19CS4111:MACHINE LEARNING

B.Tech IV Year I Semester

L	T	P	C
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Prerequisites:
- Data Structures
- Knowledge on statistical methods

Course Objectives
- Define Machine Learning and understand the basic theory underlying machine learning.
- Understand the basic concepts of learning and decision trees.
- Understand neural networks and Bayesian techniques for problems appear in machine learning
- Understand the instance based learning and reinforced learning
- Perform statistical analysis of machine learning techniques

Course Outcomes: After the completion of the course student should be able to
- Choose the learning techniques and investigate concept learning
- Identify the characteristics of decision tree and solve problems associated with Decision tree Learning
- Apply effectively Neural Networks for appropriate applications
- Apply Bayesian techniques and derive effectively learning rules
- Evaluate hypothesis and investigate instance based learning, reinforced learning and Analytical Learning

UNIT – I
Introduction: Well-posed learning problems, designing a learning system. Overview of Machine learning, related areas and applications.
Concept Learning: concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm. Inductive Bias
Regression: Introduction, Regression Concepts, Linear Regression, Multiple Regression, Logistic Regression.

UNIT – II
Decision Tree Learning: - Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, issues in decision tree learning. Cross Validation and Over fitting.
Neural Network Learning: Perceptions and gradient descent back propagation, multilayer networks and back propagation An illustrative example: face recognition, advanced topics in artificial neural networks.

UNIT – III
Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.
Instance-Based Learning- Introduction, k-nearest neighbor algorithm, locally weighted regression, case-based reasoning, remarks on lazy and eager learning.

UNIT - IV
Genetic Algorithms: Motivation, Genetic algorithms, an illustrative example, hypothesis space

search, genetic programming, models of evolution and learning.

Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT – V

Reinforcement Learning – Introduction, the learning task, Q–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

Analytical Learning- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.

TEXT BOOKS:

1. Tom. M Mitchell, Machine Learning, McGraw Hill, 1997.
2. Trevor has tie, Robert Tibshirani & Jerome Friedman. The Elements of Statically Learning, Springer Verlag, 2001.

REFERENCES:

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

19IT4111: ANDROID APPLICATION DEVELOPMENT

B. Tech IV Year I Semester

L	T	P	C
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Prerequisites:

- OOPS through Java.
- XML.

Course Objectives:

- Demonstrate their understanding of the fundamentals of Android operating systems.
- Demonstrate their skills of using Android software development tools.
- Demonstrate their ability to develop software with reasonable complexity on mobile platform.
- Demonstrate their ability to deploy software to mobile devices.
- Demonstrate their ability to debug programs running on mobile devices.

Course Outcomes: After the completion of the course student should be able to

- Describe Android platform.
- Design user Interface and develop activity for Android App.
- Design and implement Database Application and Content providers
- Design and implement Multimedia Applications
- Develop various android applications using intent, user interface and database concepts.

UNIT – I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools.

Android application components - Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc., Resources for different devices and languages, Runtime Configuration Changes.

Android Application Lifecycle - Activities, Activity lifecycle, activity states, monitoring state changes.

UNIT - II

Android User Interface: Measurements – Device and pixel density independent measuring units. Layouts - Linear, Relative, Grid, Constraint, Relative and Table Layouts. User Interface (UI) Components - Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers.

Event Handling - Handling clicks or changes of various UI components.

Fragments - Creating fragments, Lifecycle of fragments, Fragment states, adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities.

UNIT - III

Intents and Broadcasts: Intent - Using intents to launch Activities, explicitly starting new Activity, Implicit Intents, passing data to Intents, getting results from Activities, Native Actions, using Intent

to dial a number, sending SMS, Opening Webpage.

Broadcast Receivers - Methods of Broadcast Receiver, Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an **Activity Notifications** - Creating and Displaying notifications, Displaying Toasts.

UNIT - IV

Persistent Storage: Files - Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences - Creating shared preferences, saving and retrieving data using Shared Preference.

Database - Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, using content Providers (insert, delete, retrieve and update). Working with MySQL Database to store, retrieve data.

UNIT - V

Advanced Topics: Alarms - Creating and using alarms. Using Internet Resources -Connecting to internet resource, using download manager.

Location Based Services - Finding Current Location and showing location on the Map, updating current location.

TEXT BOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012.
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013.

REFERENCES:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

B.Tech IV Year I Semester	**L**	**T**	**P**	**C**
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Prerequisites:
- Should have basic knowledge of computer networks and information security.

Course Objectives:
- To introduce the information security terminology, technology and its applications
- To introduce data leakage threats and its solutions
- To give guidelines for implementing security policies in the organization
- To make familiar with the roles and responsibilities in security domain
- To make familiar with information security vulnerabilities and threats

Course Outcomes: After the completion of the course student should be able to
- Identify various security attacks and issues
- Classify types of data leakage threats and prevention techniques.
- List the information security policies and procedures
- Differentiate various information security management roles and responsibilities
- Identify various threats, vulnerabilities and appropriate vulnerability management and assessment solutions

UNIT-I
Information Security Management: Information Security Overview, Threats and Attack Vectors, Types of Attacks, Common Vulnerabilities, and Exposures (CVE), Security Attacks, Fundamentals of Information Security, Computer Security Concerns, Information Security Measures etc.

UNIT-II
Fundamentals of Information Security: Key Elements of Networks, Logical Elements of Network, Critical Information Characteristics, Information States etc.
Data Leakage: What is Data Leakage and statistics, Data Leakage Threats, Reducing the Risk of Data Loss, Key Performance Indicators (KPI), and Database Security etc.

UNIT-III
Information Security Policies, Procedures, and Audits: Information Security Policies necessity-key elements & characteristics, Security Policy Implementation, Configuration, Security Standards-Guidelines & Frameworks etc.

UNIT-IV
Information Security Management – Roles and Responsibilities: Security Roles & Responsibilities, Accountability, Roles, and Responsibilities of Information Security Management, team-responding to emergency situation-risk analysis process etc.

UNIT-V
Information Security Vulnerabilities-Threats and vulnerabilities, human and computer based social engineering, social media countermeasures, vulnerability management-vulnerability scanning, testing, threat management, remediation etc. Vulnerability assessment, classification, vulnerability assessment phases, characteristics of a good vulnerability assessment solutions, vulnerability

assessment reports-tools, information security risk assessment, risk treatment, residual risk, risk acceptance, risk management feedback Loops etc.

TEXT BOOKS:
1. Information Security Management – A student's Hand Book – NASCOMM
2. Management of Information Security by Michael E. Whitman and Herbert J. Mattord
3. Assessing Information Security (strategies, tactics, logic and framework) by A Vladimirov, K.Gavrilenko, and A.Michajlowski.

REFERENCES:
1. Information Security Management Handbook, Fourth Edition, Vol.- I-TIPTON HAROLD F.
2. http://www.iso.org/iso/home/standards/management-standards/iso27001.htm2
3. http://csrc.nist.gov/publications/nistpubs/800-55-Rev1/SP800-55-rev1.pdf
4. CISSP (ISC) 2 Certified Information Systems Security Professional Official Study Guide Paperback –Import,8 Oct 2015 by James M. Stewart (Author), Mikehapple(Author), Darril Gibson (Author)
5. The Art of Computer Virus Research and Defense by Peter Szor.

19IT4171: DATA ANALYTICS
(Professional Elective – III)

B. Tech IV Year I Semester

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Pre-requisites:

- A Course on "Database Management Systems".
- Knowledge of probability and statistics.

Course Objectives:

- Understand the fundamental concepts of data management.
- Explore the fundamental concepts of data analytics.
- Learn the principles and methods of statistical analysis.
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- Understand the various search methods and visualization techniques.

Course Outcomes: After the completion of the course student should be able to

- Understand the impact of data analytics for business decisions and strategy.
- Carry out data analysis/statistical analysis.
- Carry out standard data visualization and formal inference procedures.
- Design Data Architecture.
- Understand various Data Sources.

UNIT – I

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data), Data Processing & Processing.

UNIT – II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

UNIT – III

Regression: Regression - Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc. Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT – IV

Object Segmentation: Regression vs. Segmentation - Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. Time Series Methods: ARIMA, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc. and Analyze for prediction.

UNIT – V

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:
1. Student's Handbook for Associate Analytics.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

REFERENCE BOOKS:
1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira (the authors have kindly made an online version available): http://www.dataminingbook.info/uploads/book.pdf
3. Mining of Massive Datasets Jure Leskovec Stanford University. Anand Rajaraman Milliway Labs Jeffrey D. Ullman, Stanford University.

19IT4172: **COMPUTER VISION**
(Professional Elective – III)

B. Tech IV Year I Semester

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Prerequisite:
- Programming and Mathematics course.

Course Objectives:
- Recognize and describe both the theoretical and practical aspects of computing with images. Connect issues from Computer Vision to Human Vision.
- Describe the foundation of image formation and image analysis. Understand the basics of 2D and 3D Computer Vision.
- Become familiar with the major technical approaches involved in computer vision. Describe various methods used for registration, alignment, and matching in images.
- Get an exposure to advanced concepts leading to object categorization and segmentation in images.
- Build computer vision applications.

Course Outcomes: After the completion of the course student should be able to
- Implement fundamental image processing techniques required for computer vision.
- Understand Image formation process.
- Extract features from Images and do analysis of Images.
- Generate 3D model from images and to develop applications using computer vision techniques.
- Understand video processing, motion computation and 3D vision and geometry.

UNIT - I
Introduction: Image Processing, Computer Vision and Computer Graphics, What is Computer Vision - Low - level, Mid-level, High-level.
Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality

UNIT - II
Image Formation Models: Monocular imaging system, Radiosity: The 'Physics' of Image Formation, Radiance, Irradiance, BRDF, color etc., Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading, Construction of 3D model from image.
Image Processing and Feature Extraction: Image preprocessing, Image representations (continuous and discrete), Edge detection.

UNIT - III
Motion Estimation: Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion.
Shape Representation and Segmentation: Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multi resolution analysis.

UNIT – IV
Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal Component analysis, Shape priors for recognition.
Image Understanding: Pattern recognition methods, HMM, GMM and EM.

UNIT – V
Applications: Photo album - Face detection – Face recognition - Eigen faces - Active appearance and 3D shape models of faces Application: Surveillance - foreground-background separation - particle filters - Chamfer matching, tracking, and occlusion - combining views from multiple cameras - human gait analysis Application: In-vehicle vision system: locating roadway - road markings - identifying road signs - locating pedestrians.

TEXT BOOKS:
1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall.
3. Multiple View Geometry in Computer Vision Second Edition, Richard Hartley and Andrew Zisserman, Cambridge University Press, March 2004.

REFERENCE BOOKS:
1. R. C. Gonzalez, R. E. Woods. Digital Image Processing. Addison Wesley Longman, Inc., 1992. Wiley Dreamtech.
2. D. H. Ballard, C. M. Brown. Computer Vision. Prentice-Hall, Englewood Cliffs, 1982. Java Script, D. Flanagan, O'Reilly, SPD.
3. Richard Szeliski, Computer Vision: Algorithms and Applications (CVAA). Springer, 2010.
4. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.
5. Image Processing, Analysis, and Machine Vision. Sonka, Hlavac, and Boyle. Thomson.

B. Tech IV Year I Semester

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Prerequisite:

- Basic knowledge of any programming language such as Java and frameworks such as spring boot is beneficial.

Course Objectives:

- Understand Micro service Design Principles.
- Understand Micro services Architecture.
- Develop and test a Micro service.
- Understand various Architectural Styles of micro services.
- Understand how to create flexible micro services Architecture decision.

Course Outcomes: After the completion of the course student should be able to

- Understand micro services architecture.
- Design, Develop, Deploy and Monitor micro service based system.
- Implement software architecture patterns for a distributed system to allow scalability whilst maintaining consistency.
- Comprehend implications and challenges of Microservices (and how to overcome those challenges).
- Add their Microservices to a continuous integration & continuous delivery pipeline.

UNIT - I

Micro service Design Principles: Why Micro service, Monolithic Application, Complex Release Cycles, Scaling the Team, Scaling the System, Ideal software development practice, Microservices characteristics, Fine-grained SOA, Micro service Design Principles: Designing small micro services, Designing independent micro services, Designing resilient micro services, Technical Drivers, Business Drivers.

UNIT - II

Microservices Topology: Topology overview, Remote Access, Bounded Context, Fallacies of Distributed Computing; Architectural Quantum: Defining Quantum, Quantum Communication, Quantum Example, Micro Hexagonal Service Design Pattern, Service Taxonomy, Identifying a Taxonomy, Transactions, Data Dependencies, Workflow and Choreography, Code Structure and Reuse.

UNIT - III

Core Services: Replication, Shared Libraries, Shared Services, Service Consolidation, Purpose of an API, Service Mesh, Defining Service Domains, Stamp Coupling and Bandwidth Issues, Using Field Selectors; Event-Driven Microservices: Using Messaging Between Services. Asynchronous Messaging, Workflow Event Pattern, Broadcast Capabilities, Request/Reply, Leveraging Events for Responsiveness.

UNIT - IV

Codebase Practices: Micro service Template, Code Repository Setup, Micro service Decomposition, Inter Service Communication, Service Registration, Service Discovery,

Orchestration and Choreography, Use Cases for Orchestration, Use Cases for Choreography, Issues with Gateway Orchestration, Using Micro service Orchestrators, Orchestration and Loose Coupling, Integrating Microservices Ecosystems, Aggregation vs. Orchestration, Issues with Orchestration, Interfacing With Custom or Third-Party Systems, Migrating Functionality to Microservices.

UNIT - V

Micro services and Distributed Data: Change Control Issues, Connection Issues, Bounded Context and Data; Physical Database Instances: Connection Pooling, Performance Issues, Fault Tolerance, Failover Mechanism, Circuit breakers, Logging Techniques, Data Sharing and Choreography, Using Replicated Caching, Data Domains, Data Ownership, Data Services and Data Abstraction Layers, Microservices Migration Patterns: Identifying Logical Components, Flattening and Refactoring Components, Identifying Component Dependencies.

TEXT BOOKS:
1. Building Microservices: Designing Fine- Graine Systems-Sam Newman, O'REILLY publications.
2. Microservices Patterns- Chris Richardson, Manning Publications.

REFERENCE BOOKS:

1. Micro service Architecture: Aligning Principles, Practices, and Culture- Mike Amundsen, Ronnie Mitra, O'REILLY.
2. Micro service Patterns and Best Practices-Vinicius Feitosa, Packt Publishing.

19IT4174: SOFTWARE PROJECT MANAGEMENT
(Professional Elective – IV)

B. Tech IV Year I Semester

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Prerequisite:

- Basic knowledge of Software Engineering.

Course Objectives:

- Understand different concepts involved in Software Process Maturity.
- Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project.
- Compare and differentiate organization structures and project structures.
- Perform a specific project in time with available budget.
- Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools.

Course Outcomes: After the completion of the course student should be able to

- Describe the principal tasks of software project managers, and basic concepts in software projects.
- Describe the phases involved in software development life cycle.
- Explain basic concepts and principles of components of Software Engineering, Process Planning, Software process workflows.
- Evaluate the project organization, core metrics of process management.
- Explain using the case study of the project and how the project manager can act to influence success of the project.

UNIT-I
Software Process Maturity: Software maturity Framework, Principles of Software Process Change, Software Process Assessment, the Initial Process, the Repeatable Process, the Defined Process, the Managed Process, the Optimizing Process. Process Reference Models. Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP.

UNIT- II
Software Project Management Renaissance: Conventional Software Management, Evolution of Software Economics, Improving Software Economics, the old way and the new way. Life - Cycle Phases and Process artifacts. Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model - based software architectures.

UNIT-III
Workflows and Checkpoints of process: Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessments. Process Planning, Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

UNIT-IV

Project Organizations: Line-of-business organizations, project organizations, evolution of organizations, process automation. Project Control and process instrumentation. The seven core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics and metrics automation.

UNIT-V

CCPDS-R Case Study and Future Software Project Management Practices. Modern Project Profiles, Next - Generation software Economics, Modern Process Transitions.

TEXT BOOKS:
1. Managing the Software Process, *Watts S. Humphrey*, Pearson Education.
2. Software Project Management, *Walker Royce,* Pearson Education.

REFERENCE BOOKS:
1. Effective Project Management: Traditional, Agile, Extreme, Robert Wysocki, Sixth edition, Wiley India, rp2011.
2. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000
3. Process Improvement essentials, James R. Persse, O'Reilly, 2006
4. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, TMH, 2006
5. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
6. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007
7. Software Engineering Project Management, Richard H. Thayer & Edward Yourdon, 2nd edition, Wiley India, 2004.
8. The Art of Project Management, Scott Berkun, SPD, O'Reilly, 2011.
9. Applied Software Project Management, Andrew Stellman & Jennifer Greene, SPD, O'Reilly, rp2011.
10. Agile Project Management, Jim Highsmith, Pearson education, 2004.

19IT4175: PARALLEL ALGORITHMS
(Professional Elective – IV)

B. Tech IV Year I Semester

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Pre-requisites:
- A course on "Information security"
- A course on "Network Security"

Course Objectives:
- Learn Principles and Design techniques of Parallel Algorithms.
- Understand different parallel architectures and models of computation.
- Introduce the various classes of parallel algorithms.
- Study parallel algorithms for basic problems.
- Understand the complexity of algorithms for basic and collective communication operations.

Course Outcomes: After the completion of the course student should be able to
- Gain basic understanding of fundamental concepts in parallel computing.
- Identify algorithms for searching, sorting and merging Lists.
- Analyze the computational complexity of parallel algorithms.
- Develop parallel algorithms for standard problems and applications.
- Assess efficiency and scalability of different parallel algorithms.

UNIT- I
Introduction: Need for Parallel Processing - Data and Temporal Parallelism - Models of Computation - RAM And PRAM Model - Shared Memory and Message Passing Models - Processor Organizations - PRAM Algorithm - Analysis of PRAM Algorithms - Parallel Programming Languages.

UNIT - II
PRAM Algorithms: Parallel Algorithms for Reduction - Prefix Sum - List Ranking - Preorder Tree Traversal - Searching -Sorting - Merging Two Sorted Lists - Matrix Multiplication - Graph Coloring - Graph Searching.

UNIT - III
SIMD Algorithms - I: 2D Mesh SIMD Model - Parallel Algorithms for Reduction - Prefix Computation - Selection - Odd - Even Merge Sorting - Matrix Multiplication.

UNIT – IV
SIMD Algorithms – II: Hypercube SIMD Model - Parallel Algorithms for Selection - Odd - Even Merge Sort - Bitonic Sort- Matrix Multiplication Shuffle Exchange SIMD Model - Parallel Algorithms for Reduction - Bitonic Merge Sort - Matrix Multiplication - Minimum Cost Spanning Tree.

UNIT – V
MIMD Algorithms: UMA Multiprocessor Model -Parallel Summing on Multiprocessor - Matrix Multiplication on Multiprocessors and Multicomputer - Parallel Quick Sort - Mapping Data to Processors.

TEXT BOOKS:

1. Michael J. Quinn, "Parallel Computing: Theory & Practice", Tata McGraw Hill Edition, Second edition, 2017.

2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", University press, Second edition, 2011.

3. V Rajaraman, C Siva Ram Murthy," Parallel computers- Architecture and Programming ", PHI learning, 2016.

REFERENCE BOOKS:

1. Ananth Grame, George Karpis, Vipin Kumar and Anshul Gupta, "Introduction to Parallel Computing", 2nd Edition, Addison Wesley, 2003.
2. M Sasikumar, Dinesh Shikhare and P Ravi Prakash," Introduction to Parallel Processing", PHI learning, 2013.

3. S. G. Akl, "The Design and Analysis of Parallel Algorithms", PHI, 1989.

19CS4177: INTERNET OF THINGS
(Professional Elective - IV)

B.Tech IV Year I Semester

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Course Objectives

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

Course Outcomes: After the completion of the course student should be able to

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

UNIT - I
Introduction to Internet of Things –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 Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

UNIT - II
IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT - III
Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

UNIT - IV
IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT – V
IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Web server – Web server for IoT, Cloud for IoT, Python web application framework designing a RESTful web API

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

REFERENCES:

1. The Internet of Things in the Cloud: A Middleware Perspective - Honbo Zhou – CRC Press – 2012
2. Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles-(Eds.) – Springer – 2011
3. Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley and Jon Kleinberg, Cambridge University Press - 2010
4. The Internet of Things: Applications to the Smart Grid and Building Automation by – Olivier Hersent, Omar Elloumi and David Boswarthick - Wiley -2012
5. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012

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B. Tech IV Year I Semester	**3**	**-**	**-**	**3**

Pre-requisites:

- Knowledge in Security and Applied Cryptography.
- Knowledge in Distributed Databases.

Course Objectives:

- Impart strong technical understanding of Blockchain technologies.
- Gain knowledge about applications of cryptography in Blockchain.
- Learn about the concepts of various implementations of Blockchain technology such as Bit coin, Ethereum and Hyperledger.
- Understand the modern currencies and their market usage.
- Introduce application areas, current practices and research activity.

Course Outcomes: After the completion of the course student should be able to
- Learn fundamentals of Blockchain techniques.
- Analyze various consensus problems.
- Adapt Bitcoin technology to improve usage.
- Make use of Ethereum frameworks to write smart contract.
- Interpret Blockchain technology in real time applications.

UNIT- I
Introduction: What is Blockchain, The history of block chain, Benefits and limitations of Blockchain, Distributed systems, Decentralization using block chain, CAP theorem and block chain, Crowd funding.

UNIT- II
Cryptography in Blockchain: Cryptocurrency, How a Cryptocurrency works, cryptographic primitives - Asymmetric cryptography - public and private keys -line interface - Bitcoin improvement proposals (BIPs) - Consensus Algorithms. Digital Identity verification, Blockchain Neutrality, Digital art

UNIT- III
Bitcoin - The Bitcoin network - Wallets and its types - Bitcoin payments - Bitcoin investment and buying and selling bitcoins - Bitcoin installation - Bitcoin programming and the command -line interface - Bitcoin improvement proposals (BIPs).
Blockchain Science: Grid coin, Folding coin, Blockchain Genomics

UNIT - IV
Ethereum: Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts, The Ethereum network - Applications developed on Ethereum - Scalability and security issues.

UNIT - V

Issues in Blockchain: Technical challenges, Business model challenges, Government Regulations, Zero Knowledge proofs and protocols in Blockchain
Hyperledger: Hyperledger as a protocol - Fabric - Hyperledger Fabric - Sawtooth Lake – Corda Architecture.

TEXTBOOKS:
1. Blockchain Blue print for Economy by Melanie Swan.
2. I. Bashir, Mastering Block chain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, 2nd revised edition. Birmingham: Packt Publishing, 2018.

REFERENCE BOOKS:
1. Vigna, Paul, and Michael J. Casey. The Truth Machine: The Block chain and the Future of Everything. Picador, 2019.
2. Gerard, David. Attack of the 50 foot block chain: Bitcoin, block chain, Ethereum & smart contracts. David Gerard, 2017.
3. Z. Zheng, S. Xie, H. Dai, X. Chen, and H. Wang, "An Overview of Block chain Technology: Architecture, Consensus, and Future Trends," in 2017 IEEE International Congress on Big Data (Big Data Congress), 2017, pp.557–564.

19IT4151: MACHINE LEARNING USING PYTHON LAB

B. Tech IV Year I Semester

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Prerequisites:

- Knowledge of Java Programming.
- Data mining concepts.

Course Objectives:
- Understand basics and functions using Python programming language.
- Understand all principal elements of Computational Learning Theory.
- Gain the knowledge of decision tree and decision tree learning algorithms.
- Make use of Data sets in implementing the machine learning algorithms.
- Implement the machine learning concepts and algorithms and to understand the high - performance programs designed to strengthen the practical expertise.

Course Outcomes: After the completion of the course student should be able to
- Understand the basic concepts of scripting and to explore Python especially the object - oriented concepts and the built-in objects of Python.
- Observe the concepts of computational intelligence like machine learning and design an exemplarily learning system.
- Apply the algorithms (Decision Tree techniques) to a real-world problem, optimize the models learned and report on the expected accuracy.
- Analyze the Neural Networks and its usage in machine learning applications.
- Apply Bayesian reasoning and also target based learning techniques to develop a machine learning application and analyze the different search methods.

List of Programs:

1. a) Write a program to demonstrate different number data types in Python.
   b) Write a program to perform different Arithmetic Operations on numbers in Python.
   c) Write a program to create, concatenate and print a string and accessing sub-string from a given string.
   d) Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
2. a) Write a program to create, append and remove lists in python.
   b) Write a program to demonstrate working with tuples in python.
   c) Write a program to demonstrate working with dictionaries in python.
   d) Write a python program to find largest of three numbers.
3. a) Write a Python program to convert temperatures to and from Celsius, Fahrenheit.
   [Formula: c/5 = f-32/9]
   b) Write a Python script that prints prime numbers less than 20.
   c) Write a python program to find factorial of a number using Recursion.
   d) Write a program that accepts the lengths of three sides of a triangle as inputs. The program Output should indicate whether or not the triangle is a right triangle (Recall from the Pythagorean Theorem that in a right triangle, the square of one side equals the sum of the Squares of the other two sides)

4. a) Write a python program to define a module to find Fibonacci Numbers and import the Module to another program.
    b) Write a python program to define a module and import a specific function in that module To another program.
    c) Write a script named "copyfile.py". This script should prompt the user for the names of two Text files. The contents of the first file should be input and written to the second file.

5. a) Write a program that inputs a text file. The program should print all of the unique words in The file in alphabetical order.
    b) Write a Python class to convert an integer to a roman numeral.
    c) Write a Python class to implement POW(x, n).
    d) Write a Python class to reverse a string word by word.

6. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis Based on a given set of training data samples. Read the training data from a .CSV file.

7. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent With the training examples.

8. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an Appropriate data set for building the decision tree and apply this knowledge to classify a new Sample.

9. Build an Artificial Neural Network by implementing the Back propagation algorithm and test The same using appropriate data sets.

10. Build a Neural Network to Recognize Handwritten Digits.

11. Write a program to implement the naïve Bayesian classifier for a sample training data set stored As a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

12. Assuming a set of documents that need to be classified, use the Naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

13. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Python ML library classes/API.

14. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

15. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

TEXT BOOK:

1. Machine Learning, Tom M Michel, McGraw Hill, 1997.

REFERENCE BOOKS:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis
2. https://towardsdatascience.com/tagged/model - evaluation
3. https://github.com/topics/handwriting-recognition?l=python

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B. Tech IV Year I Semester

Prerequisites:

- Knowledge of OOPS through Java.
- Knowledge of XML.

Course Objectives:

- Develop applications in android environment.
- Develop user interface applications.
- Develop URL related applications.
- Create robust mobile applications and learn how to integrate them with other services.
- Create intuitive, reliable mobile apps using the Android services and components.

Course Outcomes: After the completion of the course student should be able to

- Understand the working of Android OS Practically.
- Make use of Android Studio by installing and configuring the software.
- Develop User Interfaces.
- Develop, Deploy and Maintain the Android Applications.
- Build Enterprise level mobile applications with Android.

List of Programs:

1. (a) Create an Android application that shows Hello + name of the user and run it on an emulator.
   (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.

2. Create an android program to explain about android activity Life cycle.

3. Create an Android application for Calculator.

4. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picker), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout, (b) Relative Layout.

5. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.

6. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.

7. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.

8. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.

9. Create a user registration application that stores the user details in a database table.

10. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.

11. Develop an application that shows all contacts of the phone along with name, phone number, mobile number etc.

12. Create an application Using Alarm Manager that runs after a specific time provided by the user.

Note:

Android Application Development with MIT App Inventor: For the first one week, the student is advised to go through the App Inventor from MIT which gives insight into the various properties of each component.
The student should pay attention to the properties of each component, which are used later in Android programming.

TEXT BOOKS:
1.   Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
2.   Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

REFERENCES:
1.   http://ai2.appinventor.mit.edu
2.   https://drive.google.com/file/d/0B8rTtW_91YclTWF4czdBMEpZcWs/view
3.   https://developer.android.com/samples

19IT4181: MAJOR PROJECT PHASE – I

B.Tech IV Year I Semester

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19IT4182:   MINI PROJECT

B.Tech IV Year I Semester

L	T	P	C
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19MB4212: FUNDAMENTALS OF MANAGEMENT

B. Tech IV Year II Semester

L	T	P	C
3	-	-	3

Course Objectives:
- To understand the fundamentals of management, history and evolution of management theories
- To analyze various dimensions of organizational planning and decision making.
- To understand the function of organizing, types of organizational structures and various functions of Human resource management.
- To understand and analyze the concept of leadership and motivation in an organization.
- To understand the concept and the process of controlling in an organization.

Course Outcomes: After the completion of the course student should be able to
- Understand the fundamentals of management and contribution of management thinkers.
- Analyze the relevance and importance of planning and decision making in an organization.
- Understand the importance of organizing, types of organizational structures and various function of Human resource management
- Understand, analyze the concept of leadership and motivation in an organization.
- Understand, analyze the concept and process of controlling in an organization.

UNIT - I
Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT – II
Planning and Decision Making: General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving - Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

UNIT - III
Organization and HRM: Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change.
Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

UNIT - IV
Leading and Motivation: Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Team
Leadership. Motivation - Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT - V
Controlling: Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non- Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency and Methods.

TEXT BOOKS:
1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

REFERENCES:
1. Essentials of Management, Koontz Kleihrich, Tata Mc — Graw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.

19IT4271: AD-HOC & SENSOR NETWORKS
(Professional Elective – V)

B. Tech IV Year II Semester

L	T	P	C
3	-	-	3

Pre-requisites:

- A course on "Computer Networks"
- A course on "Mobile Computing"

Course Objectives:

- Learn Ad Hoc network and Sensor network fundamentals.
- Understand different routing protocols for ad hoc networks.
- Gain knowledge to identify the suitable routing algorithm based on the network and user requirement.
- Learn the concepts of network architecture and MAC layer protocol for WSN.
- Understand the transport layer in Ad Hoc and sensor networks.

Course Outcomes: After the completion of the course student should be able to

- Identify the major issues, fundamentals and applications associated with ad hoc/sensor networks.
- Explore current ad-hoc/sensor technologies by researching key areas such as algorithms, protocols, hardware, and applications.
- Gain Knowledge on different networking environments like Broadcasting, Multicasting and Geocasting.
- Apply the knowledge to identify appropriate physical and MAC layer protocols.
- Understand the transport layer and security issues possible in Ad Hoc and sensor networks.

UNIT - I
Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs. Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topology - based routing algorithms-Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP; Position - based routing algorithms-Location Services- DREAM, Quorum -based; Forwarding Strategies: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

UNIT - II
Data Transmission - Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability - based Methods, Area - based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree - based: AMRIS, MAODV; Mesh - based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

UNIT - III
Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented - GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad Hoc.

UNIT - IV

Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT - V

Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981–256–681–3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

REFERENCE BOOKS:

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.
2. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks- Technology, Protocols, and Applications", John Wiley, 2007.

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B. Tech IV Year II Semester	3	-	-	3

Prerequisite:

- Scripting Languages, XML, DBMS

Course Objectives:
- Introduce Bioinformatics and Elementary commands.
- Introduce PAM, BLOSUM database: BLAST and FASTA.
- Introduce Primary database Information.
- Introduce Phylogenetic analysis and tree building.
- Introduce Biochemical KEGG, EXGESCY, BRENDA, ERGO.

Course Outcomes: After the completion of the course student should be able to
- Gain knowledge on Bioinformatics and Elementary commands.
- Gain knowledge on PAM, BLOSUM database: BLAST and FASTA.
- Learn Phylogenetic analysis and tree building.
- Gain knowledge on Biological databases.
- Gain knowledge Biochemical database.

UNIT - I

Introduction to Bioinformatics: Scope of Bioinformatics, Elementary Commands and Protocols, ftp, telnet, HTTP, Primer on Information theory.

Special topics in Bioinformatics: DNA mapping and sequencing, map alignment. Large scale sequencing methods, shortgun and sanger method, cDNA sequencing Genome mapping, map assembly, Comparative sequence analysis.

UNIT - II

Sequencing Alignment and Dynamic Programming: Alignment - Local, Global alignment, pairwise and multiple sequence alignments. Concept of gap penalty and e-value. Alignment algorithms. Dynamic programming in sequence alignment: Needleman - Wunsch Algorithm and Smith Waterman Algorithm, Aminoacid Substitution matrices (PAM, BLOSUM). Sequence similarity search with database: BLAST and FASTA.

UNIT - III

Primary database Information: Introduction to Biological databases, organization and management of databases, searching and retrieval of information from World Wide Web. Structure databases-PDB (protein data Bank), Molecular Modeling databases (MMDB), Primary databases NCBL, EMBL, DDBJ.
  Secondary database: Introduction to Biological databases, organization and management of databases Swissport, PIR, KEGG.

UNIT - IV

Phylogenetic analysis and tree building: Introduction to phylogenetics, Methods of phylogenetic analysis, role of multiple sequence alignment algorithms in phylogenetic analysis, Automated tools for phylogenetic analysis, Construction of phylogenetic tree.

UNIT - V

Biochemical database: Introduction to Biological databases, organization and management of databases, KEGG, EXGESCY, BRENDA, ERGO.

Introduction to Homology: Introduction to Homology, Levels of protein structure, homology modeling of proteins (Sequence to structure) Cn3D, rasMol and SPDbv in homology modeling -case study.

TEXT BOOKS:

1. S. C. Rastogi, N. Mendiratta, "Bioinformatics Methods and Applications", CBS publications, 2004.
2. James D. Tisdall, "Beginning Perl for Bioinformatics" O'Reilly media, 1st Edition, 2001.

REFERENCE BOOKS:

1. D.R. Westhead, J.H. Parish, "Bioinformatics" Viva books private limited, New Delhi (2003).
2. Att Wood, "Bioinformatics" Pearson Education, 2004.
3. Bryan Bergeron, M.D, "Bioinformatics Computing" Pearson Education, 2003.

	L	T	P	C
B. Tech IV Year II Semester	3	-	-	3

Prerequisite:

- Knowledge of Database Management Systems.

Course Objectives:

- Enrich the previous knowledge of database systems and exposing the need for distributed database technology to confront with the deficiencies of the centralized database systems.
- Introduce basic principles and implementation techniques of distributed database systems.
- Gain knowledge on distributed DBMS architecture and design, query processing and optimization.
- Equip with the principles and knowledge of parallel and object-oriented databases.
- Understand the concept of distributed transaction management, including concurrency control, and reliability.

Course Outcomes: After the completion of the course student should be able to

- Understand good knowledge of the issues and challenges faced while designing distributed database systems.
- Understand the fundamental principles and architecture of distributed database systems and techniques of distributed query processing.
- Develop the understanding of choosing the optimized query execution plan for distributed queries.
- Have a broad picture of distributed transaction management and Concurrency Control, distributed DBMS reliability and replication techniques.
- Design multi database systems and can resolve problems of heterogeneous multi database systems in database integration strategies.

UNIT - I

Features of Distributed versus Centralized Databases: Principles of Distributed Databases, Levels of Distribution Transparency, Reference Architecture for Distributed Databases,

Distributed Database Design: Top - Down Design Process, Distributed Database Design Issues, Fragmentation, Allocation, and Database Integration - Bottom - up approach, Schema Matching, Schema Integration, and Schema Mapping.

UNIT - II

Translation of Global Queries to Fragment Queries: Equivalence transformations for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.

Optimization of Access Strategies, A Framework for Query Optimization, Join Queries, General Queries.

UNIT - III

The Management of Distributed Transactions: A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions, Architectural Aspects of Distributed Transactions.

Concurrency Control: Foundation of Distributed Concurrency Control, Distributed Deadlocks, and Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control.

UNIT - IV

Reliability and concurrency Control: Reliability, Basic Concepts, Non-blocking Commitment Protocols, Reliability and concurrency Control, Determining a Consistent View of the Network, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart, Distributed Database Administration, Catalog Management in Distributed Databases, Authorization and Protection.

UNIT - V

Object Management: Architectural Issues, Alternative Client/Server Architectures, Cache Consistency, Object Management, Object Identifier Management, Pointer Swizzling, Object Migration, Distributed Object Storage, Object Query Processing, Object Query Processor Architectures, Query Processing Issues, Query Execution, Transaction Management, Transaction Management in Object DBMSs, Transactions as Objects.

Database Integration: Scheme Translation, Scheme Integration, Query Processing Query Processing Layers in Distributed Multi-DBMSs, Query Optimization Issues Transaction Management Transaction and Computation Model, Multi database Concurrency Control, Multi database Recovery, Object Orientation and Interoperability, Object Management Architecture CORBA and Database interoperability, Distributed Component Object Model, COM/OLE and Database Interoperability, PUSH-Based Technologies

TEXT BOOKS:
1. Stefano Ceri, Giuseppe Pelagatti, Distributed Databases: Principles and Systems, Tata McGraw-Hill Edition, 2008.
2. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez, Pearson Education, 2nd Edition.

REFERENCE BOOKS:
1. Chanda Ray (2012), Distributed Database Systems, Pearson Education, 1st Edition, Indi

19CS4273: NATURAL LANGUAGE PROCESSING
(Professional Elective- V)

B.Tech IV Year II Semester

L	T	P	C
3	-	-	3

Prerequisites:
- Data structures, finite automata and probability theory

Course Objectives
- Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.
- To provide knowledge of various levels of analysis involved in NLP.
- To understand the applications of NLP.
- To Gain knowledge in automated Natural Language Generation and Machine Translation.
- To learn different language modeling Techniques.

Course Outcomes: After the completion of the course student should be able to
- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems.
- Manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Design, implement, and analyze NLP algorithms
- Design different language modeling Techniques.

UNIT – I
Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models.
Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, and Performances of the Approaches.

UNIT - II
Syntax Analysis: Parsing Natural Language, Tree banks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues.

UNIT - III
Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT - IV
Predicate-Argument Structure, Meaning Representation Systems, Software.

UNIT - V
Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling.

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice– Daniel M. Bikel and Imed Zitouni, Pearson Publication.

2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S.Tiwary

REFERENCES:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.

	L	**T**	**P**	**C**
B. Tech IV Year II Semester	**3**	**-**	**-**	**3**

Prerequisite:
- Object Oriented Programming through Java

Course Objectives:
- Understand the basic concepts of Design patterns.
- Understand the various Design patterns.
- Understand the importance of design patterns for development of a reusable product.
- Apply the suitable design patterns to refine the basic design for given context.
- Relate the Creational, Structural and Behavioral Design Patterns.

Course Outcomes: After the completion of the course student should be able to
- Appreciate the basic concepts of design patterns and able to know how to select and use the design patterns.
- Identify the design pattern in the existing code and use of creational patterns.
- Apply and use the structural patterns.
- Identify and use the behavioral patterns.
- Find and catalog patterns in the object-oriented software.

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

UNIT - II
A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary What to Expect from Design Patterns.

UNIT - III
Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT - IV
Structural Patterns: Adapter, Bridge and Composite, Decorator, façade, Flyweight, Proxy.

UNIT - V
Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.

TEXT BOOKS:
1. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, Addison-Wesley, 1995.
2. Java™ Design Patterns: A Tutorial, James W. Cooper, Addison Wesley, 2000.

REFERENCE BOOKS:

1. Patterns in Java: A catalog of reusable Design Patterns Illustrated with UML, Mark Grand, Volume 1, Wiley DreamTech.
2. Patterns in Java, Mark Grand, Volume 2, Wiley DreamTech, 2008.
3. Java Enterprise Design Patterns, Mark Grand, Wiley DreamTech, 2006.

19IT4275: DATA SCIENCE
(Professional Elective – VI)

B. Tech IV Year II Semester

L	**T**	**P**	**C**
3	**-**	**-**	**3**

Pre-requisite:

- A course on "Python"

Course Objectives:
- Facilitate learning fundamentals of Numpy, Pandas and various file formats.
- Familiarize with data pre-processing operations.
- Introduce time series data and inferential statistics.
- Acquire knowledge about visualization and prediction.
- Analyze unstructured data with text mining.

Course Outcomes: After the completion of the course student should be able to
- Understand the usage of Numpy, Pandas libraries and various file formats.
- Apply data pre-processing and visualization techniques on the data.
- Perform time series data analysis and apply inferential statistics.
- Visualize the data and apply prediction techniques.
- Understand Collaborative filtering, clustering and ensemble models.

UNIT-I
Numpy Basics: Arrays and Vectorized Computation, Getting Started with pandas, Data Loading, Storage, and File Formats.

UNIT-II
Data Cleaning and Preparation, Data Wrangling: Join, Combine, and Reshape, Plotting and Visualization, Data Aggregation and Group Operations.

UNIT-III
Time Series, Advanced Pandas, Introduction to Modeling Libraries in Python, Data Analysis Examples, Inferential Statistics.

UNIT-IV
Finding a Needle in a Haystack, Making Sense of Data through Advanced Visualization, Performing Predictions with a Linear Regression, Estimating the Likelihood of Events.

UNIT-V
Generating Recommendations with Collaborative Filtering, Pushing Boundaries with Ensemble Models, Applying Segmentation with k-means Clustering, and Analyzing Unstructured Data with Text Mining.

TEXT BOOKS:
1. William McKinney, - Python for Data Analysis Data Wrangling with Pandas, NumPy and IPython‖, 2nd Edition, O'Reilly Media, 2017.
2. Samir Madhavan, - Mastering Python for Data Science‖, Packt Publishing, 2015.

REFERENCE BOOKS:

1. Joel Grus, - Data Science from Scratch‖, O'Reilly Media, 2015.

2. John V. Guttag, - Introduction to Computation and Programming Using Python - with Application to Understanding Data, the MIT Press, 2nd Edition, 2016.

3. Alberto Boschetti, Luca Massaron, - Python Data Science Essentials: A practitioner's guide covering essential data science principles, tools, and techniques, 3rd Edition, 2018.

B. Tech IV Year II Semester

L	T	P	C
3	-	-	3

Pre-requisite: Knowledge of Information Security

Course Objectives:
- Familiarize various types of cyber-attacks and cyber-crimes, cyber forensics.
- Study the defensive techniques against these attacks.
- Acquire knowledge relating to Cyberspace and laws.
- Aware of cybercrime related to mobile and laptop etc.
- Understand ethical laws of computer for different countries, Offences under the Cyberspace and Internet in India.

Course Outcomes: After the completion of the course student should be able to
- Understand cyber-attacks, types of cybercrimes.
- Realize the importance of cyber security, various forms of cyber - attacks and its countermeasures.
- Explain the computer forensics fundamentals.
- Get familiar with obscenity and pornography in cyber space
- Understand the violation of Right of privacy on Internet.

UNIT-I:
Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc.

UNIT - II
Cyberspace and the Law: Introduction to Cyber Security Regulations, International Law. The INDIAN Cyberspace, National Cyber Security Policy. Internet Governance - Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threats.

Cyber Forensics: Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III
Cybercrime-Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops and desktop.

UNIT- IV

Cyber Security-Organizational Implications: Introduction cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT – V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Cybercrime: Examples and Mini-Cases Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:
1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley.
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCE BOOKS:
1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan.-.Hwa (john) Wu, .J. David Irwin, CRC Press T&F Group.
3. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2ndEdition, O' Reilly Media, 2006.
4. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, New Delhi, 2006.
5. Cyberspace and Cyber security, George Kostopoulos, Auerbach Publications, 2012.
6. Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, Second Edition, Albert Marcella, Jr., Doug Menendez, Auerbach Publications, 2007.
7. Cyber Laws and IT Protection, Harish Chander, PHI, 2013

19IT4277: DISTRIBUTED SYSTEMS
(Professional Elective – VI)

B. Tech IV Year II Semester

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Prerequisites:

- A course on "Operating Systems".
- A course on "Computer Organization & Architecture".

Course Objectives:

- Understand the basic concepts of Distributed system and sharing of resources in a distributed manner.
- Familiarize the basics of Distributed systems.
- Demonstrate the concepts of IPC, group communication and RPC.
- Describe the theoretical concepts, namely, virtual time, agreement and consensus protocols.
- Understand the concepts of Transaction in Distributed Environment, Concurrency control, Deadlocks and Error recovery.

Course Outcomes: After the completion of the course student should be able to

- Characterize the Distributed Systems.
- Know the support of Operating System like Operating system architecture, Protection, Communication and Invocation and architecture of file service.
- Understand peer to peer systems and applications with case studies.
- Understand Transactions and Concurrency control.
- Understand Security issues like Transactions with replicated data.

UNIT - I
Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models - Introduction, Architectural and Fundamental models, Networking and Internetworking, Inter - process Communication, Distributed objects and Remote Invocation - Introduction, Communication between distributed objects, RPC, Events and notifications, Case study - Java RMI.

UNIT - II
Operating System Support - Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems - Introduction, File Service architecture.

UNIT - III
Peer to Peer Systems - Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies - Squirrel, OceanStore.
Time and Global States - Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.
Coordination and Agreement - Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT - IV

Transactions and Concurrency control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering.

Distributed Transactions- Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT - V

Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data. Distributed shared memory, Design and Implementation issues, and Consistency models.

TEXT BOOKS:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, 4th Edition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman & Hall/ CRC, Taylor & Francis Group, 2010.

REFERENCE BOOKS:

1. Distributed Systems - Principles and Paradigms, A.S. Tannenbaum and M.V. Steen, Pearson Education.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010.

19IT4281:   MAJOR PROJECT-PHASE II

B.Tech IV Year II Semester

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