogies, A Critique of Software Defect Prediction Models, Using Regression Trees to Classify Fault-Prone Software Modules, Can genetic programming improve software effort estimation? A comparative evaluation, Optimal software release scheduling based on artificial neural networks.

| UNIT - III | | Lecture Hrs:10 |
|---|---|---|

ML Applications in Property and model discovery:Identifying Objects in Procedural Programs Using Clustering Neural Networks, BAYESIAN-LEARNING BASED GUIDELINES TO DETERMINE EQUIVALENT MUTANTS. ML Applications in Reuse: On the Reuse of Software: A Case-Based Approach Employing a Repository.

| UNIT – IV | | Lecture Hrs:10 |
|---|---|---|

ML Applications in Requirements Acquisition: Inductive Specification Recovery: Understanding Software by Learning from Example Behaviors, Explanation-Based Scenario Generation for Reactive System Models.

| UNIT – V | | Lecture Hrs:9 |
|---|---|---|

ML Applications in Management of Development Knowledge: Case-Based Knowledge Management Tools for Software Development.

**Textbooks:**
1. Machine Learning Applications in Software Engineering- Edited By: Du Zhang (*California State University, USA*) and Jeffrey J P Tsai (*University of Illinois, Chicago, USA*)Feb 2005.
2. Applied Software Development with Python & Machine Learning by Wearable & Wireless Systems for Movement Disorder Treatment via Deep Brain Stimulation by By (author): Robert LeMoyne (*Northern Arizona University, USA*) and Timothy Mastroianni.

**Reference Books:**
1. HandBook on Machine Learning- Volume 1: Foundation of Artificial Intelligence by TshilidziMarwala.

**Online Learning Resources:**
https://www.worldscientific.com/worldscibooks/10.1142/5700#t=toc

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | COMPUTER SYSTEM PERFORMANCE & ANALYSIS | L | T | P | C |
|---|---|---|---|---|---|
| **21D25202c** | | 3 | 0 | 0 | 3 |
| | **Semester** | | **II** | | |

| | |
|---|---|
| **Course Objectives:** | |

- To understand the various performance evaluation techniques
- To apply the techniques to systematically evaluate the performance of computer sub-systems.
- To design and conduct performance evaluation experiments
- To formulate hypothesis about the causes of poor performance across different layers of a data system's stack
- To select appropriate set of tools for troubleshooting performance problems.
- To analyze the performance of a complex real-world data system.

**Course Outcomes (CO):** Student will be able to

- Comprehend the need for performance evaluation and its systematic approach.
- Apply performance measurement techniques to evaluate computer systems.
- Design and analyze various performance evaluation techniques.
- Compare and evaluate performance of computer systems using sophisticated models.

| UNIT - I | | Lecture Hrs:10 |
|---|---|---|

**Introduction:**
The art of Performance Evaluation, Common mistakes in Performance Evaluation, A systematic approach to Performance Evaluation, Selecting an evaluation technique.
**Metrics of Performance:** What is a performance metric? Characteristics of a good performance metric, Processor and system performance metrics, Other types of performance metrics, Speedup and relative change, Means versus ends metrics, Summary.

| UNIT - II | | Lecture Hrs:10 |
|---|---|---|

**Average Performance and Variability:** Why mean values? Indices of central tendency, Other types of means**,** Quantifying variability, Summary. **Errors in Experimental Measurements:** Accuracy, precision, and resolution, Sources of errors, A model of errors, Quantifying errors.

| UNIT - III | | Lecture Hrs:10 |
|---|---|---|

**Comparing Alternatives:** Comparing two alternatives, Comparing more than two alternatives, Summary, For further reading, Exercises. **Measurement Tools and Techniques:** Events and measurement strategies, Interval timers, Program profiling, Event tracing, Indirect and ad hoc measurements, Perturbations due to measuring.

| UNIT - IV | | Lecture Hrs:10 |
|---|---|---|

**Benchmark Programs:** Types of benchmark programs, benchmark strategies, example of benchmark programs, summary. **Linear regression models:** Least squares minimization, confidence intervals for regression parameters, correlation, multiple linear regression, verifying linearity, nonlinear models, summary.

| UNIT - V | | Lecture Hrs:10 |
|---|---|---|

**The design of experiments:** Types of experiments, terminology, two factor experiments, generalized m-factor experiments, n2m experiments, summary. **Queueing Analysis:** Queuing Network models, basic assumptions and notation, Operational analysis, stochastic analysis, summary.

**Textbooks:**

1. Measuring Computer Performance: A Practitioner's Guide; David J. Lilja, Cambridge University Press, 2005,ISBN: 9781107439863.
2. The Art of Computer Systems Performance Analysis, Raj Jain; John Wiley, 2008,ISBN: 8126519053.

## M.TECH. IN SOFTWARE ENGINEERING

## COURSE STRUCTURE & SYLLABI

**Reference Books:**
1. Probability and Statistics with Reliability, Queuing and Computer Science Applications; Trivedi K S, Kishor S. Trivedi; 2nd Edition, John Wiley, 2008,ISBN: 978-0-471-33341-8.
2. Research Methodology; R. Panneerselvam, Prentice Hall, 2004, ISBN - 9788120324527.

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | DATA ANALYTICS | L | T | P | C |
|---|---|---|---|---|---|
| 21D58301c | (Common to M.Tech CSE, SE) | 3 | 0 | 0 | 3 |
| | Semester | | III | | |

**Course Objectives:**
- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- To understand the various search methods and visualization techniques.

**Course Outcomes (CO):** Student will be able to
- Understand the ideas of statistical approaches to learning
- Understand the significance of exploratory data analysis (EDA) in data science and apply basic tools (plots, graphs, summary statistics) to perform EDA
- Apply basic machine learning algorithms (Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naive Bayes) for predictive modeling. Explore the merits of Naive Bayes technique
- Recognize the characteristics of machine learning techniques that are useful to solve real-world problems

| UNIT - I | | Lecture Hrs: |
|---|---|---|

Introduction: What is Data Science? Big Data and Data Science hype and getting past the hype, Why now?, Datafication, Current landscape of perspectives, Skill sets, Life cycle of Data Science, Different phases.

| UNIT - II | | Lecture Hrs: |
|---|---|---|

Exploratory Data Analysis and the Data Science Process: Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study: RealDirect (online real estate firm), Three Basic Machine Learning Algorithms: Linear Regression, k-Nearest Neighbours (k-NN), k-means.

| UNIT - III | | Lecture Hrs: |
|---|---|---|

One More Machine Learning Algorithm and Usage in Applications: Motivating application: Filtering Spam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam, Data Wrangling: APIs and other tools for scrapping the Web, Feature Generation and Feature Selection (Extracting Meaning From Data), Motivating application: user (customer) retention,

| UNIT - IV | | Lecture Hrs: |
|---|---|---|

Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms: Filters; Wrappers; Decision Trees; Random Forests, Recommendation Systems: Building a User-Facing Data Product: Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis, Exercise: build your own recommendation system.

| UNIT - V | | Lecture Hrs: |
|---|---|---|

Data Visualization: Basic principles, ideas and tools for data visualization, Case study on industry projects, Exercise: create your own visualization of a complex dataset, Data Science and Ethical Issues: Discussions on privacy, security, ethics, A look back at Data Science, Next-generation data scientists.

**Textbooks:**
1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly, 2014.
2. Jure Leskovek, AnandRajaraman and Jerey Ullman. Mining of Massive Datasets, Cambridge University Press, 2014.

**Reference Books:**
1. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. MIT Press, 2013.
2. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. OʹReilly, 2013.
3. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second

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Edition. Springer, 2009.
4. Avrim Blum, John Hopcroft and RavindranKannan. Foundations of Data Science.2018.
5. Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press, 2014.
6. Jiawei Han, MichelineKamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. Morgan Kaufmann, 2011.

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | SECURE SOFTWARE ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| **21D25203a** | | **3** | **0** | **0** | **3** |
| | **Semester** | | **II** | | |

**Course Objectives:**
- To evaluate secure software engineering problems.
- To analyze and elicit security requirements using SRS.
- To design and plan software solutions to security problems using various paradigms.
- To model the secure software systems using Unified Modeling Language.

**Course Outcomes (CO):** Student will be able to
- Evaluate secure software engineering problems, including the specification, design, implementation, and testing of software systems
- Elicit, analyse and specify security requirements through SRS
- Design and Plan software solutions to security problems using various paradigms
- Model the secure software systems using Unified Modelling Language Sec(UMLSec)
- Develop and apply testing strategies for Secure software applications

| UNIT - I | | Lecture Hrs:9 |
|---|---|---|

Software assurance and software security, threats to software security, sources of software insecurity, benefits of detecting software security, managing secure software development

| UNIT - II | | Lecture Hrs:9 |
|---|---|---|

Defining properties of secure software, how to influence the security properties of software, how to assert and specify desired security properties

| UNIT - III | | Lecture Hrs:9 |
|---|---|---|

Secure software Architecture and Design: Software security practices for architecture and design: Architectural risk analysis, software security knowledge for Architecture and Design: security principles, security guidelines, and attack pattens, secure design through threat modeling

| UNIT - IV | | Lecture Hrs:9 |
|---|---|---|

Writing secure software code: Secure coding techniques, Secure Programming: Data validation, Secure Programming: Using Cryptography Securely, Creating a Software Security Programs.

| UNIT - V | | Lecture Hrs:9 |
|---|---|---|

Secure Coding and Testing: code analysis- source code review, coding practices, static analysis, software security testing, security testing consideration through SDLC

**Textbooks:**
1. Julia H Allen, Sean J Barnum, Robert J Ellison, Gary McGraw, Nancy R Mead, Software Security Engineering: A Guide for Project Managers, Addison Wesley, 2008
2. Ross J Anderson, Security Engineering: A Guide to Building Dependable Distributed Systems, 2nd Edition, Wiley, 2008

**Reference Books:**
Howard, M. and LeBlanc, D., Writing Secure Code, 2nd Edition, Microsoft Press, 20032.

## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | SOFTWARE AGENTS | L | T | P | C |
|---|---|---|---|---|---|
| 21D25203b | | 3 | 0 | 0 | 3 |
| | **Semester** | | **II** | | |

**Course Objectives:**
- To introduce the concept of agents, their design and manipulation.
- To study the various aspects related to agent architecture and communication.
- To understand the concept of agents, their architecture.
- To understand agent communication and their role in information sharing.
- To be able to apply the knowledge gained to implement a software agent.

**Course Outcomes (CO):** Student will be able to
- Identify and explore the advantages of agents and design the architecture for an agent
- Analyze the agent in details in a view for the implementation
- Analyze communicative actions with agents.
- Analyze typical agents using a tool for different types of applications.

| UNIT - I | | Lecture Hrs:10 |
|---|---|---|

An introduction to Software Agents, Incorporating Agents as Resource Managers, Overcoming user Interface Problems, Toward Agent-Enabled System Architectures. Agents, Artificial Intelligence, Decentralization, Why Linking works, The Theatrical Metaphor, Direct. Interfaces Agents Metaphors with Character: Introduction, Objections to Agents, In Defense of Anthropomorphism, Key Characteristics of Interface Agents, Agency, Responsiveness, Competence, Accessibility, Design and Dramatic Character, An R & D Agenda.

| UNIT - II | | Lecture Hrs:10 |
|---|---|---|

Designing Agents as if People Mattered, The Agent Metaphor, Direct Manipulation versus Agents, Agents for Information Sharing and Coordination, Semiformal Systems an d Radical Tailorability, Oval: A Radically Tailorable Tool for Information Management and Cooperative Work, Examples of Application and Agents in Oval, Conclusions: An Addendum: The Relationship between Oval and Objects Lens

| UNIT - III | | Lecture Hrs:10 |
|---|---|---|

Agents that Reduce Work and Information Overload Introduction, Approaches to Building Agents, Training a Personal Digital Assistant, Some Example of Existing Agents, Acknowledgements Software Agents for Cooperative Learning: Computer-Supported Cooperative Learning, Examples of Software Agents for Cooperative Learning, Examples of Software Agents for Cooperative Learning, Developing an Example, Discussion and Perspectives.

| UNIT - IV | | Lecture Hrs:10 |
|---|---|---|

An Overview of Agent-Oriented Programming: Agent-Oriented Programming, AGENT-0: A Simple Language and its Interpreter, KQML as an Agent Communication Language: The approach of knowledge sharing effort(KSE), The Solution of the knowledge sharing efforts, knowledge Query Manipulation Language (KQML),Implementation, Application of KQML , Other Communication Language, The Approach of Knowledge-Sharing Effect,(KSE),The Solutions of the Sharing Effect.

| UNIT - V | | Lecture Hrs:10 |
|---|---|---|

Agent for Information Gathering: Agent Organization, The Knowledge of an Agent, The Domain Model of an Agent, Modeling other Agent, communication language and protocol, query processing, Mobile Agents: Enabling Mobile Agents, Programming Mobile Agents, Using Mobile Agents.

**Textbooks:**

| 1 | Software Agents | Jeffrey M. Bradshaw | PHI(MIT Press) | 2012 |
|---|---|---|---|---|

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| | Reference Books: | | | |
|---|---|---|---|---|
| 1 | Developing In telligent Agent Systems: A Practical Guide | Lin Padgham and Michael Winikoff | John Wiley & sons Publication | 2004 |
| 2 | Agent-Based and Individual Based modeling: A Practical Introduction | Steven F. RailsBack and Volker Grimm | Princeton University Press | 2012 |
| 3 | Disappearing Cryptography – Information Hiding: Steganography & Watermarking | Peter Wayner | Morgan Kaufmann Publishers | 2002 |
| 4 | Multimedia Secuirty, Watermarking, Steganography and Forensics | Frank Y. Shih | CRC Press | 2012 |

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## M.TECH. IN SOFTWARE ENGINEERING

## COURSE STRUCTURE & SYLLABI

| Course Code | DATA BASE MANAGEMENT SYSTEMS LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| 21D25204 | | 0 | 0 | 4 | 2 |
| | Semester | | II | | |
| | | | | | |

**Course Objectives:**
- Acquire skills in using SQL commands for data definition and data manipulation.
- To familiarize issues of concurrency control and transaction management.
- Develop solutions for database applications using procedures, cursors and triggers

**Course Outcomes (CO):**
- Work on the concepts of Software Testing and ADBMS at the practical level
- Compare and pick out the right type of software testing process for any given real world problem
- Carry out the software testing process in efficient way
- Establish a quality environment as specified in standards for developing quality software
- Model and represent the real world data using object oriented database
- Embed the rules set in the database to implement various features of ADBMS
- Choose, design and implement recent applications database for better interoperability

**List of Experiments**:

**Note: Part A:** The following experiments may be implemented on MySQL/ORACLE or any other suitable RDBMS with support for Object features **Part B:** Develop a mini project

1. **Develop a database application to demonstrate storing and retrieving of BLOB and CLOB objects.**
a. Write a binary large object (BLOB) to a database as either binary or character (CLOB) data, depending on the type of the field in your data source. To write a BLOB value to the database, issue the appropriate INSERT or UPDATE statement and pass the BLOB value as an input parameter. If your BLOB is stored as text, such as a SQL Server text field, pass the BLOB as a string parameter. If the BLOB is stored in binary format, such as a SQL Server image field, pass an array of type byte as a binary parameter.
b. Once storing of BLOB and CLOB objects is done, retrieve them and display the results accordingly.

2. **Develop a database application to demonstrate the representation of multi valued attributes, and the use of nested tables to represent complex objects. Write suitable queries to demonstrate their use.**

Consider Purchase Order Example: This example is based on a typical business activity: managing customer orders. Need to demonstrate how the application might evolve from relational to object-relational, and how you could write it from scratch using a pure object-oriented approach.
a. Show how to implement the schema -- Implementing the Application under the Relational Model -- using only Oracle's built-in data types. Build an object-oriented application on top of this relational schema using object views

3. **Design and develop a suitable Student Database application by considering appropriate attributes. Couple of attributes to be maintained is the Attendance of a student in each subject for which he/she has enrolled and Internal Assessment Using TRIGGERS, write active rules to do the following:**

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a. Whenever the attendance is updated, check if the attendance is less than 85%; if so, notify the Head of the Department concerned.

b. Whenever, the marks in an Internal Assessment Test are entered, check if the marks are less than 40%; if so, notify the Head of the Department concerned.

**Use the following guidelines when designing triggers:**

 Use triggers to guarantee that when a specific operation is performed, related actions are performed.

 Use database triggers only for centralized, global operations that should be fired for the triggering statement, regardless of which user or database application issues the statement.

 Do not define triggers that duplicate the functionality already built into Oracle. For example, do not define triggers to enforce data integrity rules that can be easily enforced using declarative integrity constraints.

 Limit the size of triggers (60 lines or fewer is a good guideline). If the logic for your trigger requires much more than 60 lines of PL/SQL code, it is better to include most of the code in a stored procedure, and call the procedure from the trigger.

 Be careful not to create recursive triggers. For example, creating an AFTER UPDATE statement trigger on the EMP table that itself issues an UPDATE statement on EMP causes the trigger to fire recursively until it has run out of memory.

1. **Design, develop, and execute a program to implement specific Apriori algorithm for mining association rules. Run the program against any large database available in the public domain and discuss the results.**

Association rules are if/then statements that help uncover relationships between seemingly unrelated data in a relational database or other information repository. An example of an association rule would be "If a customer buys a dozen eggs, he is 80% likely to also purchase milk."

**References:**

1. Database Management Systems solutions manual, Raghu Ramakrishnan, Johannes Gehrke, Jeff Derstadt, Scott Selikoff and Lin Zhu, third Edition, 2013
2. SQL with Guru99 by Krishna Rungta, Smashwords 2013
3. A Primer on SQL by Rahul Batra, dreamincode.net 2012

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**COURSE STRUCTURE & SYLLABI**

| Course Code | CLOUD COMPUTING LAB | L | T | P | C |
|---|---|---|---|---|---|
| 21D25205 | | 0 | 0 | 4 | 2 |
| | Semester | | II | | |

**Course Objectives:**
- To develop web applications in cloud
- To learn the design and development process involved in creating a cloud based application
- To learn to implement and use parallel programming using Hadoop

**Course Outcomes (CO):**
- Configure various virtualization tools such as Virtual Box, VMware workstation.
- Design and deploy a web application in a PaaS environment.
- Learn how to simulate a cloud environment to implement new schedulers.
- Install and use a generic cloud environment that can be used as a private cloud.
- Manipulate large data sets in a parallel environment.

**List of Experiments:**

- Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
- Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
- Install Google App Engine. Create hello world app and other simple web applications using python/java.
- Use GAE launcher to launch the web applications.
- Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
- Find a procedure to transfer the files from one virtual machine to another virtual machine.
- Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
- Install Hadoop single node cluster and run simple applications like wordcount.

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## COURSE STRUCTURE & SYLLABI

| Course Code | Program Elective Course – V | L | T | P | C |
|---|---|---|---|---|---|
| **21D08203a** | **MOBILE UTILITIES DEVELOPMENT** | **3** | **0** | **0** | **3** |
| | **Semester** | | III | | |

| | |
|---|---|
| **Course Objectives:** | |
| • To understand features of android in application development.<br>• To understand android applications using fragments and controls.<br>• To identify various android services.<br>• To design and test various android applications for real life. | |
| **Course Outcomes (CO):** Student will be able to | |
| • Adapt unique features of Android in application development<br>• Model android applications using fragments and controls<br>• Demonstrate knowledge of different services of android<br>• Design applications with the technology of android storage<br>• Develop and test real time applications with android | |

| **UNIT - I** | | Lecture Hrs:9 |
|---|---|---|
| **Basics of Building Android Application:** Features, Android Development Environment Android Architecture: Android Software Stack, Linux Kernel, Android Runtime - Dalvik Virtual Machine, Gradle, Building blocks, Intent, Activity, Activity Lifecycle and Android Layout Managers. | | |
| **UNIT - II** | | Lecture Hrs:9 |
| **Fragments and Controls:** Fragments- passing data, Interfragment communication, Custom Styles & Themes, Animation, Retrieving Data from Users - controls - common-Text- Button- Widgets, Alert Dialog, Toast, Menus, Event Handling. | | |
| **UNIT - III** | | Lecture Hrs:9 |
| **Services and Broadcasting:** Android Manifest XML, Services, Android Broadcast Intent and Broadcast Receiver, Basics of networking in Android -Asynctask- HttpUrlConnection, Threading and handlers - Multithreading, Background Services, Android Job Scheduling Task, Notifications. | | |
| **UNIT - IV** | | Lecture Hrs:9 |
| **Content Providers:** Access files in Assets, Access Resources, Saving or Loading data and files, SQLite Databases, Content Providers, Shared Preferences, Internal Storage, and External Storage. | | |
| **UNIT - V** | | Lecture Hrs:9 |
| **Building Applications**: Telephony Services, SMS Messages, Sending Email, Introduction to Location-Based Service, Multimedia: Playing Audio- Video and Media player, Gaming, Android Security and Testing. | | |
| **Textbooks:** | | |
| 1. Neil Smyth, Android Studio 3.0 Development Essentials – Android 8 Edition, 2017.<br>2. Barry Burd, Android Application Development All-in-One for Dummies, 2012. | | |
| **Reference Books:** | | |
| 1. Reto Meier and Ian Lake, Professional Android, Fourth Edition, John Wiley and Sons, 201. | | |
| **Online Learning Resources:** | | |
| | | |

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### COURSE STRUCTURE & SYLLABI

| Course Code | Program Elective Course - V | L | T | P | C |
|---|---|---|---|---|---|
| **21D58203b** | **SERVICE ORIENTED ARCHITECTURE AND MICRO SERVICES** | **3** | **0** | **0** | **3** |
| | **Semester** | | **III** | | |

| | |
|---|---|

**Course Objectives:**
- To gain understanding of the basic principles of service orientation
- To learn service-oriented analysis techniques
- To learn technology underlying the service design
- To learn advanced concepts such asservice composition, orchestration and Choreography
- To know about various service-oriented specification standards

**Course Outcomes (CO):** Student will be able to
- Comprehend the need for SOA and its systematic evolution.
- Apply SOA technologies to enterprise domain
- Design and analyze various SOA patterns and techniques.
- Compare and evaluate best strategies and practices of SOA.

| **UNIT - I** | | Lecture Hrs:8 |
|---|---|---|

**Introduction:**
SOA and MSA Basics: Service Orientation in Daily Life, Evolution of SOA and MSA. Service-oriented Architecture and Microservices architecture – Drivers for SOA, Dimensions of SOA, Conceptual Model of SOA, Standards and Guidelines for SOA, Emergence of MSA.
**Enterprise-Wide SOA:**
Considerations for Enterprise-wide SOA, Strawman Architecture for Enterprise-wide SOA, Enterprise SOA Reference Architecture, Object-oriented Analysis and Design (OOAD) Process, Service-oriented Analysis and Design (SOAD) Process, SOA Methodology for Enterprise.

| **UNIT - II** | | Lecture Hrs:8 |
|---|---|---|

**Service-Oriented Applications**:
Considerations for Service-oriented Applications, Patterns for SOA, Pattern-based Architecture for Service-oriented Applications, Composite Applications, Composite Application Programming Model.
**Service-Oriented Analysis and Design:**
Need for Models, Principles of Service Design, Non-functional Properties for Services, Design of Activity Services (or Business Services), Design of Data Services, Design of Client Services, Design of Business Process Services.

| **UNIT - III** | | Lecture Hrs:8 |
|---|---|---|

**Technologies for SOA:**
Technologies for Service Enablement, Technologies for Service Integration, Technologies for Service Orchestration.
**SOA Governance and Implementation:**
Strategic Architecture Governance, Service Design-time Governance, Service Run-time Governance, Approach for Enterprise-wide SOA Implementation.

| **UNIT - IV** | | Lecture Hrs:8 |
|---|---|---|

**Big Data and SOA:** Concepts, Big Data and its characteristics, Technologies for Big Data, Service-orientation for Big Data Solutions.
**Business Case for SOA:** Stakeholder Objectives, Benefits of SOA, Cost Savings, Return on Investment (ROI), Build a Case for SOA.

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| UNIT - V | Lecture Hrs:7 |
|---|---|

**SOA Best Practices:** SOA Strategy – Best Practices, SOA Development – Best Practices, SOA Governance – Best Practices.

**EA and SOA for Business and IT Alignment:** Enterprise Architecture, Need for Business and It Alignment, EA and SOA for Business and It Alignment.

**Textbooks:**

1 Service - Oriented Architecture & Microservices Architecture: For Enterprise, Cloud, Big Data and Mobile; Shankar Kambhampaty, 3rd Edition, Wiley, 2018, ISBN: 9788126564064.
2 Icon Group International; The 2018-2023 World Outlook for Service-Oriented Architecture (SOA) Software and Services; ICON Group International; 1st Edition, 2017, ASIN: B06WGPN8YD.

**Reference Books:**

1 Thomas Erl; Service Oriented Architecture Concepts Technology & Design, Pearson Education Limited; 2015, ISBN-13: 9788131714904.
2 Guido Schmutz, Peter Welkenbach, Daniel Liebhart; Service Oriented Architecture An Integration Blueprint; Shroff Publishers & Distributors; 2010, ISBN-13: 9789350231081

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## M.TECH. IN SOFTWARE ENGINEERING

## COURSE STRUCTURE & SYLLABI

| Course Code | BLOCK CHAIN TECHNOLOGIES | L | T | P | C |
|---|---|---|---|---|---|
| 21D25301a | | 3 | 0 | 0 | 3 |
| | Semester | | III | | |

**Course Objectives:**
- Understand basic crypto currency concepts.
- Understand the working and transactions of bit coin.
- To analyze the function of Block chain technique.

**Course Outcomes (CO):** Student will be able to
- Understand crypto currency concepts.
- Should be able to understand the working and transactions of bit coin.
- Should know the different advanced transactions and scripting techniques.
- Knowledge on analyzing the function of Block chain

| UNIT - I | | Lecture Hrs:10 |
|---|---|---|

**Introduction:** Bitcoin - History of Bitcoin - Uses, Users, Choosing a Bitcoin Wallet - Quick Start - Getting Your First Bitcoin - Finding the Current Price of Bitcoin - Sending and Receiving Bitcoin - .Transaction Inputs and Outputs - Transaction Chains - Making Change - Common Transaction Forms - Constructing a Transaction - Getting the Right Inputs - Creating the Outputs - Adding the Transaction to the Ledger - Bitcoin Mining - Mining Transactions in Blocks - Spending the Transaction

| UNIT – II | | Lecture Hrs:10 |
|---|---|---|

**Bitcoin Core:** The Reference Implementation - Bitcoin Development Environment - Compiling Bitcoin Core from the Source Code - Selecting a Bitcoin Core Release - Configuring the Bitcoin Core Build - Building the Bitcoin Core Executables - Running a Bitcoin Core Node - Running Bitcoin Core for the First Time - Configuring the Bitcoin Core Node - Bitcoin Core Application Programming Interface (API) - Getting Information on the Bitcoin Core Client Status - Exploring and Decoding Transactions - Exploring Blocks - Using Bitcoin Core

| UNIT – III | | Lecture Hrs:10 |
|---|---|---|

**Wallets and Transactions:**Wallet Technology - Overview Nondeterministic (Random) Wallets - Deterministic (Seeded) Wallets - HD Wallets (BIP-32/BIP-44) - Seeds and Mnemonic Codes (BIP-39) - Wallet Best Practices - Using a Bitcoin Wallet - Wallet Technology Details - Mnemonic Code Words (BIP-39) - Creating an HD Wallet from the Seed - Using an Extended Public Key on a Web Store Transactions - Transactions in Detail – Transactions Behind the Scenes - Transaction Outputs and Inputs - Transaction Outputs - Transaction Inputs - Transaction Fees - Adding Fees to Transactions Transaction Scripts 59 and Script

| UNIT - IV | | Lecture Hrs:10 |
|---|---|---|

**Advanced Transactions and Scripting:**Multisignature -Pay-to-Script-Hash (P2SH) -P2SH Addresses -Benefits of P2SH -Redeem Script and Validation -Data Recording Output (RETURN) - Time locks -Transaction Lock time (nLocktime) -Check Lock Time Verify (CLTV) -Relative time locks -Relative time locks with nSequence -Relative time locks with -The Extended Bitcoin Network , Bloom Filters -How Bloom Filters Work -How SPV Nodes Use Bloom Filters -SPV Nodes and Privacy - Encrypted and Authenticated Connections -Tor Transport -Peer-to-Peer Authentication and Encryption -Transaction Pools

| UNIT - V | | Lecture Hrs:10 |
|---|---|---|

**Block chain :**The Blockchain Structure of a Block -Block Header -Block Identifiers: Block Header Hash and Block Height -The Genesis Block -Linking Blocks in the Blockchain -Merkle Trees - Merkle Trees and Simplified Payment Verification (SPV) -Bitcoin Test Blockchains - Testing

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**M.TECH. IN SOFTWARE ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| |
|---|
| Playground -The Segregated Witness Testnet -The Local Blockchain -Using Test Blockchains for Development. |
| **Textbooks:** |
| 1. Mastering Bitcoin: Programming the Open Block chain, Andreas M. Antonopoulos, Shroff/O'Reilly; Second edition, 2017.<br>2. Imran BashirMastering BlockchainPack Publishing Limited ,2016. |
| **Reference Books:** |
| ArshdeepBahga ,Blockchain Applications: A Hands-On Approach , 2017. |

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# AUDIT COURSE-I

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## M.TECH. IN SOFTWARE ENGINEERING

## COURSE STRUCTURE & SYLLABI

| Course Code | ENGLISH FOR RESEARCH PAPER WRITING | L | T | P | C |
|---|---|---|---|---|---|
| **21DAC101a** | | **2** | **0** | **0** | **0** |
| | **Semester** | | I | | |

| | |
|---|---|

**Course Objectives:** This course will enable students:

- Understand the essentials of writing skills and their level of readability
- Learn about what to write in each section
- Ensure qualitative presentation with linguistic accuracy

**Course Outcomes (CO):** Student will be able to

- Understand the significance of writing skills and the level of readability
- Analyze and write title, abstract, different sections in research paper
- Develop the skills needed while writing a research paper

| **UNIT - I** | | Lecture Hrs:10 |
|---|---|---|

1Overview of a Research Paper- Planning and Preparation- Word Order- Useful Phrases - Breaking up Long Sentences-Structuring Paragraphs and Sentences-Being Concise and Removing Redundancy -Avoiding Ambiguity

| **UNIT - II** | | Lecture Hrs:10 |
|---|---|---|

Essential Components of a Research Paper- Abstracts-  Building Hypothesis-Research Problem - Highlight Findings- Hedging and Criticizing, Paraphrasing and Plagiarism, Cauterization

| **UNIT - III** | | Lecture Hrs:10 |
|---|---|---|

Introducing Review of the Literature – Methodology - Analysis of the Data-Findings - Discussion-Conclusions-Recommendations.

| **UNIT - I**V | | Lecture Hrs:9 |
|---|---|---|

Key skills needed for writing a Title, Abstract, and Introduction

| **UNIT - V** | | Lecture Hrs:9 |
|---|---|---|

Appropriate language to formulate Methodology, incorporate Results, put forth Arguments and draw Conclusions

**Suggested Reading**

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Model Curriculum of Engineering & Technology PG Courses [Volume-I]
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | DISASTER MANAGEMENT | | L | T | P | C |
|---|---|---|---|---|---|---|
| 21DAC101b | | | 2 | 0 | 0 | 0 |
| | | Semester | | I | | |

**Course Objectives:** This course will enable students:

- Learn to demonstrate critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives.
- Developanunderstandingofstandardsofhumanitarianresponseandpracticalrelevanceinspecific types of disasters and conflict situations
- Criticallyunderstandthestrengthsandweaknessesofdisastermanagementapproaches,planningand programming in different countries, particularly their home country or the countries they work in

**UNIT - I**

**Introduction:**

Disaster:Definition,FactorsandSignificance;DifferenceBetweenHazardandDisaster;Naturaland Manmade Disasters: Difference, Nature, Types and Magnitude.

**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 - II**

**Repercussions of Disasters and Hazards**:

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes,Volcanisms,Cyclones,Tsunamis,Floods,DroughtsandFamines,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 Preparedness and Management:**

Preparedness: Monitoring of Phenomena Triggering ADisasteror Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

**UNIT - IV**

**Risk Assessment Disaster Risk:**

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. TechniquesofRiskAssessment,GlobalCo-OperationinRiskAssessmentand Warning, People's Participation in Risk Assessment. Strategies for Survival.

**UNIT - V**

**Disaster Mitigation:**

Meaning,ConceptandStrategiesofDisasterMitigation,EmergingTrendsInMitigation.Structural Mitigationand Non-Structural Mitigation, Programs of Disaster Mitigation in India.

**Suggested Reading**

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**COURSE STRUCTURE & SYLLABI**

1. R.Nishith,SinghAK,"DisasterManagementinIndia:Perspectives,issuesandstrategies
2. "'New Royal book Company..Sahni,PardeepEt.Al.(Eds.),"DisasterMitigationExperiencesAndReflections",PrenticeHall OfIndia, New Delhi.
3. GoelS.L.,DisasterAdministrationAndManagementTextAndCaseStudies",Deep&Deep Publication Pvt. Ltd., New Delhi

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**M.TECH. IN SOFTWARE ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | SANSKRITFOR TECHNICAL KNOWLEDGE | L | T | P | C |
|---|---|---|---|---|---|
| **21DAC101c** | | **2** | **0** | **0** | **0** |
| | **Semester** | | I | | |

**Course Objectives:** This course will enable students:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- LearningofSanskrittodevelopthelogicinmathematics,science&othersubjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge
- Knowledge from ancientliterature

**Course Outcomes (CO):** Student will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science &technology can be understood
- Being a logical language will help to develop logic in students

| **UNIT - I** | | |
|---|---|---|
| Alphabets in Sanskrit, | | |

| **UNIT - II** | | |
|---|---|---|
| Past/Present/Future Tense, Simple Sentences | | |

| **UNIT - III** | | |
|---|---|---|
| Order, Introduction of roots | | |

| **UNIT - IV** | | |
|---|---|---|
| Technical information about Sanskrit Literature | | |

| **UNIT - V** | | |
|---|---|---|
| Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics | | |

**Suggested Reading**

1."Abhyaspustakam" –Dr.Vishwas, Sanskrit-Bharti Publication, New Delhi
2."Teach Yourself Sanskrit" Prathama Deeksha- VempatiKutumbshastri, RashtriyaSanskrit Sansthanam, New Delhi Publication
3."India's Glorious ScientificTradition" Suresh Soni, Ocean books (P) Ltd.,New Delhi

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**COURSE STRUCTURE & SYLLABI**

# AUDIT COURSE-II

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | PEDAGOGY STUDIES | | L | T | P | C |
|---|---|---|---|---|---|---|
| **21DAC201a** | | | **2** | **0** | **0** | **0** |
| | | **Semester** | | **II** | | |

**Course Objectives:** This course will enable students:

- Reviewexistingevidenceonthereviewtopictoinformprogrammedesignandpolicy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

**Course Outcomes (CO):** Student will be able to

Students will be able to understand:

- Whatpedagogicalpracticesarebeingusedbyteachersinformalandinformalclassrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- Howcanteachereducation(curriculumandpracticum)andtheschoolcurriculumand guidance materials best support effective pedagogy?

**UNIT - I**

**Introduction and Methodology:** Aims and rationale, Policy back ground, Conceptual frame work and terminology Theories oflearning,Curriculum,Teachereducation.Conceptualframework,Research questions**.** Overview of methodology and Searching.

**UNIT - II**

**Thematic overview:** Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

**UNIT - III**

Evidence on theeffectivenessofpedagogicalpractices,Methodologyfortheindepthstage:quality assessmen t of included studies. How can teacher education (curriculumandpracticum) andthescho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of th body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

**UNIT - IV**

**Professional development:** alignment with classroom practices and follow-up support, Peer support, Support from the head teacherandthecommunity.Curriculumandassessment,Barrierstolearning:limitedresourcesand large class sizes

**UNIT - V**

**Researchgapsandfuturedirections:**Researchdesign**,**Contexts**,**Pedagogy**,**Teachereducation**,** Curriculum and assessment**,** Dissemination and research impact.

**Suggested Reading**

1. AckersJ,HardmanF(2001)ClassroominteractioninKenyanprimaryschools,Compare, 31 (2): 245-261.
2. AgrawalM(2004)Curricularreforminschools:Theimportanceofevaluation,Journalof

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3. Curriculum Studies, 36 (3): 361-379.
4. AkyeampongK(2003) Teacher training in Ghana - does it count? Multi-site teachereducation research project (MUSTER) country report 1. London: DFID.
5. Akyeampong K, LussierK, PryorJ, Westbrook J (2013)Improving teaching and learning of basic maths and reading in Africa: Does teacherpreparation count?International Journal Educational Development, 33 (3): 272–282.
6. Alexander RJ(2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
   Chavan M (2003)ReadIndia: A mass scale, rapid, 'learning to read'campaign.
7.  www.pratham.org/images/resource%20working%20paper%202.pdf.

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**M.TECH. IN SOFTWARE ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Course Code | STRESSMANAGEMENT BY YOGA | | L | T | P | C |
|---|---|---|---|---|---|---|
| **21DAC201b** | | | **2** | **0** | **0** | **0** |
| | | Semester | | II | | |

**Course Objectives:** This course will enable students:

- To achieve overall health of body and mind
- To overcome stres

**Course Outcomes (CO):** Student will be able to

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

| **UNIT - I** | | |
|---|---|---|
| Definitions of Eight parts of yog.(Ashtanga) | | |
| **UNIT - II** | | |
| Yam and Niyam. | | |
| **UNIT - III** | | |
| Do`sand Don't'sin life. <br><br> i) Ahinsa,satya,astheya,bramhacharyaand aparigrahaii) Shaucha,santosh,tapa,swadhyay,ishwarpranidhan | | |
| **UNIT - IV** | | |
| Asan and Pranayam | | |
| **UNIT - V** | | |
| i)Variousyogposesand theirbenefitsformind &body <br><br> ii)Regularizationofbreathingtechniques and its effects-Types ofpranayam | | |

**Suggested Reading**

1.'Yogic Asanas forGroupTarining-Part-I": Janardan SwamiYogabhyasiMandal, Nagpur
2."Rajayogaor conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | PERSONALITY DEVELOPMENT THROUGHLIFE ENLIGHTENMENTSKILLS | L | T | P | C |
|---|---|---|---|---|---|
| 21DAC201c | | 2 | 0 | 0 | 0 |
| | Semester | | II | | |
| | | | | | |

**Course Objectives:** This course will enable students:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

**Course Outcomes (CO):** Student will be able to

- StudyofShrimad-Bhagwad-Geetawillhelpthestudentindevelopinghispersonalityand achieve the highest goal in life
- The person who has studied Geetawilllead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

| **UNIT - I** | | |
|---|---|---|

Neetisatakam- Holistic development of personality

    Verses-19,20,21,22(wisdom)

    Verses-29,31,32(pride &heroism)

    Verses-26,28,63,65(virtue)

| **UNIT - II** | | |
|---|---|---|

Neetisatakam- Holistic development of personality

    Verses-52,53,59(dont's)

    Verses-71,73,75,78(do's)

| **UNIT - III** | | |
|---|---|---|

Approach to day to day work and duties.

    ShrimadBhagwadGeeta:Chapter2-Verses41,47,48,

    Chapter3-Verses13,21,27,35,Chapter6-Verses5,13,17,23,35,

    Chapter18-Verses45,46,48.

| **UNIT - IV** | | |
|---|---|---|

Statements of basic knowledge.

    ShrimadBhagwadGeeta:Chapter2-Verses 56,62,68

    Chapter12 -Verses13,14,15,16,17,18

    Personality of Rolemodel. Shrimad Bhagwad Geeta:

| **UNIT - V** | | |
|---|---|---|

    Chapter2-Verses 17,Chapter3-Verses36,37,42,

    Chapter4-Verses18,38,39

    Chapter18– Verses37,38,63

**Suggested Reading**

1."SrimadBhagavadGita"bySwamiSwarupanandaAdvaitaAshram(PublicationDepartment), Kolkata

2.Bhartrihari'sThree  Satakam (Niti-sringar-vairagya) by  P.Gopinath,  RashtriyaSanskrit Sansthanam, New Delhi.

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**M.TECH. IN SOFTWARE ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

# OPEN ELECTIVE

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | INDUSTRIAL SAFETY | L | T | P | C |
|---|---|---|---|---|---|
| **21DOE301b** | **(Common to M.Tech CSE, CN, SE,AI & ML)** | **3** | **0** | **0** | **3** |
| | **Semester** | | **III** | | |

**Course Objectives:**
- To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models
- To understand about fire and explosion, preventive methods, relief and its sizing methods
- To analyse industrial hazards and its risk assessment.

**Course Outcomes (CO):** Student will be able to
- To list out important legislations related to health, Safety and Environment.
- To list out requirements mentioned in factories act for the prevention of accidents.
- To understand the health and welfare provisions given in factories act.

| UNIT - I | | Lecture Hrs: |
|---|---|---|

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

| UNIT - II | | Lecture Hrs: |
|---|---|---|

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

| UNIT - III | | Lecture Hrs: |
|---|---|---|

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working andapplications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

| UNIT - IV | | Lecture Hrs: |
|---|---|---|

Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

| UNIT - V | | Lecture Hrs: |
|---|---|---|

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

**Textbooks:**
1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.

**Reference Books:**
1.Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
2. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | BUSINESS ANALYTICS | L | T | P | C |
|---|---|---|---|---|---|
| **21 DOE301c** | **(Common to M.Tech CSE, CN, SE,AI & ML)** | **3** | **0** | **0** | **3** |
| | **Semester** | | **III** | | |

| | |
|---|---|

**Course Objectives:**
- The main objective of this course is to give the student a comprehensive understanding of business analytics methods.

**Course Outcomes (CO):** Student will be able to
- Students will demonstrate knowledge of data analytics.
- Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
- Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
- Students will demonstrate the ability to translate data into clear, actionable insights.

| UNIT - I | | Lecture Hrs: |
|---|---|---|

Business Analysis: Overview of Business Analysis, Overview of Requirements, Role of the Business Analyst. Stakeholders: the project team, management, and the front line, Handling Stakeholder Conflicts.

| UNIT - II | | Lecture Hrs: |
|---|---|---|

Life Cycles: Systems Development Life Cycles, Project Life Cycles, Product Life Cycles, Requirement Life Cycles.

| UNIT - III | | Lecture Hrs: |
|---|---|---|

Forming Requirements: Overview of Requirements, Attributes of Good Requirements, Types of Requirements, Requirement Sources, Gathering Requirements from Stakeholders, Common Requirements Documents. Transforming Requirements: Stakeholder Needs Analysis, Decomposition Analysis, Additive/Subtractive Analysis, Gap Analysis, Notations (UML & BPMN), Flowcharts, Swim Lane Flowcharts, Entity-Relationship Diagrams, State-Transition Diagrams, Data Flow Diagrams, Use Case Modeling, Business Process Modeling

| UNIT - IV | | Lecture Hrs: |
|---|---|---|

Finalizing Requirements: Presenting Requirements, Socializing Requirements and Gaining Acceptance, Prioritizing Requirements. Managing Requirements Assets: Change Control, Requirements Tools

| UNIT - V | | Lecture Hrs: |
|---|---|---|

Recent Trands in: Embedded and colleborative business intelligence, Visual data recovery, Data Storytelling and Data Journalism.

**Textbooks:**
1. Business Analysis by James Cadle et al.
2. Project Management: The Managerial Process by Erik Larson and, Clifford Gray

**Reference Books:**
1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.

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## M.TECH. IN SOFTWARE ENGINEERING

### COURSE STRUCTURE & SYLLABI

| Course Code | OPTIMIZATION TECHNIQUES | L | T | P | C |
|---|---|---|---|---|---|
| 21 DOE301f | (Common to M.Tech CSE, CN, SE,AI & ML) | 3 | 0 | 0 | 3 |
| | Semester | | III | | |

**Course Objectives:**
- Enumerate the fundamental knowledge of Linear Programming and Dynamic Programming problems.
- Learn classical optimization techniques and numerical methods of optimization.
- Know the basics of different evolutionary algorithms.
- Explain Integer programming techniques and apply different optimization techniques to solve various models arising from engineering areas.

**Course Outcomes (CO):** Student will be able to
- Explain the fundamental knowledge of Linear Programming and Dynamic Programming problems.
- Use classical optimization techniques and numerical methods of optimization.
- Describe the basics of different evolutionary algorithms.
- Enumerate fundamentals of Integer programming technique and apply different techniques to solve various optimization problems arising from engineering areas

| UNIT - I | | Lecture Hrs: |
|---|---|---|

LINER PROGRAMMING (L.P):
Revised Simplex Method, Duel simplex Method, Sensitivity Analysis
DYNAMIC PROGRAMMING (D.P):
Multistage decision processes. Concepts of sub optimization, Recursive Relation-calculus method, tabular method, LP as a case of D.P.

| UNIT - II | | Lecture Hrs: |
|---|---|---|

CLASSICAL OPTIMIZATION TECHNIQUES:
Single variable optimization without constraints, Multi variable optimization without constraints, multivariable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions.
NUMERICAL METHODS FOR OPTIMIZATION:
Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method

| UNIT - III | | Lecture Hrs: |
|---|---|---|

MODERN METHODS OF OPTIMIZATION:
GENETIC ALGORITHM (GA):
Differences and similarities between conventional and evolutionary algorithms, working principle, Genetic Operators- reproduction, crossover, mutation
GENETIC PROGRAMMING (GP):
Principles of genetic programming, terminal sets, functional sets, differences between GA &GP, Random population generation. Fuzzy Systems: Fuzzy set Theory, Optimization of Fuzzy systems

| UNIT - IV | | Lecture Hrs: |
|---|---|---|

INTEGER PROGRAMMING:
Graphical Representation, Gomory's Cutting Plane Method,Balas' Algorithm for Zero–One Programming, Branch-and-Bound Method

| UNIT - V | | Lecture Hrs: |
|---|---|---|

APPLICATIONS OF OPTIMIZATION IN DESIGN AND MANUFACTURING SYSTEMS:
Formulation of model- optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

**Textbooks:**
      1. Engineering Optimization (4th Edition) by S.S.Rao, New Age International,

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**(Established by Govt. of A.P., ACT No.30 of 2008)**
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**M.TECH. IN SOFTWARE ENGINEERING**

**COURSE STRUCTURE & SYLLABI**

| Reference Books: |
|---|
| 1. Optimization for Engineering Design by Kalyanmoy Deb, PHI Publishers<br>2. Genetic algorithms in Search, Optimization, and Machine learning – D.E.Goldberg, Addison-Wesley Publishers<br>3. Operations Research by Hillar and Liberman, TMH Publishers<br>4. Optimal design – JasbirArora, McGraw Hill (International) Publisher |