



**V & VI Semester  
Scheme and Syllabus  
With effect from Academic Year 2022-23**

**Vision**

To prepare the next generation practitioners and researcher for data centric world by bringing together interdisciplinary faculty across the globe.

**Mission**

**M1:** To provide Skill Based Education to master the students in problem solving and analytical skills to enhance their niche expertise in the field Data Science

**M2:** To educate the students with latest technologies to update their knowledge in the field of Data Science

**M3:** To enable students to experience the Content Based Learning with premier quality data science education, research and industrial collaboration

**M4:** To enable students to become leaders in the Industry and Academia Nationally as well as internationally

**M5:** To guide students in research on Data Science, with the aim of having an ethical impact on society by tackling societal grand challenges

**PROGRAM OUTCOMES (POs):** Graduates of the Computer Science and Engineering – Data Science Program will be able to achieve the following

**POs:**

**PO1:** Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and Computer Science and Engineering principles to the solution of complex problems in Computer Science and Engineering.

**PO2:** Problem Analysis: Identify, formulate, research literature, and analyses complex Computer Science and Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

**PO3:** Design/Development of Solutions: Design solutions for complex Computer Science and 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 related to Computer Science and Engineering problems.

**PO5:** Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex

Computer Science and 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 Computer Science and Engineering practice.

**PO7:** Environment and Sustainability: Understand the impact of the professional Computer Science and 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 Computer Science and 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 Computer Science and 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 Computer Science and Engineering 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 Outcome (PSO)**

**PSO1:** Ability to analyse complex computing issues and apply the principles to achieve related solution.

**PSO2:** Ability to design, implement and evaluate computing based solutions to meet range of computing requirements based in the data science.

**PSO3:** Ability to effectively communicate within diverse work group related to professional framework.

#### **Program Educational Objectives (PEOs)**

**PEO 1:** To make students competent for higher studies and employable, to meet industrial requirements.

**PEO 2:** To develop students having core competence in science, mathematics and fundamentals of Data Science to address ever changing industrial requirements globally.

**PEO 3:** To create academically conducive environment to learn engineering skills in the domains such as Data Analytics, Data Modelling, Data Visualization and Allied Technologies.

**PEO 4:** To enrich students with professional ethics, leadership qualities, and entrepreneurial skills.

**PEO 5:** An ability to engage in lifelong learning for effective adaptation to technological developments.

### Fifth Semester B.E. CSE-DS – Scheme

| SL. No                                                                        | Course Code              | Course Name                         | Total Credits | L: T: P: S (Hrs./Week) | Online | Offline | Marks      |
|-------------------------------------------------------------------------------|--------------------------|-------------------------------------|---------------|------------------------|--------|---------|------------|
| 1                                                                             | <a href="#">20CDI51</a>  | Machine Learning (IC)               | 3             | 2 : 0 : 2 : 0          | -      | 100%    | 100        |
| 2                                                                             | <a href="#">20CDI52</a>  | Computer Networks (IC)              | 4             | 3 : 0 : 2 : 0          | -      | 100%    | 100        |
| 3                                                                             | <a href="#">20CDI53</a>  | Data Mining & Data Warehousing (IC) | 4             | 3 : 0 : 2 : 0          | -      | 100%    | 100        |
| 4                                                                             | <a href="#">20CDT54</a>  | Software Engineering                | 3             | 3 : 0 : 0 : 0          | -      | 100%    | 100        |
| 5                                                                             | <a href="#">20CDT55</a>  | Supply Chain management             | 3             | 3 : 0 : 0 : 0          | -      | 100%    | 100        |
| 6                                                                             | <a href="#">20CDT56X</a> | Professional Elective 1             | 3             | 3 : 0 : 0 : 0          | -      | 100%    | 100        |
| 7                                                                             | 20CDP57                  | Mini Project                        | 3             | 0 : 0 : 6 : 0          | -      | 100%    | 100        |
| 8                                                                             | 20PEC58                  | Employability Skills                | 2             | 1 : 2 : 0 : 0          | -      | 100%    | 100        |
|                                                                               |                          | <b>Total</b>                        | <b>25</b>     | <b>18 : 2 : 12 : 0</b> | -      |         | <b>800</b> |
| <b>Note: Internship has to be completed compulsorily before VIII Semester</b> |                          |                                     |               |                        |        |         |            |

### Professional Elective 1

| SL. No | Course Code              | Course Name              |
|--------|--------------------------|--------------------------|
| 1      | <a href="#">20CDT561</a> | Wireless sensor networks |
| 2      | <a href="#">20CDT562</a> | Internet of Things       |
| 3      | <a href="#">20CDT563</a> | Information Retrieval    |

### Sixth Semester B.E. CSE-DS – Scheme

| SL. No | Course Code | Course Name                          | Total Credits | L: T: P: S (Hrs./Week) | Online | Offline | Marks      |
|--------|-------------|--------------------------------------|---------------|------------------------|--------|---------|------------|
| 1      | 20CDI61     | Android Application Programming (IC) | 4             | 3 : 0 : 2 : 0          | -      | 100%    | 100        |
| 2      | 20CDI62     | Big Data Analytics (IC)              | 3             | 2 : 0 : 2 : 0          | -      | 100%    | 100        |
| 3      | 20CDI63     | Advanced Web Programming (IC)        | 4             | 3 : 0 : 2 : 0          | -      | 100%    | 100        |
| 4      | 20CDT64     | Cloud Computing                      | 3             | 3 : 0 : 0 : 0          | -      | 100%    | 100        |
| 5      | 20CDT65X    | Professional Electives 2             | 3             | 3 : 0 : 0 : 0          | -      | 100%    | 100        |
| 6      | 20CDT66X    | Professional Elective 3              | 3             | 3 : 0 : 0 : 0          | -      | 100%    | 100        |
| 7      | 20ENV67     | Environmental Studies                | 1             | 1 : 0 : 0 : 0          | -      | 100%    | 100        |
| 8      | 20CDT68     | Research Methodology                 | 2             | 2 : 0 : 0 : 0          | -      | 100%    | 100        |
| 9      | 20PET69     | Employability Skills                 | 2             | 1 : 2 : 0 : 0          | -      | 100%    | 100        |
|        |             | <b>Total</b>                         | 25            | 21 : 2 : 6 : 0         |        |         | <b>900</b> |

**Note: Internship has to be completed compulsorily before VIII Semester**

#### Professional Elective 2

| SL. No | Course Code              | Course Name                            |
|--------|--------------------------|----------------------------------------|
| 1      | <a href="#">20CDT651</a> | Software Testing and Quality Assurance |
| 2      | <a href="#">20CDT652</a> | Artificial Intelligence                |
| 3      | <a href="#">20CDT653</a> | Block chain Technology                 |

#### Professional Elective 3

| SL. No | Course Code              | Course Name              |
|--------|--------------------------|--------------------------|
| 1      | <a href="#">20CDT661</a> | Digital Image Processing |
| 2      | <a href="#">20CDT662</a> | Computer Vision          |
| 3      | <a href="#">20CDT663</a> | Devops                   |
| 4      | <a href="#">20CDT664</a> | Unix Shell Programming   |

## MACHINE LEARNING (IC)

| Course Code | L: T : P : S  | Credits | Exam Marks    | Exam Duration | Course Type |
|-------------|---------------|---------|---------------|---------------|-------------|
| 20CDI51     | 2 : 0 : 2 : 0 | 3       | CIE:50 SEE:50 | 3 Hours       | PCI         |

**Prerequisites:** Linear algebra, Trigonometry, Statistics, Calculus, JAVA / Python Programming.

### Course Objectives:

#### As a student will be able to learn:

- The basics of Machine learning with examples.
- Decision tree algorithms and classify supervised, unsupervised and reinforcement learning algorithms.
- Artificial Neural Networks with multi perceptron's.
- How to evaluate hypothesis for learning and Bayesian algorithms?
- Probability learning theory and hypothesis learning.

### Syllabus

#### Module – I

**Introduction:** Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning. **Concept Learning:** Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

**08 Hours**

#### Module – II

**Decision Tree Learning:** Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

**08 Hours**

#### Module – III

**Artificial Neural Networks:** Introduction, Neural Network representation, Appropriate problems, Perceptron's, Back propagation algorithm.

**08 Hours**

#### Module – IV

**Bayesian Learning:** Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm.

**08 Hours**

#### Module – V

**Evaluating Hypothesis:** Motivation, estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms. **Instance Based Learning:** Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning.

**08 Hours**

**Course Outcomes:****After studying this course, the students will be able to:**

- Choose the learning techniques and investigate concept learning.
- Identify the characteristics of decision tree and solve problems associated with.
- Apply effectively neural networks for appropriate applications.
- Apply Bayesian techniques and derive effectively learning rules.
- Evaluate hypothesis and investigate instant based learning and reinforced learning.

**Text Books:**

1. Tom M. Mitchell, “Machine Learning”, (Chapters: 1.1–1.3, 2.1-2.5, 2.7, 3.1-3.7, 4.1–4.6, 6.1–6.6, 6.9, 6.11, 6.12, 5.1-5.6, 8.1-8.5, 13.1-13.3), India Edition, 2013, McGraw Hill Education.

**Reference Books:**

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, “The Elements of Statistical Learning”, 2<sup>nd</sup> Edition, Springer series in statistics.
2. Ethem Alpaydin, “Introduction to Machine Learning”, 2<sup>nd</sup> Edition, MIT press.

**Reference Online Resources:**

1. <https://www.geeksforgeeks.org/machine-learning/>
2. <https://www.javatpoint.com/machine-learning>

**List of Programs****Part A**

1. Write a R program to compute
  - Central Tendency Measures: Mean, Median, Mode
  - Measure of Dispersion: Variance, Standard Deviation
2. Write a R program to implement Simple Linear Regression, Decision tree, KNN, Logistic Regression, K-Means Clustering.

**Part B**

Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

## COMPUTER NETWORKS (IC)

| Course Code    | L: T : P : S         | Credits  | Exam Marks           | Exam Duration  | Course Type |
|----------------|----------------------|----------|----------------------|----------------|-------------|
| <b>20CDI52</b> | <b>3 : 0 : 2 : 0</b> | <b>4</b> | <b>CIE:50 SEE:50</b> | <b>3 Hours</b> | <b>PCI</b>  |

### Course Learning Objectives

- CLO 1.** Understand the basics principle and standards for data Communication, Network Types, Topologies and Protocols.
- CLO 2.** Recognize the data link design issues and various data link protocols used for data transmission.
- CLO 3.** Familiarize the design, working and implementation of Internet protocols as well as routing protocols responsible for network layer communication.

### Syllabus

#### Module- I: INTRODUCTION AND PHYSICAL LAYER

Network hardware, Network software, Reference models - OSI, TCP/IP; Example networks – Internet; Wireless LANs - 802.11.

Physical Layer - Guided transmission media, Wireless transmission, Switching – Circuit switches, Packet switching.

**08 Hours**

#### Module - II: DATA LINK LAYER AND MEDIUM ACCESS CONTROL SUBLAYER

**Data Link Layer:** Data link layer design issues, Error detection and correction - CRC, Hamming codes; Elementary data link protocols, Sliding window protocols.

**Medium Access Control Sub layer:** ALOHA, Carrier sense multiple access protocols, Collision free protocols, Ethernet.

**08 Hours**

#### Module - III: NETWORK LAYER

Network layer design issues, Routing algorithms - Shortest path algorithm, Flooding, Distance vector routing, Hierarchical routing, Broadcast routing, Multicast routing, Congestion control algorithms, Network layer in the internet - The IP version 4 protocol, IP addresses, IP version 6, Internet control protocols, OSPF, BGP.

**08 Hours**

#### Module - IV: TRANSPORT LAYER

**UDP**–Segment header, Remote procedure call, Real-time transport protocols; **TCP** – service model, Protocol, Segment header, Connection establishment, Connection release, Sliding window, Timer management, Congestion control.

**08 Hours**

#### Module - V: APPLICATION LAYER

Domain Name System (DNS) - Name space, Domain resource records, Name servers; Electronic mail - Architecture and services, User agent, Message formats, Message transfer, The World Wide Web - Architectural overview, HTTP, FTP.

**08 Hours**

#### Laboratory Component:

1. Study and submission of Report on Network Hardware Components, Network cables and Servers.
2. Implement the following data link layer framing methods Using Java.
  - i) Character count
  - ii) Character stuffing
  - iii) Bit stuffing

3. Design and develop a Java program to compute checksum for the given frame 1101011011 using CRC-12, CRC-16, and CRC-CCIP. Display the actual bit string transmitted. Suppose any bit is inverted during transmission. Show that this error is detected at the receiver's end.
4. Implement Dijkstra's algorithm to compute the shortest path from Source to Destination in the network using Java
5. Implementation of Basic Network Commands and Network Configuration Commands using Command Prompt.
6. Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped using NS2.
7. Build a LAN with Hubs and Switches and perform Simulation of LAN using packet Tracer
8. Build a Multi-LAN with Router Configuration and perform Simulation of Multi-LAN using packet Tracer.
9. Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion using NS2.
10. Implementation of RIP using Packet Tracer
11. Simulation of OSPF Protocol using Packet Tracer
12. Configure and simulation of a VLAN using Packet Tracer

**COURSE OUTCOMES:**

**After successful completion of this course, the students will be able to:**

- Gain Knowledge on the principles and standards of Reference Models, types of network topologies, Functions of layers and protocols.
- Analyze Subnetting and routing algorithms for finding optimal paths in networks.
- Develop and Solve problems related to flow control, error control and congestion control in data transmission.
- Simulate the Network Topologies using the Packet Tracer Tool to analyze packet Transmission.
- Apply Ethical principles and standards for developing network-based solutions.

**Text Books**

1. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, Pearson, 5<sup>th</sup> Edition, 2015.

**Reference:**

1. Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill, 5th Edition, 2013.
2. James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach, Pearson, 7th Edition, 2017.

**E-Resources:**

- <https://archive.org/details/Data.Communications.and.Networking.5th.Edition>
- <https://www.cisco.com/c/en/us/solutions/smallbusiness/resourcecenter/networking/networking-basics.html>.
- <http://ptgmedia.pearsoncmg.com/images/9780133814743/samplepages/9780133814743.pdf>



## DATA MINING & DATA WAREHOUSING (IC)

| Course Code | L:T:P:S | Credits | Exam Marks    | Exam duration | Course Type |
|-------------|---------|---------|---------------|---------------|-------------|
| 20CDI53     | 3:0:2:0 | 4       | CIE:50 SEE:50 | 3 hours       | PCI         |

### Course Objectives:

**This course will enable students to,**

- Identify the scope and necessity of Data Mining and Warehousing for society
- Describe various Data Models and Design Methodologies of Data Warehousing destined to solve the root problems
- Understand various Tools of Data Mining and their Techniques to solve the real-time problems
- Learn how to analyze the data, identify the problems, and choose the relevant algorithms to apply.
- Assess the Pros and Cons of various algorithms and analyze their behavior on real datasets.

### Syllabus

#### Module – I

**Data Mining: Introduction** - Steps in KDD - System Architecture – Types of data -Data mining functionalities - Classification of data mining systems - Integration of a data mining system with a data warehouse - Issues - Data Preprocessing – Data Mining Application.

**08 Hours**

#### Module – II

**Data Warehousing:** Data warehousing components - Building a data warehouse - Multi Dimensional Data Model - OLAP Operation in the Multi- Dimensional Model - Three Tier Data Warehouse Architecture - Schemas for Multi-dimensional data Model - Online Analytical Processing (OLAP) - OLAP Vs OLTP Integrated OLAM and OLAP Architecture.

**08 Hours**

#### Module – III

**Association Rule Mining:** Mining frequent patterns - Associations and correlations - Mining Methods Finding Frequent item set using Candidate Generation - Generating Association Rules from Frequent Item sets - Mining Frequent item set without Candidate Generation Mining various kinds of association rules - Mining Multi-Level Association Rule.

**08 Hours**

#### Module – IV

**Classification and Prediction:** Classification and prediction - Issues Regarding Classification and Prediction - Classification by Decision Tree Induction - Bayesian classification – Bayes’ Theorem - Naïve Bayesian Classification - Bayesian Belief Network - Rule based classification - Classification by Back propagation - Support vector machines - Prediction-Linear Regression.

**08 Hours**

#### Module – V

**Clustering, Applications and Trends in Data Mining:** Cluster analysis - Types of data in Cluster Analysis- Categorization of major clustering methods - Partitioning methods– Hierarchical methods - Density-based methods - Grid-based methods - Model based clustering methods -Constraint Based cluster analysis - Outlier analysis - Social Impacts of Data Mining.

**08 Hours**

**DATA G MINING AND DATA WAREHOUSIN LAB INDEX**

| <b>S.No</b> | <b>Name of the Experiment</b>                                                                                                                                                           |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1           | Installation of WEKA Tool                                                                                                                                                               |
| 2           | Creating new Arff File<br><a href="https://machinelearningmastery.com/load-csv-machine-learning-data-weka/">https://machinelearningmastery.com/load-csv-machine-learning-data-weka/</a> |
| 3           | Pre-Processes Techniques on Data Set                                                                                                                                                    |
|             | Pre-process a given dataset based on Handling Missing Values                                                                                                                            |
| 4           | Generate Association Rules using the Apriori Algorithm                                                                                                                                  |
| 5           | Generating association rules using fpgrowth algorithm                                                                                                                                   |
| 6           | Build a Decision Tree by using J48algorithm                                                                                                                                             |
| 7           | Naïve bayes classification on a givendata set                                                                                                                                           |

**Course Outcomes:**

**On completion of this course, the students will be able to,**

**CO1:** Assess Raw Input Data and process it to provide suitable input for a range of data mining algorithm

**CO2:** Design and Modelling of Data Warehouse

**CO3:** Discover interesting pattern from large amount of data

**CO4:** Design and Deploy appropriate Classification Techniques

**CO5:** Able to cluster high dimensional data

**Text Books:**

- 1) Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", 2ndEdition, Elsevier, 2007,ISBN-10 -9789380931913,ISBN-13-978-9380931913.
- 2) Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Published by Tata McGraw-Hill Education Pvt. Ltd., 2004, ISBN 10: 0070587418 / ISBN 13: 9780070587410.
- 3) Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Person Education, 2007.ISBN-13-9788131714720,ISBN-10-8131714720.
- 4) G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006,ISBN-13:9788120350021,ISBN - 10 :8120350022.
- 5) Daniel T.Larose, "Data Mining Methods and Models", Publisher-John Wiley & Sons, 2006, 2006,ISBN 8126507764, 9788126507764.

**References:**

1. Pieter Adriagus, DolfZantinge "DataMining", Addison-WesleyPublisher, Pearson education,2007, ISBN978-81-317-0717-3.
2. Sam Anahory, Dennis Murray "Data Warehousing in the Real World", Pearson education,ISBN978-81-317-0459-2,2009.

**E-Resources:**

- 1) <https://study.com/academy/lesson/data-warehousing-and-data-mining-information-for-business-intelligence.html>
- 2) <http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-Series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.pdf>.
- 3) <https://www-users.cs.umn.edu/~kumar001/dmbook/index.php>

| <b>SOFTWARE ENGINEERING</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                |                      |                      |                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------------|----------------------|--------------------|
| <b>Course Code</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>L:T:P:S</b> | <b>Credits</b> | <b>Exam marks</b>    | <b>Exam Duration</b> | <b>Course Type</b> |
| <b>20CDT54</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>3:0:0:0</b> | <b>3</b>       | <b>CIE:50 SEE:50</b> | <b>3 hours</b>       | <b>PCC</b>         |
| <b>Pre-requisite:</b> Software Development Life Cycle (SDLC), Scripting Language, Version Control Tool, Database                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                |                      |                      |                    |
| <b>Course Objectives:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |                |                      |                      |                    |
| <p><b>This course will enable students to,</b></p> <ul style="list-style-type: none"> <li>• Recollect Software process models and compare their applicability</li> <li>• Acquire Software Requirement Analysis and Specification</li> <li>• Acquire Systematic software design procedure for Object Oriented and Real Time software</li> <li>• Interpret how to develop and test a software application/product</li> <li>• Cognize software cost estimation techniques and to know project management</li> </ul>                                                                                                                                                     |                |                |                      |                      |                    |
| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                |                      |                      |                    |
| <b>Module – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                |                      |                      |                    |
| <p><b>Introduction to Software Engineering &amp; Software Process Model:</b> what is Software Engineering (SE), Difference between SE and System Engineering. The evolving role of software – the changing nature of software- Life cycle models [Text Book-1]</p> <p><b>Software Process Model:</b> - Water fall, Incremental, Spiral, Evolutionary, Prototyping Concurrent development – Specialized Process Models: Component-Based Development, The Formal Methods Model, and Aspect-Oriented Software Development [Text Book-2]</p> <p style="text-align: right;"><b>08 Hours</b></p>                                                                           |                |                |                      |                      |                    |
| <b>Module – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                |                      |                      |                    |
| <p><b>Software Requirement Analysis and Specifications:</b> Functional and Non-Functional, User, System – Requirement, Interface specification, software requirement documents.[Text Book-1]</p> <p><b>Requirement Engineering Process:</b> Feasibility Studies, Requirements Elicitation and analysis, Requirement Validation and Requirement management. [Text Book-1]</p> <p><b>System Model:</b> Context Model, Behavioral model, Data Model, Object Model, Structured Model [Text Book-1]</p> <p style="text-align: right;"><b>08 Hours</b></p>                                                                                                                 |                |                |                      |                      |                    |
| <b>Module – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                      |                      |                    |
| <p><b>Software Design:</b> Architectural design, Architectural Design Document, Client Server Architecture Distributed Object Architecture. [Text Book-1]</p> <p><b>Object Oriented Design:</b> Object Oriented Design Process, Design Evolution, [Text Book-1]</p> <p><b>Real time Software Design:</b> System Design, Real time Operating System, Monitoring and Control System and Data Acquisition System [Text Book-1]</p> <p style="text-align: right;"><b>08 Hours</b></p>                                                                                                                                                                                    |                |                |                      |                      |                    |
| <b>Module – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                |                      |                      |                    |
| <p><b>Software Development and Testing:</b> Rapid Software Development-Agile Methods, Extreme Programming, Rapid Application Development, [Text Book-1]</p> <p><b>Software Reuse:</b> Reuse landscape, Design Pattern, Application system Reuse [Text Book-1]</p> <p><b>Verification and Validation;</b> Planning Verification &amp; Validation, Software Inspection, Verification and formal Methods. [Text Book-1]</p> <p><b>Software Testing:</b> Approaches of Software Testing, Software Testing Strategies, Test Strategies for Object Oriented Software-Unit Testing, Integration Testing [Text Book-2]</p> <p style="text-align: right;"><b>08 Hours</b></p> |                |                |                      |                      |                    |
| <b>Module – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                |                      |                      |                    |

**Software Cost Estimation and Project Management:** Software cost estimation - COCOMO model – Estimation Techniques, Project Duration and Staffing, [Text Book-1]

**Quality management:** Quality Assurance and Standard, Quality Planning and Quality Control [Text Book-1]

**Configuration Management:** Configuration Management Planning, Change Management, Version and Release Management [Text Book-1]

**Emerging Technology:** Security Concepts, Security Risk Management. [Text Book-1]

**08 Hours**

**Course Outcomes:**

**On completion of this course, the students will be able to,**

- Identify and apply Software life cycle and process models to compare their applicability
- Analyze the types of requirements and summarize Requirement Engineering for various System models
- Design data, functional and behavioural model for any given software requirement
- Apply appropriate techniques and Test the software application/product for a given problem
- Comprehend concepts of software quality assurance and software configuration management

**Text Books:**

1. Ian Sommerville, "Software Engineering", 8th Edition, ISBN-10-9332582696, ISBN-13- 978-9332582699, Pearson Education (24 May 2017).
2. Rogar Pressman, "Software Engineering and Application", 7th Edition, McGraw Hill Education Publication, 2009, ISBN-13:9789339212087.

**REFERENCES**

1. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010, ISBN: 9788126523115
2. Pfleeger and Lawrance, "Software Engineering: Theory and Practice" Pearson Education, 2nd Edition, 2001.
3. Stephan Schach, "Software Engineering", Tata McGraw Hill, 2007.
4. Rajib Mall, "Fundamentals of Software Engineering", 3rd Edition, PHI Learning Private Limited, 2009, .ISBN-10-9788120338197, ISBN-13-978-8120338197.
5. Kelkar S.A., "Software Engineering", ISBN 10: 8120332725, ISBN 13: 9788120332720, Publisher: Prentice-Hall of India Pvt. Ltd, 2007.

**E-Resources:**

1. <https://www.pearson.com/us/higher-education/product/Sommerville-Software-Engineering-9th-Edition/9780137035151.html>.
2. <https://www.abebooks.com/9788120332720/Software-Engineering-Kelkar-S-A-8120332725/plp>
3. <https://www.wileyindia.com/pankaj-jalote-s-software-engineering-a-precise-approach.html>

## SUPPLY CHAIN MANAGEMENT

| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | L:T:P:S | Credits | Exam Marks    | Exam Duration | Course Type |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|---------------|---------------|-------------|
| 20CDT55                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 3:0:0:0 | 3       | CIE:50 SEE:50 | 3 hours       | PCC         |
| <b>Course Objectives:</b><br>The objectives of this course are <ul style="list-style-type: none"> <li>• To provide Knowledge on logistics and supply chain management</li> <li>• To enable them in designing the distribution network</li> <li>• To train the students in knowing the supply chain Analysis</li> <li>• Impart knowledge on Dimensions of logistic</li> <li>• To know the recent trends in supply chain management</li> </ul>                                                     |         |         |               |               |             |
| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |         |               |               |             |
| <b>Module – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |         |               |               |             |
| <b>Introduction to Supply Chain Management:</b> Supply chain - objectives - importance - decision phases - process view competitive and supply chain strategies - achieving strategic fit – supply chain drivers - obstacles – framework – facilities -inventory-transportation-information-sourcing-pricing.                                                                                                                                                                                    |         |         |               |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |         |               |               |             |
| <b>Module – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |         |         |               |               |             |
| <b>Designing the distribution network:</b> Role of distribution - factors influencing distribution - design options - e-business and its impact distribution networks in practice –network design in the supply chain - role of network -factors affecting the network design decisions modeling for supply chain. Role of transportation - modes and their performance – transportation infrastructure and policies - design options and their trade-offs tailored transportation.              |         |         |               |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |         |               |               |             |
| <b>Module – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |         |               |               |             |
| <b>Supply Chain Analysis:</b> Sourcing - In-house or Outsource - 3rd and 4th PLs - supplier scoring and assessment, selection - design collaboration - Procurement process - Sourcing planning and analysis. Pricing and revenue management for multiple customers, perishable products, seasonal demand, bulk and spot contracts.                                                                                                                                                               |         |         |               |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |         |               |               |             |
| <b>Module – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |         |         |               |               |             |
| <b>Dimensions of Logistics:</b> A macro and micro dimension - logistics interfaces with other areas - approach to analyzing logistics systems - logistics and systems analysis - techniques of logistics system analysis - factors affecting the cost and importance of logistics. Demand Management and Customer Service Outbound to customer logistics systems - Demand Management –Traditional Forecasting CPFRP - customer service - expected cost of stock outs - channels of distribution. |         |         |               |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |         |               |               |             |
| <b>Module – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |         |               |               |             |
| <b>Recent Trends in Supply Chain Management-Introduction,</b> New Developments in Supply Chain Management, Outsourcing Supply Chain Operations, Co-Maker ship, The Role of E-Commerce in Supply Chain Management, Green Supply Chain Management, Distribution Resource Planning, World Class Supply Chain Management.                                                                                                                                                                            |         |         |               |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |         |               |               |             |

**Course Outcomes:**

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

- Understand the strategic role of logistic and supply chain management in the cost reduction and offering best service to the customer
- Understand Advantages of SCM in business
- Apply the knowledge of supply chain Analysis
- Analyze reengineered business processes for successful SCM implementation
- Evaluate Recent trend in supply chain management

**TEXT BOOKS:**

- Sunil Chopra and Peter Meindl, Supply Chain Management – “Strategy, Planning and Operation”, 3<sup>rd</sup> Edition, Pearson/PHI,2007.
- Supply Chain Management by Janat Shah Pearson Publication2008.

**REFERENCE BOOKS:**

- A Logistic approach to Supply Chain Management – Coyle, Bardi, Longley, Cengage Learning,1/e
- Donald J Bowersox, Dand J Closs, M Bixby Coluper, “Supply Chain Logistics Management”, 2<sup>nd</sup> edition, TMH,2008.
- Wisner, Keong Leong and Keah-Choon Tan, “Principles of Supply Chain Management A Balanced Approach”, Cengage Learning,1/e
- David Simchi-Levi et al, “Designing and Managing the Supply Chain” –Concepts

| <b>WIRELESS SENSOR NETWORKS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                      |                      |                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------------|----------------------|--------------------|
| <b>Course Code</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>L:T:P:S</b> | <b>Credits</b> | <b>Exam Marks</b>    | <b>Exam duration</b> | <b>Course Type</b> |
| <b>20CDT561</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>3:0:0:0</b> | <b>3</b>       | <b>CIE:50 SEE:50</b> | <b>3 Hours</b>       | <b>PEC</b>         |
| <b>Prerequisites:</b> Basic knowledge of Data Communication Networks.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |                |                      |                      |                    |
| <b>Descriptions:</b><br>Wireless sensor networks (WSNs) refer to networks of spatially dispersed and dedicated sensors that monitor and record the physical conditions of the environment and forward the collected data to a central location provide an interdisciplinary, integrative overview of latest development in the domain of smart farming.                                                                                                                                                                          |                |                |                      |                      |                    |
| <b>Course Objectives:</b><br>This course will enable students to: <ol style="list-style-type: none"> <li>1. To make students understand the basics of Wireless Sensor Networks.</li> <li>2. To familiarize with learning of the Architecture of WSN.</li> <li>3. To understand the concepts of Networking and Networking in WSN.</li> <li>4. To study the design consideration of topology control and solution to the various problems.</li> <li>5. To introduce the hardware and software platforms and tool in WSN</li> </ol> |                |                |                      |                      |                    |
| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                      |                      |                    |
| <b>Module – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |                |                      |                      |                    |
| Overview of Wireless Sensor Networks- Single-Node Architecture - Hardware Components - Network Characteristic s - unique constraints and challenges, Enabling Technologies for Wireless Sensor Networks Types of wireless sensor networks.                                                                                                                                                                                                                                                                                       |                |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                      |                      |                    |
| <b>Module – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                |                      |                      |                    |
| Architectures - Network Architecture, Sensor Networks - Scenarios - Design Principle, Physical Layer and Transceiver Design Considerations, Optimization Goals and Figures of Merit, Gateway Concepts, Operating Systems and Execution Environments - introduction to Tiny OS and nest Internet to WSN Communication.                                                                                                                                                                                                            |                |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                      |                      |                    |
| <b>Module – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                |                      |                      |                    |
| Networking Sensors - MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts – SMAC, BMAC Protocol, IEEE 802.15.4 standard and ZigBee, the Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols Energy Efficient Routing, Geographic Routing.                                                                                                                                                                          |                |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                      |                      |                    |
| <b>Module – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                |                      |                      |                    |
| Infrastructure Establishment - Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.                                                                                                                                                                                                                                                                                                                                                                                     |                |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                      |                      |                    |
| <b>Module – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |                |                      |                      |                    |
| Sensor Network Platforms and Tools –Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node level software platforms, Node level Simulators, State centric programming.                                                                                                                                                                                                                                                                                                                                              |                |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                |                      |                      |                    |

**Course Outcomes:**

1. Understand challenges and technologies for wireless networks
2. Understand architecture and sensors
3. Describe the communication, energy efficiency, computing, storage and transmission
4. Establishing infrastructure and simulations
5. Explain the concept of programming the in WSN environment

**Text books:**

1. Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks", JohnWiley, 2005.
2. Feng Zhao & Leonidas J.Guibas, "Wireless Sensor Networks An Information Processing Approach", Elsevier, 2007.
3. Walteneus Dargie , Christian Poellabauer, "Fundamentals of Wireless Sensor Networks Theoryand Practice", John Wiley & Sons Publications, 2011

**Reference books:**

1. Kazem Sohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks Technology, Protocols, and Applications", John Wiley, 2007.
2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003

**Web Links for Reference:**

1. <https://nptel.ac.in/courses/106/105/106105160/>
2. [https://onlinecourses.swayam2.ac.in/arp19\\_ap52/preview](https://onlinecourses.swayam2.ac.in/arp19_ap52/preview)
3. <https://cse.iitkgp.ac.in/~smisra/course/wasn.html>

**Research Papers:**

1. I.F. Akyildiz, W. Su, Y. Sankarasubramaniam and E. Cayirci, "Wireless sensor networks: a survey", Computer Networks, 38 (2002) 393–422.
2. EikoYoneki and Jean Bacon, "A survey of Wireless Sensor Network technologies: research trends and middleware's role", Technical Report, University of Cambridge, September 2005.



| <b>INTERNET OF THINGS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |                |                      |                      |                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------------|----------------------|--------------------|
| <b>Course Code</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>L:T:P:S</b> | <b>Credits</b> | <b>Exam Marks</b>    | <b>Exam Duration</b> | <b>Course Type</b> |
| <b>20CDT562</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>3:0:0:0</b> | <b>3</b>       | <b>CIE:50 SEE:50</b> | <b>3 hours</b>       | <b>PEC</b>         |
| <b>Course Objectives:</b><br><b>This course will enable the students to:</b> <ul style="list-style-type: none"> <li>➤ Gain the knowledge about IOT concepts.</li> <li>➤ Know different Application protocols for IOT.</li> <li>➤ Understand methods of deploying smart objects and connect them to network.</li> <li>➤ Know the diverse methods of deploying smart objects and connect them to network.</li> <li>➤ Learn about genesis and impact of IOT applications</li> </ul>          |                |                |                      |                      |                    |
| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                      |                      |                    |
| <b>Module – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |                |                      |                      |                    |
| <b>Introduction to Internet of Things:</b> Definition and Characteristics of IOT, Physical Design of IOT– IOT Protocols, IOT communication models, IOT Communication APIs IOT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IOT Levels and Templates. Overview of Microprocessor and Microcontroller, Basics of Sensors and actuators.                                                                 |                |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                      |                      |                    |
| <b>Module – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                |                      |                      |                    |
| <b>Prototyping IoT Objects Using Microprocessor/Microcontroller:</b> Working principles of sensors and actuators – Setting up the board - Programming for IOT – Reading from Sensors, Communication: Connecting microcontroller with mobile devices – communication through Bluetooth, Wi-Fi, Ethernet, Zigbee, RFID, NFC.                                                                                                                                                                |                |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                      |                      |                    |
| <b>Module – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                |                      |                      |                    |
| <b>IOT Architecture and Protocols:</b> Architecture Reference Model- Introduction, Reference Model and architecture, IOT reference Model. Protocols- 6 Low PAN, RPL, CoAP, MQTT.                                                                                                                                                                                                                                                                                                          |                |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                      |                      |                    |
| <b>Module – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                |                      |                      |                    |
| <b>Smart Objects:</b> The “Things” in IOT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria.                                                                                                                                                                                                                                                                                                                                     |                |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                      |                      |                    |
| <b>Module – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |                |                      |                      |                    |
| <b>Cloud Services For IOT:</b> Introduction to Cloud Storage models and communication APIs Webserver – Web server for IOT, Cloud for IOT, Python web application framework designing a RESTful web API, Amazon Web services for IOT.                                                                                                                                                                                                                                                      |                |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |                      |                      |                    |
| <b>Course outcomes:</b><br><b>After studying this course, students will be able to</b> <p><b>CO1:</b> Analyze IOT architectural components.</p> <p><b>CO2:</b> Interfacing Sensor and Actuator with Arduino development board.</p> <p><b>CO3:</b> Describe protocols of resource constraint network.</p> <p><b>CO4:</b> Compare and contrast the deployment of smart objects and the technologies to connect them to network.</p> <p><b>CO5:</b> Design and develop IOT applications.</p> |                |                |                      |                      |                    |

**Text Book:**

- 1) “Internet of Things (A Hands-on-Approach)” by Vijay Madiseti and Arshdeep Bahga, 1st Edition, VPT, 2014. ISBN 13: 9780996025515
- 2) Srinivasa K G, “Internet of Things”, CENGAGE Learning India, 2017 ISBN: 9789386858955
- 3) David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, “IOT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)

**Reference Books:**

- 1) Vijay Madiseti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014. (ISBN: 978-8173719547)
- 2) Raj Kamal, “Internet of Things: Architecture and Design Principles”, 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)
- 3) “The Internet of Things – Key applications and Protocols” by Olivier Hersent, David Boswarthick, Omar Elloumi , , Wiley, 2012 ISBN: 978-1-119-99435-0

**Reference sites:**

- 1) [www.coursera.org/specializations/IOT](http://www.coursera.org/specializations/IOT)
- 2) [www.futurelearn.com/courses/internet-of-things](http://www.futurelearn.com/courses/internet-of-things)

| INFORMATION RETRIEVAL                                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |         |               |               |             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|---------------|---------------|-------------|
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                           | L:T:P:S | Credits | Exam Marks    | Exam Duration | Course Type |
| 20CDT563                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 3:0:0:0 | 3       | CIE:50 SEE:50 | 3 hours       | PEC         |
| <b>Prerequisite:</b> <ul style="list-style-type: none"> <li>Probabilistic models, statistical language models, Text classification &amp; Text clustering</li> </ul>                                                                                                                                                                                                                                                                                                   |         |         |               |               |             |
| <b>Course Objectives:</b><br>This course is designed to: <ul style="list-style-type: none"> <li>Learn to write code for text indexing and retrieval.</li> <li>Learn to evaluate information retrieval systems</li> <li>Learn to analyze textual and semi-structured datasets</li> <li>Learn to evaluate information retrieval systems</li> <li>Learn about text similarity measure</li> <li>Understanding about search engine</li> <li>Text Classification</li> </ul> |         |         |               |               |             |
| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |         |               |               |             |
| <b>Module – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |         |               |               |             |
| <b>Overview of text retrieval systems:</b> Boolean retrieval, the term vocabulary and postings lists, Dictionaries and tolerant retrieval, Index construction and compression. <b>Retrieval models and implementation: Vector Space Models, Vector Space Model, TF-IDF Weight, Evaluation in information retrieval.</b>                                                                                                                                               |         |         |               |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |         |               |               |             |
| <b>Module – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                    |         |         |               |               |             |
| <b>Query expansion and feedback:</b> Relevance feedback, pseudo relevance feedback, Query Reformulation.                                                                                                                                                                                                                                                                                                                                                              |         |         |               |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |         |               |               |             |
| <b>Module – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |         |               |               |             |
| <b>Probabilistic models; statistical language models:</b> Okapi/BM25, Language models, KL-divergence, Smoothing.                                                                                                                                                                                                                                                                                                                                                      |         |         |               |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |         |               |               |             |
| <b>Module – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                    |         |         |               |               |             |
| <b>Text classification &amp; Text clustering:</b> The text classification problem, Naive Bayes text classification, k- nearest neighbors, Support vector Machine, Feature Selection, Vector-space clustering, K-means algorithm, Hierarchical clustering, DBSCAN algorithm, PAM and PAMK EM algorithm.                                                                                                                                                                |         |         |               |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |         |               |               |             |
| <b>Module – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |         |               |               |             |
| <b>Web search basics, crawling, indexes, Link analysis:</b> Web Characteristic, Crawling, Web as a graph, Page Rank, Hubs and Authorities, <b>IR applications:</b> Information extraction, Question answering, Opinion summarization, Social Network.                                                                                                                                                                                                                 |         |         |               |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |         |               |               |             |
| <b>Course outcomes:</b><br><b>Upon completion of the course, the students should be able to:</b> <ul style="list-style-type: none"> <li>To Understand Document as Vector</li> <li>Performance evolution metric for IR</li> <li>To understand search Engine functionality</li> <li>Various Supervised and Unsupervised Learning Method</li> </ul>                                                                                                                      |         |         |               |               |             |

**Text Book:**

- Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Introduction to Information Retrieval, Cambridge University Press. 2008.  
<http://nlp.stanford.edu/IR-book/information-retrieval-book.html>
- ChengXiang Zhai, Statistical Language Models for Information Retrieval (Synthesis Lectures Series on Human Language Technologies), Morgan & Claypool Publishers, 2008.

## ANDROID APPLICATION PROGRAMMING (IC)

| Course Code | L : T : P : S | Credits | Exam Marks    | Exam Duration | Course Type |
|-------------|---------------|---------|---------------|---------------|-------------|
| 20CDI61     | 3 : 0 : 2 : 0 | 4       | CIE:50 SEE:50 | 3 Hours       | PCI         |

**Prerequisite:** Basic Knowledge of JAVA Programming and XML (Extension Markup Language)

### Course Objectives:

This course will enable students to:

- Outline the Android SDK features and the Development Framework and understanding Activities.
- Learn adaptive, responsive user interfaces that work across a wide range of devices.
- Identify background work and long-running tasks in Android applications
- Describe the concepts of Storing, sharing and retrieving data in Android applications
- Learn permissions, security and performance affect applications.

### Syllabus

#### Module- I

**Basics of Android:** What Is Android? Android Versions, Features of Android, Architecture of Android, Android Devices in the Market, The Android Market, Obtaining the Required Tools, Eclipse, Android SDK, Android Development Tools (ADT), Creating Android Virtual Devices (AVDs), Creating Your First Android Application, Anatomy of an Android Application. Understanding Activities, Applying Styles and Themes to Activity, Hiding the Activity Title, displaying a Dialog Window, displaying a Progress Dialog, Linking Activities Using Intents, Resolving Intent Filter Collision, Returning Results from an Intent.

**08 Hours**

#### Module- II

**Components of Screen, Views and Layouts:** Understanding the Components of a Screen, Views and View Groups, Linear Layout, Absolute Layout, Table Layout, Relative Layout, Frame Layout, Scroll View, Adapting to Display Orientation, Anchoring Views, Resizing and Repositioning, Managing Changes to Screen Orientation, Persisting State Information during Changes in Configuration, Detecting Orientation Changes, Controlling the Orientation of the Activity, Creating the User Interface Programmatically, Basic Views.

**08 Hours**

#### Module- III

**Image Views, Preferences ( ) and Storage:** Using Image Views to Display Pictures - Gallery and Image View Views, Image Switcher, Grid View, Using Menus with Views - Creating the Helper Methods, Options Menu, Context Menu, Saving and Loading User Preferences - Using get Shared Preferences( ), Using get Preferences( ), Persisting Data to Files - Saving to Internal Storage, Saving to External Storage (SD Card), Choosing the Best Storage Option, Using Static Resources, Creating and Using Databases.

**08 Hours**

#### Module- IV

**Content Provider, SMS Messaging Sharing** Data in Android, using a Content Provider - Predefined Query String Constants, Projections, Filtering, Sorting, Creating Your Own Content Providers - Using the Content Provider. SMS Messaging - Sending SMS Messages Programmatically, Getting Feedback after Sending the Message, Sending SMS Messages Using Intent, Receiving SMS Messages, updating an Activity from a Broadcast Receiver, Invoking an Activity from a Broadcast Receiver.

**08 Hours**

## Module- V

**Services, Activities and Publishing APK Files.** Creating Your Own Services - Performing Long-Running Tasks in a Service, Performing Repeated Tasks in a Service, Executing Asynchronous Tasks on, Separate Threads Using Intent Service, Communicating between a Service and an Activity, Binding Activities to Services. Preparing for Publishing, Versioning, Digitally Signing Your Android Applications, Deploying APK Files - Using the adb.exe Tool, using a Web Server, publishing on the Android Market, creating a Developer Profile, Submitting Your Apps.

**08 Hours**

### List of Experiments

Programs supplement the lecture concepts will be based on the latest version of Android SDK.

#### PART-A

- 1) Develop an android app which displays “Hello World” message
- 2) Using Android, Create a login Activity. It asks “username” and “password” from user. If username and password are valid, it displays Welcome message using new activity
- 3) Create Implicit Intents
- 4) “Happy Birth Day” App using TextView and ImageView
- 5) Set and retrieve shared preferences

#### PART-B

- 1) Develop an android app which displays a form to get following information from user. 1) Username 2) Password 3) Email Address 4) Phone Number 5) Country Form should be followed by a Button with label “Submit”. When user clicks the button, a message should be displayed to user describing the information entered. Utilize suitable UI controls (i.e. widgets). [When user enters country in Auto Complete TextView, list of states should be displayed in Spinner automatically]
- 2) The Simple Calculator app has two edit texts and four buttons. When you enter two numbers and click a button, the app performs the calculation for that button and displays the result.
- 3) Develop an android app for Text to Speech.
- 4) Create the MP3 player like application with service

#### Course Outcomes:

On completion of this course, students will be able to:

**CO1:** Comprehend the basic features of Android Platform and Create Activities in Android.

**CO2:** Demonstrate the design concepts of user interface using components and views in Android.

**CO3:** Create and use databases for Android Application.

**CO4:** Implement messaging services in Android.

**CO5:** Deploy mobile applications in various market place for distribution

#### Text Books:

- 1) Wei – Meng Lee: “Beginning Android Application Development”, Wiley publications, ISBN: 978-1-118-01711-1, (Chapters 1-8,10,11).
- 2) Reto Meier: “Professional Android 4 Application Development”, Wiley publications Publisher, 2012, ISBN-10: 812653608X

#### Reference Books:

- 1) Mark Murphy: “Beginning Android 3”, Apress Springer India Pvt. Ltd., 1st Edition, 2011, ISBN-13: 978-1-4302-3297-1
- 2) Sayed Hashimi, Satya Komatineni, Dave MacLean; Pro Android 4; Apress Springer India Pvt Ltd; 1st Edition; 2012; ISBN: 978-1-4302-3930-7.
- 3) Reto Meier: “Professional Android 2 Application Development”, Wiley India Pvt. Ltd., 1st Edition, 2012, ISBN: 9788126525898.
- 4) James Steele: “The Android Developer’s Cookbook: Building Applications with the Android SDK”, Addison-Wesley Professional, 2010.

#### E-Resources:

- 1) <https://developers.google.com/training/adf>
- 2) <https://goo.gl/ADKvq8>
- 3) <https://innovator.samsungmobile.com>

# BIG DATA ANALYTICS

| Course Code | L : T : P : S | Credits | Exam Marks      | Exam Duration | Course Type |
|-------------|---------------|---------|-----------------|---------------|-------------|
| 20CDI62     | 2 : 0 : 2 : 0 | 3       | CIE: 50 SEE: 50 | 3 hours       | PCI         |

**Prerequisite:** Good knowledge skill on Database and Data Structures

## Course Objectives:

This course will enable students to

- Understand Big – Data, Hadoop Distributed File system and Map Reduce.
- Explore Hadoop tools and manage Hadoop Administration.
- Appraise the role of Business intelligence and its applications across industries.
- Assess core data mining techniques for data analytics.
- Learn various Text Mining techniques.

## Syllabus

### Module – I

**Introduction to Big Data:** Big Data and its importance, Four Vs, Big data applications. Introduction to Hadoop: Hadoop Distributed File System Basics, Hadoop components, Hadoop Eco-System, Hadoop Map Reduce Framework.

**08 Hours**

### Module – II

Essential Hadoop Tools – Yarn, Hive, Oozie, Pig, Flume, Hadoop YARN Applications, Managing Hadoop with Apache Ambari, Basic Hadoop Administration Procedures.

**08 Hours**

### Module – III

Business Intelligence Concepts and Application – BI – Tools, Skills, Applications, Data Warehousing – Approaches and Architecture, Data Mining – CRISP – DM, Techniques, Tools, Myths, Mistakes, Data Visualization – Types of charts.

**08 Hours**

### Module – IV

Decision Trees- Pseudo code, Regression – Logistic, Advantages and Disadvantages, Artificial Neural Networks – Design principles, steps in developing ANN, Advantages and Disadvantages, Cluster Analysis - K-means algorithm, Association Rule Mining - Apriori algorithm.

**08 Hours**

### Module – V

Text Mining – Architecture, TDM, Applications, Naïve-Bayes Analysis - Model, Advantages and Disadvantages, Support Vector Machines - Model, Advantages and Disadvantages, Web Mining – Content, Structure, Usage, Social Network Analysis - Techniques and Algorithm, Page Rank, Practical Considerations.

**08 Hours**

## List of Experiments:

1. Downloading and installing Hadoop; Understanding different Hadoop modes. Startup scripts, Configuration files.
2. Hadoop Implementation of file management tasks, such as Adding files and directories, Retrieving files and Deleting files
3. Implement of Matrix Multiplication with Hadoop Map Reduce
4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
5. Implementation of K-means clustering using Map Reduce
6. Installation of Hive along with practice examples.
7. Installation of HBase, Installing thrift along with Practice examples
8. Patrice importing and exporting data from various data bases.

**Course Outcomes**

On completion of this course, the students are able to:

**CO1:** Master the concepts of Big Data, HDFS and Map Reduce framework

**CO2:** Investigate Hadoop related tools for Big Data Analytics and perform basic Hadoop Administration

**CO3:** Recognize the role of Business Intelligence, Data warehousing and Visualization in decision making

**CO4:** Demonstrate the importance of core data mining techniques for data analytics

**CO5:** Illustrate and analyze Text Mining Techniques

**Text Books:**

- 1) Douglas Eadline, "Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem", 1st Edition, Pearson Education, 2016. ISBN-13: 978-9332570351
- 2) Anil Maheshwari, "Data Analytics", 1st Edition, McGraw Hill Education, 2017. ISBN-13: 978-9352604180

**Reference Books:**

- 1) Tom White, —Hadoop: The Definitive Guide, 4 Edition, O'Reilly Media,
- 2) Boris Lublin sky, Kevin T. Smith, Alexey Yakubovich, —Professional Hadoop Solutions", 1st Edition, Wrox Press, 2014 ISBN-13: 978-8126551071
- 3) Eric Sammer, —Hadoop Operations: A Guide for Developers and Administrators", 1<sup>st</sup> Edition, O'Reilly Media, 2012. ISBN-13: 978-9350239261

**E-Resources:**

- 1) [https://www.tutorialspoint.com/big\\_data\\_tutorials.htm](https://www.tutorialspoint.com/big_data_tutorials.htm)
- 2) <https://nptel.ac.in/courses/106/104/106104189/>



## ADVANCED WEB PROGRAMMING (IC)

| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | L:T:P:S        | Credits  | Exam Marks           | Exam Duration  | Course Type |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------|----------------------|----------------|-------------|
| <b>20CDI63</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>3:0:2:0</b> | <b>4</b> | <b>CIE:50 SEE:50</b> | <b>3 Hours</b> | <b>PCI</b>  |
| <p><b>Course Objectives:</b><br/>                     This course will enable the students to</p> <ol style="list-style-type: none"> <li>1. Apply the knowledge to manage and to handle web site design and development to solve the real world problems.</li> <li>2. Illustrate user content using Bootstrap Frontend Framework.</li> <li>3. Understand Node JS and its facilities.</li> <li>4. Learn ES6 and build your Interactive React User Interface.</li> <li>5. Develop Java based web applications using React JS and Spring Boot.</li> </ol>                                                                              |                |          |                      |                |             |
| <b>Module – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |          |                      |                |             |
| <p><b>Bootstrap 5: Front-end Design Framework</b><br/>                     Bootstrap Scaffolding, Bootstrap CSS, Bootstrap Layout Components, Bootstrap JavaScript Plugins, Using Bootstrap, Understanding Bootstrap Admin Templates.</p> <p style="text-align: right;"><b>08 Hours</b></p>                                                                                                                                                                                                                                                                                                                                         |                |          |                      |                |             |
| <b>Module – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |          |                      |                |             |
| <p><b>Node JS: Back-end JavaScript runtime environment</b><br/>                     Introduction to NodeJS, Setting up NodeJS, First Application, Node Package Manager (npm), Template Engines: Jade and Handlebars, Web Modules, Setting up Express Framework, Web app development in Express Framework.</p> <p style="text-align: right;"><b>08 Hours</b></p>                                                                                                                                                                                                                                                                     |                |          |                      |                |             |
| <b>Module – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |          |                      |                |             |
| <p><b>ECMA Script 6 (ES6): Foundation for Modern Javascript Frameworks</b><br/>                     ES6: What is ES6?, let &amp; const keywords, Arrow functions, Default Parameters, Template literals, Destructuring Assignments, Enhanced Object Literals, Block scope, Spread and Rest operators, Classes, Inheritance, Static properties and methods, Promises, Iterators and Iterables, Generators, Modules, ReactJS: What is React? Why React? Just React – Hello World, Using create-react-app, Anatomy of react project, Running the app, Debugging first react app.</p> <p style="text-align: right;"><b>08 Hours</b></p> |                |          |                      |                |             |
| <b>Module – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |          |                      |                |             |
| <p><b>React: Building UI</b><br/>                     Templating using JSX (Javascript Syntax Extension): Working with React, understanding the structure. Components: Significance of component architecture, Types of components, Functional, Class based, Pure, Component Composition. Working with states and props, Event Handling in React, Understanding component lifecycle and handling errors, Working with Forms, Context API, Code Splitting, Hooks, Routing using React Router, Introduction to Redux, Redux Middleware.</p> <p style="text-align: right;"><b>08 Hours</b></p>                                         |                |          |                      |                |             |
| <b>Module – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |          |                      |                |             |
| <p><b>Spring Boot: Building Java based Web Application</b><br/>                     Introduction to Micro Services, What is Spring Boot?, Why Spring Boot? How does it work? Spring boot bootstrapping, Spring boot tomcat development, build system, Building RESTful Web services, Building Web application using React UI and spring Boot.</p> <p style="text-align: right;"><b>08 Hours</b></p>                                                                                                                                                                                                                                 |                |          |                      |                |             |

## Lab Experiments

1. Explain the role of the following semantic elements of HTML5 with syntax and script segments:  
i <nav> ii <section> iii <aside>.
2. Build a web server using HTTP Module in Node JS and perform file system modules like
  - i. Read files
  - ii. Create files
  - iii. Update files
  - iv. Delete files
  - v. Rename files
3. Perform CRUD Operation in MongoDB with connection to NodeJS.
4. Write a Program to handle async wait in Javascript.
5. Design a page by creating Class and Functional based Components in React JS.
6. Create a basic app with Spring Boot and React to handle RESTful APIs for performing CRUD operations.

## Course outcomes:

### At the end of the course, the student will be able to:

1. Demonstrate an ability to identify formulate and solve the web based problems .
2. Ability to apply conceptual skills of web site design and development.
3. Adapt Bootstrap framework for frontend views.
4. Develop Web App in NodeJS platform using Express framework.
5. Develop Java based Web Apps using ReactJS and Spring Boot.

## Text Books:

1. Aravind Shenoy, Ulrich Sossou, "Learning Bootstrap" Packet Publishing.
2. Ethan Brown, "Web Development with Node & Express", O'Reilly Publications, ISBN: 978-1-491-94930-6
3. Alex Banks & Eve Porcello, "Learning React – Modern Patterns for Developing React Apps", O'Reilly Publications, ISBN: 978-1-492-05172-5
4. Juha Hinkula, "Hands-On Full Stack Development with Spring Boot 2 and React: Build modern and scalable full stack applications using Spring Framework 5 and React with Hooks", 2nd Edition.

## Reference Books:

1. Dr. Axel Rauschmayer, "ES6-Javascript for Impatient Programmers", ISBN 978-1-09-121009-7
2. Fabio Cimo, "Bootstrap Programming Cookbook"
3. Craig Walls, "Spring in Action" Manning Shelter Island Publications, 5<sup>th</sup> Edition, ISBN: 9781617294945.

## Justification:

- The syllabus previously prepared earlier was not up to the industrial requirements, most of content already upgraded.
- The students need to get awareness about the skills and tools been upgraded.
- The reframed syllabus covers the content of Full Stack Web Development to meet the industrial standards.
- The students will undergo the practical hands on for designing the Websites.

| CLOUD COMPUTING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |         |               |               |             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------|---------------|---------------|-------------|
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | L : T : P : S | Credits | Exam Marks    | Exam Duration | Course Type |
| 20CDT64                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3 : 0 : 0 : 0 | 3       | CIE:50 SEE:50 | 3 Hours       | PCC         |
| <b>Prerequisite:</b> Computer Networks, Database Management System, Operating system                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |         |               |               |             |
| <b>Course Objectives:</b><br>This course will enable students to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |         |               |               |             |
| <ul style="list-style-type: none"> <li>➤ Identify the Cloud infrastructure components and service management processes</li> <li>➤ Explain the fundamentals of cloud computing</li> <li>➤ Gain the knowledge about virtualization and its techniques.</li> <li>➤ Illustrate the cloud application programming and Aneka platform</li> <li>➤ Differentiate Various cloud platforms used in industry</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                |               |         |               |               |             |
| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |         |               |               |             |
| <b>Module – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |         |               |               |             |
| <b>Introduction:</b> Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility- Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Google App Engine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Manjra soft Aneka.                                                                                                                                                                                                                                                |               |         |               |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |         |               |               |             |
| <b>Module – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |         |               |               |             |
| <b>Cloud Computing Architecture:</b> Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition, Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy Organizational Aspects. Aneka: Cloud Application Platform, Framework Overview, Anatomy of the Aneka Container, From the Ground Up: Platform Abstraction Layer, Fabric Services, foundation Services, Application Services, Building Aneka Clouds, Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode. |               |         |               |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |         |               |               |             |
| <b>Module – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |         |               |               |             |
| <b>Concurrent Computing:</b> Thread Programming, Introducing Parallelism for Single Machine Computation, Programming Applications with Threads, What is a Thread?, Thread APIs, Multithreading with Aneka, Introducing the Thread Programming Model, Aneka Thread vs. Common Threads. High-Throughput Computing: Task Programming, Task Computing, characterizing a Task, Computing Categories, Frameworks for Task Computing, Task-based Application Models, Embarrassingly Parallel Applications, Parameter Sweep Applications, Workflow Applications with Task Dependencies.                                                                                                                                                                                                                                             |               |         |               |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |         |               |               |             |
| <b>Module – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |         |               |               |             |
| <b>Data Intensive Computing:</b> Map-Reduce Programming, What is Data-Intensive Computing? Characterizing Data-Intensive Computations, Challenges Ahead, Historical Perspective, Technologies for Data-Intensive Computing, Storage Systems, Programming Platforms.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |         |               |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |         |               |               |             |
| <b>Module – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |         |               |               |             |

**Cloud Platforms in Industry:** Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google App Engine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance. Cloud Applications: Scientific Applications, Business and Consumer Applications, CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.

**08 Hours**

**Course Outcomes**

On completion of this course, the students will be able to:

**CO1:** Explain cloud computing, classify services of cloud computing

**CO2:** Illustrate architecture and programming in cloud

**CO3:** Demonstrate data intensive computing.

**CO4:** Apply cloud computing services to commercial systems for deploying cloud

**CO5:** Analyzing different Cloud platform in industry and their applications

**Text Books:**

1. Rajkumar Buyya, Christian Vecchiola, and ThamaraiSelvi, “Mastering Cloud Computing”, McGraw Hill Education, ISBN: 9780124095397

**Reference Books:**

- 1) Dan C. Marinescu, “Cloud Computing Theory and Practice”, Morgan Kaufmann, Elsevier 2013.
- 2) Thomas Erl: “Cloud Computing”, Pearson Education, 1st Edition, 2014, ISBN-13: 978-9332535923.

**Reference Online Resources:**

- 1) <http://index-of.co.uk/Cloud-Computing-Books/Mastering%20Cloud%20Computing%20-%20Rajkumar%20Buyya.pdf>
- 2) <http://nptel.ac.in/courses/106105033/41>
- 3) <http://video.mit.edu/watch/mitef-nyc-cloud-computing-8347/>

| ENVIRONMENTAL STUDIES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |         |               |               |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|---------------|---------------|-------------|
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | L:T:P:S | Credits | Exam Marks    | Exam Duration | Course Type |
| 20ENV57/67                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1:0:0:0 | 1       | CIE:50 SEE:50 | 1 Hours       | HSMC        |
| <p><b>Course Objectives:</b> To recognize major concepts in environmental sciences and demonstrate in-depth understanding of the environment. The industrial revolution and development have led to the stress on environment in the form of pollution. Checking of the pollution in all fronts at local and global level encompassing the issues of carbon credit, ozone level depletion, global warming, desertification and polar ice cap melting. The main objectives of the course is to expose to students to the problems and mitigation measures concerned to the environmental components like resources, air, water and land.</p>                                                                                                                                                                                                     |         |         |               |               |             |
| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |         |               |               |             |
| <b>Module 1:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |         |               |               |             |
| <p><b>Ecosystems</b> (Structure and Function): Forest, Desert, Wetlands, Riverine, Oceanic and Lake.<br/> <b>Biodiversity:</b> Types, Value; Hot-spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation. <span style="float: right;"><b>3 Hours</b></span></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |         |               |               |             |
| <b>Module 2:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |         |               |               |             |
| <p><b>Advances in Energy Systems</b> (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind.<br/> <b>Natural Resource Management</b> (Concept and case-studies): Disaster Management, Sustainable Mining, Cloud Seeding, and Carbon Trading. <span style="float: right;"><b>4 Hours</b></span></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |         |               |               |             |
| <b>Module 3:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |         |               |               |             |
| <p><b>Environmental Pollution</b> (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution.<br/> <b>Waste Management &amp; Public Health Aspects:</b> Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge. <span style="float: right;"><b>4 Hours</b></span></p>                                                                                                                                                                                                                                                                                                                                                                                                       |         |         |               |               |             |
| <b>Module 4:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |         |               |               |             |
| <p><b>Global Environmental Concerns</b> (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology. <span style="float: right;"><b>3 Hours</b></span></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |         |               |               |             |
| <b>Module 5:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |         |               |               |             |
| <p><b>Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications):</b> G.I.S. &amp; Remote Sensing, Environment Impact Assessment, Environmental Management Systems, ISO14001; Environmental Stewardship- NGOs.<br/> <b>Field work:</b> Visit to an Environmental Engineering Laboratory or Green Building; Visit to a local area to document environment assets river / forest / grassland / hill / mountain. Visit to a local polluted site-urban/rural/industrial/agricultural/Water Treatment Plant/ Waste water treatment Plant. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hills lopes; etc (field work equal to 2 lecture works) ought to be Followed by understanding of process and its brief documentation. <span style="float: right;"><b>4 Hours</b></span></p> |         |         |               |               |             |
| <p><b>Course outcomes:</b> At the end of the course, students will be able to: ·</p> <ul style="list-style-type: none"> <li>• CO1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale, ·</li> <li>• CO2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.</li> <li>• CO3: Demonstrate ecology knowledge of a complex relationship between biotic and a biotic components.</li> <li>• CO4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.</li> </ul>                                                                                                                          |         |         |               |               |             |

| <b>Sl. No</b>          | <b>Name of the Textbook/s</b>                       | <b>Title of the Book Author/s</b>                   | <b>Name of the Publisher</b>         | <b>Edition and Year</b>        |
|------------------------|-----------------------------------------------------|-----------------------------------------------------|--------------------------------------|--------------------------------|
| 1                      | Environmental Studies                               | Benny Joseph                                        | Tata Mc Graw – Hill.                 | 2 <sup>nd</sup> Edition, 2012  |
| 2                      | Environmental Studies                               | S M Prakash                                         | Pristine Publishing House, Mangalore | 3 <sup>rd</sup> Edition, 2018  |
| 3                      | Environmental Studies – From Crisis to Cure         | R Rajagopalan                                       | Oxford Publisher                     | 2005                           |
| 4.                     | Environmental Studies                               | R. Geetha Balakrishna, K. G. Lakshminarayana Bhatta | SM Publications.                     | 2016                           |
| <b>Reference Books</b> |                                                     |                                                     |                                      |                                |
| 1                      | Principals of Environmental Science and Engineering | Raman Sivakumar                                     | Cengage learning, Singapur.          | 2 <sup>nd</sup> Edition, 2005  |
| 2                      | Environmental Science – working with the Earth      | G. Tyler Miller Jr.                                 | Thomson Brooks /Cole,                | 11 <sup>th</sup> Edition, 2006 |
| 3                      | Text Book of Environmental and Ecology              | Pratiba Sing, Anoop Singh & Piyush Malaviya         | Acme Learning Pvt. Ltd. New Delhi.   | 1 <sup>st</sup> Edition        |

| <b>RESEARCH METHODOLOGY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                      |                |                      |                      |                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|----------------------|----------------------|--------------------|
| <b>Course Code</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>L : T : P : S</b> | <b>Credits</b> | <b>Exam Marks</b>    | <b>Exam Duration</b> | <b>Course Type</b> |
| <b>20CDT68</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>2 : 0 : 0 : 0</b> | <b>2</b>       | <b>CIE:50 SEE:50</b> | <b>3 Hours</b>       | <b>AEC</b>         |
| <b>Course objectives:</b> <ol style="list-style-type: none"> <li>To give an overview of the research methodology and explain the technique of defining a research problem</li> <li>To explain the functions of the literature review in research.</li> <li>To explain carrying out a literature search, its review, developing theoretical and conceptual frame works and writing a review and research reports.</li> <li>To explain various Testing of Hypotheses and statistical analysis.</li> <li>To discuss techniques of Interpretation and effective Report Writing.</li> </ol>                                                                                                                                                      |                      |                |                      |                      |                    |
| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                |                      |                      |                    |
| <b>Module – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                      |                |                      |                      |                    |
| <b>Research Methodology:</b> Introduction, Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India.<br><b>Defining the Research Problem:</b> Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.                                                                                                                                                                                                                                   |                      |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                |                      |                      |                    |
| <b>Module – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                |                      |                      |                    |
| <b>Reviewing the literature:</b> Place of the literature review in research, bringing clarity and focus to research problem, improving research methodology, broadening knowledge base in research area, enabling contextual findings, Review of the literature, searching the existing literature, reviewing the selected literature, developing a theoretical framework, developing a conceptual framework, writing about the literature reviewed.[ Book 2, Chapter 3].<br><b>Research Design:</b> Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. |                      |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                |                      |                      |                    |
| <b>Module – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                      |                |                      |                      |                    |
| <b>Design of Sample Surveys:</b> Design of Sampling: Introduction, Sample Design, Sampling and Non Sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.<br><b>Measurement and Scaling:</b> Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement, Techniques of Developing Measurement Tools, Scaling, Scale Classification Bases, Scaling Technics, Multidimensional Scaling, Deciding the Scale.                                                                                                                                                                                                                           |                      |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                |                      |                      |                    |
| <b>Module – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                |                      |                      |                    |
| <b>Data Collection:</b> Introduction, Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.<br><b>Testing of Hypotheses:</b> Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis.                                                                                 |                      |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                |                      |                      |                    |

## Module – V

**Chi-square Test:** Test of Difference of more than Two Proportions, Test of Independence of Attributes, Test of Goodness of Fit, Cautions in Using Chi-Square Tests.

**Interpretation and Report Writing:** Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

**08 Hours**

### Course Outcomes (Course Skill Set)

At the end of the course the student will be able to:

CO1. Explain the meaning of engineering research.

CO2. Explore the procedure of Literature Review and Technical Reading.

CO3. Explain the fundamentals of Testing of Hypotheses and statistical analysis.

CO4. Explore the techniques of Interpretation and effective Report Writing.

CO5. Comprehend the basic principles of research methodologies.

### Textbooks

|   |                                                          |                            |                       |                               |
|---|----------------------------------------------------------|----------------------------|-----------------------|-------------------------------|
| 1 | Research Methodology: Methods and Techniques             | C. R. Kothari, Gaurav Garg | New Age International | 4 <sup>th</sup> Edition, 2019 |
| 2 | Research Methodology a step-by- step guide for beginners | Ranjit Kumar               | SAGE Publications Ltd | 3 <sup>rd</sup> Edition, 2011 |

### Reference Books

|   |                                  |                |                            |      |
|---|----------------------------------|----------------|----------------------------|------|
| 1 | "Research Methods for Engineers" | David V. Thiel | Cambridge University Press | 2020 |
|---|----------------------------------|----------------|----------------------------|------|

### Online Resources

1. [https://onlinecourses.nptel.ac.in/noc22\\_ge08/preview](https://onlinecourses.nptel.ac.in/noc22_ge08/preview)
2. <https://archive.nptel.ac.in/courses/127/106/127106227/>
3. [https://onlinecourses.swayam2.ac.in/cec20\\_hs17/preview](https://onlinecourses.swayam2.ac.in/cec20_hs17/preview)
4. <https://archive.nptel.ac.in/courses/110/105/110105139/>



## SOFTWARE TESTING AND QUALITY ASSURANCE

| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | L : T : P:S    | Credits  | Exam Marks | Exam Duration | Course Type |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------|------------|---------------|-------------|
| <b>20CDT651</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>3:0:0:0</b> | <b>3</b> | <b>100</b> | <b>3hrs</b>   | <b>PEC</b>  |
| <p><b>Prerequisite:</b> Software Engineering (Software Design) Basic concepts: encapsulation, abstraction, inheritance, and polymorphism.</p>                                                                                                                                                                                                                                                                                                                                                                     |                |          |            |               |             |
| <p><b>Course Description:</b> Regardless of the software development approach, from the classic waterfall to extreme programming (XP), all of the experts agree that quality software development requires both analysis and design. The Unified Modelling Language (UML) provides a common, standard notation for recording both analysis models and design artefacts. This course delves into the processes of both object-oriented analysis and object-oriented design using UML as the notation language.</p> |                |          |            |               |             |
| <p><b>Course Objectives:</b></p> <ul style="list-style-type: none"> <li>• To learn the importance of modelling in the software development life cycle.</li> <li>• To apply the UML notation and symbols.</li> <li>• To know the design patterns. To learn the object-oriented approach systems design and software solutions.</li> <li>• To know the object oriented software testing.</li> </ul>                                                                                                                 |                |          |            |               |             |
| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |          |            |               |             |
| <b>Module – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |          |            |               |             |
| <p><b>Basic concepts:</b> objects, classes, abstract classes, data types, ADT, encapsulation and information hiding, inheritance, association, aggregation, composition, polymorphism, dynamic binding, object-oriented principles.</p>                                                                                                                                                                                                                                                                           |                |          |            |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |          |            |               |             |
| <b>Module – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |          |            |               |             |
| <p><b>Modelling Using UML:</b> Use case diagrams, class diagrams, various relationships among classes: generalization, association, aggregation, composition, inheritance, dependency etc., object diagram, UML packages, activity diagram, state machine diagram, sequence diagram, communication diagram, interaction overview diagram, component diagram, deployment diagram, UML 2 diagrams.</p>                                                                                                              |                |          |            |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |          |            |               |             |
| <b>Module – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |          |            |               |             |
| <p><b>Design Patterns:</b> Basic pattern concepts, Types of patterns, some common design patterns such as Expert, Creator, Façade, MVS, MVC, Publish-Subscribe, Observer, Proxy etc.</p>                                                                                                                                                                                                                                                                                                                          |                |          |            |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |          |            |               |             |
| <b>Module – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |          |            |               |             |
| <p><b>Designing using UML:</b> Overview of OOAD methodology, Use case model development, Domain modelling, Identification of entity objects, Brooch’s object identification method, Interaction modelling, CRC cards, Applications of the analysis and design process, object-oriented design principles. OOD goodness criteria, CK Metrics, LK Metrics, MOOD Metrics, Code Refactoring.</p>                                                                                                                      |                |          |            |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |          |            |               |             |
| <b>Module – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |          |            |               |             |
| <p><b>Testing Object Oriented Software:</b> Challenges in testing object-oriented software, Implications of object-oriented Features in testing object-oriented software, Importance of grey-box testing of object-oriented software, Coverage analysis, State-based testing, Class testing, Fault-Based Testing, Scenario-Based Test Design, Integration Testing: Thread-based integration Strategies, Use-based integration Strategies, Cluster Testing, Validation Testing, System Testing, Testing tools.</p> |                |          |            |               |             |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |          |            |               |             |

**Course Outcomes:**

At the end of this course, the students will learn:

- Understand the importance of modelling in the software development life cycle.
- Analyze to apply the UML notation and symbols.
- Understand the design patterns.
- Design and develop the object-oriented approach systems Design and software solutions.
- Explore object oriented software testing.

**Text Book:**

1. Rajib Mall, “Fundamentals of Software Engineering”, 5th Edition, PHI, 2018.

**Reference Books:**

1. Rumbaugh and Blaha, Object-oriented Modelling and design with UML, Pearson, 2007.
2. Bernd Bruegge and, Allen H. Dutoit, Object-Oriented Software Engineering Using UML, Patterns, and Java, Pearson, 2009.

## ARTIFICIAL INTELLIGENCE

| Course Code | L:T:P:S | Credits | Exam Marks    | Exam Duration | Course Type |
|-------------|---------|---------|---------------|---------------|-------------|
| 20CDT652    | 3:0:0:0 | 3       | CIE:50 SEE:50 | 3 hours       | PEC         |

### Course Objectives:

#### This course will enable students to:

- Understand AI technique to a given concrete problem
- Study non-trivial AI techniques to handle complex problem
- Understand uncertainty and Problem-solving techniques.
- Learn various symbolic knowledge representations to specify domains and reasoning tasks of a situated software agent.
- Gain knowledge on logical systems for inference over formal domain

### Syllabus

#### Module – I

**Introduction:** What is AI? Intelligent Agents: Agents and environment; Rationality; the nature of environment; the structure of agents. Problem solving: Problem-solving agents; Example problems; Searching for solution; Uninformed search strategies.

**08 Hours**

#### Module – II

**Informed Search, Exploration, Constraint Satisfaction, Adverbial Search:** Informed search strategies; Heuristic functions; On-line search agents and unknown environment. Constraint satisfaction Problems; Backtracking search for CSPs. Adverbial search: Games; Optimal decisions in games; Alpha- Beta pruning.

**08 Hours**

#### Module – III

**Logical Agents: Knowledge-based agents;** The wumpus world as an example world; Logic; propositional logic Reasoning patterns in propositional logic; Effective propositional inference; Agents based on propositional logic.

**08 Hours**

#### Module – IV

**First-Order Logic, Inference in First-Order Logic-1:** Representation revisited; Syntax and semantics of first-order logic; Using first-order logic; Knowledge engineering in first-order logic. Propositional versus first-order inference; Unification and lifting.

**08 Hours**

#### Module – V

**Inference in First-Order Logic-2:** Forward chaining; backward chaining; Resolution.

**08 Hours**

### Course Outcomes:

#### On completion of this course, students will be able to:

- CO1:** Design intelligent agents for solving simple gaming problems.
- CO2:** Apply non-trivial AI techniques to handle complex problems.
- CO3:** Apply various symbolic knowledge representation to specific problems.
- CO4:** Design Knowledge-based agents.
- CO5:** Describe syntax and semantics of first-order logic.

**Text Books:**

- Stuart Russel, Peter Norvig: “Artificial Intelligence A Modern Approach”, 2nd Edition, Pearson Education, 2003, (Chapters 1.1, 2, 3.1 - 3.4, 4.1, 4.2, 4.5, 5.1, 5.2, 6.1- 6.3, 7, 8, 9, 10, 11.1, 11.2, 11.4, 11.5, 13.1, 13.4, 13.5, 13.6.) ISBN:0-13-103805-2.

**Reference Books:**

- Elaine Rich, Kevin Knight: “Artificial Intelligence”, 3rd Edition, Tata McGraw Hill, 2009, ISBN-10: 0070087709.
- Nils J. Nilsson: “Principles of ArtificialIntelligence”, Elsevier, 1980, ISBN: 978-3-540-11340-9.

**E-Resources:**

- <http://stpk.cs.rtu.lv/sites/all/files/stpk/materiali/MI/Artificial%20Intelligence>
- <http://www.getfreebooks.com/16-sites-with-free-artificial-intelligence-ebook>

## BLOCK CHAIN TECHNOLOGY

| Course Code     | L:T:P:S              | Credits  | Exam Marks           | Exam Duration | Course Type |
|-----------------|----------------------|----------|----------------------|---------------|-------------|
| <b>20CDT653</b> | <b>3 : 0 : 0 : 0</b> | <b>3</b> | <b>CIE:50 SEE:50</b> | <b>3hrs</b>   | <b>PEC</b>  |

**Prerequisite:** Network Security and Information Security

### Course Objectives:

- Understand about Symmetric and Asymmetric Encryption, block chain and Bit coin concepts
- Analyse the Working of Block Chain System.
- Design, build, and deploy smart contracts and distributed applications
- Evaluate security, privacy, and efficiency of a given block chain system.
- Cognize about ‘digital’ currency, Storage and Currency Exchange Services.

### Syllabus

#### Module – I

**Introduction to Block chain:** Back story of Block chain, what is Block chain? Centralized vs. Decentralized Systems, Layers of Block chain, why is Block Chain Important? Limitations of Centralized Systems, Block chain Adoption So Far, Block chain Uses and Use Cases How Block chain Works-1: Laying the Block Chain Foundation, Cryptography, Symmetric Key Cryptography, Cryptographic Hash Functions.

**08 Hours**

#### Module – II

**Cryptography and Transactions:** Asymmetric Key Cryptography, Diffie-Hellman Key Exchange, Symmetric vs. Asymmetric Key Cryptography, Merkle Trees, Putting It All Together, Properties of Block Chain Solutions, Block chain Transactions, Distributed Consensus Mechanisms, Block chain Applications, Scaling Block chain, Off-Chain Computation, Sharding Block Chain State.

**08 Hours**

#### Module – III

**Bitcoin Works:** The History of Money, Dawn of Bitcoin, What Is Bitcoin? Working with Bitcoins, The Bitcoin Block chain, Block Structure, The Genesis Block, The Bitcoin Network, Network Discovery for a New Node, Bitcoin Transactions, Consensus and Block Mining, Block Propagation, Bitcoin Scripts, Bitcoin Transactions Revisited, Scripts.

**08 Hours**

#### Module – IV

**Ethereum and Crypto Currencies:** Ethereum Introduction, Ethereum Block chain, Elements of Ethereum Block chain and Smart Contracts, The Turing Completeness of Smart Contract Languages and verification challenges, Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Crypto currency.

**08 Hours**

#### Module – V

**How to Store and Use Bitcoins:** Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets.

**08 Hours**

### Course Outcomes

**After the completion of this course, student will be able to**

- Gain Knowledge in Symmetric Encryption, Asymmetric Encryption, Block Chain System and Crypto currencies.
- Analyze the working of Block Chain System, Ledger Transaction and Mining mechanism.
- Design and Implement Ethereum block chain contract.
- Pertain to ethical and legal usage of Block chain applications.
- Use of Bitcoins, online wallets, Currency Exchanges and payment services.

**Text Books:**

1. Beginning Block chain: A Beginner's Guide to Building Block Chain Solutions by Bikramaditya Singhal, Gautam Dhameja and Priyansu Sekhar Panda
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bit coin and Crypto-currency Technologies: A Comprehensive Introduction, Princeton University Press (July 19,2016).

**Reference Books:**

1. Mastering Bit coin by Andreas M. Antonopoulos
2. Block chain Technology: Crypto-currency and Applications by S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, Oxford University Press 2019.
3. Imran Bashir, Mastering Block chain: Deeper Insights into Decentralization, Cryptography, Bitcoin, and Popular Block chain Frameworks, Packt Publishing, 1<sup>st</sup> Edition, 2017.

**E-Resources:**

1. NPTEL online course: <https://nptel.ac.in/courses/106/104/106104220/#>
2. Udemy: <https://www.udemy.com/course/build-your-blockchain-az/>
3. EDUXLABS Online training: [https://eduxlabs.com/courses/block chain technology- training/?tab=tab-curriculum](https://eduxlabs.com/courses/block-chain-technology-training/?tab=tab-curriculum)

## DIGITAL IMAGE PROCESSING

| Course Code     | L:T:P:S        | Credits  | Exam Marks           | Exam Duration  | Course Type |
|-----------------|----------------|----------|----------------------|----------------|-------------|
| <b>20CDT661</b> | <b>3:0:0:0</b> | <b>3</b> | <b>CIE:50 SEE:50</b> | <b>3 Hours</b> | <b>PEC</b>  |

### Course Objectives:

This course will enable students to:

- Study the fundamental concepts of image representation and image processing system.
- Evaluate techniques followed in image enhancements
- Illustrate image segmentation and compression algorithms

### Syllabus

#### Module – I

**Introduction to Image Processing:** Digital Image Fundamentals Light, brightness adaption and discrimination, Human visual system, Image as a 2D data, Image representation Gray scale and Color images, Image sampling and quantization, Color Fundamentals, Color Models, Pseudo-color image processing.

**08 Hours**

#### Module – II

**Image Enhancement In The Spatial Domain:** Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

**08 Hours**

#### Module – III

**Image Enhancement in Frequency Domain:** Introduction, Fourier Transform, Discrete Fourier Transform (DFT), properties of DFT, Discrete Cosine Transform (DCT), Image filtering in frequency domain.

**08 Hours**

#### Module – IV

**Image Segmentation:** Introduction, Detection of isolated points, line detection, Edge detection, Edge linking, Region based segmentation- Region growing, split and merge technique, local processing, regional processing, Hough transform, Segmentation using Threshold.

**08 Hours**

#### Module – V

**Image Compression:** Introduction, coding Redundancy, Inter-pixel redundancy, image compression model, Lossy and Lossless compression, Huffman Coding, Arithmetic Coding, LZW coding, Transform Coding, Sub-image size selection, blocking, DCT implementation using FFT, run length coding.

**08Hours**

**Course Outcomes:**

On completion of this course, students will be able to:

- Explain fundamentals of image processing
- Compare transformation algorithms
- Contrast enhancement, segmentation and compression techniques

**Text Book:**

1. Rafael C. Gonzalez and Richard E. Woods: "Digital Image Processing, 3rd Edition, Pearson Education, Pearson Education, 2014, ISBN-10: 9332518467, ISBN-13: 9789332518469,

**Reference Books:**

1. S Jayaraman, S Esakkirajan, T Veerakumar: "Digital Image Processing", Tata Mc- Graw Hill Publication.

2. S Sridhar: "Digital Image Processing", Oxford University Press, ISBN-10: 0199459355, ISBN-13: 9780199459353.

**E-Resources:**

1. <https://www.abebooks.com/9789332518469/Digital-Image-Processing-3rd-Edition-9>

2. [www.synergy.ac.in/intranet/classnotes/introduction.pdf](http://www.synergy.ac.in/intranet/classnotes/introduction.pdf)



| <b>COMPUTER VISION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                    |                |                      |                      |                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------|----------------------|----------------------|--------------------|
| <b>Course Code</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>L : T : P:S</b> | <b>Credits</b> | <b>Exam Marks</b>    | <b>Exam Duration</b> | <b>Course Type</b> |
| <b>20CDT662</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>3:0:0:0</b>     | <b>3</b>       | <b>CIE:50 SEE:50</b> | <b>3hrs</b>          | <b>PEC</b>         |
| <b>Prerequisite:</b> Computer graphics, drawing and animation Image processing techniques                                                                                                                                                                                                                                                                                                                                                                                      |                    |                |                      |                      |                    |
| <b>Course Objectives:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                |                      |                      |                    |
| Upon Completion of the course, the students will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |                |                      |                      |                    |
| <ul style="list-style-type: none"> <li>• Recall image processing techniques for computer vision</li> <li>• Do shape and region analysis</li> <li>• Elucidate Hough Transform and its applications to detect lines, circles, ellipse</li> <li>• Apply three-dimensional image analysis techniques</li> <li>• Exploit motion analysis</li> <li>• Study real world applications of computer vision algorithms</li> </ul>                                                          |                    |                |                      |                      |                    |
| <b>Module – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |                |                      |                      |                    |
| <b>Image Processing Foundations:</b> Fundamentals of Image Processing Techniques – Classical Filtering Operations – Thresholding Techniques – Edge Detection Techniques – Corner and Interest Point Detection–Mathematical Morphology –Texture.                                                                                                                                                                                                                                |                    |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |                |                      |                      |                    |
| <b>Module – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                    |                |                      |                      |                    |
| <b>Shapes and Regions:</b> Binary Shape Analysis – Connectedness – Object Labeling and Counting – Size Filtering – Distance Functions – Skeletons and Thinning – Deformable Shape Analysis – Boundary Tracking Procedures – Active Contours – Shape Models and Shape Recognition – Centroidal Profiles – Handling Occlusion – Boundary Length Measures – Boundary Descriptors – Chain Codes – Fourier Descriptors – Region Descriptors – Moments.                              |                    |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |                |                      |                      |                    |
| <b>Module – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |                |                      |                      |                    |
| <b>Hough Transform:</b> Line Detection – Hough Transform (HT) For Line Detection – Foot-of-Normal Method – Line Localization – Line Fitting – RANSAC for Straight Line Detection – HTBased Circular Object Detection – Accurate Center Location – Speed Problem – Ellipse Detection – Case Study: Human Iris Location – Hole Detection – Generalized Hough Transform – Spatial Matched Filtering – GHT for Ellipse Detection – Object Location – GHT for Feature Collation.    |                    |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |                |                      |                      |                    |
| <b>Module – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                    |                |                      |                      |                    |
| <b>3D Vision and Motion:</b> Methods for 3D Vision – Projection Schemes – Shape From Shading–Photometric Stereo –Shape from Texture – Shape from Focus – Active Range Finding – Surface Representations –Point-Based Representation – Volumetric Representations – 3D Object Recognition – 3D Reconstruction – Introduction to Motion – Triangulation – Bundle Adjustment – Translational Alignment – Parametric Motion – Spline-Based Motion – Optical Flow – Layered Motion. |                    |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |                |                      |                      |                    |
| <b>Module – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |                |                      |                      |                    |
| <b>Applications: Application:</b> Content Based Image Retrieval, Content Based Video Retrieval.                                                                                                                                                                                                                                                                                                                                                                                |                    |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |                |                      |                      |                    |
| Case Study: Face Recognition, Gait Recognition.                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |                |                      |                      |                    |

**Text Books:**

1. E. R. Davies, (2012), 'Computer & Machine Vision', Fourth Edition, Academic Press.
2. R.Szeliski,(2011), 'Computer Vision: Algorithms and Applications', Springer 2011.
3. Simon J. D. Prince, (2012) 'Computer Vision: Models, Learning, and Inference', Cambridge University Press, 2012.
3. MarkNixonandAlbertoS.Aquado,(2012), 'FeatureExtraction&ImageProcessing for Computer Vision', Third Edition, Academic Press.

**Reference Books:**

1. D.L.Baggioetal.,(2012), 'Mastering Open CV with Practical Computer Vision Projects', Packet Publishing,.
2. Jan Erik Solem, (2012), 'Programming Computer Vision with Python: Tools and algorithms for analyzing images', O'Reilly Media.

**Course Outcomes:**

Upon the successful completion of the course, students will be able to:

| CO Nos. | Course Outcomes                                                                         |
|---------|-----------------------------------------------------------------------------------------|
| CO1     | Explain the basic image processing techniques                                           |
| CO2     | Interpret in-shape , boundary tracking and apply chain codes in region detection        |
| CO3     | Apply hough transform for detection of geometric shapes like line, ellipse and objects. |
| CO4     | Illustrate 3D vision process and motion estimation techniques                           |
| CO5     | Apply computer vision in real time scenario.                                            |

| <b>DEVOPS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                      |                |                      |                      |                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|----------------------|----------------------|--------------------|
| <b>Course Code</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>L : T : P : S</b> | <b>Credits</b> | <b>Exam Marks</b>    | <b>Exam Duration</b> | <b>Course Type</b> |
| <b>20CDT663</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>3 : 0 : 0 : 0</b> | <b>3</b>       | <b>CIE:50 SEE:50</b> | <b>3 Hours</b>       | <b>PEC</b>         |
| <b>Course objectives:</b><br>This course will enable students to: <ul style="list-style-type: none"> <li>➤ Understand the DevOps Concepts and DevOps Tool.</li> <li>➤ Expose to the evolving Applications and advance features of Jenkins and Docker.</li> <li>➤ Get Familiarize with Docker and Chef workstations.</li> <li>➤ Understand the importance of testing using Jenkins, AWS EC2.</li> <li>➤ Identify and understand security in Jenkins and monitor the azure Applications.</li> </ul>                                                                                                                                  |                      |                |                      |                      |                    |
| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                      |                |                      |                      |                    |
| <b>Module – I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                      |                |                      |                      |                    |
| <b>Introduction to DevOps Concepts:</b> Understanding DevOps movement, DevOps with changing times, The waterfall model, Agile Model, Why DevOps? DevOps lifecycle, Benefits of DevOps. <p style="text-align: right;"><b>08 Hours</b></p>                                                                                                                                                                                                                                                                                                                                                                                           |                      |                |                      |                      |                    |
| <b>Module – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                      |                |                      |                      |                    |
| <b>Continuous Integration with Jenkins 2:</b> Introduction, Installing Jenkins, Jenkins dashboard, Configuration Java, Maven/Ant in Jenkins, Creating and Configuring build job for Java application with Maven, Managing Nodes, Email notifications based on build status. <p style="text-align: right;"><b>08 Hours</b></p>                                                                                                                                                                                                                                                                                                      |                      |                |                      |                      |                    |
| <b>Module – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                |                      |                      |                    |
| <b>Containers:</b> Overview of Docker containers, Understanding the difference between virtual machines and containers, Installing and configuring Docker, Creating a Tomcat container.<br><b>Cloud Computing and Configuration Management:</b> An overview of the Chef Configuration management tool, Installing and configuring a Chef workstation, Installing knife plugins for Amazon Web Services and Microsoft Azure. <p style="text-align: right;"><b>08 Hours</b></p>                                                                                                                                                      |                      |                |                      |                      |                    |
| <b>Module – IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                      |                |                      |                      |                    |
| <b>Automated Testing (Functional and Load Testing):</b> Functional testing using Selenium, Functional test execution in Jenkins, Load test execution using Jenkins.<br><b>Orchestration - End-to-End Automation:</b> End-to-end automation of application life cycle management using Jenkins, End-to-end automation using Jenkins, Chef, and AWS EC2, End-to-end automation using Jenkins and AWS Elastic Beanstalk, End-to end automation using Jenkins and Microsoft Azure app services, End-to-end automation orchestration of application life cycle Management using VSTS. <p style="text-align: right;"><b>08 Hours</b></p> |                      |                |                      |                      |                    |
| <b>Module – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                      |                |                      |                      |                    |
| <b>Security and Monitoring:</b> Security in Jenkins and VSTS, Security in Jenkins and VSTS, Monitoring Jenkins and Microsoft Azure, Monitoring Jenkins, Azure Web Apps troubleshooting and monitoring, Azure App Services - CPU and memory consumption, Azure App Services - Activity log, Azure Application Insights for application monitoring, Azure web application monitoring, Diagnostics logs. <p style="text-align: right;"><b>08 Hours</b></p>                                                                                                                                                                            |                      |                |                      |                      |                    |

**Laboratory Component:**

- 1) Download and install Jenkins CI on GCP.
- 2) Configuration. Change language interface and Create the first Jenkins job
- 3) Build Triggers, corn syntax, Artifacts.
- 4) Create and run Jenkins pipeline.
- 5) Create parameterized jobs in Jenkins.
- 6) Install and configure Docker.

**Course outcomes:**

On completion of this course, the students are able to:

- CO1:** Understand the fundamentals of DevOps engineering and be fully proficient with DevOps terminologies, concepts, benefits, and deployment options to meet your business requirements
- CO2:** Build jobs and configurations in Jenkins and Master in docker , Continuous Delivery and chef Configuration Management.
- CO3:** Create tomcat container and work on Dockers and chef workstation.
- CO4:** Analyze, design and evaluate automation scripts & systems.
- CO5:** Use Azure application services and monitor the security issues in Jenkins and Microsoft Azure.

**Text Books:**

- Mitesh Soni: DevOps for Web Development,Packet Publishing,ISBN:9781786465702,Released October 2016
- Mitesh Soni: DevOps Bootcamp-A fast-paced guide to implement DevOps with ease, May2017(Chapters: 3,4,6,7,8),ISBN 978-1-78728-596-5.

**Reference Books**

- Len Bass, Ingo Weber, Liming Zhu, Devops Software Architect's perspective, first edition, ISBN 978-0-13-404984-7,2015 Pearson Education, Inc.
- Trevor Roberts, Jr.,Josh Atwell, Egle Sigler, Yvo van Doorn, Devops for VMware Administrator, First Printing: April 2015, ISBN-10: 0-13-384647-4, ISBN-13: 978-0-13-384647-8,Pearson Education, Inc.
- Sanjeev Sharma "The DevOps Adoption Playbook: A Guide to Adopting DevOps in a Multi-Speed IT Enterprise "Published by John Wiley & Sons, Inc. ISBN: 978-1-119-30874-4, ISBN:978-1-119-31052-5 (eBook) ,ISBN: 978-1-119-31076-1 (eBook)

**E-Recourses**

- <https://resources.collab.net/devops-101/what-is-devops>.
- <https://www.ibm.com/cloud/learn/devops-a-complete-guide>.
- <https://newrelic.com/devops/what-is-devops>
- <https://www.oreilly.com/library/view/devops-for-web/9781786465702/>

| <b>UNIX and Shell Programming</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                |                      |                      |                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|----------------------|----------------------|--------------------|
| <b>Course Code</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>L : T : P : S</b> | <b>Credits</b> | <b>Exam Marks</b>    | <b>Exam Duration</b> | <b>Course Type</b> |
| <b>20CDT664</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>3 : 0 : 0 : 0</b> | <b>3</b>       | <b>CIE:50 SEE:50</b> | <b>3 Hours</b>       | <b>PEC</b>         |
| <b>Course Objectives:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                      |                |                      |                      |                    |
| This course will enable students to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                |                      |                      |                    |
| <ul style="list-style-type: none"> <li>• Learn basic commands to interact with UNIX System and VI editor.</li> <li>• Understand the history, origin, features and architecture of UNIX Operating System.</li> <li>• Identify and define key terms related to operating system</li> <li>• Develop the ability to evaluate regular expressions and use them for pattern matching.</li> <li>• Apply essential facets of SHELL programming in order to solve the SHELL script problems.</li> </ul>                |                      |                |                      |                      |                    |
| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                      |                |                      |                      |                    |
| <b>Module - I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                |                      |                      |                    |
| <b>General Overview of the System</b> : System structure, user perspective ,O/S services assumption about Hardware: The Kernel and buffer cache architecture of Unix O/System concepts, Kernel data Structure, System administration , Buffer headers, Structure of the buffer pool ,Scenarios for retrieval of the buffer, Reading and writing disk block, Advantage and disadvantage of buffer cache.                                                                                                       |                      |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                      |                |                      |                      |                    |
| <b>Module – II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                      |                |                      |                      |                    |
| <b>The File system</b> –The Basics of Files-What’s in a File-Directories and File Names-Permissions-I Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.                                                                                                                                                        |                      |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                      |                |                      |                      |                    |
| <b>Module – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                      |                |                      |                      |                    |
| <b>Internal Representation of Files:</b> INODES, Structure of regular, Directories conversions of a path name to an inode, Super block, Inode assignment to a new file, Allocation of disk blocks. System Calls for the System: Open read write file and record close, File creation, Operation of special files change directory and change root, change owner and change mode, STAT and FSTAT, PIPES Mounting and unmounting files system, Link Unlink.                                                     |                      |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                      |                |                      |                      |                    |
| <b>Module – III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                      |                |                      |                      |                    |
| <b>Structures of Processes and process control:</b> Process states and transitions layout of system memory, the context of a process, manipulation of process address space, Sleep process creation/termination. The user Id of a process, changing the size of a process. The SHELL Interprocess Communication and multiprocessor system: Process tracing system V IPO network communication sockets problem of multiprocessors systems, solution with master and hare process, and solution with semaphores |                      |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                      |                |                      |                      |                    |
| <b>Module – V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                |                      |                      |                    |
| <b>Introduction to shell:</b> Shell Bourne shell, C shell, Unix commands, permissions, editors, filters, sed, grep family, shell variables, scripts, meta characters and environment, if and case statements, for while and until loops. Shell programming. Connecting MYSQL to Shell, Running SQL queries from Shell Scripts, Generating a report and storing in a file Shopping cart. Case Study of LINUX operating System.                                                                                 |                      |                |                      |                      |                    |
| <b>08 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                      |                |                      |                      |                    |

**Instructional Method and Pedagogy:**

1. At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
2. Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
3. Three internal exam will be conducted as a part of internal theory evaluation.
4. Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
5. Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.

**Course Outcomes:**

On completion of this course, the students are able to:

- Describe history, origin, feature and architecture of UNIX operating system.
- Construct and edit files, search for any patterns using regular expressions.
- Solve complex jobs using tools and utilities available in UNIX.
- Design and develop various tasks by using Shell scripting.

**Text Book:**

1. Sumitabha Das: “UNIX – Concepts and Applications”, (Chapters 1,2,4,6-9,11-14,17,19), Tata McGraw Hill, Noida, 4th Edition, 15th Reprint, 2011, ISBN-13: 978-0-07-063546-3.

**Reference Books:**

1. Behrouz A. Forouzan and Richard F. Gilberg: “UNIX and Shell programming”, Cengage Learning, India, 1st Edition, 2005, ISBN: 81-35-0325-9.
2. M G Venkatesh Murthy: “UNIX and Shell programming”, Pearson Education, Delhi, 1st Edition, 2005, ISBN: 81-7758-745-5.

**E-Resources:**

1. <http://www.mhhe.com/das/uca>
2. [http://www.tutorialspoint.com/unix/unix\\_tutorials.pdf](http://www.tutorialspoint.com/unix/unix_tutorials.pdf).
3. <http://www.perldoc.perl.org/>