19CS4111:MACHINE LEARNING

B.Tech IV Year I Semester

L	T	P	C
3	1	-	4

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.

19CS4112:DATA MINING

B.Tech IV Year I Semester

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

Pre-Requisites:

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

Course Objectives

- To Understand the concepts of Data Mining
- To Familiarize with frequent patterns, associations, and correlations.
- To describes methods for data classification and prediction.
- To understand the data–clustering approaches.
- To understand various types of data stores such as spatial, textual, multimedia, streams.

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

- Ability to understand the types of the data to be mined and present a general classification of Tasks and primitives to integrate a data mining system.
- Apply preprocessing methods for any given raw data, Extract interesting patterns from large amounts of data.
- Discover the role played by data mining in various fields.
- Choose and employ suitable data mining algorithms to build analytical applications
- Evaluate the accuracy of supervised and unsupervised models and algorithms.

UNIT - I

Data Mining: Data–Types of Data–, Data Mining Functionalities– Interestingness Patterns– Classification of Data Mining systems– Data mining Task primitives –Integration of Data mining system with a Data warehouse–Major issues in Data Mining–Data Preprocessing- Data Cleaning, Data Integration and Transformation Data Reduction, Discretization and Concept Hierarchy Generation, measures of similarity and dissimilarity-basics.

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UNIT - II

Association Rule Mining: Mining Frequent Patterns–Associations and correlations – Mining Methods – Mining various kinds of Association Rules– Correlation Analysis– Constraint based Association mining. Graph Pattern Mining, Sequential Pattern Mining.

UNIT - III

Classification and Prediction: Basic concepts, Decision tree induction, Bayesian classification, Naive Bayes Classification, classification by Back propagation, Support vector machines, Lazy learners, other classification methods, Prediction.

UNIT - IV

Clustering and Applications: Cluster analysis–Types of Data in Cluster Analysis–Categorization of Major Clustering Methods– Partitioning Methods, Hierarchical Methods– Density–Based Methods, Grid–Based Methods, Outlier Analysis.

UNIT - V

Advanced Concepts: Basic concepts in mining data streams–Mining Time–series data—Mining sequence patterns in Transactional databases– Mining Object– Spatial– Multimedia–Text and Web data – Spatial Data mining– Multimedia Data mining–Text Mining– Mining the World Wide Web.

TEXT BOOKS:

1. Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3rd Edition Elsevier.
2. Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.

REFERENCES:

1. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan Kaufmann, 2005.

19CS4171: SECURITY ANALYSIS
(Professional Elective - III)

B.Tech IV Year I Semester

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

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, Volume 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 byJames M.
   Stewart (Author), Mikehapple(Author), Darril Gibson (Author)
5. The Art of Computer Virus Research and Defense by Peter Szor.

19CS4172: CLOUD COMPUTING
(Professional Elective - III)

B.Tech IV Year I Semester

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

Pre-requisites:

- A course on "Computer Networks"
- A course on "Operating Systems"

Course Objectives:

- To explain the evolving computer model called cloud computing.
- To Understand the current trend and basics of cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.
- To Learn cloud enabling technologies and its applications.

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

- Understand various service delivery models of a cloud computing architecture.
- Understand the virtualization and cloud computing concepts.
- Understand cloud computing architecture and managing cloud infrastructure and its applications.
- Acquire knowledge on cloud service models.
- Acquire knowledge on cloud service providers.

UNIT-I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano Computing.

UNIT-II

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud Computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, and Four Cloud Deployment Models.

UNIT-III

Cloud Computing Architecture and Management: Cloud Architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud Application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT-IV

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS,

Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models

UNIT-V

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,Service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjrasoft, Aneka Platform.

TEXT BOOKS:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014.

REFERENCES:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej, M.Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An EnterprisePerspective on Risks and Compliance, Tim Mather, SubraKumaraswamy, ShahedLatif, O'Reilly, SPD, rp2011.

19CS4173: **AD-HOC & SENSOR NETWORKS**
(Professional Elective - III)

B.Tech IV Year I Semester

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

Prerequisites

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

Course Objectives

- To understand the concepts of sensor networks.
- To understand the MAC and transport protocols for ad hoc networks.
- To understand the security of sensor networks.
- To understand the applications of adhoc and sensor networks.
- To Understand the transport layer and security issues possible in Ad hoc and Sensor networks.

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

- Understand the state-of-the-art research in the emerging subject of Ad Hoc and Wireless Sensor Networks.
- Solve the issues in real-time application development based on ASN.
- Conduct further research in the domain of ASN.
- Understand the transport layer and security issues possible in Ad hoc and sensor networks.
- Acquire knowledge on upper layer issues of WSN.

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, and Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, and 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, Eseview Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

REFERENCES:

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, ―Ad Hoc and Sensor Networks: Theory and Applications (2nd Edition)‖, World Scientific Publishing, 2011.

19CS4174: DIGITAL FORENSICS
(Professional Elective - III)

B.Tech IV Year I Semester

L	T	P	C
3	-	-	3

Pre-Requisites:

- Computer Networks
- Protocols

Course Objective

- To understand the basic digital forensics and techniques for conducting the forensic examination on different digital devices.
- To impart an introduction to the need of computer forensics.
- To understand how to examine digital evidences such as the data acquisition, identification analysis.
- To study the tools and tactics associated with cyber forensics.
- To analyze and validate computer forensics data.

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

- Know how to apply forensic analysis tools to recover important evidence for identifying computer crime.
- Be well-trained as next-generation computer crime investigators.
- Knowledge on Forensics acquisition tools.
- Knowledge on Processing crimes and Scenes.
- Knowledge on validating and testing forensic software's.

UNIT -I

Computer Forensics Fundamentals, Benefits of Forensics, Computer Crimes, Computer Forensics Evidence and Courts, Legal Concerns and Private issues.

UNIT- II

Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

UNIT-III

Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

UNIT-IV

Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.

UNIT-V

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, e-mail investigations-

investigating email crime and violations, understanding e-mail servers, specialized e-mail forensics tool

TEXT BOOKS:

1. Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002.
2. Nelson, B, Phillips, a, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.

REFERENCES:

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

19CS4175: SOFTWARE PROCESS & PROJECT MANAGEMENT

(Professional Elective - IV)

B.Tech IV Year I Semester

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

Course Objectives

- A basic knowledge of software project management principles.
- The ability to come up with a project schedule and assign resources.
- Choose an appropriate project development methodology (e.g. waterfall, spiral...)
- Identify project risks, monitor and track project deadlines.
- The capability to work in a team environment and be aware of different modes of communications.

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

- Identify and describe how different project contexts will impact upon all aspects of a software development project.
- Identify and describe the key phases of project management and the key skills associated with each.
- Determine an appropriate project management approach through an evaluation of the business ontextandprojectscopeandknowledgeofagileandtraditionalprojectmanagement approaches.
- Demonstrate through application, knowledge of the key project management skills, such as product and work break-down structure, schedule; governance including progress reporting, risk and quality management.
- As part of a small team research and produce a concise piece of writing suitable for presentation to senior management.

UNIT-I

Conventional Software Management: The waterfall model, conventional software Management performance. Overview of Project Planning – Stepwise Project Planning.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT –II

The old way and the new way: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life cycle phases: Engineering and production stages, Inception, Elaboration, Construction, Transition phases.

Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT –III

Work Flows of the process: Software process workflows, Iteration workflows.

Checkpoints of the process: Major milestones, Minor Milestones, Periodic status Assessments.

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule

estimating, Iteration planning process, Pragmatic planning.

UNIT–IV

Process Automation: Automation Building blocks.

Project Control and Process instrumentation: These Vencor Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Tailoring the Process: Process discriminates.

UNIT–V

Project Organizations and Responsibilities:

Line-of-Business Organizations, Understanding Behavior – Organizational Behavior

Future Software Project Management: Modern Project Profiles, Next generation Software economics, modern process transitions.

Case Study: The command Center Processing and Display system-Replacement (CCPDS-R).

TEXT BOOKS:

1. Software Project Management, Walker Royce: Pearson Education, 2005.

REFERENCES:

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
2. Software Project Management, Joel Henry, Pearson Education.
3. Software Project Management in practice, Pankaj Jalote, Pearson Education.2

19CS4176: SCRIPTING LANGUAGES

(Professional Elective - IV)

B.Tech IV Year I Semester

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

Prerequisites:

- A course on "Computer Programming and Data Structures"
- A course on "Object Oriented Programming Concepts"
- A course on "Web Technologies"

Course Objectives

- Introduces Ruby, Ruby on Rails, RubyGems and RubyTk scripting languages.
- Introduces scripting languages such as Extending Ruby and Embedding a Ruby Interpreter.
- Introduces PERL and Scripting.
- Introduces Advanced PERL to create Internet applications.
- Introduces TCL, Tk and Perl-Tk.

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

- Understand how to comprehend the differences between Ruby, Ruby on Rails and RubyTk and Designing CGI scripts using Ruby and Web.
- Understand and Extend the Ruby and Embedding a Ruby Interpreter.
- Create and run scripts using PERL and able to translate from Perl/Tk to Ruby.
- Create Internet ware applications by Advanced Perl.
- Acquire programming skills in TCL, Tk and Perl-Tk.

UNIT - I

Introduction: Ruby, Rails, Difference between Ruby and Ruby on Rails, The structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Web servers, SOAP and web services, RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling.

UNIT - II

Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter

UNIT - III

Introduction to PERL and Scripting:

Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages,UsesforScriptingLanguages,WebScripting,andtheuniverseofScriptingLanguages.PERL -Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, has, strings, pattern and regular expressions, subroutines, Translating from Perl/Tk to Ruby.

UNIT - IV

Advanced perl:

Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT - V

TCL: TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and up level commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface. Tk Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

TEXT BOOKS:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro MatsumotoO'Reilly
3. "Programming Ruby" The Pramatic Programmers guide by Dabve Thomas Second edition

REFERENCES:

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) PearsonEducation.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, PearsonEducation.
5. Perl Power, J. P. Flynt, CengageLearning.

19CS4177: INTERNET OF THINGS

(Professional Elective - IV)

B.Tech IV Year I Semester

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

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

19CS4178–HUMAN COMPUTER INTERACTION
(Professional Elective - IV)

B.Tech IV Year I Semester

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

Course Objectives

- To gain an overview of human computer interaction (HCI).
- To understand the basic HCI concepts and various design process, standards and guidelines.
- To Perform implementation support and evaluation of their design
- To become familiar with the vocabulary associated with sensory and cognitive systems as relevant to task performance by humans.
- To learn various cognitive models models.

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

- Apply HCI and principles to interaction design.
- Design certain tools for blind or PH people.
- Understand user interface design in general and alternatives to traditional "keyboard and mouse" computing.
- Implement HCI in software process.
- Apply models from cognitive psychology to predicting user performance in various HCI tasks and recognize the limits of human performance as they apply to computer operation.

UNIT-I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design.

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user–Interface popularity, characteristics-Principles of user interface.

UNIT-II

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds and understanding business junctions.

Screen Designing: Design goals–Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing

Composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web– statistical graphics– Technological consideration in interface design.

UNIT-III

Windows–New and Navigation schemes selection of window, selection of devices based and screen-based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT-IV

HCI in the software process, The software lifecycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques ,Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction

UNIT-V

Cognitive models Goal and task hierarchies Design Focus: GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient **Wood** – augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.

TEXTBOOKS:

1. The essential guide to user interface design, Wilbert OGalitz, WileyDreamTech.Units1,2,3
2. Human–computer Interaction. AlanDix, JanetFincay, GreGoryd, Abowd, Russell Bealg, Pearson Education Units4,5

REFERENCS:

1. Designing the user interface.3rdEditionBenShneidermann, PearsonEducationAsia.
2. Interaction Design Prece, Rogers, Sharps.WileyDreamtech.
3. User Interface Design, SorenLauesen, PearsonEducation.
4. Human– Computer Interaction, D.R.Olsen, CengageLearning.
5. Human–Computer Interaction, Smith- Atakan, CengageLearning.

19CS4151: MACHINE LEARNING LAB

B.Tech IV Year I Semester

L	T	P	C
-	-	3	1.5

Course Description

- Machine Learning is concerned with computer programs that automatically improve their performance through experience.
- This course covers the theory and practical algorithms for machine learning from a variety of perspectives.
- This course covers topics such as FIND-S, Candidate Elimination Algorithm, Decision tree (ID3 Algorithm), Back propagation Algorithm, Naïve Bayesian classifier, Bayesian Network, k-Means Algorithm, k-Nearest Neighbor Algorithm, Locally Weighted Regression Algorithm.

Course Objectives

- Make use of Data sets in implementing the machine learning algorithms.
- Implement the machine learning concepts and algorithms in any suitable language of choice.

Course Outcomes

- Understand the implementation procedures for the machine learning algorithms.
- Design Java/Python programs for various Learning algorithms.
- Apply appropriate data sets to the Machine Learning algorithms.
- Identify and apply Machine Learning algorithms to solve real world problems.

List of Experiments

1. 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.
2. 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
3. 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
4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5. 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.
6. 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.
7. 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 Java/Python ML library classes/API.

8. 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.
9. 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.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

19CS4152: DATA MINING LAB

B.Tech IV Year I Semester

L	T	P	C
-	-	3	1.5

Prerequisites:

- A Course on "database systems"

Course Objectives

- To obtain practical experience using data mining techniques on real world data sets.
- Intended to provide practical exposure of the concepts in data mining algorithms.
- Implement various data mining functionalities.

Course Outcomes

- Extract knowledge using data mining techniques.
- Adapt to new data mining tools.
- Design small projects using data mining techniques on real world data sets.

List of Sample Problems:

Task 1: Credit Risk Assessment

Description:

The business of banks is making loans. Assessing the credit worthiness of an applicant is of crucial importance. You have to develop a system to help a loan officer decide whether the credit of a customer is good, or bad. A bank's business rules regarding loans must consider two opposing factors. On the one hand, a bank wants to make as many loans as possible. Interest on these loans is the banks profit source. On the other hand, a bank cannot afford to make too many bad loans. Too many bad loans could lead to the collapse of the bank. The bank's loan policy must involve a compromise: not too strict, and not too lenient.

To do the assignment, you first and foremost need some knowledge about the world of credit. You can acquire such knowledge in a number of ways. 1. Knowledge Engineering. Find a loan officer who is willing to talk. Interview her and try to represent her knowledge in the form of production rules. 2. Books. Find some training manuals for loan officers or perhaps a suitable textbook on finance. Translate this knowledge from text form to production rule form. 3. Common sense. Imagine yourself as a loan officer and make up reasonable rules which can be used to judge the credit worthiness of a loan applicant. 4. Case histories. Find records of actual cases where competent loan officers correctly judged when, and when not to, approve a loan application.

The German Credit Data: Actual historical credit data is not always easy to come by because of confidentiality rules. Here is one such dataset, consisting of 1000 actual cases collected in Germany. Credit dataset (original) Excel spreadsheet version of the German credit data. In spite of the fact that the data is German, you should probably make use of it for this assignment. (Unless you really can consult a real loan officer!)

A few notes on the German dataset • DM stands for Deutsche Mark, the unit of currency, worth about 90 cents Canadian (but looks and acts like a quarter). • owns telephone. German phone rates are much higher than in Canada so fewer people own telephones. Foreign worker. There are

millions of these in Germany (many from Turkey). It is very hard to get German citizenship if you were not born of German parents.

There are 20 attributes used in judging a loan applicant. The goal is the classify the applicant into one of two categories, good or bad.

Subtasks: (Turn in your answers to the following tasks)

1. List all the categorical (or nominal) attributes and the real-valued attributes separately. (5 marks)
2. What attributes do you think might be crucial in making the credit assessment? Come up with some simple rules in plain English using your selected attributes. (5 marks)
3. One type of model that you can create is a Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training. (10 marks)
4. Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy? (10 marks)
5. Is testing on the training set as you did above a good idea? Why or Why not? (10 marks)
6. One approach for solving the problem encountered in the previous question is using cross-validation? Describe what cross-validation is briefly. Train a Decision Tree again using cross-validation and report your results. Does your accuracy increase/decrease? Why? (10 marks)
7. Check to see if the data shows a bias against "foreign workers" (attribute 20),or "personal-status" (attribute 9). One way to do this (perhaps rather simple minded) is to remove these attributes from the dataset and see if the decision tree created in those cases is significantly different from the full dataset case which you have already done. To remove an attribute you can use the preprocess tab in Weka's GUI Explorer. Did removing these attributes have any significant effect? Discuss. (10 marks)
8. Another question might be, do you really need to input so many attributes to get good results? Maybe only a few would do. For example, you could try just having attributes 2, 3, 5, 7, 10, 17 (and 21, the class attribute (naturally)). Try out some combinations. (You had removed two attributes in problem 7. Remember to reload the arff data file to get all the attributes initially before you start selecting the ones you want.) (10 marks)
9. Sometimes, the cost of rejecting an applicant who actually has a good credit (case 1) might be higher than accepting an applicant who has bad credit (case 2). Instead of counting the misclassifications equally in both cases, give a higher cost to the first case (say cost 5) and lower cost to the second case. You can do this by using a cost matrix in Weka. Train your Decision Tree again and report the Decision Tree and cross-validation results. Are they significantly different from results obtained in problem 6 (using equal cost)? (10 marks)
10. Do you think it is a good idea to prefer simple decision trees instead of having long complex decision trees? How does the complexity of a Decision Tree relate to the bias of the model? (10 marks)
11. You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning - Explain this idea briefly. Try reduced error pruning for training

your Decision Trees using cross-validation (you can do this in Weka) and report the Decision Tree you obtain? Also, report your accuracy using the pruned model. Does your accuracy increase? (10 marks)

12. (Extra Credit): How can you convert a Decision Trees into "if-then-else rules". Make up your own small Decision Tree consisting of 2-3 levels and convert it into a set of rules. There also exist different classifiers that output the model in the form of rules - one such classifier in Weka is rules.PART, train this model and report the set of rules obtained. Sometimes just one attribute can be good enough in making the decision, yes, just one ! Can you predict what attribute that might be in this dataset ? OneR classifier uses a single attribute to make decisions (it chooses the attribute based on minimum error). Report the rule obtained by training a one R classifier. Rank the performance of j48, PART and oneR. (10 marks)

Task Resources:

- Mentor lecture on Decision Trees
- Andrew Moore's Data Mining Tutorials (See tutorials on Decision Trees and Cross Validation)
- Decision Trees (Source: Tan, MSU)
- Tom Mitchell's book slides (See slides on Concept Learning and Decision Trees)

1. Weka resources: o Introduction to Weka (html version) (download ppt version)

a. Download Weka

b. Weka Tutorial

c. ARFF format

d. Using Weka from command line

Task 2: Hospital Management System

Data Warehouse consists Dimension Table and Fact Table.

REMEMBER The following
Dimension
The dimension objects (Dimension):
_ Name
_ Attributes (Levels), with one primary key
_ Hierarchies
One time dimension is must.

About Levels and Hierarchies Dimension objects (dimension) consist of a set of levels and a set of hierarchies defined over those levels. The levels represent levels of aggregation. Hierarchies describe parent-child relationships among a set of levels.
For example, a typical calendar dimension could contain five levels. Two hierarchies can be defined on these levels:

H1: YearL > QuarterL > MonthL > WeekL > DayL
H2: YearL > WeekL > DayL
The hierarchies are described from parent to child, so that Year is the parent of Quarter, Quarter the parent of Month, and so forth.

About Unique Key Constraints

When you create a definition for a hierarchy, Warehouse Builder creates an identifier key for each level of the hierarchy and a unique key constraint on the lowest level (Base Level)
Design a Hospital Management system data warehouse (TARGET) consists of Dimensions Patient, Medicine, Supplier, and Time. Where measures are 'NO UNITS', UNIT PRICE.
Assume the Relational database (SOURCE) table schemas as follows
TIME (day, month, year),
PATIENT (patient name, Age, Address, etc.,)
MEDICINE (Medicine_Brand_name, Drug name, Supplier, no units, Uinit_Price, etc.)
SUPPLIER :(Supplier_name, Medicine_Brand_name, Address, etc.)
If each Dimension has 6 levels, decide the levels and hierarchies, assume the level names suitably.

Design the Hospital Management system data warehouse using all schemas. Give the example 4-D cube with assumption names.

19CS4181: MAJOR PROJECT PHASE – I

B.Tech IV Year I Semester

L	T	P	C
-	-	6	3

19CS4182: MINI PROJECT

B.Tech IV Year I Semester

L	T	P	C
-	-	-	2

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.

19CS4271: SOFT COMPUTING
(Professional Elective- V)

B.Tech IV Year II Semester

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

Course Objectives

- Familiarize with soft computing concepts.
- Introduce and use the idea of fuzzy logic and use of heuristics based on human experience.
- Familiarize the Neuro-Fuzzy mode lingusing Classification and Clustering techniques.
- Learn the concepts of Genetic algorithm and its applications.
- Acquire the knowledge of Rough Sets.

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

- Identify the difference between Conventional Artificial Intelligence to Computational Intelligence.
- Understand fuzzy logic and reasoning to handle and solve engineering problems
- ApplytheClassificationandclusteringtechniquesonvariousapplications.
- Understand the advanced neural networks and its applications
- Perform various operations of genetic algorithms, Rough Sets.
- Comprehend various techniques to build model for various applications

UNIT-I

Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing, Applications of Soft Computing Techniques.

UNIT-II

Fuzzy Systems: Fuzzy Sets, Fuzzy Relations, Fuzzy Logic, Fuzzy Rule-Based Systems

UNIT-III

Fuzzy Decision Making, Particle Swarm Optimization

UNIT-IV

Genetic Algorithms: Basic Concepts, Basic Operators for Genetic Algorithms, Cross over and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm.

UNIT-V

Rough Sets, Rough Sets, Rule Induction, and Discernibility Matrix, Integration of Soft Computing Techniques.

TEXTBOOK:

1. Soft Computing–Advances and Applications an 2015 by B.K.Tripathy and J.Anuradha – Cengage Learning

REFERENCES:

1. N.Sivanandam & S.N.Deepa, "Principles of Soft Computing", 2ndedition,Wiley India, 2008.
2. DavidE. Goldberg, "Genetic Algorithms- In Search, optimization and Machine learning", Pearson Education.
3. J.S.R.Jang,C.T.SunandE.Mistune,"Neuro-Fuzzy and SoftComputing",Pearson Education,2004.
4. G.J.Klir&B.Yuan, "FuzzySets & Fuzzy Logic", PHI, 1995.
5. MelanieMitchell,"An Introduction to Genetic Algorithm", PHI, 1998.
6. TimothyJ.Ross,"FuzzyLogic with Engineering Applications", McGraw-HillInternationaleditions, 1995.

19CS4272: ADVANCED ALGORITHMS
(Professional Elective- V)

B.Tech IV Year II Semester

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

Pre-requisites:

- A course on "Computer Programming & Data Structures"
- A course on "Advanced Data Structures & Algorithms"

Course Objectives:

- Introduces the recurrence relations for analyzing the algorithms.
- Introduces the graphs and their traversals.
- Describes major algorithmic techniques (divide-and-conquer, greedy, dynamic programming, Brute Force, Transform and Conquer approaches) and mention problems for which each technique is appropriate.
- Describes how to evaluate and compare different algorithms using worst-case, average-case and best-case analysis.
- Ability to solve a real life problems with these algorithmic techniques.

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

- Analyze the performance of algorithms.
- Choose appropriate data structures and algorithm design methods for a specified application.
- Understand how the choice of data structures and the algorithm design methods impact the performance of programs.
- Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering.

UNIT-I

Introduction: Role of Algorithms in computing, Order Notation, Recurrences, Probabilistic Analysis and Randomized Algorithms. Sorting and Order Statistics: Heap sort, Quick sort and Sorting in Linear Time.

Advanced Design and Analysis Techniques: Dynamic Programming- Matrix chain Multiplication, Longest common Subsequence and optimal binary Search trees.

UNIT-II

Greedy Algorithms- Huffman Codes, Activity Selection Problem. Amortized Analysis.

Graph Algorithms: Topological Sorting, Minimum Spanning trees, Single Source Shortest Paths, Maximum Flow algorithms.

UNIT-III

Sorting Networks: Comparison Networks, Zero-one principle, bitonic Sorting Networks, Merging

Network, and Sorting Network.
Matrix Operations- Strassen's Matrix Multiplication, Inverting matrices,
Solving system of linear Equations.

UNIT-IV

String Matching: Naive String Matching, Rabin-Karp algorithm, matching with finite Automata, Knuth-Morris-Pratt algorithm.

UNIT-V

NP-Completeness and Approximation Algorithms: Polynomial time, polynomial time verification, NP-Completeness and reducibility, NP-Complete problems. Approximation Algorithms- Vertex covers Problem, Travelling Salesperson problem.

TEXTBOOK:

1. Introduction to Algorithms, "T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein" Third Edition, PHI.

REFERENCES:

1. Fundamentals of Computer Algorithms, EllisHorowitz, Satraj Sahniand Rajasekharam, Galgotia publications pvt.Ltd.
2. Design and Analysis Algorithms-ParagHimanshuDave, Himanshu Bhalchandra Dave Publisher: Pearson.
3. Algorithm Design: Foundations, Analysis and Internet examples, M.T.Good rich and R.Tomassia, JohnWileyand sons.
4. Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Pearson education.

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.

19CS4274: HIGH PERFORMANCE COMPUTING
(Professional Elective- V)

B.Tech IV Year II Semester

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

Prerequisites:

- Computer networks

Course Objectives

- Knowledge on parallel programming paradigms, HPC platforms with particular reference to Cluster system.
- To learn about Modern Processors and concepts.
- To learn about Parallel Computers and Programming.
- To Study about Memory Parallel Programming using OpenMP and MPI.
- Understand the means by which to measure, assess and analyse the performance of HPC applications.

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

- Understand the role of HPC in science and engineering.
- Use HPC platforms and parallel programming models.
- Measure, analyze and assess the performance of HPC applications and their supporting hardware.
- Administration, scheduling, code portability and data management in an HPC environment, with particular reference to Grid Computing.
- Analyze the suitability of different HPC solutions to common problems found in Computational Science.

UNIT I

Introduction: Characteristics and requirements, Review of Computational Complexity, Performance: metrics and measurements, Granularity and Partitioning, Locality: temporal/spatial/stream/kernel, Basic methods for parallel programming, Real-world case studies (drawn from multi scale, multi-discipline applications).

UNIT -II

High-End Computer Systems: Memory Hierarchies, Multi-core Processors: Homogeneous and Heterogeneous, Shared-memory Symmetric Multiprocessors, Vector Computers, Distributed Memory Computers, Supercomputers and Peta scale Systems, Application Accelerators / Reconfigurable Computing, Novel computers: Stream, multithreaded, and purpose-built.

UNIT -III

Parallel Algorithms: Parallel models: ideal and real frameworks, Basic Techniques: Balanced Trees, Pointer Jumping, Divide and Conquer, Partitioning, Regular Algorithms: Matrix operations and Linear Algebra, Irregular Algorithms: Lists, Trees, Graphs, Randomi.

UNIT -IV

Parallel Programming: Revealing concurrency in applications, Task and Functional Parallelism, Task Scheduling, Synchronization Methods, Parallel Primitives (collective operations), SPMD Programming (threads, OpenMP, MPI), I/O and File Systems, Parallel Matlabs (Parallel Matlab, Star-P, Matlab MPI), Partitioning Global Address Space (PGAS) languages (UPC, Titanium, and Global Arrays

UNIT -V

Performance: Measuring performance, Identifying performance bottlenecks, restructuring applications for deep memory hierarchies, Partitioning applications for heterogeneous resources, using existing libraries, tools, and frameworks.

TEXT BOOKS:

1. Contemporary High Performance Computing by Jeffrey S. Vetter, Released November 2017, Publisher(s): Chapman and Hall/CRC, ISBN: 9781466568358.

REFERENCES:

1. High Performance Computing by Charles Severance & Kevin Dowd, Copyright Year: 2010, Last Update: 2021, Publisher: Opens tax CNX.

19CS4275: BIG DATA ANALYTICS
(Professional Elective- VI)

B.Tech IV Year II Semester

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

Course Objectives:

- To introduce the concepts of Big Data Analytics.
- To introduce the concept of Big Data Architecture
- To introduce tools/algorithms that are available for a variety of analytics.
- To introduce the Database for Modern Web.
- To Realize the Hadoop architecture and implementation of Map Reduce Application.

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

- Know about sources of BigData and Analyzing Tools.
- Map statistical methods to analyze huge data.
- Know the other frameworks in Distributed File Systems.
- Know to create cluster in Hadoop distributed file system.
- Apply Map Reduction in HDFS.

UNIT – I

INTRODUCTION TO BIG DATA: Introduction –distributed file system –Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce.

UNIT – II

INTRODUCTION TO HADOOP AND HADOOP ARCHITECTURE: Big Data – Apache Hadoop & Hadoop EcoSystem, Moving Data in and out of Hadoop –Understanding inputs and outputs of MapReduce - Data Serialization.

UNIT – III

HDFS, HIVE AND HIVEQL, HBASE HDFS: Overview, Installation and Shell, Java API; Hive Architecture and Installation, Comparison with Traditional Database, HiveQL, Querying Data, Sorting And Aggregating, Map Reduce Scripts, Joins & Sub queries, HBase concepts, Advanced Usage, Schema Design, Advance Indexing, PIG, Zookeeper , how it helps in monitoring a cluster, how to Build Applications with Zookeeper.

UNIT –IV

SPARK: Introduction to Data Analysis with Spark, Downloading Spark and Getting Started, Programming with RDDs, Machine Learning with MLlib. **NoSQL** What is it?, Where It is Used, Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs NoSQL, NewSQL.

UNIT –V

DATA BASE FOR THE MODERN WEB: Introduction to MongoDB key features, Core Server tools, MongoDB through the JavaScript's Shell, Creating and Querying through Indexes, Document-Oriented data, principles of schema design, constructing queries on Databases, collections and Documents, MongoDB Query Language.

TEXT BOOKS:

1. Boris lublinsky, Kevin t. Smith, AlexeyYakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 19788126551071, 2015.
2. Chris Eaton, Dirk derooset al. “Understanding Big data”, McGraw Hill, 2012.
3. BIG Data and Analytics , Sima Acharya, Subhashini Chhellappan, Willey
4. MongoDB in Action, Kyle Banker,Piter Bakkum , Shaun Verch, Dream tech Press
5. Tom White, “HADOOP: The definitive Guide”, O Reilly 2012.
6. VigneshPrajapati, “Big Data Analytics with R and Hadoop”, Packet Publishing 2013.http://www.bigdatauniversity.com/
7. Learning Spark: Lightning Fast Big Data Analysis Paperback by Holden Karau

REFERENCES:

1. Michael Minelli, Michele Chambers, Ambiga Dhiraj, JimStogdill, “Big Data BigAnalytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses”, 1stEdition, Wiley Publications, 2013.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawhill Publishing, 2012 3. Pete Warden, “Big Data Glossary”, O’Reilly, 2011.

19CS4276: NEURAL NETWORKS & DEEP LEARNING
(Professional Elective- VI)

B.Tech IV Year II Semester

L	T	P	C
3	-	-	3

Course Objectives

- To introduce the foundations of Artificial Neural Networks.
- To acquire the knowledge on Deep Learning Concepts.
- To learn various types of Artificial Neural Networks.
- To gain knowledge to apply optimization strategies .
- To learn optimization strategies for large scale applications.

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

- Understand the concepts of Neural Networks.
- Select the Learning Networks in modeling real world systems .
- Use an efficient algorithm for Deep Models .
- Apply optimization strategies for large scale applications.
- Understand the concepts of Deep learning algorithms.

UNIT-I

Artificial Neural Networks: Introduction, benefits of Neural networks –, Model of Artificial Neuron, Neural Network Architectures – Learning Methods, important terminologies, applications. Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, and Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

UNIT-II

Unsupervised Learning Network: Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

UNIT - III

Introduction to Deep Learning: Historical Trends in Deep learning, Deep Feed - forward networks- Convolution Neural Network- Basic structure of Convolution Network, Case studies: Alex net, VGG-Net, Google Net, Applications of CNN– Object D Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

UNIT - IV

Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier.

UNIT - V

Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates,

Approximate Second Order Methods, Optimization Strategies and Meta-Algorithms **Applications:** Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing.

TEXT BOOKS:

1. Deep Learning: An MIT Press Book By Ian Good fellow and Joshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

REFERENCES:

1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
2. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.

19CS4277: ROBOTIC PROCESS AUTOMATION
(Professional Elective- VI)

B.Tech IV Year II Semester

L	T	P	C
3	-	-	3

Prerequisites:

- Programming Concepts Basics ,Understanding the application,
- Basic Web Concepts, Protocols, Email Clients, Data Structures

Course Objectives

- To understand the Basics of Robotic Process Automation.
- Identify the intensity of Design Robotic Process Automation.
- To comprehend the installation process of RPA Tools.
- To understand the control structure to design RPA Application.
- To know the way of interaction of Robotic Process Automation with external Applications.
- To understand the Exception Handling Mechanism in RPA.

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

- Provide knowledge on Robotic Process Automation.
- Compare RPA with Non Automation process.
- Skills to Design RPA with Internal interactions.
- Skills to Design RPA with External Application interaction.
- Knowledge on implement RPA using Exception Handling mechanism.

UNIT - I

Processes, Software Design, SDL C: Programming Concepts Basics – 2 : Scripting, .Net Framework, .Net ,Fundamentals, Control structures and functions, XML, HTML, CSS, Variables& Arguments.

RPA Basics: History of Automation, What is RPA, RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, and Workloads, which can be automated.

UNIT - II

RPA Advanced Concepts: Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team. Process Design Document/Solution Design Document, Industries best suited for RPA, Risks, & Challenges with RPA, RPA and emerging ecosystem.

Installation: Installing Studio community edition, The User Interface, Keyboard Shortcuts, About Updating, About Automation Projects, Introduction to Automation Debugging, Managing Activation Packages, Reusing Automations Library, Installing the Chrome Extension, Installing the Firefox Extension, Connecting your project to a source control system, Activities Guide.

Variables : Managing Variables, Naming Best Practices, The Variables Panel, Generic Value Variables, Text Variables, True or False Variables, Number Variables, Array Variables ,Date and Time Variables, Data Table Variables, Managing Arguments, Naming Best Practices, The

Arguments Panel, Using Arguments, About Imported Namespaces, Importing New Namespaces.

UNIT - III

Control Flow: Control Flow Introduction, If Else Statements, Loops, Advanced Control Flow, Sequences, Flowcharts, About Control Flow, Control Flow Activities, The Assign Activity, The Delay Activity, The Do While Activity, The If Activity, The Switch Activity, The While Activity, The For Each Activity, The Break Activity.

Data Manipulation :Data Manipulation Introduction, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data.

Recording and Advanced UI Interaction :Recording Introduction, Basic and Desktop Recording, Web Recording, Input / Output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques.

Selectors: Selectors, Defining and Assessing Selectors, Customization, Debugging, Dynamic Selectors, Partial Selectors, RPA Challenge.

UNIT- IV

Advanced Automation concepts and techniques: Image, Text & Advanced Citrix Automation: Introduction to Image &Text, Automation, Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, Using tab for Images, Starting Apps.

Excel Data Tables &PDF: Data Tables in RPA, Excel and Data Table basics, Data Manipulation in excel, Extracting Data from PDF, Extracting a single piece of data, Anchors, Using anchors in PDF.

Email Automation: Email Automation, Incoming Email automation, Sending Email automation.

UNIT- V

Exceptional Handling & Best Practice: Debugging and Exception Handling: Debugging Tools, Strategies for solving issues, Catching errors.

Introduction to Orchestrator: Tenants, Authentication, Users, Roles, Robots, Environments, Queues & Transactions, Schedules.

Emerging and Future Trends in IT: Emerging and Future Trends in IT: Artificial Intelligence, Machine Learning, Agent awareness, Natural Language Processing, Computer Vision.

TEXT BOOKS:

1. Learning Robotic Process Automation by Alok Mani Tripathi, Published by Packt Publishing Ltd.
2. Robotic Process Automation Succinctly By Ed Freitas Foreword by Daniel Jebara

REFERENCES:

1. Robotic Process Automation by Nividous
2. Robotic Process Automation NICE Special Edition by NICE RPA team with Steve Kaelble, Published by: John Wiley & Sons, Ltd., The Atrium, Southern Gate.

19CS4278: REAL TIME SYSTEMS
(Professional Elective- VI)

B.Tech IV Year II Semester

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Prerequisite:

- Programming and Data Structures, Operating Systems, Computer Architecture and Organization Computer Communication, Database Systems.

Course Objectives

- To provide broad understanding of the requirements of Real Time Operating Systems.
- To understand real-time operating system (RTOS) and the types of RTOS.
- To learn various approaches to real-time scheduling.
- To learn software development process and tools for RTOS applications.
- To understand the concept of real-time system on an embedded processor.

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

- Explain real-time concepts such as preemptive multitasking, task priorities, priority inversions, mutual exclusion, context switching, and synchronization, interrupt latency and response time, and semaphores.
- Describe how a real-time operating system kernel is implemented.
- Discuss how tasks can communicate using semaphores, mailboxes, and queues.
- Implement a real-time system on an embedded processor.
- Work with real time operating systems like RT Linux, Vx Works, MicroC /OSII, TinyOs.

UNIT–I

Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O, (open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec) with example.

UNIT-II

Real Time Operating Systems: Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use.

UNIT-III

Objects, Services and I/O: Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem.

UNIT-IV

Exceptions, Interrupts and Timers: Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

UNIT-V

Case Studies of RTOS: RT Linux, Micro C/OS-II, VxWorks, Embedded Linux, and Tiny OS.

TEXTBOOKS:

1. Real Time Concepts for Embedded Systems– QingLi,Elsevier,2011
2. Rajib Mall, "Real-Time Systems: Theory and Practice," Pearson, 2008.

REFERENCES:

1. Embedded Systems-Architecture, Programming and Design by Rajkamal, 2007, TMH.
2. Advanced UNIX Programming, Richard Stevens
3. Embedded Linux: Hardware, Software and Interfacing– Dr.CraigHollabaugh.

19CS4281: MAJOR PROJECT-PHASE II

B.Tech IV Year II Semester

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