# M.E.COMPUTER SCIENCE AND ENGINEERING

**CURRICULUM FOR CHOICE**

**BASED CREDIT SYSTEM**

**Regulations 2024**

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

## MAHENDRA ENGINEERING COLLEGE

## (AUTONOMOUS)

**MALLASAMUDRAM WEST, TAMILNADU 637503**

# MAHENDRA ENGINEERING COLLEGE,

# (AUTONOMOUS)

## MALLASAMUDRAM WEST, TAMIL NADU 637503

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

**Institute Vision**

- To be an internationally recognized institute for engineering research with ethical values

**Institute Mission**

- To ensure the effective use of resources to mould the students as professionals and entrepreneurs
- To enhance industry institute interaction for innovative technology practice
- To encourage the faculty members and students for advanced research
- To inculcate ethical values among the faculty members and students

**Department Vision**

- To produce competent computer engineers proficient with state of the art technologies.

**Department Mission**

- To impart good quality technical education through effective teaching-learning process.
- To enhance the students employability through mentoring and skill development.
- To promote innovation and research activities with analytical skills to face global challenges.
- To enable students imbibe ethical and enterprising characteristics to become socially responsible engineers.

**Programme Educational Objectives**

- PEO1 – Good communication, leadership and entrepreneurship skills
- PEO2 – Expertise on advanced computer technologies to become competitive
- PEO3 – The habit of learning and nurture the research attitude
- PEO4 – The ability to work in a team with professional ethics

**Programme Specific Outcomes**

1. PSO1 - Ability to understand the basic concepts and methodologies of computing techniques
2. PSO2 - Ability to apply engineering knowledge to design and develop computerized solutions by selecting appropriate technology to solve the problems
3. PSO3 - Ability to use engineering practices and standard strategies in various domains by providing different approaches towards career success

**BoS Chairman**

# MAHENDRAENGINEERING COLLEGE
**(Autonomous)**

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

**Regulations 2024**

**I Semester**

| Sl. No. | Course code | Course Title | L | T | P | C | Cate-gory |
|---|---|---|---|---|---|---|---|
| | **THEORY** | | | | | | |
| 1 | 24CSE11101 | Applied Probability and Statistics | 4 | 0 | 0 | 4 | BS |
| 2 | 24CSE13101 | Research Methodology and IPR | 3 | 0 | 0 | 3 | PC |
| 3 | 24CSE14101 | Advanced Data Structures and Algorithms | 3 | 0 | 0 | 3 | PC |
| 4 | 24CSE14102 | Database Practices | 3 | 1 | 0 | 4 | PC |
| 5 | 24CSE14103 | Network Technologies | 3 | 0 | 0 | 3 | PC |
| 6 | 24CSE14104 | Principles of Programming Languages | 3 | 0 | 0 | 3 | PC |
| 7 | 24AUC70001 | Disaster Management | 2 | 0 | 0 | 0 | AC |
| | **PRACTICAL** | | | | | | |
| 8 | 24CSE24101 | Advanced Data Structures and Algorithms Laboratory | 0 | 0 | 4 | 2 | PC |
| | | **TOTAL** | **21** | **1** | **4** | **22** | |

*Audit course is optional

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<table>
<tr><td colspan="7">MAHENDRA ENGINEERING COLLEGE<br>(Autonomous)</td></tr>
<tr><td colspan="7">Syllabus</td></tr>
<tr><td>Department</td><td colspan="3">Computer Science and Engineering</td><td colspan="3">Programme Code</td><td>5032</td></tr>
<tr><td colspan="7">I Semester</td></tr>
<tr><td>Course code</td><td>Course Name</td><td colspan="4">Hours/week</td><td>Credit</td><td>Maximum marks</td></tr>
<tr><td rowspan="2">24CSE11101</td><td rowspan="2">APPLIED PROBABILITY AND STATISTICS</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>4</td><td>0</td><td>0</td><td>4</td></tr>
<tr><td>Objective(s)</td><td colspan="6">To enable the students to,<br>• Gain knowledge of random variables and various standard distributions and their properties.<br>• Familiarizes the students with two dimensional discrete and continuous random variables, correlation and regression curve.<br>• Study about unbiased estimators and curve fitting.<br>• Study the types of small sample tests.<br>• Acquire about random vectors and principle concepts.</td></tr>
<tr><td>Outcome(s)</td><td colspan="6">At the end of the course the students will be able to,<br>• Understand the basic concepts of probability and have knowledge of standard distributions which can describe real life phenomena.<br>• Acquired skills in handling situations involving more than one random variable.<br>• Explain the basic concepts of unbiased estimators and curve fitting.<br>• Familiarized with testing of hypothesis of small samples.<br>• Gain knowledge of random vectors and principle concepts.</td></tr>
<tr><td>UNIT-I</td><td colspan="5">PROBABILITY AND RANDOM VARIABLES</td><td>12</td></tr>
<tr><td colspan="7">Probability – Axioms of probability – Conditional probability – Baye‘s theorem - Random variables - Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.</td></tr>
<tr><td>UNIT-II</td><td colspan="5">TWO DIMENSIONAL RANDOM VARIABLES</td><td>12</td></tr>
<tr><td colspan="7">Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Regression curve – Correlation..</td></tr>
</table>

| UNIT-III | ESTIMATION THEORY | 12 |
|---|---|---|
| Unbiased estimators – Method of moments – Maximum likelihood estimation - Curve fitting by principle of least squares – Regression lines. | | |
| **UNIT-IV** | **TESTING OF HYPOTHESIS** | **12** |
| Sampling distributions – Type I and Type II errors – Small and large samples – Tests based on Normal, t, Chi square and F distributions for testing of mean, variance and proportions – Tests for independence of attributes and goodness of fit. | | |
| **UNIT-V** | **MULTIVARIATE ANALYSIS** | **12** |
| Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components - Population principal components – Principal components from standardized variables | | |
| | **Total hours** | **60** |

| **TEXT BOOK :** | |
|---|---|
| 1 | Devore, J. L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, 2014. |
| 2 | Richard A. Johnson and Dean W. Wichern, "Applied multivariate statistical Analysis", Pearson Education, Fifth Edition, New Delhi, 2013. |
| **REFERENCES:** | |
| 1 | Dallas E. Johnson, "Applied Multivariate Methods for Data Analysis", Thomson and Duxbury press, 1998 . |
| 2 | Gupta S.C. and Kapoor V.K., "Fundamentals of Mathematical Statistics", Sultan and Sons, New Delhi, 2001. |
| 3 | Johnson R. A. and Gupta C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson India Education, Asia, New Delhi, 2017. |

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**MAHENDRA ENGINEERING COLLEGE**
**(Autonomous)**

**Syllabus**

| **Department** | **Computer Science and Engineering** | **Programme Code** | **5032** |
|---|---|---|---|

**I Semester**

| **Course code** | **Course Name** | **Hours/week** | | | **Credit** | **Maximum marks** |
|---|---|---|---|---|---|---|
| | | **L** | **T** | **P** | **C** | |
| **24CSE13101** | **RESEARCH METHODOLOGY AND IPR** | 3 | 0 | 0 | 3 | **100** |

| | |
|---|---|
| **Objective(s)** | • To identify an appropriate research problem in their interesting domain<br>• To understand the data collections and measurements.<br>• To learn the data analysis and reporting.<br>• To know adequate knowledge on IPR<br>• To expose the law of patent process. |
| **Outcome(s)** | Upon completion of this course , students will be able to<br>• Identify the research problem and research process.<br>• Explain the data collection and sources.<br>• Prepare a well-structured research paper and scientific presentations<br>• Examine on various IPR components and process of filing.<br>• Prove the adequate knowledge on patent. |

| **UNIT-I** | **RESEARCH DESIGN** | **9** |
|---|---|---|

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

| **UNIT-II** | **DATA COLLECTION AND SOURCES** | **9** |
|---|---|---|

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

| **UNIT-III** | **DATA ANALYSIS AND REPORTING** | **9** |
|---|---|---|

Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.

| **UNIT-IV** | **NEW DEVELOPMENT IN IPR** | **9** |
|---|---|---|

New Development in IPR: Administration of Patent System – New developments in IPR – IPR of Biological Systems – Computer Software etc – Traditional knowledge Case Studies – IPR and IITs

| UNIT-V | PATENTS | 9 |
|---|---|---|
| Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filing, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licences, Licensing of related patents, patent agents, Registration of patent agents. | | |
| | Total hours | **45** |

| **TEXT BOOK :** | |
|---|---|
| 1 | Cooper Donald R, Schindler Pamela S and Sharma JK, "Business Research Methods", Tata McGraw Hill Education, 11e(2012). |
| 2 | Catherine J. Holland, "Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets", Entrepreneur Press, 2007. |
| **REFERENCES:** | |
| 1 | David Hunt, Long Nguyen, Matthew Rodgers," Patent Searching :tools & techniques", Wiley, 2007. |
| 2 | The Institute of Company Secretaries of India, Statutory body under an Act of parliament, "Professional Programme Intellectual Property Rights, Law and practice", September2013. |

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<tr><td>Course code</td><td>Course Name</td><td colspan="3">Hours/week</td><td>Credit</td><td>Maximum marks</td></tr>
<tr><td rowspan="2">24CSE14101</td><td rowspan="2">ADVANCED DATA STRUCTURES AND ALGORITHMS</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Objective(s)</td><td colspan="6">• To understand the usage of algorithms in computing<br>• To learn and use hierarchical data structures and its operations<br>• To learn the usage of graphs and its applications<br>• To select and design data structures and algorithms that is appropriate for problems<br>• To study about NP Completeness of problems.</td></tr>
<tr><td>Outcome(s)</td><td colspan="6">Upon completion of this course , students will be able to<br>• Explain data structures and algorithms to solve computing problems.<br>• Demonstrate efficient data structures and apply them to solve problems.<br>• Examine algorithms using graph structure and various string-matching algorithms to solve real-life problems.<br>• Design one’s own algorithm for an unknown problem.<br>• Choose suitable design strategy for problem solving.</td></tr>
<tr><td>UNIT-I</td><td colspan="5">ROLE OF ALGORITHMS IN COMPUTING & COMPLEXITY ANALYSIS</td><td>9</td></tr>
<tr><td colspan="7">Algorithms – Algorithms as a Technology - Time and Space complexity of algorithms- Asymptotic analysis-Average and worst-case analysis-Asymptotic notation-Importance of efficient algorithms- Program performance measurement - Recurrences: The Substitution Method – The Recursion-Tree Method- Data structures and algorithms.</td></tr>
<tr><td>UNIT-II</td><td colspan="5">HIERARCHICAL DATA STRUCTURES</td><td>9</td></tr>
<tr><td colspan="7">Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion -B-Trees: Definition of B - trees – Basic operations on B-Trees – Deleting a key from a B-Tree- Heap – Heap Implementation – Disjoint Sets - Fibonacci Heaps: structure – Mergeable-heap operations- Decreasing a key and deleting a node-Bounding the maximum degree.</td></tr>
</table>

| UNIT-III | GRAPHS | 9 |
|---|---|---|
| Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra's Algorithm; Dynamic Programming - All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm | | |
| **UNIT-IV** | **ALGORITHM DESIGN TECHNIQUES** | **9** |
| Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: – Elements of the Greedy Strategy- An Activity-Selection Problem - Huffman Coding. | | |
| **UNIT-V** | **ITERATIVE IMPROVEMENT** | **9** |
| The Simplex Method - The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs - The Stable marriage Problem. | | |
| | Total hours | **45** |

| **TEXT BOOK :** | |
|---|---|
| 1 | S.Sridhar," Design and Analysis of Algorithms", Oxford University Press, 1st Edition, 2014. |
| 2 | Adam Drozdex, "Data Structures and algorithms in C++", Cengage Learning, 4th Edition, 2013. |
| **REFERENCES:** | |
| 1 | T.H. Cormen, C.E.Leiserson, R.L. Rivest and C.Stein, "Introduction to Algorithms", Prentice Hall of India, 3rd Edition, 2012. |
| 2 | Mark Allen Weiss, "Data Structures and Algorithms in C++", Pearson Education, 3rd Edition, 2009. |
| 3 | E. Horowitz, S. Sahni and S. Rajasekaran, "Fundamentals of Computer Algorithms", University Press, 2nd Edition, 2008. |

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<tr><td>Course code</td><td>Course Name</td><td colspan="3">Hours/week</td><td>Credit</td><td>Maximum marks</td></tr>
<tr><td rowspan="2">24CSE14102</td><td rowspan="2">DATABASE PRACTICES</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Objective(s)</td><td colspan="6">• Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.<br>• Understand query processing in a distributed database system<br>• Understand the basics of XML and create well-formed and valid XML documents.<br>• Distinguish the different types of NoSQL databases<br>• To understand the different models involved in database security and their applications in real time world to protect the database and information associated with them.</td></tr>
<tr><td>Outcome(s)</td><td colspan="6">Upon completion of this course , students will be able to<br>• Convert the ER-model to relational tables, populate relational databases and formulate SQL queries on data.<br>• Choose the methods and techniques for distributed query processing.<br>• Explain well-formed XML documents<br>• Determine secure database systems.<br>• Extend data control, definition, and manipulation languages of the NoSQL databases</td></tr>
<tr><td>UNIT-I</td><td colspan="5">RELATIONAL DATA MODEL</td><td>9+3</td></tr>
<tr><td colspan="7">Entity Relationship Model – Relational Data Model – Mapping Entity Relationship Model to Relational Model – Relational Algebra – Structured Query Language – Database Normalization</td></tr>
<tr><td>UNIT-II</td><td colspan="5">DISTRIBUTED DATABASES, ACTIVE DATABASES AND OPEN DATABASE CONNECTIVITY</td><td>9+3</td></tr>
<tr><td colspan="7">Distributed Database Architecture – Distributed Data Storage – Distributed Transactions – Distributed Query Processing – Distributed Transaction Management – Event Condition Action Model – Design and Implementation Issues for Active Databases – Open Database Connectivity.</td></tr>
<tr><td>UNIT-III</td><td colspan="5">XML DATABASES</td><td>9+3</td></tr>
<tr><td colspan="7">Structured, Semi structured, and Unstructured Data – XML Hierarchical Data Model – XML Documents – Document Type Definition – XML Schema – XML Documents and Databases – XML Querying – XPath –XQuery</td></tr>
</table>

| UNIT-IV | NOSQL DATABASES AND BIG DATA STORAGE SYSTEMS | 9+3 |
|---|---|---|
| NoSQL – Categories of NoSQL Systems – CAP Theorem – Document-Based NoSQL Systems and MongoDB – MongoDB Data Model – MongoDB Distributed Systems Characteristics – NoSQL Key-Value Stores – DynamoDB Overview – Voldemort Key-Value Distributed Data Store – Wide Column NoSQL Systems – Hbase Data Model – Hbase Crud Operations – Hbase Storage and Distributed System Concepts – NoSQL Graph Databases and Neo4j – Cypher Query Language of Neo4j – Big Data – MapReduce – Hadoop –YARN. | | |
| **UNIT-V** | **DATABASE SECURITY & EMERGING TECHNOLOGIES** | **9+3** |
| Introduction to Database Security Issues–Security Models–Different Threats to databases– Counter measures to deal with these problems. Cloud databases – Streaming Databases - Graph Databases- New SQL | | |
| | Total hours | **60** |

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

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**MAHENDRA ENGINEERING COLLEGE**
**(Autonomous)**

**Syllabus**

| **Department** | **Computer Science and Engineering** | **Programme Code** | **5032** |
|---|---|---|---|

**I Semester**

| **Course code** | **Course Name** | **Hours/week** | | | **Credit** | **Maximum marks** |
|---|---|---|---|---|---|---|
| | | **L** | **T** | **P** | **C** | |
| **24CSE14103** | **NETWORK TECHNOLOGIES** | 3 | 0 | 0 | 3 | **100** |

| | |
|---|---|
| **Objective(s)** | • To understand the basic concepts of networks<br>• To explore various technologies in the wireless domain<br>• To study about 4G and 5G cellular networks<br>• To learn about Network Function Virtualization<br>• To understand the paradigm of Software defined networks |
| **Outcome(s)** | Upon completion of this course , students will be able to<br>• Identify basic networking concepts<br>• Classify different wireless networking protocols<br>• Describe the developments in each generation of mobile data networks<br>• Explain and develop SDN based applications<br>• Examine the concepts of network function virtualization |

| **UNIT-I** | **NETWORKING CONCEPTS** | **9** |
|---|---|---|

Peer To Peer Vs Client-Server Networks, Network Devices, Network Terminology, Network Speeds, Network throughput, delay, OSI Model, Packets, Frames and Headers, Collision and Broadcast Domains, LAN Vs WAN, Network Adapter, Hub, Switch, Router, Firewall, IP addressing.

| **UNIT-II** | **WIRELESS NETWORKS** | **9** |
|---|---|---|

Wireless access techniques- IEEE 802.11a, 802.11g, 802.11e, 802.11n/ac/ax/ay/ba/be, QoS – Bluetooth – Protocol Stack – Security – Profiles – zigbee

| **UNIT-III** | **MOBILE DATA NETWORKS** | **9** |
|---|---|---|

4G Networks and Composite Radio Environment – Protocol Boosters – Hybrid 4G Wireless Networks Protocols – Green Wireless Networks – Physical Layer and Multiple Access – Channel Modeling for 4G – Concepts of 5G – channel access –air interface -Cognitive Radio- spectrum management – C-RAN architecture - Vehicular communications-protocol – Network slicing – MIMO, mmWave, Introduction to 6G.

| **UNIT-IV** | **SOFTWARE DEFINED NETWORKS** | **9** |
|---|---|---|

SDN Architecture: Characteristics of Software - Defined Networking, SDN and NFV - Related Standards, SDN Data Plane, Data Plane Functions, Data Plane Protocols, OpenFlow Logical Network

| | | |
|---|---|---|
| Device, Flow Table Structure, Flow Table Pipeline, The Use of Multiple Tables, Group Table, OpenFlow Protocol, SDN Control Plane Architecture, Control Plane Functions, Southbound Interface, Northbound Interface, Routing. ITU-T Model, OpenDaylight, OpenDaylight Architecture, OpenDaylight Helium, SDN Application Plane Architecture, Northbound Interface, Network Services Abstraction Layer, Network Applications, User Interface. | | |
| **UNIT-V** | **CELLULAR NETWORKS** | **9** |
| GSM – Mobility Management and call control – GPRS – Network Elements – Radio Resource Management – Mobility Management and Session Management – Small Screen Web Browsing over GPRS and EDGE – MMS over GPRS – UMTS – Channel Structure on the Air Interface – UTRAN – Core and Radio Network Mobility Management – UMTS Security | | |
| | Total hours | **45** |

| | |
|---|---|
| **TEXT BOOK :** | |
| 1 | James Bernstein, "Networking made Easy", 2018. ( UNIT I ) |
| 2 | HoudaLabiod, Costantino de Santis, HossamAfifi "Wi-Fi, Bluetooth, Zigbee and WiMax",, Springer 2007 ( UNIT 2 ) |
| **REFERENCES:** | |
| 1 | Erik Dahlman, Stefan Parkvall, Johan Skold, 4G: LTE/LTE-Advanced for Mobile Broadband, Academic Press, 2013 ( UNIT 3) |
| 2 | Saad Z. Asif – "5G Mobile Communications Concepts and Technologies" CRC press – 2019 (UNIT 3) |
| 3 | William Stallings –"Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud" , 1st Edition, Pearson Education, 2016.( Unit 4 and 5 ) |
| 4 | Thomas D.Nadeauand Ken Gray, SDN – Software Defined Networks, O'Reilly Publishers, 2013. |
| 5 | Guy Pujolle, "Software Networks", Second Edition, Wiley-ISTE, 2020 |

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<tr><td>Course code</td><td>Course Name</td><td colspan="3">Hours/week</td><td>Credit</td><td>Maximum marks</td></tr>
<tr><td rowspan="2">24CSE14104</td><td rowspan="2">PRINCIPLES OF PROGRAMMING LANGUAGES</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Objective(s)</td><td colspan="6">• To understand and describe syntax and semantics of programming languages<br>• To understand data, data types, and basic statements<br>• To understand call-return architecture and ways of implementing them<br>• To understand object-orientation, concurrency, and event handling in Programming languages<br>• To develop programs in non-procedural programming paradigms</td></tr>
<tr><td>Outcome(s)</td><td colspan="6">Upon completion of this course , students will be able to<br>• Describe syntax and semantics of programming languages<br>• Explain data, data types, and basic statements of programming languages<br>• Demonstrate subprogram constructs<br>• Examine object-oriented, concurrency, and event handling programming constructs<br>• Develop programs in Scheme, ML, and Prolog</td></tr>
<tr><td>UNIT-I</td><td colspan="5">SYNTAX AND SEMANTICS</td><td>9</td></tr>
<tr><td colspan="7">Evolution of programming languages – describing syntax – context – free grammars –attribute grammars – describing semantics – lexical analysis – parsing – recursive-descent – bottom- up parsing</td></tr>
<tr><td>UNIT-II</td><td colspan="5">DATA, DATA TYPES AND BASIC STATEMENTS</td><td>9</td></tr>
<tr><td colspan="7">Names – variables – binding – type checking – scope – scope rules – lifetime and garbage collection –primitive data types–strings–array types– associative arrays–record types– union types – pointers and references – Arithmetic expressions – overloaded operators – type conversions – relational and boolean expressions – assignment statements – mixed- mode assignments – control structures – selection – iterations – branching – guarded statements</td></tr>
</table>

| UNIT-III | SUBPROGRAMS AND IMPLEMENTATIONS | 9 |
|---|---|---|
| Subprograms – design issues – local referencing – parameter passing – overloaded methods – generic methods – design issues for functions – semantics of call and return – implementing simple subprograms – stack and dynamic local variables – nested subprograms – blocks – dynamic scoping | | |
| **UNIT-IV** | **OBJECT-ORIENTATION, CONCURRENCY AND EXCEPTION HANDLING** | **9** |
| Object-orientation – design issues for OOP languages – implementation of object-oriented constructs – concurrency – semaphores – monitors – message passing – threads – statement level concurrency – exception handling – event handling. Exceptions, exception Propagation, Exception handler in Ada, C++ and Java. | | |
| **UNIT-V** | **FUNCTIONAL AND LOGIC PROGRAMMING LANGUAGES** | **9** |
| Introduction to lambda calculus – fundamentals of functional programming languages – Programming with Scheme – Programming with ML – Introduction to logic and logic programming – Programming with Prolog – multi-paradigm languages | | |
| | Total hours | **45** |

| **TEXT BOOK :** | |
|---|---|
| 1 | Robert W. Sebesta, "Concepts of Programming Languages", Eleventh Edition, Addison Wesley,2012 |
| 2 | W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003 |
| **REFERENCES:** | |
| 1 | Michael L.Scott, "ProgrammingLanguage Pragmatics", Fourth Edition, MorganKaufmann, 2009. |
| 2 | R.KentDybvig,"TheSchemeprogramminglanguage",FourthEdition,MITPress, 2009 |
| 3 | Richard A. O'Keefe, "The craft of Prolog", MIT Press, 2009 |
| 4 | W.F.Clocksinand C.S.Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer,2003 |

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**MAHENDRA ENGINEERING COLLEGE**
**(Autonomous)**

**Syllabus**

| **Department** | **Computer Science and Engineering** | **Programme Code & Name** | **5032** |
|---|---|---|---|

**Semester-I**

| **Course Code** | **Course Name** | **Hours/Week** | | | **Credit** | **Maximum marks** |
|---|---|---|---|---|---|---|
| | | **L** | **T** | **P** | **C** | |
| **24CSE24101** | **ADVANCED DATA STRUCTURES AND ALGORITHMSLABORATORY** | **0** | **0** | **4** | **2** | **100** |

| | |
|---|---|
| **Objective(s)** | • To acquire the knowledge of using advanced tree structures<br>• To learn the usage of heap structures<br>• To understand the usage of graph structures and spanning trees<br>• To understand the problems such as matrix chain multiplication, activity selection and Huffman coding<br>• To understand the necessary mathematical abstraction to solve problems. |
| **Outcome(s)** | Upon completion of this course , students will be able to<br>• Write and implement basic and advanced data structures extensively<br>• Compute algorithms using graph structures<br>• Design and develop efficient algorithms with minimum complexity using design techniques<br>• Develop programs using various algorithms.<br>• Design appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem. |

**LISTOF EXPERIMENTS**

| | |
|---|---|
| 1 | Implementation of recursive function for tree traversal and Fibonacci |
| 2 | Implementation of iteration function for tree traversal and Fibonacci |
| 3 | Implementation of Merge Sort and Quick Sort |
| 4 | Implementation of a Binary Search Tree |
| 5 | Red-Black Tree Implementation |
| 6 | Heap Implementation |
| 7 | Fibonacci Heap Implementation |
| 8 | Graph Traversals |
| 9 | Spanning Tree Implementation |

| | | |
|---|---|---|
| 10 | Shortest Path Algorithms (Dijkstra's algorithm, Bellman Ford Algorithm) | |
| 11 | Implementation of Matrix Chain Multiplication | |
| 12 | Implementation of Line segment intersection | |
| | Total hours | **60** |

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# MAHENDRAENGINEERING COLLEGE
**(Autonomous)**

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

**Regulations 2024**

## II Semester

| Sl. No. | Course code | Course Title | L | T | P | C | Category |
|---|---|---|---|---|---|---|---|
| | **THEORY** | | | | | | |
| 1 | 24CSE14201 | Internet of Things | 3 | 0 | 0 | 3 | PC |
| 2 | 24CSE14202 | Multicore Architecture and Programming | 3 | 0 | 0 | 3 | PC |
| 3 | 24CSE14203 | Machine Learning | 3 | 0 | 0 | 3 | PC |
| 4 | 24CSE14204 | Advanced Software Engineering | 3 | 0 | 0 | 3 | PC |
| 5 | | Professional Elective I | 3 | 0 | 0 | 3 | PE |
| 6 | | Professional Elective II | 3 | 0 | 0 | 3 | PE |
| 7 | | Audit Course – II* | 2 | 0 | 0 | 0 | AC |
| | **PRACTICAL** | | | | | | |
| 8 | 24CSE44201 | Term Paper and Seminar | 0 | 0 | 2 | 1 | EEC |
| 9 | 24CSE24201 | Software Engineering Laboratory | 0 | 0 | 2 | 1 | PC |
| | | **TOTAL** | **20** | **0** | **4** | **20** | |

*Audit course is optional

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**MAHENDRA ENGINEERING COLLEGE**
**(Autonomous)**

**Syllabus**

| **Department** | **Computer Science and Engineering** | **Programme Code** | **5032** |
|---|---|---|---|

**II Semester**

| **Course code** | **Course Name** | **Hours/week** | | | **Credit** | **Maximum marks** |
|---|---|---|---|---|---|---|
| | | **L** | **T** | **P** | **C** | |
| **24CSE14201** | **INTERNET OF THINGS** | 3 | 0 | 0 | 3 | **100** |

| | |
|---|---|
| **Objective(s)** | The student should be made to:<br>• To Understand the Architectural Overview of IoT<br>• To learn the IoT Reference Architecture and Real World Design Constraints<br>• To identify the various IoT levels<br>• To know the basics of cloud architecture<br>• To familiarize in Raspberry PI and experiment simple IoT application on it |
| **Outcome(s)** | Upon completion of this course, students will be able to<br>• Explain the various concept of the IoT and their technologies<br>• Develop the IoT application using different hardware platforms<br>• Demonstrate the various IoT Protocols<br>• Use the basic principles of cloud computing<br>• Develop and deploy the IoT application into cloud environment |

| **UNIT-I** | **INTRODUCTION** | **9** |
|---|---|---|
| Internet of Things- Domain Specific IoTs - IoT and M2M-Sensors for IoT Applications–Structure of IoT– IoT Map Device- IoT System Management with NETCONF-YANG | | |
| **UNIT-II** | **IoT ARCHITECTURE, GENERATIONS AND PROTOCOLS** | **9** |
| IETF architecture for IoT - IoT reference architecture -First Generation – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics | | |
| **UNIT-III** | **IoT PROTOCOLS AND TECHNOLOGY** | **9** |
| SCADA and RFID Protocols - BACnet Protocol -Zigbee Architecture - LowPAN - CoAP -Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module | | |
| **UNIT-IV** | **IoT USE CASES** | **9** |
| Smart and Connected Cities – An IoT Strategy for Smarter Cities – Architecture – Use cases: Street Lighting – Smart Parking – Smart Traffic – Smart Home. | | |

| UNIT-V | IOT PROJECTS ON RASPBERRY PI | 9 |
|---|---|---|
| Building IOT with RASPBERRY PI- Creating the sensor project - Preparing Raspberry Pi - Clysters libraries – Hardware Interacting with the hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data - External representation of sensor values - Exporting sensor data | | |
| | **Total hours** | **45** |

| **TEXT BOOK :** | |
|---|---|
| 1 | Arshdeep Bahga, Vijay Madisetti, Internet of Things: A hands-on approach, Universities Press, 2015 |
| 2 | Dieter Uckelmann, Mark Harrison, Florian Michahelles (Eds), Architecting the Internet of Things, Springer, 2011 |
| 3 | Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 |
| **REFERENCES:** | |
| 1 | Ovidiu Vermesan Peter Friess, 'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014 |
| 2 | N. Ida, Sensors, Actuators and Their Interfaces: A Multidisciplinary Introduction, 2nd Edition Scitech Publishers, 2014 |
| 3 | Reese, G. (2009). Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. Sebastopol, CA: O'Reilly Media, Inc. (2009) |

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|---|---|---|---|---|---|---|---|
| **Syllabus** | | | | | | | |
| **Department** | **Computer Science and Engineering** | **Programme Code** | | | **5032** | | |
| **II Semester** | | | | | | | |
| **Course code** | **Course Name** | **Hours/week** | | | **Credit** | **Maximum marks** | |
| **24CSE14202** | **MULTICORE ARCHITECTURE AND PROGRAMMING** | **L** | **T** | **P** | **C** | **100** | |
| | | 3 | 0 | 0 | 3 | | |
| **Objective(s)** | The student should be made to:<br>• To understand the need for multi-core processors, and their architecture.<br>• To identify the challenges in parallel and multithreaded programming.<br>• To learn about the various parallel programming paradigms,<br>• To familiarize multicore programs and design parallel solutions.<br>• To Exposing adequate knowledge in memory hierarchy design | | | | | | |
| **Outcome(s)** | Upon completion of this course, students will be able to<br>• Describe multicore architectures and identify their characteristics and challenges.<br>• Identify the issues in programming Parallel Processors.<br>• Write programs using OpenMP and MPI.<br>• Design parallel programming solutions to common problems.<br>• Compare and contrast programming for serial processors and programming for parallel processors. | | | | | | |
| **UNIT-I** | **MULTI-CORE PROCESSORS** | | | | | | **9** |
| Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks – Symmetric and Distributed Shared Memory Architectures – Cache coherence – Performance Issues – Parallel program design. | | | | | | | |
| **UNIT-II** | **PARALLEL PROGRAM CHALLENGES** | | | | | | **9** |
| Performance – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (mutexes, locks, semaphores, barriers) – deadlocks and livelocks – communication between threads (condition variables, signals, message queues and pipes). | | | | | | | |
| **UNIT-III** | **SHARED MEMORY PROGRAMMING WITH OpenMP** | | | | | | **9** |
| OpenMP Execution Model – Memory Model – OpenMP Directives – Work-sharing Constructs – Library functions – Handling Data and Functional Parallelism – Handling Loops – Performance Considerations. | | | | | | | |

| UNIT-IV | DISTRIBUTED MEMORY PROGRAMMING WITH MPI | 9 |
|---|---|---|
| MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and Collective communication – MPI derived data types – Performance evaluation | | |
| **UNIT-V** | **MEMORY HIERARCHY DESIGN** | **9** |
| Introduction – basics of memory hierarchies – memory technology and optimization – ten advanced optimization of cache Performance – Virtual Memory and Virtual Machines – Design of Memory Hierarchies | | |
| | **Total hours** | **45** |

| **TEXT BOOK :** | |
|---|---|
| 1 | Peter S. Pacheco, "An Introduction to Parallel Programming, Morgan-Kauffman/Elsevier, 2021. |
| 2 | Darryl Gove, "Multicore Application Programming for Windows, Linux, and Oracle Solaris, Pearson, 2011 (unit 2) |
| 3 | Michael J Quinn, "Parallel programming in C with MPI and OpenMP, Tata McGraw Hill, 2003. |
| **REFERENCES:** | |
| 1 | Victor Alessandrini, Shared Memory Application Programming, 1st Edition, Concepts and Strategies in Multicore Application Programming, Morgan Kaufmann, 2015. |
| 2 | Yan Solihin, Fundamentals of Parallel Multicore Architecture, CRC Press, 2015. |

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**MAHENDRA ENGINEERING COLLEGE**
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**Syllabus**

| **Department** | **Computer Science and Engineering** | **Programme Code** | **5032** |
|---|---|---|---|

**II Semester**

| **Course code** | **Course Name** | **Hours/week** | | | **Credit** | **Maximum marks** |
|---|---|---|---|---|---|---|
| | | **L** | **T** | **P** | **C** | |
| **24CSE14203** | **MACHINE LEARNING** | 3 | 0 | 0 | 3 | **100** |

| | |
|---|---|
| **Objective(s)** | The student should be made to:<br>• To understand the concepts and mathematical foundations of machine learning and types of problems tackled by machine learning<br>• To provide the different supervised learning techniques including ensemble methods<br>• To know different aspects of unsupervised learning and reinforcement learning<br>• To learn the role of probabilistic methods for machine learning<br>• To familiarize the basic concepts of neural networks and deep learning |
| **Outcome(s)** | Upon completion of this course, students will be able to<br>• Explain and outline problems for each type of machine learning<br>• Design a Decision tree and Random forest for an application<br>• Implement Probabilistic Discriminative and Generative algorithms for an application and analyze the results.<br>• Use a tool to implement typical Clustering algorithms for different types of applications.<br>• Design and implement an HMM for a Sequence Model type of application and identify applications suitable for different types of Machine Learning with suitable justification |

| **UNIT-I** | **INTRODUCTION AND MATHEMATICAL FOUNDATIONS** | **9** |
|---|---|---|

What is Machine Learning? Need –History – Definitions – Applications - Advantages, Disadvantages & Challenges -Types of Machine Learning Problems – Mathematical Foundations - Linear Algebra & Analytical Geometry -Probability and Statistics- Bayesian Conditional Probability-Vector Calculus & Optimization - Decision Theory - Information theory

| UNIT-II | SUPERVISED LEARNING | 9 |
|---|---|---|
| Introduction-Discriminative and Generative Models -Linear Regression - Least Squares -Under-fitting / Overfitting -Cross-Validation – Lasso Regression- Classification - Logistic Regression- Gradient Linear Models -Support Vector Machines –Kernel Methods -Instance based Methods- K-Nearest Neighbors - Tree based Methods –Decision Trees –ID3 – CART - Ensemble Methods -Random Forest - Evaluation of Classification Algorithms | | |
| **UNIT-III** | **UNSUPERVISED LEARNING AND REINFORCEMENT LEARNING** | **9** |
| Introduction - Clustering Algorithms -K – Means – Hierarchical Clustering - Cluster Validity - Dimensionality Reduction –Principal Component Analysis – Recommendation Systems - EM algorithm. Reinforcement Learning – Elements -Model based Learning – Temporal Difference Learning | | |
| **UNIT-IV** | **PROBABILISTIC METHODS FOR LEARNING** | **9** |
| Introduction -Naïve Bayes Algorithm -Maximum Likelihood -Maximum Apriori -Bayesian Belief Networks -Probabilistic Modelling of Problems -Inference in Bayesian Belief Networks – Probability Density Estimation - Sequence Models – Markov Models – Hidden Markov Models | | |
| **UNIT-V** | **NEURAL NETWORKS** | **9** |
| Perceptron - Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyper parameter tuning, batch normalization, regularization, dropout. | | |
| | **Total hours** | **45** |

| **TEXT BOOK :** | |
|---|---|
| 1 | Stephen Marsland, “Machine Learning: An Algorithmic Perspective”, Chapman & Hall/CRC, 2nd Edition, 2014. |
| 2 | Kevin Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012 |
| **REFERENCES:** | |
| 1 | Ethem Alpaydin, “Introduction to Machine Learning”, Third Edition, Adaptive Computation and Machine Learning Series, MIT Press, 2014 |
| 2 | Tom M Mitchell, “Machine Learning”, McGraw Hill Education, 2013. |
| 3 | Peter Flach, “Machine Learning: The Art and Science of Algorithms that Make Sense of Data”,First Edition, Cambridge University Press, 2012. |
| 4 | Shai Shalev-Shwartz and Shai Ben-David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge University Press, 2015 |
| 5 | Aurélien Géron , Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems 2nd Edition, o'reilly, (2017) |
| 6 | Hal Daumé III, “A Course in Machine Learning”, 2017 (freely available online) |

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|---|---|---|---|---|---|---|---|
| **Syllabus** | | | | | | | |
| **Department** | **Computer Science and Engineering** | **Programme Code** | | | **5032** | | |
| **II Semester** | | | | | | | |
| **Course code** | **Course Name** | **Hours/week** | | | **Credit** | **Maximum marks** | |
| **24CSE14204** | **ADVANCED SOFTWARE ENGINEERING** | **L** | **T** | **P** | **C** | **100** | |
| | | 3 | 0 | 0 | 3 | | |
| **Objective(s)** | The student should be made to:<br>• To understand the rationale for software development process models<br>• To know why the architectural design of software is important;<br>• To provide five important dimensions of dependability, namely,availability, reliability, safety, security, and resilience.<br>• To learn the basic notions of a web service, web service standards, and service- oriented architecture;<br>• To familiarize the different stages of testing from testing during development of a software system | | | | | | |
| **Outcome(s)** | Upon completion of this course, students will be able to<br>• Identify appropriate process models based on the Project requirements<br>• Explain the importance of having a good Software Architecture.<br>• Demonstrate the five important dimensions of dependability, namely, availability, reliability, safety, security, and resilience.<br>• Use the basic notions of a web service, web service standards, and service-oriented architecture;<br>• Develop skills with various levels of Software testing | | | | | | |
| **UNIT-I** | **SOFTWARE PROCESS &MODELING** | | | | | | **9** |
| Prescriptive Process Models – Agility and Process – Scrum – XP – Kanban – DevOps – Prototype Construction – Prototype Evaluation – Prototype Evolution – Modelling – Principles – Requirements Engineering – Scenario-based Modelling – Class-based Modelling – Functional Modelling – Behavioural Modelling. | | | | | | | |
| **UNIT-II** | **SOFTWARE DESIGN** | | | | | | **9** |
| Design Concepts – Design Model – Software Architecture – Architectural Styles – Architectural Design – Component-Level Design – User Experience Design – Design for Mobility – Pattern-Based Design. | | | | | | | |

| UNIT-III | DISTRIBUTED SOFTWARE ENGINEERING | 9 |
|---|---|---|
| Distributed Software Engineering - Distributed system characteristics - Design Issues – Middleware - Client-Server Computing - Client-Server Interaction - Architectural patterns for Distributed Systems: Master/Slave, Two-tier, Multi-tier, Distributed component, and Peer-to-Peer - Software as a Service (SaaS) - Key elements Implementation factors - Configuration of a system offered as a service. | | |
| **UNIT-IV** | **SERVICE-ORIENTED SOFTWARE ENGINEERING, SYSTEMS ENGINEERING AND REAL-TIME SOFTWARE ENGINEERING** | **9** |
| Service-oriented Architecture – RESTful Services – Service Engineering – Service Composition – Systems Engineering – Sociotechnical Systems – Conceptual Design – System Procurement – System Development – System Operation and Evolution – Real-time Software Engineering – Embedded System Design – Architectural Patterns for Real-time Software – Timing Analysis – Real-time Operating Systems. | | |
| **UNIT-V** | **SOFTWARE TESTING AND SOFTWARE CONFIGURATION MANAGEMENT** | **9** |
| Software Testing Strategy – Unit Testing – Integration Testing – Validation Testing – System Testing – Debugging – White-Box Testing – Basis Path Testing – Control Structure Testing – Black-Box Testing – Software Configuration Management (SCM) – SCM Repository – SCM Process – Configuration Management for Web and Mobile Apps. | | |
| | **Total hours** | **45** |

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

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|---|---|---|---|---|---|---|
| **Syllabus** | | | | | | |
| **Department** | **Computer Science and Engineering** | **Programme Code** | | | **5032** | |
| **II Semester** | | | | | | |
| **Course Code** | **Course Name** | **Hours/Week** | | | **Credit** | **Maximum marks** |
| | | **L** | **T** | **P** | **C** | |
| **24CSE44201** | **TERM PAPER AND SEMINAR** | **0** | **0** | **2** | **1** | **100** |
| **Objective(s)** | • In this course, students will develop their scientific and technical reading and writing skills that they need to understand and construct research articles. A term paper requires a student to obtain information from a variety of sources (i.e., Journals, dictionaries, reference books) and then place it in logically developed ideas. The work involves the following step | | | | | |

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

| | |
|---|---|
| **Total hours** | **30** |

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|---|---|---|---|---|---|---|---|
| **Syllabus** | | | | | | | |
| **Department** | **Computer Science and Engineering** | | | **Programme Code & Name** | | **5032** | |
| **Semester-II** | | | | | | | |
| **Course Code** | **Course Name** | **Hours/Week** | | | **Credit** | **Maximum marks** | |
| | | **L** | **T** | **P** | **C** | | |
| **24CSE24201** | **SOFTWARE ENGINEERING LABORATORY** | **0** | **0** | **2** | **1** | **100** | |
| **Objective(s)** | The student should be made to:<br>• To understand state-of-the-art knowledge on Software Engineering and UML in an interactive manner through the Web.<br>• To learn case studies to demonstrate practical applications of different concepts.<br>• To Provide a scope to students where they can solve small, real-life problems. | | | | | | |
| **Outcome(s)** | • Explain the requirements and use cases the client wants for the software being Produced.<br>• Analyze the costs of a project with the help of several different assessment methods.<br>• Create and specify such a software design based on the requirement specification that the software can be implemented based on the design. | | | | | | |
| **LISTOF EXPERIMENTS** | | | | | | | |
| 1 | Write a Problem Statement to define a title of the project with bounded scope of project | | | | | | |
| 2 | Select relevant process model to define activities and related task set for assigned project | | | | | | |
| 3 | Prepare broad SRS (Software Requirement Specification) for the above selected projects | | | | | | |
| 4 | Prepare USE Cases and Draw Use Case Diagram using modelling Tool | | | | | | |
| 5 | Develop the activity diagram to represent flow from one activity to another for software development | | | | | | |
| 6 | Develop data Designs using DFD Decision Table & ER Diagram. | | | | | | |
| 7 | Draw class diagram, sequence diagram, Collaboration Diagram, State Transition Diagram for the assigned project | | | | | | |
| 8 | Write Test Cases to Validate requirements of assigned project from SRS Document | | | | | | |
| 9 | Evaluate Size of the project using function point metric for the assigned project | | | | | | |
| 10 | Estimate cost of the project using COCOMO and COCOCMOII for the assigned project | | | | | | |
| 11 | Use CPM/PERT for scheduling the assigned project | | | | | | |
| 12 | Use timeline Charts or Gantt Charts to track progress of the assigned project | | | | | | |
| | | | | | **Total hours** | **30** | |

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## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

**Regulations 2024**

**III Semester**

| Sl. No. | Course code | Course Title | L | T | P | C | Category |
|---|---|---|---|---|---|---|---|
| | **THEORY** | | | | | | |
| 1 | 24CSE14301 | Security Practices | 3 | 0 | 0 | 3 | PC |
| 2 | | Professional Elective III | 3 | 0 | 0 | 3 | PE |
| 3 | | Professional Elective IV | 3 | 0 | 0 | 3 | PE |
| 4 | | Open Elective | 3 | 0 | 0 | 3 | OE |
| | **PRACTICAL** | | | | | | |
| 5 | 24CSE36301 | Project Work Phase I | 0 | 0 | 12 | 6 | EEC |
| | | **TOTAL** | **12** | **0** | **12** | **18** | |

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**MAHENDRA ENGINEERING COLLEGE**
**(Autonomous)**

**Syllabus**

| **Department** | **Computer Science and Engineering** | **Programme Code** | **5032** |
|---|---|---|---|

**III Semester**

| **Course code** | **Course Name** | **Hours/week** | | | **Credit** | **Maximum marks** |
|---|---|---|---|---|---|---|
| | | **L** | **T** | **P** | **C** | |
| **24CSE14301** | **SECURITY PRACTICES** | 3 | 0 | 0 | 3 | **100** |

| | |
|---|---|
| **Objective(s)** | The student should be made to:<br>• To learn the core fundamentals of system and web security concepts<br>• To have through understanding in the security concepts related to networks<br>• To know the security essentials in IT Sector<br>• To be exposed to the concepts of Cyber Security and cloud security<br>• To perform a detailed study of Privacy and Storage security and related Issues |
| **Outcome(s)** | Upon completion of this course, students will be able to<br>• Explain the core fundamentals of system security<br>• Elaborate the security concepts to wired and wireless networks<br>• Demonstrate and Manage the security essentials in IT Sector<br>• Analyze the concepts of Cyber Security and Cyber forensics<br>• Develop concepts for privacy and storage security |

| **UNIT-I** | **SYSTEM SECURITY** | **9** |
|---|---|---|

Building A Secure Organization- A Cryptography Primer – Preventing System Intrusions – Guarding against network intrusions – Unix and Linux Security – Protecting User accounts and strengthening authentication

| **UNIT-II** | **NETWORK SECURITY** | **9** |
|---|---|---|

Internet Security - Intranet security- Local Area Network Security - Wireless Network Security - Wireless Sensor Network Security- Cellular Network Security - Mobile security - IOT security - Case Study - Kali Linux.

| **UNIT-III** | **SECURITY MANAGEMENT** | **9** |
|---|---|---|

Information security essentials for IT Managers- Security Management System - Policy Driven System Management- IT Security - Online Identity and User Management System. Case study: Metasploit

| UNIT-IV | CYBER SECURITY AND CLOUD SECURITY | 9 |
|---|---|---|
| Cyber Forensics- Disk Forensics – Network Forensics – Wireless Forensics – Database Forensics – Malware Forensics – Mobile Forensics – Email Forensics- Best security practices for automate Cloud infrastructure management – Establishing trust in IaaS, PaaS, and SaaS Cloud types. Case study: DVWA | | |
| **UNIT-V** | **PRIVACY AND STORAGE SECURITY** | **9** |
| Privacy on the Internet - Privacy Enhancing Technologies - Personal privacy Policies - Detection of Conflicts in security policies- privacy and security in environment monitoring systems. Storage Area Network Security - Storage Area Network Security Devices - Risk management - Physical Security Essentials. | | |
| | **Total hours** | **45** |

| **TEXT BOOK :** | |
|---|---|
| 1 | John R. Vacca, Computer and Information Security Handbook, Third Edition, Elsevier 2017 |
| 2 | Michael E. Whitman, Herbert J. Mattord, Principles of Information Security, Seventh Edition, Cengage Learning, 2022 |
| **REFERENCES:** | |
| 1 | Richard E. Smith, Elementary Information Security, Third Edition, Jones and Bartlett Learning, 2019 |
| 2 | Mayor, K.K.Mookhey, Jacopo Cervini, Fairuzan Roslan, Kevin Beaver, Metasploit Toolkit for Penetration Testing, Exploit Development and Vulnerability Research, Syngress publications, Elsevier, 2007. ISBN : 978-1-59749-074-0 |
| 3 | John Sammons, "The Basics of Digital Forensics- The Primer for Getting Started in Digital Forensics", Syngress, 2012 |
| 4 | Cory Altheide and Harlan Carvey, "Digital Forensics with Open Source Tools", 2011 Syngress, ISBN: 9781597495875. |
| 5 | Siani Pearson, George Yee "Privacy and Security for Cloud Computing" Computer Communications and Networks, Springer, 2013 |

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| | **MAHENDRAENGINEERING COLLEGE**<br>**(Autonomous)** | | | | | | |
| | **DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING** | | | | | | |
| | **Regulations 2024** | | | | | | |
| **IV Semester** | | | | | | | |
| **Sl. No.** | **Course code** | **Course Title** | **L** | **T** | **P** | **C** | **Category** |
| | **PRACTICAL** | | | | | | |
| 1 | 24CSE36401 | Project Work Phase II | 0 | 0 | 24 | 12 | EEC |
| | | **TOTAL** | **0** | **0** | **24** | **12** | |

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