Semester – VI

Course Objective:

This course includes learning about computer network organization and implementation. Students are introduced to computer network design and its operations, and discuss the topics of OSI communication model; error detection and recovery; LANs; network naming and addressing; and basics of cryptography and network security.

Course Outcome:

<table>
<thead>
<tr>
<th>CO</th>
<th>Description</th>
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<tbody>
<tr>
<td>CO1</td>
<td>Describe and analyze the importance of data communications and the layered protocol model</td>
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<tr>
<td>CO2</td>
<td>Describe, analyze and evaluate a number of data link, network, and transport layer protocols and network devices.</td>
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<tr>
<td>CO3</td>
<td>Have a basic knowledge of the use of cryptography and network security;</td>
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<tr>
<td>CO4</td>
<td>Explain concepts and theories of networking and apply them to various situations, classifying networks, analyzing performance and implementing new technologies</td>
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CO-PO Mapping:

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Course Description:

MODULE 1:


MODULE 2:


MODULE 3:

MODULE 4:

MODULE 5:
Application Layer: Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Basics of Wi-Fi.

MODULE 6:
Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.

Text Books:


Reference Books:

2. “Data and Computer Communications ”, W. Stallings, PHI/ Pearson Education
Course Objective:
The main objective of this course is to train the student to do theoretical with practical data science work. Career-wise, we expect our students to be able to develop into skilled data science researchers or software developers.

Course Outcome:
1. To enable students with data analytics skill
2. To develop knowledge of fundamentals of data science
3. To empower students with hands-on for data science
4. To make students experience with theoretical data science and programming

CO-PO Mapping:

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MODULE-I
INTRODUCTION: -
Introduction to data science, Different sectors of using data science, Purpose and components of Python, Data Analytics processes, Exploratory data analytics, Quantitative technique and graphical technique, Data types for plotting.

MODULE-II
STATISTICAL ANALYSIS: -
Introduction to statistics, statistical and non-statistical analysis, major categories of statistics, population and sample, Measure of central tendency and dispersion, Moments, Skewness and kurtosis, Correlation and regression, Theoretical distributions – Binomial, Poisson, Normal

MODULE-III
INTRODUCTION TO MACHINE LEARNING: -
Machine learning, Types of learning, Properties of learning algorithms, Linear regression and regularization, model selection and evaluation, classification: SVM, kNN and decision tree, Ensemble methods: random forest, Naive Bayes and logistic regression, Clustering: k-means, feature engineering and selection, Dimensionality reduction: PCA
MODULE-IV

PYTHON SETUP FOR MATHEMATICAL AND SCIENTIFIC COMPUTING:

Anaconda installation process, data types with python, basic operators and setup, introduction to numpy, mathematical functions of numpy, introduction to scipy, scipy packages, data frame and data operations, data visualisation using matplotlib

Text Books:

3. AurelienGeron, Hands-On Machine Learning with Scikit – Learn &TensorFlow – O’reilly

Reference Books:

2. James, G., Witten, D., Hastie, T., Tibshirani, R. An introduction to statistical learning with applications in R. Springer.
4. Jan Erik Solem, Programming Computer Vision with Python – O’ Reilly
Pre-requisite(s)

Knowledge of Data Structures, Computer Graphics required for this course.

Objectives of the course

Course Outcomes:

After completing this course, students will be able to:

<table>
<thead>
<tr>
<th>CO1</th>
<th>To study the image fundamentals and image transforms necessary for image processing</th>
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<tr>
<td>CO2</td>
<td>To study the image enhancement techniques.</td>
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<td>CO3</td>
<td>To study the image restoration procedures and segmentation tools.</td>
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<tr>
<td>CO4</td>
<td>To study the wavelet tools and the image compression procedures.</td>
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with program outcomes:

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Mapping of course outcomes

MODULE-I:

INTRODUCTION AND DIGITAL IMAGE FUNDAMENTALS

MODULE-II:

IMAGE TRANSFORM


MODULE-III:

IMAGE ENHANCEMENT


MODULE-IV:

IMAGE RESTORATION AND SEGMENTATION

Image Restoration: Noise models, Mean Filters, Order Statistics, Adaptive filters, Band reject Filters, Band pass Filters, Notch Filters, Optimum Notch Filtering, Inverse Filtering, Wiener filtering. Segmentation: Thresholding.

MODULE-V:

WAVELETS AND IMAGE COMPRESSION


TEXT BOOK:


REFERENCES:

Objectives of the course
To introduce the student to key concepts in Phase transformations and enable an understanding of the steps involved in several important phase transformations.

Course Outcomes
After completing this course, the student should be able to:

<table>
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<tr>
<th>CO1</th>
<th>Explain the organization of basic computer, its design and the design of control unit.</th>
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<tr>
<td>CO2</td>
<td>Understand the organization of memory and memory management hardware.</td>
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<td>CO3</td>
<td>Distinguish between Operating Systems software and Application Systems software.</td>
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<tr>
<td>CO4</td>
<td>Identify the primary functions of an Operating System.</td>
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<tr>
<td>CO5</td>
<td>Master attributes and assessment of quality, reliability and security of software.</td>
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</tbody>
</table>

Detailed Syllabus:

MODULE-I


MODULE-II

MODULE-III


MODULE-IV


TEXT BOOKS:


REFERENCES:

Course objective:

This course covers the basic understanding of distributed computing system. The course aims to provide an understanding of the principles on which the Internet and other distributed systems are based; their architecture, algorithms and how they meet the demands of contemporary distributed applications. The course covers the building blocks for a study of distributed systems, and addressing the characteristics and the challenges that must be addressed in their design: scalability, heterogeneity, security and failure handling being the most significant. Distributed computing is a field of computer science that studies distributed systems. A distributed system is a system whose components are located on different networked computers, which communicate and coordinate their actions by passing messages to one another. The components interact with one another in order to achieve a common goal. Three significant characteristics of distributed systems are: concurrency of components, lack of a global clock, and independent failure of components.

Course Outcomes:

At the end of this course the students will be able to:

<table>
<thead>
<tr>
<th>CO1</th>
<th>Demonstrate knowledge of the basic elements and concepts related to distributed system technologies.</th>
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</thead>
<tbody>
<tr>
<td>CO2</td>
<td>Demonstrate knowledge of the core architectural aspects of distributed systems</td>
</tr>
<tr>
<td>CO3</td>
<td>Demonstrate knowledge of details the main underlying components of distributed systems (such as RPC, file systems);</td>
</tr>
<tr>
<td>CO4</td>
<td>Use and apply important methods in distributed systems to support scalability and fault tolerance;</td>
</tr>
<tr>
<td>CO5</td>
<td>Demonstrate experience in building large-scale distributed applications.</td>
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</tbody>
</table>

Detailed Syllabus:

**MODULE-I.**

Introduction to distributed computing system, evolution different models, gaining popularity, definition, issues in design, DCE, message passing – introduction, desirable features of a good message passing system,
issues in IPC, synchronization, buffering, multigram messages, encoding and decoding of message data, process addressing, failure handling, group communication.

**MODULE-II.**

Introduction, model, transparency, implementation mechanism, stub generation, RPC messages, marshalling arguments and results, server management, parameter passing semantics, call semantics, communication protocols for RPCs, client – server binding, exception handling, security, mini project using Java RMI.

**MODULE-III.**

General architecture of DSM systems, design and implementation issues of DSM systems, granularity, structure of shared memory space, consistency model, replacement strategy, thrashing, advantages of DSM, clock synchronization DFS and security- Desirable features of good DFS, file models, file accessing Models, file sharing semantics, file catching schemes, file replication, fault Tolerance, atomic transaction, potential attacks to computer system, cryptography, authentication, access control.Digital signatures, DCE security service.

**MODULE-IV.**


**MODULE-V.**

For development, implementation & evaluation of distributed information systems, workflow, software processes, transaction management, and data modeling, infrastructure e.g. middle-ware to glue heterogeneous, autonomous, and partly mobile/distributed data systems, such as e.g. client/server-, CORBA-, and Internet- technologies. Methods for building distributed applications.

**Text / Reference**

Course objectives –

1. To develop basic Knowledge in Software Engineering and its applications.
2. To understand software Engineering layered architecture and the process frame work.
3. To analyze software process models such as the waterfall, spiral, evolutionary models and agile method for software development.
4. To design software requirements and specifications of documents.
5. To understand project planning, scheduling, cost estimation, risk management.
6. To describe data models, object models, context models and behavioral models.
7. To learn coding style and testing issues.
8. To know about the quality checking mechanism for software process and product.

Course outcomes –

CO.1 Identify the principles of large scale software systems, and the processes that are used to build them.

CO.2 Able to use tools and techniques for producing application software solutions from informal and semi-formal problem specifications.

CO.3 Develop an appreciation of the cost, quality, and management issues involved in software construction.

CO.4 Implement design and communicate ideas about software system solutions at different levels.

CO.5 Establish the relation with other people in a team, communicating computing ideas effectively in speech and in writing.

Mapping of course outcomes with program outcomes:

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JHARKAHAND UNIVERSITY OF TECHNOLOGY, RANCHI
Syllabus for B. Tech course in Computer Science & Engineering and Information Technology

MODULE-I:
SOFTWARE PROCESS AND AGILE DEVELOPMENT

MODULE-II:
REQUIREMENTS ANALYSIS AND SPECIFICATION

MODULE-III:
SOFTWARE DESIGN

MODULE-IV:
TESTING AND MAINTENANCE

MODULE-V:
PROJECT MANAGEMENT

TEXT BOOKS:

REFERENCE BOOKS:
Course objective:
This course covers the basic understanding of distributed computing system. The course aims to provide an understanding of the principles on which the Internet and other distributed systems are based; their architecture, algorithms and how they meet the demands of contemporary distributed applications. The course covers the building blocks for a study of distributed systems, and addressing the characteristics and challenges that must be addressed in their design: scalability, heterogeneity, security and failure handling being the most significant. Distributed computing is a field of computer science that studies distributed systems. A distributed system is a system whose components are located on different networked computers, which communicate and coordinate their actions by passing messages to one another. The components interact with one another in order to achieve a common goal. Three significant characteristics of distributed systems are: concurrency of components, lack of a global clock, and independent failure of components.

Course Outcomes:
At the end of this course the students will be able to:

<table>
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<tr>
<th>CO</th>
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<tbody>
<tr>
<td>CO1</td>
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<td>CO3</td>
<td>Demonstrate knowledge of details the main underlying components of distributed systems (such as RPC, file systems);</td>
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<td>CO4</td>
<td>Use and apply important methods in distributed systems to support scalability and fault tolerance;</td>
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<tr>
<td>CO5</td>
<td>Demonstrate experience in building large-scale distributed applications.</td>
</tr>
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</table>

Detailed Syllabus:

MODULE-I:
Introduction to distributed computing system, evolution different models, gaining popularity, definition, issues in design, DCE, message passing—introduction, desirable features of a good message passing system, issues in IPC, synchronization, buffering, multigram messages, encoding and decoding of message data, process addressing, failure handling, group communication.
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MODULE-III:
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MODULE-IV:

MODULE-V:
For development, implementation & evaluation of distributed information systems, workflow, software processes, transaction management, and data modeling, infrastructure e.g. middle-ware to glue heterogeneous, autonomous, and partly mobile/distributed data systems, such as e.g. client/server-, CORBA-, and Internet- technologies. Methods for building distributed applications.

Text / Reference

Course objectives -

The aim of Artificial Intelligence & Machine Learning course is to prepare students for career in computer science & engineering where knowledge of AI & ML techniques leading to the advancement of research and technology. Artificial Intelligence and Machine Learning are the terms of computer science. Machine Learning is the learning in which machine can learn by its own without being explicitly programmed. It is an application of AI that provides the ability to automatically learn and improve from experience.

Course Outcomes: After completing this course the student will be able to:

<table>
<thead>
<tr>
<th>CO1</th>
<th>Demonstrate fundamental understanding of artificial intelligence (AI) and expert systems.</th>
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<tbody>
<tr>
<td>CO2</td>
<td>Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.</td>
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<tr>
<td>CO3</td>
<td>Demonstrate proficiency in applying scientific method to models of machine learning.</td>
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<td>CO4</td>
<td>Discuss the basics of ANN and different optimizations techniques.</td>
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Mapping of course outcomes with program outcomes:

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Course Detail -
JHARKHAND UNIVERSITY OF TECHNOLOGY, RANCHI
Syllabus for B. Tech course in Computer Science & Engineering and Information Technology

MODULE-I:
Overview and Search Techniques: Introduction to AI, Problem Solving, Statespacesearch, Blindsearch: Depthfirstsearch, Breadthfirstsearch, Informedsearch: Heuristic function, Hill climbing search, Best first search, A* & AO* Search, Constraint satisfaction problem; Game tree, Evaluation function, Mini-Max search, Alpha-beta pruning, Games of chance.

MODULE-II:

MODULE-III:
Handling uncertainty and Learning: Source of uncertainty, Probabilistic inference, Bayes’ theorem, Limitation of naïve Bayesian system, Bayesian Belief Network (BBN); Machine learning, Basic principal, Utility of ML Well defined learning system, Challenges in ML, Application of ML.

MODULE-IV:
Learning and Classifier: Linear Regression (with one variable and multiple variables), Decision Trees and issue in decision tree, Clustering (K-means, Hierarchical, etc), Dimensionality reduction, Principal Component Analysis, Anomaly detection, Feasibility of learning, Reinforcement learning.

MODULE-V:

Text Book:
1. Artificial Intelligence by Elaine Rich and Kevin Knight, Tata McGrawHill
2. Understanding Machine Learning. ShaiShalev-Shwartz and Shai Ben-David. Cambridge University Press.
3. Artificial Neural Network, B. Yegnanarayana, PHI,2005

Reference Book:
1. Christopher M. Bishop. Pattern Recognition and Machine Learning(Springer)
2. IntroductiontoArtificialIntelligenceandExpertSystemsbyDanW.Patterson,Prentice Hall of India
CO 1: Students will be able to classify the routing protocols and analyse how to assign the IP addresses for the given network.
CO 2: Students will be able to understand the architecture of different internet servers.
CO 3: Students will be able to configure the firewall in the network.

CO-PO Mapping:

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*3: high, 2: moderate, 1: low

MODULE-I:
AN OVERVIEW ON INTERNET

The need for an Internet, The TCP/IP Internet, Internet services, Internet protocols and standardization, Review of Networktechnologies.

INTERNETWORKING CONCEPTS

Architectural model introduction, Application level interconnection, Network level interconnection, Properties of the Internet, Internet Architecture, Interconnection through IP Gateways or routers, Internet and Intranet.

MODULE-II:
INTERNET ADDRESS

Introduction, Universal identifiers, Three primary classes of IP addresses, Classless IP address, Network and Broadcast addresses, Mapping internet addresses to physical addresses (ARP), ARP protocol format, Transport Gateways and subnet addressing, Multicastaddressing.

MODULE-III:
INTERNET PROTOCOL
Internet Architecture and Philosophy, The concept of unreliable delivery, Connectionless delivery system, The Internet Datagram, Routing direct and indirect delivery, Table driven IP routing, Protocol layering, Reliable stream transport, TCP performance, Bootstrap protocol(BOOTP).

MODULE-IV:

ROUTING


MODULE-V:

ENTERPRISE NETWORKING AND INTERNET SERVERS

Corporate networking, Broadband at the Metropolitan area level, High speed dedicated WAN services and switched WAN services, ISDN, BISDN and ATM services, Frame relay technology and services, Virtual private network concepts PPTP protocol. DNS, DHCP Servers, FTP, TELNET, E-Mail.

MODULE-VI:

FIREWALL & NETWORKING

Introduction, Implementation of Firewall, Activities of Firewall, Configuration of firewall, Firewalls & SSL, SSL implementation, Bit implementation of SSL, Use of SSL.

REFERENCE BOOKS

1. Computer Networks and Internets - Douglas E. Comer;PE.
2. Communication Networks - Leon-Garcia-Widjaja;TMH.
3. Internet working with TCP/IP -Douglas E.Comer;PE.
4. TCP/IP protocol suite- ForouzanBehrouz A;TMH.
5. Computer Networks – Andrew S. Tanenbaum;PHI.
7. The Complete reference of Networking -CraigZacker;TMH.
Course objective:
This course will cover fundamental concepts used in Soft computing. Soft Computing refers to a partnership of computational techniques in computer science, artificial intelligence, machine learning and some engineering disciplines, which attempt to study, model, and analyze complex phenomena. The concepts of Artificial Neural Networks (ANNs) will be covered first, followed by Fuzzy logic (FL) and optimization techniques using Genetic Algorithm (GA). Applications of Soft Computing techniques to solve a number of real-life problems will be covered to have hands on practices. In summary, this course will provide exposure to theory as well as practical systems and software used in soft computing.

Course outcomes:
At the end of the course students will be able to:

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<th>CO1</th>
<th>Present the feasibility of applying a soft computing methodology for specific problem.</th>
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<td>CO2</td>
<td>Identify and describe soft computing techniques and their roles in building intelligent machines.</td>
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<tr>
<td>CO3</td>
<td>Apply neural networks to pattern classification and regression problems.</td>
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<tr>
<td>CO4</td>
<td>Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.</td>
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<tr>
<td>CO5</td>
<td>Apply genetic algorithms to combinatorial optimization problems.</td>
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Mapping of course outcomes with program outcomes:

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**Detailed Syllabus**

**MODULE-I:**

**INTRODUCTION TO SOFT COMPUTING:** Soft computing: Soft computing concepts, soft computing versus hard computing, various types of soft computing techniques, applications of soft computing.

**MODULE-II:**

**ARTIFICIAL NEURAL NETWORKS:** Neural Networks: History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, learning rules, Learning Paradigms- Supervised, Unsupervised and reinforcement Learning, ANN training, Algorithms-perceptions; Training rules, Delta, Back Propagation Algorithm, Multilayer PerceptronModel.

**MODULE-III:**

**SPECIAL LEARNING NETWORK:** Competitive learning networks, Kohonen Self-organizing networks, Hebbian learning, Hopfield Networks, Associative memories, The Boltzman machine, Applications of Artificial Neural Networks.

**MODULE-IV:**


**MODULE-V:**

**FUZZY RULE BASED SYSTEM:** Fuzzy rule base system: Fuzzy Propositions, implications and inferences, Fuzzy reasoning, Defuzzification techniques, Fuzzy logic controller design, Fuzzy decision making & Applications of fuzzy logic.
MODULE VI:

**GENETIC ALGORITHMS:** Genetic Algorithms: An Overview of Genetic algorithm (GA), Evolution strategies (ES), Evolutionary programming (EP), Genetic programming (GP); GA operators: Encoding, Selection, Crossover, Mutation, schema analysis, analysis of selection algorithms; convergence; optimization, of travelling salesman problem using genetic algorithm approach; Markov & other stochastic models. Other Soft Computing Techniques: Simulated annealing, Tabu search, Ant colony-based optimization (ACO), etc.

Text Book:

Supplementary Reading:
OBJECTIVES: To provide an overview of Information Retrieval systems. Expose them to various retrieval models with emphasis on pros and cons of these models. Discuss mechanisms of web search along with the details of ranking algorithms. Introduce basic concepts of text categorization and recommender systems.

MODULE -I


MODULE -II


MODULE -III

Web Information Retrieval: Hypertext, web crawling, search engines, ranking, link analysis, PageRank, HITS. Retrieving Structured Documents: XML retrieval, semantic web.


MODULE -IV


MODULE -V

Advanced Topics: Summarization, Topic detection and tracking, Personalization, Question answering, Cross language information retrieval (CLIR). Recommender System.
COURSE OUTCOMES:

Students will get:

CO1: The understanding of different Information retrieval models

CO2: To know about evaluation methods of the information retrieval model

CO3: Exposures of implementing retrieval models on text data

CO4: To know about text categorization and its implementation

CO5: To know the challenges associated with each topics on new domain of retrieval and classification

CO-PO mapping table

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TEXT BOOKS:


REFERENCES:

Objectives of the course:

The aim of this course is to understand the basics and importance of cloud computing. Cloud computing is a general term for anything that involves delivering hosted services over the Internet. These services are broadly divided into different categories: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS). The name cloud computing was inspired by the cloud symbol that’s often used to represent the Internet in flowcharts and diagrams. Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user. The term is generally used to describe data centers available to many users over the Internet. Large clouds, predominant today, often have functions distributed over multiple locations from central servers.

Course Outcomes:

At the end of the course, the student should be able to:

| CO1  | To identify the appropriate cloud services for a given application and perform cloud-oriented analysis. |
| CO2  | To design the composition of a cloud services. |
| CO3  | To analyze authentication, confidentiality and privacy issues in Cloud computing environment. |
| CO4  | To Determine financial and technological implications for selecting cloud computing platforms. |

Mapping of course outcomes with program outcomes:

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Detailed syllabus:

MODULE – I:


MODULE – II:

**Cloud services**: Communication-as-a-Service (CAAS), Infrastructure-as-a-Service (IAAS), Monitoring-as-a-Service (MAAS), Platform-as-a-Service (PAAS), Software-as-a-Service (SAAS).

MODULE – III:


MODULE – IV:

**The MSP Model**: Evolution from the MSP Model to Cloud Computing and Software-as-a-Service, The Cloud Data Center, Basic Approach to a Data Center-Based SOA, Open Source Software, Service- Oriented Architectures as a Step Toward Cloud Computing.

MODULE – I:

**Virtualization concepts & Smartphone**: virtualization benefits, Hardware & Software Virtualization, Memory Virtualization, Storage Virtualization, Data Virtualization, Network Virtualization, Virtualization Security Recommendations, Introduction to Various Virtualization OS VMware, KVM, Virtual Machine Security, Smartphone, Mobile Operating Systems for Smartphone’s (iPhone, Windows Mobile, Google(Android)).
JHARKAHAND UNIVERSITY OF TECHNOLOGY, RANCHI
Syllabus for B. Tech course in Computer Science & Engineering and Information Technology

Course outcomes:
At the end of this course

1. Student will be able to identify the appropriate cloud services for a given application and perform cloud-oriented analysis.
2. Students will be able to design the composition of a cloud services.
3. Student will be able to analyze authentication, confidentiality and privacy issues in Cloud computing environment.
4. Determine financial and technological implications for selecting cloud computing platforms.

Text Book:

Reference Book: