# CURRICULUM

## Academic Year 2020– 2021

# DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

## VII &VIII Semester B. E.

**RAMAIAH INSTITUTE OF TECHNOLOGY**
(Autonomous Institute, Affiliated to VTU)
**BANGALORE – 54**

## About the Institute:

Ramaiah Institute of Technology (RIT) (formerly known as M. S. Ramaiah Institute of Technology) is a self-financing institution established in Bangalore in the year 1962 by the industrialist and philanthropist, Late Dr. M S Ramaiah. The institute is accredited with "A" grade by NAAC in 2014 and all engineering departments offering bachelor degree programs have been accredited by NBA. RIT is one of the few institutes with prescribed faculty student ratio and achieves excellent academic results. The institute was a participant of the Technical Education Quality Improvement Program (TEQIP), an initiative of the Government of India. All the departments have competent faculty, with 100% of them being postgraduates or doctorates. Some of the distinguished features of RIT are: State of the art laboratories, individual computing facility to all faculty members. All research departments are active with sponsored projects and more than 304 scholars are pursuing PhD. The Centre for Advanced Training and Continuing Education (CATCE), and Entrepreneurship Development Cell (EDC) have been set up on campus. RIT has a strong Placement and Training department with a committed team, a good Mentoring/Proctorial system, a fully equipped Sports department, large air-conditioned library with over 1,35,427 books with subscription to more than 300 International and National Journals. The Digital Library subscribes to several online e-journals like IEEE, JET etc. RIT is a member of DELNET, and AICTE INDEST Consortium. RIT has a modern auditorium, several hi-tech conference halls and all are air-conditioned with video conferencing facilities. It has excellent hostel facilities for boys and girls. RIT Alumni have distinguished themselves by occupying high positions in India and abroad and are in touch with the institute through an active Alumni Association. RIT obtained Academic Autonomy for all its UG and PG programs in the year 2007. As per the National Institutional Ranking Framework, MHRD, Government of India, Ramaiah Institute of Technology has achieved 59$^{th}$ rank in 2020 among the top 100 engineering colleges across India.

## About the Department:

Information Science and Engineering department is established in the year 1992 with an objective of producing high-quality professionals to meet the demands of the emerging field of Information Science and Engineering. Department also started M.Tech program in Software Engineering in the year 2004 and has been recognized as R&D center by VTU in 2012. The department is accredited by the NBA in 2001, 2004, 2010, 2015 and reaccredited in 2018 under Tier-1 till 2021. Department has highly qualified and motivated faculty members and well equipped state of the art laboratories. All faculty members are involved in research and technical papers publications in reputed journals, conferences across the world. Strong collaboration with industries and high profile institutions is in place for curriculum updates, more hands on training, practical's, project based learning, EPICS, expert lectures, partial course deliveries by industry experts and student interns to enhance the skills in emerging areas to keep an inclusive and diverse academic environment. Department is successfully conducting seminars, conferences and workshops for students and academicians in the emerging areas of Information Technology. Introduced EPICS in senior projects. Some of the laboratories have also been set up in collaboration with industries such as Intel, Microsoft, Apple, SECO, Honeywell, $EMC^2$, NVIDIA, IBM, Green Sense Werks, Tech Machinery Labs, Sesovera Tech Pvt. Ltd., and Ramaiah Medical College (Emergency department). Also, an echo system is built to initiate start-ups at the department level along with the mentorship. All the above potential activities have led to high profile placements, motivation to become an entrepreneur, and encouragement for higher learning.

## VISION OF THE INSTITUTE

To be an Institution of International Eminence, renowned for imparting quality technical education, cutting edge research and innovation to meet global socio economic needs

## MISSION OF THE INSTITUTE

MSRIT shall meet the global socio-economic needs through

- Imparting quality technical education by nurturing a conducive learning environment through continuous improvement and customization
- Establishing research clusters in emerging areas in collaboration with globally reputed organizations
- Establishing innovative skills development, techno-entrepreneurial activities and consultancy for socio-economic needs

## QUALITY POLICY

We at MS Ramaiah Institute of Technology strive to deliver comprehensive, continually enhanced, global quality technical and management education through an established Quality Management System complemented by the synergistic interaction of the stake holders concerned

## VISION OF THE DEPARTMENT

To evolve as an outstanding education and research center of Information Technology to create high quality Engineering Professionals for the betterment of Society

## MISSION OF THE DEPARTMENT

- To provide a conducive environment that offers well balanced Information Technology education and research.
- To provide training and practical experience in fundamentals and emerging technologies.
- To nurture creativity for overall personality development.

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

**PEO1**: Become competent Information Technology professionals with continuous progress in career or learning.

**PEO2**: Enhance the skills in developing computing systems using modern tools and technologies.

**PEO3**: Function effectively as professionals in a team environment or individually.

## PROGRAM OUTCOMES (POs)

**PO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2: Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3: Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4: Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12: Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## PROGRAM SPECIFIC OUTCOMES (PSOs)

**PSO1: Problem Solving Skills,** ability to understand and analyze the Information Technology problems and develop computer programs.

**PSO2: Applied Engineering Skills**, ability to apply standard practices and strategies in Software Development.

**PSO3: Communication and Higher Learning,** ability to exchange knowledge and continue learning advances in the field of Information Technology.

**Curriculum Course Credits Distribution Batch 2019-20**

| Semester | Humanities & Social Sciences (HSS) | Basic Sciences / Lab (BS) | Engineering Sciences/ Lab (ES) | Professional Courses- Core (Hard core, soft core, Lab) (PC-C) | Professional Courses - Electives (PC-E) | Other Electives (OE) | Project Work (PW) | Internship/ other activities (IS/ECA) | Total semester load |
|---|---|---|---|---|---|---|---|---|---|
| **First** | 2 | 9 | 14 | | | | | | 25 |
| **Second** | 4 | 9 | 10 | | | | | | 23 |
| **Third** | 3 | 4 | | 18 | | | | | 25 |
| **Fourth** | | 4 | | 21 | | | | | 25 |
| **Fifth** | 2 | | | 19 | 4 | | | | 25 |
| **Sixth** | | | | 15 | 4 | | 6 | | 25 |
| **Seventh** | | | | 14 | 12 | | | | 26 |
| **Eighth** | | | | | | 4 | 16 | 6 | 26 |
| **Total** | | | | | | | | | **200** |

## SCHEME OF TEACHING VII SEMESTER

| Sl.No | Course Code | Course | Category | Credits* | | | | | Contact Hours |
|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | S | Total | |
| 1 | IS71 | Data Mining | PC-C | 3 | 0 | 0 | 1 | 04 | 04 |
| 2 | IS72 | Distributed Computing | PC-C | 3 | 0 | 0 | 1 | 04 | 04 |
| 3 | IS73 | Information Security | PC-C | 4 | 0 | 0 | 0 | 04 | 04 |
| 4 | ISL74 | Data Mining Lab | PC-C | 0 | 0 | 1 | 0 | 01 | 01 |
| 5 | ISL75 | Distributed Computing Lab | PC-C | 0 | 0 | 1 | 0 | 01 | 01 |
| 6 | ISECX | Elective C | PC-E | 4 | 0 | 0 | 0 | 04 | 04 |
| 7 | ISEDX | Elective D | PC-E | 4 | 0 | 0 | 0 | 04 | 04 |
| 8 | ISEEX | Elective E | PC-E | 4 | 0 | 0 | 0 | 04 | 04 |
| | | | **Total** | **22** | **0** | **2** | **2** | **26** | **26** |

**Elective C:**

| | |
|---|---|
| ISEC1 | Software Testing |
| ISEC2 | Internet of Things |
| ISEC3 | Virtual and Augmented Reality |

**Elective D:**

| | |
|---|---|
| ISED1 | System Simulation and Modeling |
| ISED2 | Cloud Computing |
| ISED3 | Soft Computing |

**Elective E:**

| | |
|---|---|
| ISEE1 | Data Science |
| ISEE2 | Mobile Computing |
| ISEE3 | Deep Learning |

**SCHEME OF TEACHING**
**VIII SEMESTER**

| Sl.No | Course Code | Course | Category | Credits* | | | | | Contact Hours |
|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | S | Total | |
| 1 | - | Open Elective | OE | 4 | 0 | 0 | 0 | 04 | 04 |
| 2 | ISIN | Internship | IN | 4 | 0 | 0 | 0 | 04 | 04 |
| 3 | ISP | Senior Project | PW | 0 | 0 | 16 | 0 | 16 | 16 |
| 4 | EAC | Extra/Co-Curricular Activities | EAC | 0 | 0 | 2 | 0 | 02 | 02 |
| | | | **Total** | **8** | **0** | **18** | **0** | **26** | **26** |

## VII Semester

# DATA MINING

**Course Code: IS71** **Credit: 3:0:0:1**
**Prerequisite: Nil** **Contact Hours: 42L**
**Course Coordinator: Mrs. Pushpalatha M N**

### Course Content:

#### UNIT-I

**Data Mining-** Introduction, Challenges, Data Mining Tasks, Types of Data, Data Quality- Measurements and data collection errors, precision, bias, accuracy, missing value, inconsistent values. Noise and artifacts, outliers, duplicate data, Issues at the measurement and data collection level to particular applications and fields.
**Data Preprocessing-** aggregation, sampling, dimensionality reduction,
**Association Analysis-** Basic Concepts & Algorithms: Frequent Item set Generation.
**Self Study:** problem solving to analyze the data, discretization and binarization, variable transformation.

#### UNIT-II

**Association Analysis:** Rule Generation, Compact Representation of Frequent Item sets, Alternative methods for generating Frequent Item sets, FP Growth Algorithm, Evaluation of Association Patterns–Objective Measures of Interestingness, Measures beyond Pairs of Binary Variables, properties of objective measures
**Self Study :** Handling Categorical & Continuous Attributes, Mining various kinds of association rules, problem solving.

#### UNIT-III

**Classification:** Basics, General approach to solve classification problem, Decision Trees classifiers, Model Overfitting- Overfitting due to presence of noise and lack of representative samples, Evaluating the performance of a classifier , Methods for comparing classifiers. Rule based classifiers , Prediction, Accuracy and Error measures.
**Self Study :** Ensemble Methods, problem solving.

#### UNIT-IV

**Clustering Techniques:** What is cluster analysis?, Types of Data in Cluster Analysis, Partitioning methods, Density-Based Methods- OPTICS, DENCLUE,
**Self Study:** Clustering High-Dimensional Data- CLIQUE, Outlier Analysis, problem on clustering techniques.

## UNIT-V

**Mining different types of data:** Graph Mining, Social Network Analysis, Mining the world wide web-Mining web page layout structure, Case studies: Finance, Retail Industry.

**Self Study:** Mining web's link structures, Web usage mining, Case Study: Intrusion detection.

**Text Books:**


1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education, 2005.
2. Jiawei Han and MichelineKamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006


**Reference:**


1. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.


**Course Outcomes (COs):**

At the end of the course, students will be able to-

1 Identify the data and various data preprocessing techniques.(PO: 1,2,3) (PSO-1,2)

2 Apply association mining approaches to identify pattern on transactional data and analyze through problem solving.(PO-1,2,3) (PSO-1,2)

3 Perform classification on the dataset and evaluate using measures.(PO- 1,2,3) (PSO-1,2)

4 Identify the similar groups on the data set using various clustering techniques.(PO-1,2,3) (PSO-1,2)

5 Apply data mining approaches in Graph, Social Network Analysis and web and identify the applications of data mining.(PO- 1,2,3) (PSO-1,2).

# DISTRIBUTED COMPUTING

**Course Code: IS72** **Credit: 3:0:0:1**
**Prerequisite: Computer Organization and Architecture** **Contact Hours: 42L**
**Course Coordinator: Mr. Jagadeesh Sai D**

## Course Content:

### UNIT-I

**Introduction:** Parallelism = Opportunities, Challenges, The Power and Potential of Parallelism, Examining Sequential and Parallel Programs, A Paradigm Shift, Parallelism Using Multiple Instruction Streams, The Goals: Scalable Performance and Portability, Parallel Computers And Their Model, Balancing Machine Specifics with Portability, A Look at Six Parallel Computers , The RAM: An Abstraction of a Sequential Computer , **The PRAM:** A Parallel Computer Model.
**Self-study:** Memory Reference Mechanisms, Communication and Applying the CTA Model.

### UNIT-II

Reasoning about Performance, Introduction, Motivation and Basic Concepts, Sources of Performance Loss, Parallel Structure, Reasoning about Performance, Performance Trade-Offs, Measuring Performance, What should we measure?, First Steps Towards Parallel Programming, Task and Data Parallelism, Peril-L, Count 3s Example, Conceptualizing Parallelism, Alphabetizing Example, Comparison of Three Solutions,
**Self-study:** solving problems and evaluating performance metrics.

### UNIT-III

Scalable Algorithmic Techniques, Blocks of Independent Computation, Schwartz' Algorithm, Reduce and Scan Abstractions, Assigning Work to Processes Statically and Dynamically, Trees: allocation by subtree, Dynamic allocations.
**Self-study:** Illustrative examples on different case studies.

## UNIT-IV

Parallel programming Languages: Programming with Threads, POSIX Threads, Thread Creation and Destruction, Mutual Exclusion, Synchronization, Safety Issues, Performance Issues, Open MP, The Count 3s Example, Semantic Limitations, Reduction, Thread Behavior and Interaction, Sections, Exercises on analysis and performance,

**Self-study:** OpemMP detailed study using OpenMP manual at OpenMp.org

## UNIT-V

Local View Programming Languages, MPI: The Message Passing Interface, Safety Issues, Performance Issues, Unified Parallel C, Titanium, Evaluating Existing Approaches, Hidden Parallelism, Transparent performance, Future Directions in Parallel Programming, Attached Processors,

**Self-study:** Grid Computing, Transactional Memory, Map Reduce.

**Text Book:**


1. Calvin Lin, Lawrence Snyder, "*Principles of Parallel Programming*", 1st Edition, 2009, Pearson Education, Inc. New Delhi. .


**References:**


1. Michael J Quinn, Parallel Programming in C with MPI and OpemMP, Tata McGraw Hill.\
2. Ananth Grama, Introduction to Parallel Computing, 2nd Edition, Perason, 2013


**Course Outcomes (COs):**

At the end of the course, students will be able to-

1. Explain different types of parallel machines available (PO-1,2,9,10,12) ( PSO-1)
2. Analyze the different factors to Reason about parallel performance.

   (PO-1,2.4,5,10,12) (PSO-1,2)
3. Write Scalable Parallel Programs and apply different techniques to improve efficiency. (PO-1,3,10,12) ( PSO-1,2)
4. Compare and Contrast parallel performance with serial execution
   ( PO-1,2,,5,10,12) ( PSO-1,2,
5. Make out parallelism in recent trends like GPU and Grid Computing
   ( PO-1,2,5) (PSO- 1,3)

## INFORMATION SECURITY

**Course Code: IS73** **Credit: 4:0:0:0**
**Prerequisite: Nil** **Contact Hours: 56L**
**Course Coordinator: Mrs. Bhuvaneshwari Patil**

### Course Content:

#### UNIT-I

**Symmetric Ciphers:** Symmetric cipher model, cryptography, cryptanalysis, Substitution techniques, Transposition Techniques. **Block Ciphers and the Data Encryption Standard**: Simplified DES, Block Cipher Principles, DES, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher modes of operation.

#### UNIT-II

**Public Key Algorithms**: Introduction, Modular Arithmetic, RSA, Diffie-Hellman, Digital Signature Standards, How Secure are RSA and Diffie-Hellman, Elliptic Curve Cryptography. **Hash and MAC Algorithms**: Secure Hash Algorithm, Whirlpool, HMAC and CMAC.

#### UNIT-III

**Passive information Gathering**: starting at the source, Mining Job ads and analyzing Financial Data, Using Google to Mine sensitive information, Exploring Domain Ownership. **Detecting Live Systems:** Detecting Active Systems, Port Scanning, OS fingerprinting, Scanning countermeasures. **Enumerating systems:** Enumerating systems, Advanced Enumeration.

#### UNIT-IV

**Automated Attack and Penetration Tools:** Why attack and penetration Tools are Important, Automated Exploit Tools, Determining Which Tools to use
**Defeating Malware:** Evolving threat, viruses, and Worms, Trojans.
**Malicious Software**: Viruses and Related Threats, Virus Countermeasures, DDoS Attacks
**Firewalls**: Firewall Design Principles, Trusted Systems

## UNIT-V

**Securing Wireless Systems**: Wi-Fi Basics, Wi-Fi Security, Wireless LAN threats, Exploiting wireless networks, Securing wireless Networks

**Intrusion Detection:** Overview ID detection and Prevention, IDS Types and Components, an overview of Snort, Installing Snort on windows System, and Building snort rules and interface.

**Text Books:**


1. William Stallings, "Cryptography and Network Security principles and practices" 4th Edition PHI.
2. Charlie Kaufman et. al , Network Security, 2nd Edition PHI.
3. Michael Gregg, "Building your own Security LAB, A field Guide for Network Testing" Wiley India 2012.


**Reference:**


1. Forouzan, "Cryptography and Network Security" 3rd Edition, Tata McGraw Hill


**Course Outcomes (COs):**

At the end of the course, students will be able to-

1. Describe and Design Symmetric cipher model, cryptography algorithms and their techniques. (PO-3) (PSO-1)
2. Describe the most widely used encryption techniques. (PO-2, 3) (PSO-2)
3. Identify, Scan and Solve the problems in the live systems. (PO-2, 5) (PSO-1)
4. Explain the importance of automated tools for network security. (PO-4, 6) (PSO-2)
5. Discuss threats and security aspects of wireless networks and intrusion detection and prevention techniques. (PO-2,8) (PSO-1)

# DATA MINING LABORATORY

**Course Code: ISL74** **Credit: 0:0:1:0**
**Prerequisite: Object Oriented Programming with Java/C++**
**Course Coordinator: Mrs. Ashwitha** **Contact Hours: 14P**

## Course Content:

**Note: The dataset considered should have at least 10 attributes and minimum of 50 records.**

**Part – A (2 sessions)**

**Use of Rapidminer tool**
**Importing and Exporting data.**
**Data Preprocessing**

- Data Cleaning
- Aggregation
- Normalization
- Sampling
- Variable Selection

**Modeling and evaluation**

- Association mining using measures
- Decision Tree Classification and evaluate them
- Ensemble Method Classification and evaluate them
- Clustering with evaluation

**Part – B (8 sessions)**

**Perform the following tasks using R/Python programming**

1. Read the dataset and perform data preprocessing on this dataset.
2. Visualize the data and datasets and identify anomalies and identify types of data preprocessing to be performed
3. Find useful patterns and associations using the Apriori approach.
4. Find useful patterns and associations using the Frequent Pattern Tree Approach.
5. Model Classifiers, evaluate performance and visualize the results.
6. Use Ensemble methods of classification to model a dataset, evaluate the performance and visualize the results.
7. Group the data in a dataset based on similarity by using partitioning methods.

8. Group the data in a dataset based on similarity by using Density Based methods.

**Part-C( 4 sessions)**

Students will be assigned dataset based on an application. This dataset needs to be explored through suitable visualizations. Data in the data set is to be mined to produce essential interpretations. The results obtained have to be evaluated for various metrics depending on the type of approach used.

**Text Books:**


1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education, 2005.
2. Jiawei Han and MichelineKamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006


**References:**


1. Arun K Pujari: Data Mining Techniques, 2nd Edition, Universities Press, 2009.
2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.


**Course Outcomes (COs):**

At the end of the course, students will be able to -

1. Create, import and mine data using R-programming/Python (PO – 1,2,3,5,9) (PSO - 1,2)
2. Import data, preprocess them and perform mining using data mining tools. (PO – 1,2,3,5,6,9,10,12) (PSO - 1,2)
3. Design and develop preprocessing techniques , perform data mining tasks , analyze and evaluate the obtained result.(PO – 2,3,4,5,6,9,10,12) (PSO - 1,2,3)

# DISTRIBUTED COMPUTING LABORATORY

**Course Code: ISL75** **Credit: 0:0:1:0**
**Prerequisite: Computer Networks & Operating Systems** **Contact Hours: 14P**
**Course Coordinator: Mr. Koushik S**

**Course Content:**

**Part-A**

1. Write parallel program using OpenMP to sort n element using merge sort.
2. Write a program to Multiply a matrix by a vector and get the result of the operation.
3. Write an OpenMP program which demonstrates how to "multitask", implement two separate task, one to generate prime table and other to generate sine table for a given input using OpenMP for parallel execution. Justify the inference.
4. Write a program to show how first private clause works. (Factorial program)
5. Write an OpenMP parallel program for Points Classification. Prove the correctness of sequential program with that of parallel.
6. Write an OpenMP program to convert a color image to black and white image. Demonstrate the performance of different scheduling techniques for varying chunk values.

**Part-B**

7. Write a program for communication among two processes.
8. Write MPI program to compute dot product of two vectors using block-striped partitioning with uniform data distribution.
9. Write MPI program that computes the value of PI using Monto-Carlo Algorithm.
10. C program which creates new communicators involving a subset of initial set of MPI processes in the default communicator MPI_COMM_WORLD
11. Write MPI program to compute Matrix-Matrix Multiplication using self-scheduling algorithm.
12. C program which searches integers between A and B for a value J such that F(J) = C, using the MPI parallel programming environment

**Text Book:**

1. Calvin Lin, Lawrence Snyder, “Principles of Parallel Programming”, 1st Edition, 2009, Pearson Education, Inc. New Delhi.

**References:**

1. OpenMP Spec 3.0 handbook available on the Web
2. Lecture Notes & Web Reference Bookss

**Course Outcomes (COs):**

At the end of the course, students will be able to -

1. Design and Develop distributed computing using parallel programming concepts. (PO-3,4) (PSO-1)
2. Demonstrate the concepts of Distributed and Parallel Computing Architecture.(PO-1,3,4) (PSO-2)
3. Generate an effective report on Distributed and Parallel Computing. (PO-10) (PSO-1)

# SOFTWARE TESTING

**Course Code: ISEC1** **Credit: 4:0:0:0**
**Prerequisite: Nil** **Contact Hours: 56L**
**Course Coordinator: Dr. Naresh E**

## Course Content:

### UNIT-I

**Review of Software Engineering:** Software process models, Software engineering ethics, Software engineering challenges. **Requirements Analysis:** Requirements elicitation techniques, Functional and Non-functional requirements. **Software Design:** Architectural design and its styles, Object-oriented design. Implementation Issues.

### UNIT-II

**Perspective on Testing:** Basic definitions, Test Scenarios, Test cases, Insights from a Venn diagram, identifying test cases, Error, fault and Failure taxonomies, Levels of testing, Activities of Test engineer, Test/Debug life cycle, testing principles, Testing throughout the SDLC. Examples: Generalized pseudocode, the triangle problem, The NextDate function, the commission problem, The SATM (Simple Automatic Teller Machine) problem, the currency converter.

### UNIT-III

**Functional Testing:** Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations. Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations.

### UNIT-IV

**Static Testing:** Reviews, Types of reviews, Inspections, Inspection process, Inspection roles, benefits of inspection, Walkthroughs, Checklists. **Structural Testing:** Statement coverage testing, Condition coverage testing, Path coverage, computing cyclomatic complexity, exploratory testing.

## UNIT-V

**Test Management and Automation:** Introduction, Test Planning, Test Reporting, Test Plan template. Test Automation, Terms used in Automation, Skills needed for automation, scope of automation, design and Architecture for automation, Process model for automation. **Test Metrics and Measurements:** Need and types of metrics.

**Text Books:**


1. Paul C. Jorgensen, Software Testing, A Craftsman‟s Approach, 4th Edition, Auerbach Publications, 2017.
2. Graham Bath, Judy McKay, The Software Test Engineer's Handbook, 2nd Edition, Rocky Nook publisher, 2014.
3. SrinivasanDesikan, Gopalaswamy Ramesh: Software testing Principles and Practices, 2nd Edition, Pearson, 2007.
4. Ian Sommerville, Software Engineering, 9th Edition, Pearson Education, 2011.


**References:**


1. Andreas Spillner, Tilo Linz, Hans Schaefer: Software Testing Foundations, 2nd Edition, Shroff Publishers & Distributers Pvt ltd.
2. Rahul Shende, Testing in 30+ Open Source Tools, Shroff Publishers & Distributers Pvt ltd. 2010.
3. Aditya P Mathur, Foundations of Software Testing, Pearson, 2008.


**Course Outcomes (COs):**

At the end of the course, students will be able to-

1. Review the knowledge of software engineering concepts. (PO-1)(PSO-1)
2. Gain the knowledge of the basic definitions/concepts of software testing. (PO-1) (PSO-1)
3. Apply the concepts like validation and its techniques like black box testing and white box testing. (PO-4)(PSO-1,2)
4. Analyze the concepts like verification and its techniques like Reviews, Walkthroughs, and Inspections in the development of software. (PO-2)(PSO-1,2)
5. Design and Execute Test Scenarios and Test Cases with the reports to track and monitor the defects. (PO-3,4,10)(PSO-2,3)

# INTERNET OF THINGS

**Course Code: ISEC2** **Credit: 4:0:0:0**
**Prerequisite: Internet of Things**
**Course Coordinator: Mr. Jagadeesh Sai D** **Contact Hours: 56L**

## Course Content:

### UNIT-I

**Introduction to Internet of Things:** Definition & Characteristics of IoT,Physical Design of IoT Things in IoT ,IoT Protocols, Logical Design of IoT, IoT Functional Blocks ,IoT Communication Models ,IoT Communication APIs, IoT Enabling Technologies , Wireless Sensor Networks, Cloud Computing Big Data Analytics ,Communication Protocols , Embedded Systems IoT Levels & Deployment Templates, IoT Level-1,IoT Level-2,IoT Level-3,IoT Level-4,IoT Level-5,IoT Level-6

### UNIT-II

**IoT and M2M :** Introduction,M2M, Difference between IoT and M2M ,SDN and NFV for IoT, Software Defined Networking, Network Function Virtualization, IoT System Management with NETCONF-YANG , Need for IoT Systems Management, Simple Network Management Protocol (SNMP) , Limitations of SNMP, Network Operator Requirements, NETCONF,YANG IoT Systems Management with NETCONF-YANG,NETOPEER..

### UNIT-III

**IoT Platforms Design Methodology:** IoT Design Methodology , Purpose & Requirements Specification , Process Specification, Domain Model Specification, Information Model Specification , Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device & Component Integration, Application Development, **IoT Systems** - Logical Design using Python ,Functions Modules ,Packages ,File Handling Operations Classes, Python Packages of Interest for IoT ,JSON, XML, HTTPLib & URLLib ,SMTPLib

**UNIT-IV**

Raspberry Pi,About the Board , Linux on Raspberry Pi, Raspberry Pi Interfaces , Serial SPI ,I2C ,Programming Raspberry Pi with Python, Controlling LED with Raspberry Pi , Interfacing an LED and Switch with Raspberry, Interfacing a Light Sensor (LDR) with Raspberry Pi ,Other IoT Devices, pcDuino, Beagle Bone Black, Cubie board. IoT Physical Servers & Cloud Offerings, **WAMP** - AutoBahn for IoT,Xively Cloud for IoT, Python Web Application Framework – Django, Django Architecture , Starting Development with Django , Designing a RESTful Web API,Amazon Web Services for IoT , Amazon EC2, Amazon AutoScaling ,Amazon S3,Amazon RDS Amazon DynamoDB, Amazon Kinesis, Amazon SQS,Amazon EMR,SkyNet IoT Messaging Platform,INTEL Gen2,UDD Board example.

**UNIT-V**

Data Analytics for IoT , Apache Hadoop , Map Reduce Programming Model ,Hadoop Map Reduce Job Execution ,Map Reduce Job Execution Workflow ,Hadoop Cluster Setup, Using Hadoop Map Reduce for Batch Data Analysis, Hadoop YARN, Apache Oozie , Setting up Oozie ,Oozie Workflows for IoT Data Analysis , Apache Spark , Apache Storm,Setting up a Storm Cluster, Using Apache Storm for Real-time Data Analysis, REST-based approach , Web Socket-based approach.

**Text Book:**

1. Internet of Things (A Hands-on-Approach) by Arshdeep Bagha ,Vijay Madisetti University press 2015.

**Reference:**

1. Enterprise IoT:Strategies and Best Practices for Connected Products and Services By Dirk Slama, Frank Puhlmann, Jim Morrish, Rishi M Bhatnagar

**Course Outcomes (COs):**

At the end of the course, students will be able to-

1. Explain different design issues and domains of IoT. (PO-1,2,9,10,12) (PSO-1)
2. Identify different design methodologies and end point devices of IoT. (PO-1,2.4,5,10,12) (PSO-1,2)
3. Distinguish different cloud based solution for IoT. (PO-1,3,10,12) ( PSO-1,2)
4. Understand different case studies related to IoT framework. (PO-1,2,,5,10,12) ( PSO-1,2,
5. Solve data analytical problems on IoT. ( PO-1,2,5) (PSO- 1,3)

# VIRTUAL AND AUGMENTED REALITY

**Course Code: ISEC3** **Credit: 4:0:0:0**
**Prerequisite: Computer Graphics** **Contact Hours: 56L**
**Course Coordinator: Dr. Lingaraju G M**

## Course Content:

### UNIT-I

**Virtual Reality and Virtual Environments**:
Human factors: Eye: accommodation, to Stereopsis, Visual field, Synthetic images versus reality. Ear: sound perception to Sound direction and stage, Head- related transfer functions, Measuring HRTFs, Ambisonics. The somatic senses: Tactile and Haptic technology. Virtual reality hardware & software: Sensor hardware, Head coupled displays, Acoustic Hardware, Integrated VR systems. Modeling Virtual worlds, Physical simulation, VR toolkits.

### UNIT-II

Input Devices & Output Devices, **Requirements for VR**: Virtual databases, Real time image generation, database interaction, Physical simulation, Immersive and Non-Immersive VR systems, Hybrid VR systems, the cave, benefits of virtual reality. **3D Viewing Process**- A Review, Examples of 3D viewing, A Simple Graphics Package, Segmented Display Files, Display File Compilation, Geometric Models, Picture Structure.Graphical Input techniques, Input Functions and Event Handling.

### UNIT-III

**The generic VR system:** Virtual Environment, Computer environment, VR Technology, Modes of Interaction, VR Systems. **Computing Architectures for VR:** The Rendering Pipeline, PC Graphics Architecture, Workstation-Based Architectures, Distributed VR Architectures.

### UNIT-IV

**Modelling:** Geometric Modeling, Kinematics Modeling, Behavior Modeling, Model Management, **VR Programming**:Toolkits and Scene Graphs, World ToolKit, Java 3D General Haptics Open Software Toolkit, PeopleShop.

### UNIT-V

**Animation:** Conventional and Computer-Assisted Animation, Animation Languages, Methods of Controlling Animation, Basic Rules of Animation, Problems Peculiar to Animation. **Animating the Virtual Environment**: The dynamics of numbers, Linear interpolation, Non-linear interpolation, parametric interpolation. The animation of objects: Linear translation, Non-linear translation, Linear and Non-linear angular rotation. Shape, object parametric line/surface patch Inbetweening. Free-form deformation, Particle systems. Physics based modeling and simulation.

**Text Books:**

1. Virtual Reality Technology,2nd edition,Grigore C. Burdea, Philippe Coffet, A John Wiley & Sons, Inc., Publication.
2. Virtual Reality Systems, John Vince, Published by Dorling Kindersley ( India) pvt ltd., licensees of Pearson Education in south Asia.
3. Principles of Interactive computer graphics, second edition, William M Newman & Robert F. Sproull, McGraw-Hill International student edition.

**References:**

1. Computer Graphics, second Edition in C, James. D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, Kindle edition.
2. Virtual Reality & Augmented Reality in Industry by Dengzhe Ma,Jürgen Gausemeier, Xiumin Fan, Michael Grafe By : Springer publications.
3. Computer Vision and Augmented Reality by Kerdvibulvech Chutisant, Publisher: LAP Lambert Academic Publishing ,Edition: 2013
4. Principles and practice: Augmented Reality, By: Dieter SCHMALSTIEG, Tobias HOLLERER, Addison-Wesley Professional.

**Course Outcomes (COs):**

At the end of the course, students will be able to-

1. Apply the knowledge of Basic Science and Computer Graphics to discern the principles of hardware and other requirements for VR/AR and software tools. (PO-1,2,6,7,12) ( PSO-1,2,3)
2. Design and develop a virtual/augmented Environment using / analyzing the conceptual pipeline of 3D viewing process, Input Techniques/functions/Event handling, to create a sustainable development of products. (PO-2,3.4,5,6,7,12) (PSO-2,3)
3. Illustrate the contextual knowledge of Generic VR system and Computing Architectures for VR/AR applications. (PO-3,4,5,6,12) ( PSO-1,2,3)
4. Apply the knowledge of Modeling and VR Programming to develop projects in multidisciplinary areas. ( PO-2,3,4,5,6,11) ( PSO-1,2,3)
5. Usage of Animation techniques for the solutions of real world problem for effective communication. ( PO- 10,11,12) (PSO- 2,3)

## SYSTEM SIMULATION AND MODELING

**Course Code: ISED1** **Credit: 4:0:0:0**
**Prerequisite: Nil** **Contact Hours: 56L**
**Course Coordinator: Mr. Rajaram M Gowda**

### Course Content:

#### UNIT-I

**Introduction to Simulation:** When simulation is the appropriate tool and when it is not appropriate, Advantages and disadvantages of Simulation, Areas of application, Systems and system environment, Components of a system, Discrete and continuous systems, Model of a system, Types of Models, Discrete-Event System Simulation, Steps in a Simulation Study; **Simulation examples**: Simulation of queuing systems, Simulation of inventory systems

#### UNIT-II

**Concepts in Discrete-Event Simulation:** The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling; List processing, Simulation in Java, Simulation in GPSS; **Statistical Models in Simulation:** Review of terminology and concepts, Discrete distributions, Continuous distributions-Uniform distribution, Exponential distribution, Normal distribution

#### UNIT-III

**Random-Number Generation:** Properties of random numbers, Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers. **Random-Variate Generation**: Inverse transform technique-Exponential Distribution, Uniform Distribution, Discrete Distributions, **Acceptance-Rejection technique**: Poisson Distribution, Convolution method

#### UNIT-IV

**Queuing Models:** Characteristics of queuing systems, Queuing notation, Long-run measures of performance of queuing systems; **Input Modeling**: Data Collection, Identifying the distribution with data, Parameter estimation, Goodness of Fit Tests, Selecting input models without data

#### UNIT-V

**Verification and Validation of Simulation Models:** Model building, verification and validation, Verification of simulation models, Calibration and validation of models, **Estimation of Absolute Performance**: Types of simulations with respect to output analysis, Stochastic nature of output data; Absolute measures of performance and their estimation

**Text Book:**

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, Fifth Edition, Pearson Education, 2013.

**References:**

1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson / Prentice-Hall, 2006.
2. Sheldon M. Ross: Simulation, Fourth Edition, Elsevier, 2006.
3. Averill M. Law: Simulation Modeling and Analysis, Fourth Edition, Tata McGraw-Hill, 2007

**Course Outcomes (COs):**

At the end of the course, students will be able to-

1. Identify the concepts used to develop simulation models. (PO1, 2) (PSO-1)
2. Design and develop models using simulation algorithm techniques. (PO-1, 2, 3) (PSO-1, 2)
3. Design and develop techniques to generate and test random numbers. (PO-1, 2, 3,4) (PSO-1, 2)
4. Design and develop an input model for a given simulation system. (PO-1, 2, 3, 4) (PSO-1, 2)
5. Verify, Validate and Perform output analysis of a simulation model. (PO-4) (PSO-2)

# CLOUD COMPUTING

**Course Code: ISED2** **Credit: 4:0:0:0**
**Prerequisite: Computer Organization and Architecture** **Contact Hours: 56L**
**Course Coordinator: Dr. Siddesh.G.M**

## Course Content:

### UNIT-I

**Introduction:** Network centric computing and network centric content, Peer-to-peer systems, Cloud Computing, Cloud Computing delivery models & Services, Ethical issues, Cloud vulnerabilities, Challenges. **Cloud Infrastructure:** Amazon, Google, Azure & online services, open source private clouds. Storage diversity and vendor lock-in, intercloud, Energy use & ecological impact of data centers, service level and compliance level agreement, Responsibility sharing, user experience, Software licensing.

### UNIT-II

**Cloud Computing:** Applications & Paradigms, Challenges, existing and new application opportunities, Architectural styles of cloud applications, Workflows: Coordination of multiple activities, Coordination based on a state machine model – the ZooKeeper, The MapReduce programming model, **A case study**: the GrepTheWeb application, Clouds for science and engineering, High performance computing on a cloud, cloud computing for biological research, Social computing, digital content, and cloud computing.

### UNIT-III

**Cloud Resource Virtualization:** Virtualization, Layering and virtualization, Virtual machine monitors, Virtual machines, Performance and security isolation, Full virtualization and paravirtualization, Hardware support for virtualization, **Case study:** *Xen* -a VMM based on paravirtualization, Optimization of network virtualization in *Xen* 2.0, *vBlades* -paravirtualization targeting a *x86-64* Itanium processor, A performance comparison of virtual machines, The darker side of virtualization, Software fault isolation.

## UNIT-IV

**Cloud Resource Management and Scheduling:** Policies and mechanisms for resource management, Applications 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, A utility-based model for cloud-based web services, Resource bundling, combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, fair queuing, Start time fair queuing, Cloud scheduling subject to deadlines, Scheduling mapreduce applications subject to deadlines.

## UNIT-V

**Storage systems:** Storage models, file systems, databases, DFS, General parallel File system, GFS, Apache Hadoop, Locks & Chubby, TPS & NOSQL databases, Bigdata, Mega store. **Cloud security:** Risks, Security, privacy and privacy impacts assessments, Trust, VM Security, Security of virtualization, Security risks in shared images.

**Text Book:**


1. Dan Marinescu, Cloud Computing: Theory and Practice, 1st edition, MK Publishers, 2013.


**References:**


1. Kai Hwang, Jack Dongarra, Geoffrey Fox, Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, 1st edition, MK Publishers, 2012.
2. Anthony T. Velte, Toby J. Velete, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw Hill, 2010.


**Course Outcomes (COs):**

At the end of the course, students will be able to -

1. Describe different aspects of cloud computing including delivery models & services. (PO-1,5,6,7,8,9,10,11,12)(PSO-3)
2. Describe various cloud computing applications & paradigms. (PO-1,2,4,5,9,10,11,12) (PSO-1,3)
3. Illustrate cloud resource virtualization strategies with case studies. (PO-1,5)(PSO-1,3)
4. Describe cloud resource management and scheduling policies and mechanisms. (PO-1,2,3,4,5,7)(PSO-1,3)
5. Discuss cloud storage models and security issues. (PO-1,2,3,5,6) (PSO-1,3)

# SOFT COMPUTING

**Course Code: ISED3** **Credit: 4:0:0:0**
**Prerequisite: Nil** **Contact Hours: 56L**
**Course Coordinator: Ms. Rajeshwari S B**

## Course Content:

### UNIT-I

**Introduction:** Neural networks, Fuzzy logic, Genetic algorithms, Hybrid systems,**Artificial Neural Networks:** Fundamental concept, Evolution, Basic model of ANN, Important terminologies of ANN, MP neuron, Hebb Network

### UNIT-II

**Supervised Learning Network:** Perceptron Networks, Adaptive linear neuron, multiple adaptive linear neurons, Back propagation Network.

### UNIT-III

**Introduction to Fuzzy logic, classical sets and fuzzy sets:** Classical sets, Fuzzy sets. **Classical relations and fuzzy relations:** Cartesian product of relation, Classical relation, Fuzzy relations, Tolerance and equivalence relations. **Membership functions**: Features, Fuzzification, methods of membership value assignments.

### UNIT-IV

**Defuzzification:** Lambda-cuts for fuzzy sets, Lambda-cuts for fuzzy relations, Defuzzification methods. Fuzzy decision making: Individual, multiperson, multiobjective, multiattibute, and fuzzy Bayesian decision making

### UNIT-V

**Genetic algorithms:** Introduction, Basic operations, Traditional algorithms, Simple GA, General genetic algorithms, the schema theorem, Genetic programming, applications.

**Text Books:**


1. Principles of Soft computing, S N Sivanandam, Deepa S. N, Wiley, India, (Chapters 1, 2, 3(Up to 3.5), 7, 8, 9, 10, 13, 15 (up to 15.6 & 15.9,15,10).
2. Neuro-fuzzy and soft computing, J.S.R. Jang, C.T. Sun, E. Mizutani, PHI (EEE edition) ISBN: 978-81-203-2243-1

**Course Outcomes (COs):**

At the end of the course, students will be able to-

1. Identify and describe soft computing techniques and their roles in building intelligent machines (PO1,3,4)(PSO-1,2)
2. Identify the components and building block hypothesis of Genetic algorithm. (PO1,3,4) (PSO-1,2)
3. Examine the features of neural network and its applications. (PO1,3,4) (PSO-1,2)
4. Design Genetic algorithm to solve optimization problem. (PO1,3,4) (PSO-1,2)
5. Describe Neuro Fuzzy system for clustering and classification. (PO1,3,4) (PSO-1,2)

# DATA SCIENCE

**Course Code: ISEE1** **Credit: 4:0:0:0**
**Prerequisite: Nil** **Contact Hours: 56L**
**Course Coordinator: Dr. Krishnaraj P M**

## Course Content:

### UNIT-I

**Introductions to Data Science-** A Statistical Approach, Descriptive statistics, Cumulative distribution functions, Continuous distributions, Probability

### UNIT-II

**Statistics for data science -** Operations on distributions, Hypothesis testing, Estimation, Correlation

### UNIT-III

**Supervised Learning-** Classification and Regression, Generalization, Over fitting and under fitting, Supervised Machine learning algorithms- K-Nearest Neighbor, Linear models, Naive Bayes Classifiers, Decision trees, Random forest

### UNIT-IV

**Unsupervised learning**- Types of Unsupervised Learning, Challenges, Dimensionality Reduction- Principal Component Analysis, Clustering - k-Means Clustering, Agglomerative Clustering, DBSCAN

### UNIT-V

**Interactive graphics-** Visualizing Time Series Data, Moving Bubble Charts to show clustering and Distributions, Animation Transition Maps, Interactive Bee swarm Plots, Interactive Heat map, Searchable time series Charts

**Text Books/Reference Books:**


1. Think Stats: Probability and Statistics for Programmers, Version 1.6.0, Allen B. Downey, Green Tea Press
2. Introduction to Machine Learning with Python, A guide for Data Scientists, Andreas C. Müller & Sarah Guido, O'Reilly Publications
3. Interactive Graphics - Online ref: http://flowingdata.com/category/tutorials/

**Course Outcomes (COs):**

At the end of the course, students will be able to-

1. Apply the statistical principles required for Data Science (PO-1)(PSO-1)
2. Apply the different Testing and Estimation techniques on data (PO-1, 2, 3)(PSO-1, 2)
3. Analyze the different supervised learning algorithms (PO-2, 3, 4)(PSO-1, 2)
4. Apply the unsupervised learning algorithms for data science (PO- 2, 3, 4) (PSO-1, 2)
5. Develop interactive graphics for data exploration (PO-3, 4, 5)(PSO-1, 2)

# MOBILE COMPUTING

**Course Code: ISEE2** **Credit: 4:0:0:0**
**Prerequisite: Nil** **Contact Hours: 56L**
**Course Coordinator: Dr. Vijaya Kumar B.P**

## Course Content:

### UNIT-I

**Introduction:** Challenges in mobile computing, coping with uncertainties, resource poorness, bandwidth, etc. Cellular architecture, co-channel interference, frequency, reuse, capacity increase bu cell splitting. **Evolution of mobile system**: CDMA, FDMA, TDMA, GSM. Wireless LAN: IEEE 802.11.

### UNIT-II

**Mobility Management:** Cellular architecture, Co-channel interference, Mobility: handoff, types of handoffs; location management, HLR-VLR scheme, Mobile IP, Dynamic host configuration protocol, Mobile transport layer-Traditional and classical TCP.

### UNIT-III

**Databases:** Database Hoarding Techniques, Data Caching, Transactional Models, Query Processing. **Data Dissemination and Broadcasting Systems:** Communication Asymmetry, Classification of Data-Delivery Mechanisms, Data Dissemination Broadcast Models, Selective Tuning and Indexing Techniques.

### UNIT-IV

**Data Synchronization in Mobile Computing Systems**: Synchronization, Synchronization software for mobile devices, Synchronization protocols, SyncML - Synchronization language for mobile computing, Sync4J (Funambol), Synchronized Multimedia Markup Language (SMIL). Mobile Devices: **Server and Management**: Mobile agent, Application server, Gateways, Portals, Service Discovery, Device management, Mobile file systems, security.

### UNIT-V

**Support for Mobility**- File Systems, Mobile operating systems; Features, services and interfacing modules of: Windows, Android, iOS, Linux for Mobile devices.

**Text Books:**

1. Rajkamal, Mobile Computing, Oxford University Press, 2nd Edition, 2012
2. Jochen Schiller, Mobile Communications, 2nd edition, Pearson, 2003.

**Reference:**

1. Reza B, Mobile Computing Principles, Cambridge University Press, 2005

**Course Outcomes (COs):**

At the end of the course, students will be able to-

1. Describe the principles techniques and some of the analytics in mobile networks. (PO-1,2) (PSO-1,3)
2. Illustrate the concept of mobility and resource sharing in network and transport layer in mobile networks. (PO-1,2) ( PSO-1,3)
3. Analyze the database handling, data dissemination, Synchronization with respect to different Mobile Operating Systems. (PO-1,2) (PSO-1,3)
4. Describe and illustrate the mobility support using different file systems and platforms. (PO-1,2,4)
   (PSO-1,3)
5. Demonstrate the different mobile operating systems and develop mobile applications and computing models. (PO-1, 2, 3,5) (PSO-1,2,3)

## DEEP LEARNING

**Course Code: ISEE3** **Credit: 4:0:0:0**
**Prerequisite: Nil** **Contact Hours: 56L**
**Course Coordinator: Ms. Rajeshwari S B**

### Course Content:

**UNIT-I**

**Introduction:** Human brain, neuron models, neural nets as directed graphs, feedback, neural architectures, knowledge representation, connection to artificial intelligence

**UNIT-II**

**Learning Process**: Error-correction learning, memory based learning, Hebbian learning, competitive learning, Boltzmann learning, credit assignment, learning with and without a teacher, learning tasks, memory, statistical learning theory.

**UNIT-III**

**Modern practical deep neural networks:** Deep feedforward networks, regularization for deep learning, optimization for training deep models, convolutional Networks.

**UNIT-IV**

**Sequence Modelling:** Recurrent and recursive nets, practical Methodology, applications

**UNIT-V**

**Deep Learning Research:** Linear factor models, auto encoders, variational auto encoders, restricted Boltzmann machine, generative adversarial networks.

**Text Books:**


1. Simon Haykin, Neural networks: A comprehensive foundation, Second Edition, Prentice Hall, New Delhi, 1999, ISBN-81-203-2373-4.
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.


**Reference:**


1. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
2. Josh Patterson & Adam Gibson, Deep Learning – A Practitioners Approach, O'Reilly, 1st Edition 2017.

**Course Outcomes (COs):**

At the end of the course, students will be able to-

1. Describe what neural networks are, their properties, compositions and how they relate to artificial intelligence. (PO-1,2) (PSO-1,2)
2. Illustrate the many facets of the learning process and its statistical properties. (PO-1,2,5,9,10) (PSO-1,2)
3. Explain the core parametric function approximation technology that is behind all modern practical applications of deep learning. (PO-1,2,5,9,10) (PSO-1,2)
4. Demonstrate recurrent and recursive nets functionality and how practical problems can be mapped to them. (PO-1,2,5,9,10) (PSO-1,2)
5. Explicate the advanced approaches to deep learning, currently pursued by the research community (PO-1,2,5,9,10) (PSO-1,2)

# VIII SEMESTER

## INTERNSHIP

**Course Code: ISIN** **Credit: 0:0:4:0**
**Course Coordinator: Ms. Rajeshwari S B** **Contact Hours: 56P**

**Guidelines:**

- The student can do the Internship during the summer semester between $4^{th}$-$5^{th}$ semesters or between $6^{th}$-$7^{th}$ semesters.
- The student should take prior permission from the department committee before carrying out the internship.
- The duration of the Internship is one month.
- The report of the Internship needs to be submitted to the department in the $8^{th}$ semester.
- The department will constitute a committee for the evaluation of Internship of student.

**Course Outcomes (COs):**
At the end of the course, students will be able to-

1. Schedule milestones of deliverables and formulate the requirements of the proposed work. (PO-2,9,11)(PSO-1,2)
2. Apply the engineering knowledge to develop software in an industry setting. (PO-1,2,3,5) (PSO-1,2)
3. Develop the inter-personal skills required to work in a professional team. (PO-9, 10, 11) (PSO-2, 3)
4. Engage in independent study of technology required for development of software. (PO-12) (PSO-2, 3)
5. Demonstrate the project and appraise its effectiveness. (PO-10) (PSO-3)

## SENIOR PROJECT

**Course Code: ISP** **Credit: 0:0:16:0**

**Course Coordinators: Mrs. Lincy Meera Mathews & Mrs. Pratima M N** **Contact Hours: 448P**

**Project Work-flow:**

1. Students submit the initial details including broad area of work and choice of guide in a prescribed format.
2. The Project Co-ordinators along with Head of the department finalize the guide allocation process.
3. Students are given an option to change the guide with mutual consent by applying through prescribed form.
4. Students submit the Project Work Book to guide on the day of registration.
5. Problem statement is submitted to Project Co-ordinator within one week of registration.
6. Students maintain a blog and update it on weekly basis about their work.
7. Weekly meeting with guide is recorded in the workbook.
8. Guide evaluates the student on a regular basis according to the rubrics defined in the workbook for total of 50 marks which constitutes the final CIE score.
9. At the end of the semester, an exam is conducted with one internal and one external examiner for 50 marks which constitutes the final SEE score.

**Course Outcomes (COs):**

At the end of the course, students will be able to-

1. Schedule milestones and deliverables using appropriate project management techniques. (PO-9,11) (PSO-1,2)
2. Compare and contrast the available literature in the context of the project. (PO-2,12) (PSO-3)
3. Formulate, Design and Develop the software by applying the relevant guidelines (PO-1,2,3,4,5) (PSO-1,2)
4. Evaluate the quality of software by testing it using appropriate techniques (PO-4) (PSO-1,2)
5. Demonstrate the project before general public and appraise its effectiveness (PO-8, 10) (PSO-3)

## EXTRA-CURRICULAR /CO-CURRICULAR ACTIVITIES

**Course Code: EAC** **Credit: 0:0:2:0**

**Course Coordinator: Proctor**

**Co-Curricular Activities:**

i. Participation/Won Prizes in any event of the Technical Festivals at MSRIT/Outside in other institutes of State/National/International level.
ii. Delivering lectures/handling hands on sessions on technical topics in any technical event at MSRIT/Outside in other institutes of State/National/International level.
iii. Invitation to participate as a representative from the Institute to any technical event at MSRIT/Outside in other institutes of State/National/International level.
iv. Invitation to participate as referee/Expert/Judge to any technical event at MSRIT/Outside in other institutes of State/National/International level.
v. Won merit scholarships/Consultancy/award with monetary benefits/grants for any technical event at MSRIT/Outside in other institutes of State/National/International level.
vi. Entrepreneur activity like setting up a company in association with EDC cell of MSRIT.
vii. Team member/individual representing the State/Country in any technical event at the National/International events.
viii. Passing with good percentile the examinations like GATE/GRE/TOEFL etc and any other examinations of National/International repute.
ix. Placement in Tier-1 Company

**Extra-Curricular Activities:**

i. Participation/Won Prizes in any event of the Sports Festivals/Cultural in MSRIT/Outside the other institutes of State/National/International level.
ii. Representing the Institute in any sports event/cultural event at the University/State/National/International level.
iii. Invitation to participate as referee/expert advisor/official/Captain in any sports event/cultural event within/outside institute at State/National/International level.
iv. Won scholarships/grants for any sports event/cultural event within institute/outside in other institutes/State/National/International level.
v. Team member/individual representing the State/Country in any sports event/cultural event at the National/International events.
vi. Participation/Won awards/received grants through NCC/NSS/NGO activities

- Each student need to submit the evidence for the claims for the relevant categories mentioned above for evaluation to the proctor during 8th sem.

- If any student has a significant contribution in any category other than the above mentioned need to submit the report with proof

**Course Outcomes (COs):**

At the end of the course, students will be able to-

1. Develop interpersonal skills by participating in extra-curricular activities (PO-9, 10) (PSO-3)
2. Enhance knowledge of current technologies by involving in co-curricular activities. (PO-3,6,9,10) (PSO-3)
3. Demonstrate an ability to explore, learn and apply new skills independently. (PO-9, 12) (PSO-3)