

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES

DEVI AHILYA UNIVERSITY, INDORE

M. Tech.(IT) 5 Years

Batch 2k20

Semester -IX

JULY-DECEMBER 2024

Sub. Code	Sub. Name	L	T	P	C
IT-901	Machine Learning	3	1	0	4
IT-908A	Object Oriented Analysis and Design	3	1	0	4
IT-902B	Cyber Security	3	1	0	4
IT-905	Wireless Sensor Network and IoT	3	1	0	4
IT-903B	Research Methodology	2	0	4	4
	Elective –II 1.IT-913A:Soft Computing 2,IT-914:Design Patterns 3.IT-915:Big Data Analysis 4.IT-916:Deep Learning	3	1	0	4
IT-912	Object Oriented Analysis and Design Lab	0	0	4	2
IT-907	Comprehensive Viva	0	0	0	4
					30

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES, DAVV, INDORE
M. Tech. (IT) 5 Years IX SEMESTER
IT-901: Machine Learning

Aim of Course: The course is aimed to give the student the basic ideas and intuition behind modern machine learning methods as well as a bit more formal understanding of how, why, and when they work.

Course Outcomes:

- CO1 Understand foundational concepts of machine learning approaches.
- CO2 Apply regression techniques like Linear Regression and Logistic Regression to solve real- world problems.
- CO3 Analyze the performance of Bayesian Learning methods on various datasets.
- CO4 Evaluate and compare various techniques like Support Vector Machines, Decision Trees, and Instance Based Learning on different datasets.
- CO5 Model the solution of real-life problems using Deep Learning techniques, Genetic Algorithms and Reinforcement Learning.

Unit	Contents	Hrs.
UNIT I: BASICS	Learning Problems Perspectives and Issues Concept Learning Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search	8
UNIT II: NEURAL NETWORKS AND GENETIC ALGORITHMS	Neural Network Representation Problems Perceptions Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms Hypothesis Space Search– Genetic Programming – Models of Evolutions and Learning.	12
UNIT III: BAYESIAN AND COMPUTATIONAL LEARNING	Bayes Theorem Concept Learning Maximum Likelihood Minimum Description Length Principle Bayes Optimal Classifier Gibbs Algorithm Naïve Bayes Classifier Bayesian Belief Network EM Algorithm Probability Learning Sample Complexity Finite and Infinite Hypothesis Spaces – Mistake Bound Model.	12
UNIT IV: INSTANT BASED LEARNING	K- Nearest Neighbor Learning Locally weighted Regression Radial Bases Functions – Case Based Learning.	8
UNIT V: ADVANCED LEARNING	Learning Sets of Rules Sequential Covering Algorithm Learning Rule Set First Order Rules Sets of First Order Rules Induction on Inverted Deduction Inverting Resolution Analytical Learning Perfect Domain Theories Explanation Base Learning – FOCL Algorithm - Reinforcement Learning Task Learning Temporal Difference Learning	12

TEXT BOOK:

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill, 2010

2. Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, REFERENCES:

1. Ethem Alpaydin, (2004) “Introduction to Machine Learning (Adaptive Computation and Machine Learning)”, The MIT Press

2. T. astie, R. Tibshirani, J. H. Friedman, “The Elements of Statistical Learning”, Springer(2nd ed.), 2009

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES, DAVV, INDORE

M. Tech. (IT) 5 Years IX SEMESTER

IT-908A: Object Oriented Analysis and Design

Aim of Course: To enable the students to have a thorough understanding of the activities associated to develop projects. And establish the flow of events by making a planning that how software can be shown in its entirety prior to its implementation using Object Oriented Analysis and Design techniques.

Objectives:

The course is designed to make students:

- Develop a working understanding of formal object-oriented analysis and design processes.
- Develop the skills to determine which processes and OOAD techniques should be applied to a given project.
- Develop an understanding of the application of OOAD practices from a software project management perspective

Course Contents:

UNIT I

Object oriented analysis and its design. Software engineering best practices. UML: its road map. Root causes of software failure and symptoms of software failure.

UNIT II

Introduction to the Rational Unified process: Workflow and Lifecycle. Introduction to Object Orientations: problem definition, modeling, using UML modeling mechanisms and their representation.

UNIT III

Requirements Management: key concepts, problem statement, Glossary, use-case model, supplementary specification, functional and nonfunctional requirements.

UNIT IV

Analysis and design overview: architectural analysis-layers. Use case Analysis- Responsibilities, attributes and association, Architectural design.

UNIT V

Describe concurrency, Describe distribution, Use-case design, Subsystem Design, Class design, package.

Reference Books:

1. P. Kruchten, The Rational Unified Process: An Introduction, Pearson Education Asia, 2000.
2. G. Booch, I. Jacobson, J. Rumbaugh, The Unified Modeling Language- User's Guide, Addison Wesley, 1999.
3. W. Boggs and M. Boggs, Mastering UML with Rational Rose, BPB Publications, 1999.
4. G. Booch, Object oriented Analysis and Design with Applications, Addison Wesley, 1994.
5. M. Blaha, J. Rumbaugh, Object oriented modeling and design with UML, Pearson education 2nd edition, 2007.
6. Kathy Schwalbe, 6th Edition, Thomson Course technology.

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES, DAVV, INDORE
M. Tech. (IT) 5 Years IX SEMESTER
IT-902B: Cyber Security

Course Objectives:

Understand the field of digital security and concepts of access control mechanism.
 To introduce keywords and jargons involved in securing browser
 Understanding network basic and familiarize on security of network protocols
 Awareness and understanding on cyber-attacks and data privacy

Course Outcomes:

CO1: Apply a solid foundation in digital security and measures taken to protect device from threats.
 CO2: Learning access control mechanism and understand how to protect servers
 CO3: Understand the importance of a network basics and brief introduction on security of network protocols
 CO4: To understand cyber-attacks and learn data privacy issues and preventive measures

Unit 1	Basics of digital security, protecting personal computers and devices, protecting devices from Virus and Malware, Identity, Authentication and Authorization, need for strong credentials, keeping credentials secure, protecting servers using physical and logical security, World Wide Web (www), the Internet and the HTTP protocol, security of browser to web server interaction,	12
Unit 2	Networking basics (home network and large-scale business networks), Networking protocols, Security of protocols, sample application hosted on-premises.	6
Unit 3	Introduction to cyber-attacks, application security (design, development and testing), operations security, monitoring, identifying threats and remediating them, Principles of data security - Confidentiality, Integrity and Availability, Data Privacy, Data breaches, preventing attacks and breaches with security controls, Compliance standards, Computer Ethics.	10
Unit 4	Classifications of Cyber Crimes against individuals, property and nation, Need for Digital forensics and steps in digital forensics (scientific methods), Number System: Binary, Decimal, Hexadecimal, ASCII, and Unicode representation of data, Arenas for digital forensics: disk, network, wireless, database, mobile, e-mail, GPS and memory, Incident handling and response with forensic triage, Ethical Hacking and future of cybercrime.	12
Unit 5	Locard's exchange principle and digital forensic investigation models, types: artifacts, identifying raw and proprietary forensic storage formats, identification of potential evidence: slack space, swap space, steganography, recovery of hidden, deleted and corrupt data, standard file formats with their headers and forensic file carving, planning your investigation, order of volatility and forensic triage, overview of file systems.	12

Textbook(s)

1. Sammons, John, and Michael Cross. The basics of cyber safety: computer and mobile device safety made easy. Elsevier, 2016.
2. E. Casey, Handbook of Digital Forensics and Investigation, Academic Press; 2010.
3. David Cowen, Computer Forensics: A Beginners Guide, McGraw Hill Education; 2013.
4. Bill Nelson, Amelia Phillips, Christopher Steuart, Guide to Computer Forensics and Investigations, Fourth Edition; 2014

References:

1. Charles P. Pfleeger, Shari Lawrence, Pfleeger Jonathan Margulies; Security in Computing, Pearson Education Inc . 5th Edition, 2015
Brooks, Charles J., Christopher Grow, Philip Craig, and Donald Short. Cybersecurity essentials. John Wiley & Sons, 2018

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES, DAVV, INDORE
M. Tech. (IT) 5 Years IX SEMESTER
IT-905: Wireless & Sensor Networks and IoT

Course Objective: This course focuses on hands-on lot concepts such as sensing, actuation and communication and covers the development of Internet of Things(IoT) prototypes including devices for sensing, actuation, processing, and communication to help students develop skills and experiences.

CourseOutcomes:By the end of the course, students will

CO-1: Understand IoT value chain structure (device, data cloud), application areas and technologies involved.

CO-2: Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules.

CO-3: Know structural features and applications of the most common IoT compatible device families.

CO-4: Explore and learn about Internet of Things with the help of preparing projects.

CO-5: Learn basics of microcontroller programming.

CO-6: Perform modeling, optimizing and debugging for a IoT project.

CO-7: Possess the necessary skills to design IoT compatible embedded devices and systems using computer aided tools and techniques

Course Contents

Unit	Title	Contents	Hrs.
1	Introduction to IoT	Understanding IoT fundamentals, IoT World Forum, IoT architecture and protocols, Ecosystem of IoT, IoT design methodologies, various platforms for IoT, real time examples of IoT, overview of IoT components and IoT communication technologies, challenges in IoT.	12Hrs.
2	Sensors & Actuators with Arduino	Overview of sensors working, analog and digital sensors, interfacing of temperature, humidity, motion, light and gas sensor with Arduino, interfacing actuators with Arduino, interfacing relay switch and servo motor with Arduino.	12Hrs.
3	Arduino Programming	Basics of Arduino programming, including syntax, variables, and control structures. Sensor and actuator interfacing through Arduino using libraries and functions. Combining sensors, actuators, and programming logic within the Arduino environment.	8Hrs.
4	Arduino Simulation Environment	Arduino UNO Architecture, setup the IDE, writing Arduino software, Arduino Libraries, basics of embedded C programming for Arduino, interfacing LED, push button and buzzer with Arduino, interfacing Arduino with LCD.	8Hrs.
5	Networking with ESP8266 & ESP32 WIFI Module	Basics of wireless networking, introduction to ESP8266 Wi-Fi module and ESP32 module, various Wi-Fi library, web server introduction, installation, configuration, posting sensors data to web server.	6Hrs.
6	Cloud Platforms for IoT	Virtualization concepts and Cloud Architecture, Cloud computing, benefits, cloud services- SaaS, PaaS, IaaS, cloud providers & offerings, study of IoT cloud platforms, ThingSpeak API and Blynk IoT, Interfacing ESP8266 with Web services.	6Hrs.

Text Books:

1. Internet of Things—A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015.
2. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.

Reference Books:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on Approach)", 1st Edition, VPT, 2014.
2. Francisda Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.
3. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011.

Learning Outcome:

After the completion of the course, the students will be able to design some IoT based prototypes

LO-1: Gain a comprehensive understanding of IoT fundamentals, including its architecture, protocols, design methodologies, ecosystem, communication technologies, and challenges.

LO-2: Develop proficiency in sensor fundamentals, analog & digital sensors, and Arduino-based interfacing techniques for diverse sensors (temperature, humidity, motion, light, gas), actuators, relay switches, and servo motors.

LO-3: Master fundamental Arduino programming, encompassing syntax, variables, control structures, sensor/actuator interfacing via libraries/functions, and integration of diverse components to create functional projects within the Arduino environment.

LO-4: Achieve proficiency in Arduino UNO architecture, IDE setup, writing software, utilizing Arduino libraries, embedded C programming basics, and interfacing various components (LEDs, push buttons, buzzers, LCDs) with the Arduino platform for practical applications.

LO-5: Attain a comprehensive understanding of wireless networking fundamentals, ESP8266 and ESP32 modules, Wi-Fi libraries, web server concepts, installation, configuration, and the ability to post sensor data to a web server, leveraging these technologies for IoT applications.

LO-6: Acquire expertise in virtualization, cloud architecture, and cloud computing concepts, including service models (SaaS, PaaS, IaaS), exploring various cloud providers, understanding IoT cloud platforms like ThingSpeak and Blynk IoT, and proficiently interfacing ESP8266 with web services for IoT applications.

LO-7: Understanding the practical implications, challenges, and successes of IoT deployments across industries, fostering critical thinking and adaptability on IoT-related issues.

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES, DAVV, INDORE

M. Tech. (5 Years) IX Semester

IT-903B : Research Methodology

Unit-1:

The Information Systems and Computing disciplines, Evidence-based practice, The Internet, and Research. Definition and characteristics of Research, Evaluating research, Rigour, and relevance in research, The 6 P of Research, The purpose and products of research: Reasons for doing research, possible products/outcomes of the research, Finding and choosing research topics, Evaluating the purpose and products of research.

Unit-2:

Overview of the Research: A model of the research process, alternatives models of the research process, Evaluating the Research process. Need, types and applications of simulators for researching in CS.

UNIT-3:

Reviewing the literature: Purpose and resources of literature review, The internet, and literature reviews conducting a literature review Evaluating literature review Evaluating literature review. Surveys: Defining surveys, Planning and designing surveys, Grounded theory, and surveys, The internet and surveys, Examples of surveys in IS and computing research, Evaluating survey-based research. Interview, Observations, Questionnaire.

UNIT-4:

Design and Creation: Defining design and creation: planning and conducting design and creation research. Creative computing and digital art. the internet and design and creation research. Examples of designing and creation research in IS and computing, Evaluating design and creation research. Experiments, Case studies, Action Research, Ethnography, Documents.

UNIT-5:

Internet Research: Background to the internet and WWW, Internet Research topics, The internet and literature review The internet and research strategies and methods, Internet research, law and ethics. Participants and Research Ethics: The law and research, Rights of people directly involved, Responsibilities of an ethical researcher, Design, and creation of Project and ethics, Evaluating research ethics.

Text Book:

Briony J Oates, Researching information systems and computing, SAGE South Asia Edition, 2007 ISBN: 978-81-7829-759-0

Reference Materials:

1. Research Design. Qualitative, Quantitative, and Mixed Methods Approaches. By John W. Creswell, Fourth Edition. SAGE Publication, 2014
2. The Craft of Research, By Wayne C. Booth, Gregory G. Colomb, Joseph M. Williams, Joseph Bizup, William T. FitzGerald, Third Edition, The University of Chicago Press, 2008
3. The Elements of Style. William Strunk Jr. and E. B. White, Fourth Edition, Pearson, 1999
4. Research Methodology By Panneerselvam R, 2nd Edition, PHI, 2014
5. Selecting Empirical Methods for Software Engineering Research, Steve Easterbrook, Janice Singer, Margaret-Anne Storey, D. Damian, Book Chapter in Guide to Advanced Empirical Software Engineering, Forrest Shull, Janice Singer, and Dag I.K. Sjøberg, Springer 2008
6. Statistical Design and Analysis of Experiments With Applications to Engineering and Science, Robert L. Mason, Second Edition, Wiley InterScience. [Good for Data Analysis and Hypothesis Testing]
7. THE DESIGN OF DESIGN: ESSAYS FROM A COMPUTER SCIENTIST, Frederick P. Brooks Jr., Addison-Wesley Professional, 2010.
8. Serge Demeyer. Research Methods in Computer Science
9. Aaron Sloman. TYPES OF RESEARCH IN COMPUTING SCIENCE, SOFTWARE ENGINEERING, AND ARTIFICIAL INTELLIGENCE

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES, DEVI AHILYA UNIVERSITY, INDORE

M. Tech 5 Years IX SEMESTER

Elective I- IT- 913A Soft Computing

Course Type: Elective

Course Credits: 4

Course Objectives: The main objective of the course is to learn concepts and working of various soft computing techniques such as genetic algorithms, fuzzy logic and neural networks and apply them for various real-time engineering problems such as classification, optimizations, clustering and controls.

CO-1 Understanding of different soft computing techniques like Genetic Algorithms, Fuzzy Logic, Neural Networks and their hybridizations.

CO-2 Ability to identify, analyze and apply suitable soft computing techniques to solve engineering or real life problems.

CO3 Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.

CO2 Understand Neural Networks, architecture, functions and various algorithms involved.

CO4 Apply neural networks for pattern recognition and prediction tasks

CO5 Understand the genetic algorithm concepts and their applications.

Course Contents –

Unit No	Title	Contents	Hr	Targeted Levels of Blooms T. (Q1)	Content and Pedagogy (Q2)	(Q3) Online Resources	(Q4) Assign./ Assessment/Discussion
1	Introduction to Soft Computing	Concept of Computing, Characteristics of Hard Computing, Soft Computing, Characteristics of Soft Computing, Hard Computing Vs Soft Computing, Limitations of Hard and Soft Computing, Types of Soft Computing Techniques, Applications of Soft Computing, Hybrid Computing. LO1: Develop an understanding of hard and soft computing.	4	1 and 2*	Book 1 and 2. (Lecture)		Discussion about computing techniques
2	Introduction to Fuzzy logic	Background, Uncertainty and imprecision, Uncertainty in information, Concept of Fuzzy Logic System, Characteristics of Fuzzy Logic System, Advantages and disadvantages of Fuzzy Logic System. Concept of Fuzzy Set, Fuzzy Set Vs Crisp Set, Basic	8	1 and 2*	Book 3 and 4 (Lecture, and numerical)		Discussion on fuzzy logic systems and fuzzy sets.

		<p>terminologies, Fuzzy sets, Operations on Fuzzy Sets, Fuzzy Membership Functions.</p> <p>LO1: Understand the concept of fuzzy logic fuzzy sets and fuzzy membership.</p> <p>LO2: Able to distinguish between fuzzy and crisp logic.</p>					
3	Defuzzification	<p>Defuzzification Techniques: Concept of defuzzification, Lambda-cut methods, Max-Membership Principle, Centroid Methods and Weighted Average Method. Applications of Fuzzy Logic.</p> <p>LO1: Learn the concept and methods for defuzzification.</p> <p>LO2: Apply defuzzification in fuzzy logic systems.</p>	7	1, 2 and 3*	Book 3 and 4 (Lecture, and numerical)		Discussion on defuzzification and applications of fuzzy logic
4	Fuzzy Relations, Rules and Inferences	<p>Crisp relations- Cardinality of Crisp Relation, Operations on crisp relations, Properties of crisp relations, Composition of crisp relations, Fuzzy relations-cardinality of fuzzy relations, Operations on fuzzy relations, Properties of fuzzy relations, Fuzzy Composition.</p> <p>Fuzzy Propositions: Two valued logic Vs Multi valued logic, Fuzzy Propositions Vs Crisp propositions. Fuzzy Rules- Fuzzy Implications and Interpretation. Fuzzy Inferences Systems (FIS)- Construction and Working Principles of FIS, Methods of FIS- Mamdani FIS and Takagi-Sugeno Fuzzy Model(TS-Method).</p> <p>LO1: Perform operations on fuzzy sets.</p> <p>LO2: Use fuzzy propositions and inferences to develop fuzzy logic systems.</p>	7	1, 2 and 3*	Book 3 and 4 (Lecture, and numerical)		<p>Practice session on operations on fuzzy relations.</p> <p>Discussion on fuzzy rules and inferences.</p>

5	Neural Networks	Introduction to machine learning with Neural Networks, Types of learning, Neural network architectures, Single layer networks, Multilayer networks with backpropagation learning, Radial basis function Networks, Unsupervised learning with Neural Networks, Advances in Neural Networks, Applications of neural networks, Overview of Reinforcement Learning LO1: Understand the concept of neural networks.	4	1 and 2*	Book 1 and 2. (Lecture)	Discussion on Neural Networks, its types and architecture
6	Genetic Algorithms	Biological Background, Traditional optimization and search techniques, genetic algorithm and search space, genetic algorithm vs. traditional algorithms, basic terminologies, simple genetic algorithm, general genetic algorithm, operators in genetic algorithm, stopping condition for genetic algorithm flow, constraints in genetic algorithm, problem solving using genetic algorithm, advantages, limitations and applications of genetic algorithm. LO1: Understand the concept of genetic algorithms. LO2: Apply genetic algorithms in problem solving.	4	1, 2 and 3*	Book 1 and 2. (Lecture and algorithms design)	Discussion on Genetic Algorithms and practice on problem solving using Genetic Algorithms
7	Hybrid systems	Types of Hybridizations, Neuro-fuzzy systems, Neuro-genetic Systems, Fuzzygenetic systems, Applications of hybrid systems. LO1: Understand the concept of hybrid systems.	5	1 and 2*	Book 1 and 2. (Lecture)	Discussion on hybrid systems.

* 1- Remember, 2- Understand, 3- Apply, 4- Analyze

Books and Reading

BOOKS:

1. S.N. Sivanandam & S.N. Deepa, "Principles of Soft Computing", Wiley Publications, 2nd Edition, 2011.
2. D.K.Pratihar, Soft Computing: Fundamentals and Applications, Narosa Publishing House Pvt. Ltd. - New Delhi, 2015
3. George J. Klir, Bo Yua, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall, 1995
4. Timothy J. Ross, Fuzzy Logic with Engineering Applications, Wiley; Third edition, 2011

Reference Books:

1. Jyh Shing Roger Jang, Chuen Tsai Sun, Eiji Mizutani, Neuro-Fuzzy and Soft Computing, Prentice Hall of India, 2003
2. Nikola K. Kasabov, Foundations of Neural Networks, Fuzzy Systems, and Knowledge Engineering, MIT Press
3. S.Rajasekaran, G.A.Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications. PHI

Online Reference:

- 1 <https://nptel.ac.in/courses/106/105/106105173/>

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES, DEVI AHILYA UNIVERSITY, INDORE

M. Tech 5 Years IX SEMESTER

Elective II- IT- 914 Design patterns

Course Type: Elective

Course Credits: 4

Learning Objectives: To strengthen the knowledge of Object Oriented Design and development by understanding various design patterns for object oriented reusable Software.

Pre requisites: Knowledge of object oriented system concepts, object oriented analysis and Modeling and object oriented programming using Java.

Course Contents:

I Review of Object Orientation

Introduction to Software Patterns, Overview of UML, Class Diagrams, Collaboration Diagrams, State chart Diagram, Deployment Diagram,

II Introduction

Introduction to design pattern, describing design pattern, design Pattern for solving problem, selection of design pattern, use of design pattern. Fundamental Design Patterns: Delegation, Interface, Abstract Super-class, Interface and Abstract class, Marker Interface.

II Creational Pattern

Simple Factory pattern, Factory Method, Abstract Factory, Builder, Prototype, Singleton

III Structural Pattern

Adaptor, Bridge, Composite, Façade, Flyweight, Decorator, Proxy Pattern

IV Behavioral Pattern I

Chain of Responsibility, Command, Interpreter, Mediator, Memento Pattern

V Behavioral Pattern II

Observer, State, Strategy, Template Method, Visitor, Iterator Pattern

Text Book

- Gamma, Helm, Johnson, Vlissides, Design Patterns. Elements of Reusable Software., Pearson Education 2006

Reference Book

- Cooper, J. W., Java Design Patterns, A Tutorial, Pearson Education, 2000.
- Freeman, Freeman, Head First Design Patterns, O'Reilly Pub. 2007
- Mark Grand, Patterns in Java Vol. 1, Wiley 2002
- Mark Grand, Patterns in Java Vol. 2, Wiley 2002
- Mark Grand, Patterns in Java Vol. 3, Wiley 2002

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES, DEVI AHILYA UNIVERSITY, INDORE

M. Tech 5 Years IX SEMESTER

Elective III- IT- 915 Big Data Analysis

Course Type: Elective

Course Credits: 4

Course Objectives:

- To provide an overview of an exciting growing field of big data.
- To introduce the tools required to manage and analyze big data like Hadoop, NoSql Map-Reduce.
- To teach the fundamental techniques and principles in achieving big dataanalytics with scalability and streaming capability.
- To enable students to have skills that will help them to solve complex real-world problems in for decision support.

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

- Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
- Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics.
- Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
- Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.

Sr. No.	Module	DetailedContent	Book	Hours
1	Introduction to Big Data	Introduction to Big Data, Big Data characteristics, types of BigData, Traditional vs. Big Data business approach, Case Study of Big Data Solutions.	From Ref. Books	04
2	Introduction to Hadoop	What is Hadoop? Core Hadoop Components; Hadoop Ecosystem; Physical Architecture; Hadoop limitations.	Hadoop in Practice Chapter 1	04

3	NoSQL	<p>What is NoSQL? NoSQL business drivers; NoSQL case studies;</p> <p>NoSQL data architecture patterns: Key-value stores, Graph stores, Column family (Bigtable) stores, Document stores, Variations of NoSQL architectural patterns;</p> <p>Using NoSQL to manage big data: What is a big data NoSQL solution? Understanding the types of big data problems;</p> <p>Analyzing big data with a shared-nothing architecture;</p> <p>Choosing distribution models: master-slave versus peer-to-peer; Four ways that NoSQL systems handle big data problems</p>	No-SQL book	14
4	Map Reduce and the New Software Stack	<p>Distributed File Systems : Physical Organization of Compute Nodes, Large-Scale File- System Organization.</p> <p>Map Reduce: The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of Map Reduce Execution, Coping With Node Failures.</p> <p>Algorithms Using MapReduce:</p> <p>Matrix-Vector Multiplication by Map Reduce , Relational-Algebra Operations, Computing Selections by Map Reduce,</p> <p>Computing Projections by Map Reduce, Union, Intersection, and Difference by Map Reduce, Computing Natural Join by Map Reduce, Grouping and Aggregation by Map Reduce, Matrix Multiplication, Matrix</p> <p>Multiplication with One Map Reduce Step.</p>	Text Book1	12

6	Mining Data Streams	The Stream Data Model: A Data-Stream-Management System, Examples of Stream Sources, Stream Query, Issues in Stream Processing. Sampling Data in a Stream: Obtaining a Representative Sample, The General Sampling Problem, Varying the Sample Size. Filtering Streams: The Bloom Filter, Analysis. Counting Distinct Elements in Stream The Count-Distinct Problem, The Flajolet-Martin Algorithm, Combining Estimates, Space Requirements . Counting Ones in a Window: The Cost of Exact Counts, The Datar-Gionis-Indyk- Motwani Algorithm, Query Answering in the DGIM Algorithm, Decaying Windows.	Text Book1	12
7	Link Analysis	Page Rank Definition, Structure of the web, dead ends, Using Page rank in a search engine, Efficient computation of Page Rank: PageRank Iteration Using Map Reduce, Use of Combiners to Consolidate the Result Vector. Topic sensitive PageRank, link Spam, Hubs and Authorities.	Text Book1	08

Text Books:

1. Anand Rajaraman and Jeff Ullman “**Mining of Massive Datasets**”, Cambridge University Press,
2. Alex Holmes “**Hadoop in Practice**”, Manning Press, Dreamtech Press.
3. Dan McCreary and Ann Kelly “**Making Sense of NoSQL**” – **A guide for managers and the rest of us**, Manning Press.

References:

1. Bill Franks , “**Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics**”, Wiley
2. Chuck Lam, “**Hadoop in Action**”, Dreamtech Press
3. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, “**Big Data for Dummies**”, Wiley India
4. Michael Minelli, Michele Chambers, Ambiga Dhiraj, “**Big Data Big Analytics: Emerging Business Intelligence And Analytic Trends For Today's Businesses**”, Wiley India

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES, DEVI AHILYA UNIVERSITY, INDORE

M. Tech 5 Years IX SEMESTER

Elective IV- IT- 916 Deep Learning

Course Type: Elective

Course Credits: 4

Course Objective: The Objective of this course is to present the mathematical, statistical and computational challenges of building stable representations for high-dimensional data, such as images, text and data

Course Outcomes: Upon completion of the course students will be able to:

- Apply MLP and Perceptron concept in Neural Network
- Apply forward and back propagation in DL task.
- Apply PCA & Auto encoders in DL task.
- Apply Regularization & Normalization in DL task.
- Apply CNN in image processing.
- Apply RNN in natural language processing.

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction to Neural Network	8	L1,L2,L3
	History of Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm. Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Gradient Descent..		
2	Deep Learning Fundamentals	7	L1,L2,L3
	FeedForward Neural Networks, Backpropagation. Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp		
3	PCA & Autoencoders	8	L1,L2,L3
	Principal Component Analysis and its interpretations, Singular Value Decomposition. Auto encoders and relation to PCA, Regularization in auto encoders, Denoising auto encoders, Sparse auto encoders, Contractive auto encoders		

4	Regularization & Normalization	7	L1,L2,L3
	Regularization: Bias Variance Tradeo-, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying. Greedy Layerwise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization		
5	Convolutional Neural Networks	8	L1,L2,L3,L4
	Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet. Learning Vectorial Representations of Words		
6	Recurrent Neural Networks	7	L1,L2,L4
	Recurrent Neural Networks, LSTM, Backpropagation through time Encoder Decoder Models.		
	TotalHours	45	

Text Books:

1. Dr. S Lovelyn Rose Deep Learning using Python, Wiley First 2019.
2. Nikhil Buduma , Fundamentals to Deep Learning, Oreilly First 2017.
3. I., Bengio, Y., and Courville, A. Deep Learning Good fellow, MIT Press 2016

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES

DEVI AHILYA UNIVERSITY, INDORE

M. Tech.(IT) 5 Years

Batch 2k20

Semester -X

JANUARY-MAY 2025

ub. Code	Sub. Name	Credit
IT-1005D	Project	12

OBJECTIVES

Internships are educational and career development opportunities, providing practical experience in a field or discipline. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
- Exposure to the current technological developments relevant to the subject area of training.
- Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
- Create conditions conducive to quest for knowledge and its applicability on the job.
- Learn to apply the Technical knowledge in real industrial situations.
- Gain experience in writing Technical reports/projects.
- Expose students to the engineer's responsibilities and ethics.
- Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
- Promote academic, professional and/or personal development.
- Expose the students to future employers.
- Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
- Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

BENEFITS OF INTERNSHIP:

Benefits to the Industry

- Availability of ready to contribute candidates for employment.
- Year round source of highly motivated pre-professionals.
- Students bring new perspectives to problem solving.
- Visibility of the organization is increased on campus.
- Quality candidate's availability for temporary or seasonal positions and projects.
- Freedom for industrial staff to pursue more creative projects.
- Availability of flexible, cost-effective work force not requiring a long-term employer commitment.
- Proven, cost-effective way to recruit and evaluate potential employees.
- Enhancement of employer's image in the community by contributing to the educational enterprise.

Benefits to Students:

- An opportunity to get hired by the Industry/ organization.
- Practical experience in an organizational setting.

- Excellent opportunity to see how the theoretical aspects learned in classes are integrated into the practical world. On-floor experience provides much more professional experience which is often worth more than classroom teaching.
- Helps them decide if the industry and the profession is the best career option to pursue.
- Opportunity to learn new skills and supplement knowledge.
- Opportunity to practice communication and teamwork skills.
- Opportunity to learn strategies like time management, multi-tasking etc in an industrial setup.
- Opportunity to meet new people and learn networking skills.
- Makes a valuable addition to their resume.
- Enhances their candidacy for higher education.
- Creating network and social circle and developing relationships with industry people.
- Provides opportunity to evaluate the organization before committing to a full time position.

Benefits to the Institute:

- Build industrial relations.
- Makes the placement process easier.
- Improve institutional credibility & branding.
- Helps in retention of the students.
- Curriculum revision can be made based on feedback from Industry/ students.
- Improvement in teaching learning process.