AISSMS
INSTITUTE OF INFORMATION TECHNOLOGY
(IOIT)

ADDING VALUE TO ENGINEERING

An Autonomous Institute Affiliated to Savitribai Phule Pune University
Approved by AICTE, New Delhi and Recognised by Govt. of Maharashtra
Accredited by NAAC with "A+" Grade | NBA - 5 UG Programmes

ACADEMIC COURSE

STRUCTURE & SYLLABUS

T. Y. BTECH

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

B.TECH. 4 YEAR UG COURSE

(Applicable for the batches admitted from 2022-2023)

AISSMS INSTITUTE OF
INFORMATION TECHNOLOGY
Kennedy Road, Near RTO,
Pune- 411-001, Maharashtra State, India
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BOS–ARTIFICIAL INTELLIGENCE
& DATA SCIENCES
AISSMS IOIT (AUTONOMOUS),
PUNE-1.

Artificial Intelligence and Data Science - Third Year (Semester –V)

Sr. No.	Code	Course Title	Hours per week			Credits	Examination scheme					
			Lecture	Tutorial	Practical		ISE	ESE	TW	PR	OR	Total
1	IOHSM501	Intellectual Property Rights @@	2	--	--	2	--	--	25	--	25	50
2	ADPCC502	Computer Networks	3	--	--	3	40#	60*	--	--	--	100
3	ADPCC503	Machine Learning	3	--	--	3	40#	60*	--	--	--	100
4	ADPCC504	Web Technology	3	--	--	3	40#	60**	--	--	--	100
5	ADPEC505	Elective-I	3	--	--	3	40#	60*	--	--	--	100
6	ADOEC506	MOOC: Artificial Intelligence Search Method for Problem Solving	3	--	--	3	40$	60$$	---	--	--	100
7	ADPCC507	Machine Learning Laboratory @@	--	--	4	2	--	--	25	25	---	50
8	ADPCC508	Networking and Web Laboratory@@	--	--	4	2	--	--	25	25	--	50
9	ADPEC509	EL-I Laboratory @@	--	--	2	1	--	--	25	25	--	50
10	IOHSM5ACA / IOHSM5ACB	Audit Course 5-Foreign Language Level-I (A: German/ B:Japanese)	1	--	--	1	--	--	25	--	--	25
	Total		18	0	10	23	200	300	125	75	25	725
11	ADMNR501	Machine Learning	3	--	--	3	--	75*	--	--	--	75
12	ADMNR502	Machine Learning Laboratory	--	--	2	1	--	--	25	--	--	25
	Grand Total		21	0	12	27	200	375	150	75	25	825

*   End Semester Examination (ESE) based on subjective questions.

**   **Practical or Activity based Evaluation.**

\#   **In Semester Evaluation**
       Insem1-Subjective
       Insem-2- "GATE based MCQ" and "numerical based subjective"
       Based on Presentation/Group Discussion/Laboratory Work/Course Project/Home Assignment/Comprehensive Viva Voce/Blog Writing/Case Study/Survey/Multiple-Choice Question (MCQ) examination.

\$ **For MOOCs:** Assignments marks will be converted on the scale of 40 marks.

@@   **Separate passing** in each of the head is mandatory to earn the specified credits.

Elective-I   A. Design and Analysis of Algorithm
                      B. Data Analytics using Power BI and Tableau
                      C. Distributed Systems

MOOC: Artificial Intelligence Search Methods For Problem Solving
       https://nptel.ac.in/courses/106106226

Artificial Intelligence and Data Science - Third Year (Semester –VI)

Sr. No.	Code	Course Title	Hours per week			Credits	Examination scheme					
			Lecture	Tutorial	Practical		ISE	ESE	TW	PR	OR	Total
1	IOHSM601	Seminar and Technical Paper Writing	1	--	2	2	--	--	50	--	---	50
2	ADPCC602	Deep learning	3	--	--	3	40#	60*	--	--	--	100
3	ADPCC603	Cloud Computing	3	--	--	3	40#	60*	--	--	--	100
4	ADPCC604	ML Ops	3	--	--	3	40#	60**	--	--	--	100
5	ADPEC605	Elective-II	3	--	--	3	40#	60*	--	--	--	100
6	ADVSE606	Pattern Recognition and Applications @@	1	--	4	3	--	--	50	50	--	100
7	ADPCC607	Deep Learning and ML Ops Laboratory@@	--	--	4	2	--	--	25	50	---	75
8	ADPCC608	Cloud Computing Laboratory@@	--	--	4	2	--	--	25	25	--	50
9	ADPEC609	EL-II Laboratory	--	--	2	1	--	--	--	25	--	25
10	IOHSM6ACA / IOHSM6ACB	Audit Course -6 Foreign Language Level-II (A: German/ B:Japanese)	1	--	--	1	--	--	25	--	--	25
11	IOLLC6L3	Lifelong Learning Skills-III	--	--	--	1	--	--	25	--	--	25
12	IOLLC6L4	Lifelong Learning Skills-IV	--	--	--	1	--	--	25	--	--	25
	Total		**15**	**0**	**16**	**25**	**160**	**240**	**225**	**150**	**--**	**775**
14	ADMNR601	Deep Learning	3	--	--	3	--	75*	--	--	--	75
15	ADMNR602	Deep Learning Laboratory	--	--	2	1	--	--	25	--	--	25
	Grand Total		**18**	**0**	**18**	**29**	**160**	**315**	**225**	**150**		**875**

*   **End Semester Examination (ESE)** based on subjective questions.

**   **Practical or Activity based Evaluation.**

\#   **In Semester Evaluation**
     Insem1-Subjective
     Insem-2- "GATE based MCQ" and "numerical based subjective"
     Based on Presentation/Group Discussion/Laboratory Work/Course Project/Home Assignment/Comprehensive Viva Voce/Blog Writing/Case Study/Survey/Multiple-Choice Question (MCQ) examination.

@@   **Separate passing** in each of the head is mandatory to earn the specified credits.

     Elective-II   A.. Natural Language Processing

                               B. High Performance Computing
                               C. Intelligent Robotics Process Automation

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Third Year

SEM V

Third Year Information Technology (2022 Course)			
Intellectual Property Rights			
Course Code:	IOHSM501	Credit:	2
Contact Hrs.:	2 Hrs./week (L)	Type of Course:	Lecture
Examination Scheme:	Term-work 25 marks	Oral 25 marks	

Pre-requisites:
Nil

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25
2.	Oral	Internal	25

Course Objectives	
1	To explain the significance of Intellectual Property
2	To study various aspects of Patents
3	To understand the significance of patent information in Business development
4	To study patents documents and process for examination

Course Outcomes: Students will be able to	
501.1	Describe the significance of intellectual property
501.2	Discuss various aspects of patents
501.3	Search patent information in database
501.4	Explain patents documents and process for examination
501.5	Describe concepts related to trademarks
501.6	Differentiate copyright from patent

Topics covered:
UNIT I: INTELLECTUAL PROPERTY RIGHTS (IPR) (4 Hrs.) IPR-Meaning, Relevance, Business Impact, Types of Intellectual Property, Protection of Intellectual Property, Competing Rationales for Protection of Intellectual Property Rights, The World Intellectual Property Organization (WIPO) and the UNESCO.
UNIT II : PATENT (4 Hrs.) Concept of Patent, Types of Product / Process Patents & Terminology, Duration of Patents-Law and Policy Consideration ,Elements of Patentability (Novelty and Non Obviousness /Inventive Steps , Industrial Application, Non- Patentable Subject Matter), Procedure for Filing of Patent Application and types of Applications.

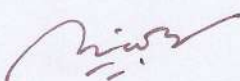| |
|---|
| **UNIT III: PATENT DATABASES & PATENT INFORMATION SYSTEM (4 Hrs.)**
Patent Offices in India, Importance of Patent Information in Business Development, Patent search through Internet, Patent Databases. |
| **UNIT IV: PATENT DOCUMENTS & PROCESS FOR EXAMINATION (4 Hrs.)**
Lab Notebooks/Logbooks/Record Books, Methods of Invention Disclosures, Patent Application and its Contents, Writing of the Patent Document, Publication of Patent Applications, Request for Examination, Process for Examination & Prosecution, Reissue & Re-examination. |
| **UNIT V: TRADEMARKS (4 Hrs.)**
Definition and concept of Trademarks, The rationale of protection of trademark, Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks). |
| **UNIT VI COPYRIGHTS (4 Hrs.)**
Definition of Copyright, Nature of Copyright, Works in which Copyrights subsist, Author & Ownership of Copyright , Rights Conferred by Copyright , Registration of Copyrights & Appeals. |
| Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)(*if complete unit is applicable then write only "unit 1/2/.." or write the contents from that unit*):
1. NA. |

Text Books:
1. Intellectual Property Rights-Law and Practice By Laser Typesetting

Reference Books
1. Aswani Kumar Bansal, "Law of Trademarks in India" ,Commercial Law Publishers, 2001
2. B L Wadehra, "Law Relating to Patents, Trademarks, Copyright, Designs and Geographical Indications" Universal Law Publishing Co Ltd.
3. G.V.G Krishnamurthy , "The Law of Trademarks, Copyright, Patents and Design"
4. Satyawrat Ponkse, "The Management of Intellectual Property" Bhate&Ponkshe, 1991
5. S K Roy Chaudhary& H K Saharay , "The Law of Trademarks, Copyright, Patents and Design.Legal Aspects of Technology Transfer: A Conspectus"

E-Resources:
1. Patent act:
   https://ipindia.gov.in/writereaddata/Portal/IPOAct/1_31_1_patent-act-1970-11march2015.pdf

2. Practice and procedures:
   https://ipindia.gov.in/writereaddata/Portal/Images/pdf/Manual_for_Patent_Office_Practice_and_Procedure_.pdf

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Third Year Artificial Intelligence & Data Science (2022 Course)
Computer Networks

Course Code	ADPCC502	Credit	03
Contact Hours	03 Hrs/weeks((L)	Type of Course	Lecture
Examination Scheme	ISE: 40Marks ESE: 60 Marks	Total Marks	100

Pre-requisites:
Basic understanding of computer systems and operating systems.

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1	In Semester Evaluation	Internal	40[#]
2	End Semester Evaluation	External	60[*]

Course Objectives

1	To demonstrate- the concepts of networking, standards and protocols
2	To explain controlling techniques in networking at different layers
3	To describe protocols at different layers of reference model.
4	To demonstrate congestion control and transport layer protocols
5	To explain concepts of application layer protocols.
6	To discuss use of AI in computer network

Course Outcomes: Students will be able to

502.1	Summarize the concept of LAN architecture, topologies, transmission media, and networking devices.
502.2	Demonstrate the working of controlling techniques for flawless data communication using data link layer protocols.
502.3	Discuss the functions of network layer, various switching techniques and internet protocol addressing
502.4	Utilize the concept of congestion control and its importance in network security.
502.5	Apply the application layer protocols in real world.
502.6	Interpret use of AI in computer network

Topics covered:

UNIT-I: (06 Hrs)
INTRODUCTION: Network hardware, Network software, reference models: OSI, TCP/IP, Internet, Connection oriented network - X.25, frame relay Network applications. THE PHYSICAL LAYER: Theoretical basis for communication, guided transmission media, wireless transmission, the public switched telephone networks, mobile telephone system.
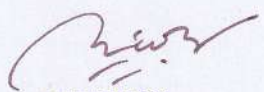
UNIT-II:	**(06 Hrs)**
DATA LINK LAYER: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols - HDLC, the data link layer in the internet. **The Medium Access Sub layer:** Channel allocations problem, multiple access protocols, Ethernet, Data Link Layer switching, Wireless LAN, Broadband Wireless, Bluetooth	
UNIT-III:	**(06 Hrs)**
NETWORK LAYER: Network layer design issues, routing algorithms, Congestion control algorithms, Internetworking, the network layer in the internet (IPv4 and IPv6), Quality of Service.	
UNIT-IV:	**(06 Hrs)**
TRANSPORT LAYER: Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP, Congestion control and Quality of Service (QoS) **Routing:** Introduction, Routing Algorithms, Unicast Routing Protocols, Introduction, Multicasting Basics, Intra-domain Multicast Protocols, Inter-domain Multicast Protocols	
UNIT-V:	**(06 Hrs)**
THE APPLICATION LAYER: Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http. Application Layer Protocols: Simple Network Management Protocol, **Network Security:** Cryptography, AES.DES, Cryptanalysis, Public Key Algorithms: RSA, Digital Signature, **Communication Security:** IPsec. Firewalls, VPN.	
UNIT-VI:	**(06 Hrs)**
AI IN COMPUTER NETWORKING: Introduction to AI in Computer Networking, the role of AI in modern networking, Intrusion detection and prevention using AI, AI-driven firewall management, AI-driven QoS optimization, AI-driven load balancing, Dynamic routing and traffic optimization	
Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)(*if complete unit is applicable then write only "unit 1/2/.." or write the contents from that unit*)	

Text Books:
1. Andrew S. Tannenbaum, "Computer Networks", Pearson Education,4 th Edition, 2003
2. Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill, 5 th Edition

Reference Books:
1. Wayne Tomasi, "Introduction to Data Communication and Networking", Pearson Education, 1st Edition.
2. Greg Tomsho, Ed Tittel, David Johnson. "Guide to Networking Essentials", Thomson India Learning, 5 th Edition, 2007.

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Third Year Artificial Intelligence & Data Science (2022 Course)
Machine Learning

Course Code	ADPCC503	Credit	03
Contact Hours	03 Hrs/weeks((L)	Type of Course	Lecture
Examination Scheme	ISE: 40Marks ESE: 60 Marks	Total Marks	100

Pre-requisites:
- Problem Solving and Programming
- Discrete Mathematics & Statistics
- Artificial Intelligence

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In Semester Evaluation	Internal	40[#]
2.	End Semester Evaluation	External	60[*]

Course Objectives

1	To discuss machine learning concepts & types of machine learning
2	To introduce regression & classification.
3	To illustrate on unsupervised learning algorithms.
4	To discuss Artificial Neuron Model
5	To explain Multilayer perceptron (MLP) and back propagation algorithm.
6	To disseminate forms of learning

Course Outcomes : Students will be able to

503.1	Explain the basic concepts in Machine Learning and to broadly classify various types of machine learning algorithms.
503.2	Analyze Mathematically, compare and design machine learning algorithms for classification and regression.
503.3	Analyze Mathematically, the effect of dimensionality reduction. Evaluate and interpret the results of the algorithms.
503.4	Apply the fundamentals of Artificial Neural Network (ANN) to design and implement ANN algorithms.
503.5	Classify the multilayer perceptron for classification.
503.6	Design and implement neural networks to particular applications.

Topics covered:

UNIT-I: Introduction to Machine Learning   (06 Hrs)

Introduction to Machine learning, Learning paradigms: Supervised, Unsupervised, Semi-Supervised, Reinforcement Learning, parametric and non-parametric modeling, Bias-Variance, over fitting, under fitting, and Generalize model. Dimensionality reduction. Feature reduction, Decision trees.

UNIT II Supervised Learning Techniques   (06 Hrs)

Regression: Least Squares regression, Types of regression: Linear Regression and nonlinear regression, Nearest Neighbors, Linear Basis Function Models, The Bias-Variance

Decomposition, Bayesian Linear Regression, Bayesian Model Comparison Linear Models for Classification: Discriminant Functions. Probabilistic Discriminative Models Multivariate Data,Parameter Estimation, Multivariate Classification, Multivariate Regression Kernel Methods: Support Vector machines and Relevance Vector Machines

UNIT- III: Unsupervised Learning	
Techniques	**(06 Hrs)**

Dimensionality Reduction: Principal Components Analysis, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis Clustering: k-Means Clustering, Mixtures of Gaussians.

UNIT- IV: Artificial Neural Networks	**(06 Hrs)**

Biological neuron, Artificial neuron model, concept of bias and threshold, types of Activation functions: sigmoid function (Unipolar sigmoid), Hyperbolic tangent (bipolar sigmoid) function, Hard Limiter, Piecewise linear, Linear, McCulloch-Pits Neuron Model, learning paradigms, concept of error energy, gradient descent algorithm and application of linear neuron for linear regression, Learning mechanisms: Hebbian, Gradient descent, Competitive, Stochastic, Delta Rule, Perceptron and its limitations.

UNIT- V: Artificial Neural Networks II	**(06 Hrs)**

Multilayer perceptron (MLP), Feed-forward neural network, Feedback neural network, back propagation algorithm, Application of MLP for classification, Self-Organizing Feature Maps, Learning vector quantization, Radial Basis Function.

UNIT- VI: Attractor Neural Networks	**(06 Hrs)**

Associative Learning, Attractor Associative Memory, Linear Associative memory, Hopfield Network, application of Hopfield Network, Brain State in a Box neural Network, Simulated Annealing, Boltzmann Machine, Bidirectional Associative Memory.

Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)
1. II,III.

Text Books:
1. Christopher Bishop, ―Pattern Recognition and Machine Learning‖, Springer, 2007.
2. Laurene Fausett ,‖ Fundamentals of Neural Networks: Architectures, Algorithms And Applications, Pearson Education, Inc, 2008.
3. "Probability and Statistics for Engineering and the Sciences", Jay Devore, Eighth Edition
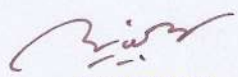
Reference Books:
1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, ―The Elements of Statistical Learning‖, Springer 2009.
3. Phil Kim, ―MATLAB Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence‖,a Press 2017.
4. EthemAlpaydın ―Introduction to Machine Learning‖ Second Edition The MIT Press 2010.
5. SimonHaykin,‖ Neural Networks : A comprehensive foundation, Prentice Hall International Inc. 1999.

EBooks:
1. Machine - Learning - Tom Mitchell
2. Machine Learning (etc.) (z-lib.org)

MOOC Course:
1. Introduction to Machine Learning - Course (nptel.ac.in)

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Third Year Artificial Intelligence & Data Science (2022 Course)
Web Technology

Course Code:	ADPCC504	Credit	03
Contact Hours:	Theory: 03 Hrs/week	Type of Course:	Lecture
Examination Scheme	ISE:40 Marks ESE:60 Marks	Total Marks	100

Pre-requisites:
1. Computer Networks.
2. Database Management Systems.

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In Semester Evaluation	Internal	40#
2.	End Semester Evaluation	External	60**

Course Objectives

1	To explain fundamental understanding of web design and development using HTML, frameworks and connecting multiple technologies for effective web applications.
2	To describe how to create responsive websites with eye-catching design using CSS and Bootstrap.
3	To implement advanced jQuery techniques for creating dynamic web pages.
4	To use PHP and MySQL to create dynamic web apps.
5	To explore the Flask and Django framework with server-side web applications.
6	To illustrate the Rails framework and the Ruby programming language.

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

504.1	Apply fundamental knowledge of HTML-based web design, frameworks, and the integration of various technologies into practical online app creation.
504.2	Design visually attractive and sophisticated websites by utilizing CSS and Bootstrap.
504.3	Develop dynamic web applications such as animations and effects using advanced query techniques.
504.4	Develop MySQL and the PHP programming language to static and dynamic web pages.
504.5	Build server-side web applications using the Flask and Django development environments.
504.6	Make use of the most recent web development platforms to create efficient web applications for business functionality.

UNIT-I Web Essentials (06 Hrs)
The Web- Terminologies, Working and Web creation, Web Services - RESTful APIs, SOAP APIs, GraphQL.
Basics of HTML – Structure, Text Chapter, Lists, URL, Links, Images, Tables, Forms, Extra

Markup, Flash, Video & Audio.

HTML5 - Layout, Styling with CSS, Process and Design, Search Engine Optimization (SEO),

Self-Study: Research and summarize the key steps in the web design process.

(06 Hrs)

UNIT-II:CSS and Bootstrap

CSS - Introduction to CSS, Importing a Style Sheet, CSS Rules, Style Types, CSS Selectors, Fonts and Typography, Managing Text Styles, CSS Colors, Positioning Elements, The Box Model and Layout.

Bootstrap – Introduction of Bootstrap, Bootstrap Grid System- Nesting and Offsetting Columns, Bootstrap Components, Optimizing Bootstrap, Bootstrap Plugins.

Self-Study: Explore the Bootstrap documentation to understand its grid system.

(06 Hrs)

UNIT- III: JavaScript andjQuery

JavaScript - Script, Designing, methods- inline, embedded, external, Statements, Comments, Variables and Data Types, Arrays, Expression, Operators, Functions, Methods , Objects, Decision and loops, Document Object Model (DOM)- Node Tree, Accessing node, Adding and Removing node. Overview of Angular JS.

jQuery - Introduction to jQuery, syntax and structure of jQuery, Basics of DOM manipulation using jQuery selectors and filters, Adding, removing, and modifying CSS properties of HTML elements, jQuery Effects and Animations, jQuery plugins and their benefits.

Self-Study: Practice DOM manipulation using jQuery selectors and filters.

(06 Hrs)

UNIT- IV: PHP and MySQL

PHP - Basic syntax and programming concepts, Working with variables, basic data types, Expressions, Conditionals, Operators, Looping, functions and Objects, Array, Cookies – Setting, Accessing, Destroying.

MySQL – Basics, Querying a MySQL Database with PHP – Process, Connecting to MySQL - Selecting a database, Building and executing a query, Fetching a result, Closing a Connection.

Self-Study: Explore techniques to prevent SQL injection and other common security threats.

(06 Hrs)

UNIT- V: Flask and Django

Flask- Introduction, Initialization, Routes and View Functions, The Request-Response Cycle, Template- The Jinja2 Template Engine, Rendering Templates, Variables, Control Structures, Bootstrap Integration with Flask, Links, Web Forms - Form Classes, HTML Rendering of Forms, Form Handling in View Functions.

Django – How to install Django, Models and databases, Handling HTTP requests, Templates, Class-based views, Built-in class-based views API, Testing in Django, User authentication in Django, Projects and applications.

Self-Study: Explore Django's built-in class-based views for common tasks.

(06 Hrs)

UNIT- VI: RUBY and Rail

Ruby - Object-Oriented Programming in Ruby - Objects and classes, Inheritance and polymorphism, Encapsulation and abstraction, Data Structures in Ruby- Arrays and hashes, Strings and regular expressions, Iteration and control structures, Scripting in Ruby- Writing and executing Ruby scripts, Input and output operations.

Rails - Introduction to Rails, Overview of Rails framework, MVC architecture, Installation and configuration of Rails, Building Applications with Rails - Creating a new Rails application, Building a database schema, Creating models, views, and controllers.

Self-Study: Investigate scaffolding and Rails generators for quick development. Examine Ruby's potential as an automation scripting language.

Text Books:
1. Jon Duckett, "HTML and CSS: Design and Build Webs", WILEY, ISBN-10 1118008189, ISBN-13 978-1118008188, 1st Edition.
2. Jennifer Niederst Robbins, "Learning Web Design", O'Reilly Media, Inc, ISBN: 978-1-491-96020-2, Fifth edition.

3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", O'Reilly Media, Inc, ISBN: 2014-05-19T13:43:53, 1st Edition.
4. William S. Vincent, "Django for Beginners- Build websites with Python & Django", Welcometocode, ISBN-10 : : 1735467200, ISBN-13.173546720-978
5. Syed Fazle Rahman, "Jump Start Bootstrap", Site Point Pty. Ltd., ISBN 978-0-9922794-3-1 (print), ISBN 978-0-9922794-7-9 (ebook).
6. Miguel Grinberg, Flask Web Development Developing, O'Reilly Media, Inc. ISBN: 9781491991732.

Reference Books:

1. Robert W. Sebesta "Programming the World Wide Web", Pearson, ISBN-10: 0-13-213081-5, ISBN-13: 978-0-13-213081-3, Sixth Edition.
2. Jeffrey C. Jackson , "Web Technologies- A Computer Science Perspective", Pearson, ISBN 0-13-185603-0,
3. Ron DuPlain, "Instant Flask Web Development", Packt Publishing Limited, ISBN-10 : : ISBN-13 ,1782169628 978-1782169628.
4. Robin Nixon , "Learning PHP, MySQL, JavaScript, CSS & HTML5", O'Reilly Media, Inc, ISBN: 2014-05-19T13:43:53, 1st Edition.

E-Books:

1. https://www.w3.org/html/
2. http://w3schools.org/
3. http://php.net/
4. https://jquery.com/
5. https://developer.mozilla.org/en-US/docs/AJAX
6. http://www.tutorialspoint.com/css/

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Third Year Artificial Intelligence and Data Science (2022 Course)
Design & Analysis of Algorithm

Course Code:	ADPEC505A	Credit	03
Contact Hours:	3 Hrs/week (L)	Type of Course:	Lecture
Examination Scheme	ISE : 40 Marks ESE : 60 Marks	Total Marks	100

Pre-requisites:
1. Programming and Problem Solving.
2. Data Structures.
3. Artificial Intelligence

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1	In Semester Evaluation	Internal	40[#]
2	End Semester Evaluation	External	60[*]

Course Objectives

1	To explain recursive and iterative algorithms using various methods.
2	To solve various problems using greedy strategy.
3	To solve various problems using dynamic strategy.
4	To apply backtracking algorithms to solve problems like N-queen & graph coloring.
5	To conduct proofs for NP problems.
6	To discuss the concept of randomness in computation.

Course Outcomes: Students will be able to

505.1	Compare iterative and recursive algorithms.
505.2	Apply Greedy approach to design algorithms.
505.3	Make use of simple dynamic programming based algorithms to solve various problems.
505.4	Explain the role of Recursive backtracking algorithm.
505.5	Classify the decision problem into various complexity classes.
505.6	Discuss Randomized and Approximation algorithms.

Topics covered:

UNIT-I: INTRODUCTION (06 Hrs)
Analysis of Algorithm: Efficiency- Analysis framework, **Brute Force method:** Introduction to Brute Force method & Exhaustive search, Brute Force solution to 8 queens' problem. **Proof Techniques:** Contradiction, Mathematical Induction, Direct proofs, Proof by contraposition Proof by counter example. **Analysis of Non-recursive and recursive algorithms:** Solving Recurrence Equations (Homogeneous and nonhomogeneous).

UNIT-II: GREEDY ALGORITHMS (06 Hrs)
Amortized Analysis: Aggregate, Accounting & Potential method with the example of stack operations. **Greedy Algorithms:** An activity selection problem, Huffman code, Matroids and Greedy methods, A task scheduling problem as a matroid.

UNIT- III: DYNAMIC PROGRAMMING (06 Hrs)
General strategy, Elements of dynamic programming, Principle of optimality, , 0/1 knapsack

Problem, Matrix chain multiplication, , Bellman-Ford Algorithm , Multistage Graph problem, Travelling Salesman Problem.

UNIT- IV: BACKTRACKING AND BARNCH-N-BOUND	(06 Hrs)

General method, Recursive backtracking algorithm, 8-Queen problem, Sum of subsets, Graph colouring, Hamiltonian Cycle. Branch-n-Bound: Principle, control abstraction, time analysis of control abstraction, strategies FIFO, LIFO and LC approaches, 0/1 Knapsack Problem.

UNIT- V: COMPLEXITY CLASSES AND NP-COMPLETENESS	(06 Hrs)

Introduction to Approximation algorithms for NP-optimization problems, NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NP-hard and NP complete, decision and optimization problems, polynomial reduction, graph based problems on NP Principle, vertex cover problem.

UNIT- VI: RANDOMIZED AND APPROXIMATION	(06 Hrs)

Introduction to randomness in computation randomized quick sort, Karger's Min-cut algorithm, coupon collector problem. Metric Traveling-Sales-Person Problem (metric-TSP).

Case Study: Monte Carlo Randomize Algorithm.

Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)(*if complete unit is applicable then write only "unit 1/2/.." or write the contents from that unit*)
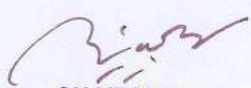
Text Books:

1. Horowitch, E.,and S.Sahani."Fundamentals of computer algorithms." *Galgotia, New Delhi* (1978).
2. Kleinberg, Jon, and Eva Tardos. *Algorithm design*. Pearson Education India, 2006.
3. Dasgupta, Sanjoy, and Christos H. Papadimitriou. *Algorithms*. 2006.

Reference Books:

1. Cormen, Thomas H., et al. *Introduction to algorithms*. MIT press, 2022
2. Motwani, Rajeev, and Prabhakar Raghavan. *Randomized algorithms*. Cambridge university press, 1995.
3. Vazirani, Vijay V. *Approximation algorithms*. Vol. 1. Berlin: springer, 2001.

References:

1. https://archive.nptel.ac.in/courses/106/106/106106131
2. https://www.youtube.com/watch?v=u2TwK3fED8A
3. https://www.udemy.com/course/design-and-analysis-of-algorithms

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Third Year Artificial Intelligence & Data Science (2022 Course)
Data Analytics Using Power Bi and Tableau

Course Code	ADPEC505	Credit	02
Contact Hours	03Hours/Week	Type of Course	Lecture/Tutorial
Examination Scheme	ISE- 40 Marks ESE-60 Marks	Total Marks	100

Pre-requisites:
1. Basic mathematics
2. Data base management systems

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1	In Semester Evaluation	Internal	40#
2	End Semester Evaluation	External	60*

Course Objectives

1	To provide students basic knowledge of Power BI
2	To make the students aware of visualization techniques.
3	To use power query in real time applications
4	To learn basic of Tableau and data visualization
5	To provide students basic knowledge of data processing in tableau
6	To make the students aware data server operations and UI with tableau.

Course Outcomes: Students will be able to

505.1	Define data analysis through power BI.
505.2	Prepare reports with power BI visualization.
505.3	Write power BI query to solve problem in real time applications.
505.4	Identify File Types & Extensions in tableau.
505.5	Apply data simplification methods with different charts.
505.6	List tableau data server operations.

Topics covered:

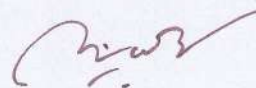**UNIT-I: DATA ANALYSIS WITH POWER BI** (06 Hrs)
Overview of Power BI: Power BI, Components of Power BI, Building blocks of Power BI, Power BI Desktop Interface Power BI Service, Power BI Apps .
Data Analysis with Power BI: Connecting to web data, Cleaning and transforming data, Data Source Connections - CSV files, Desktop, Excel , Text, SQL server , Web page , Direct SQL Query.

UNIT-II: REPORTS AND VISUALIZATION WITH POWER BI (06 Hrs)
Power BI report-create, report editor, add a page, add filter, highlight, save the report in Power BI, open -reading, editing view, aggregates, duplicate, rename, delete operation.
Visualization-types, custom visualization, move, resize and pop out, drill down histograms, charts, and its types (basic, Combo, doughnut, funnel, radial Gauge, scatter, waterfall), Tree maps in Power BI, Slicers in Power BI, KPI visuals

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UNIT-III: POWER QUERY, POWER APP , Power BI Service	**(06 Hrs)**

Power Query: M Language Purpose, Power Query Architecture, Power Query Transformation Types, Power app overview, Canvas Apps - Navigation ,Customization, **Power BI Services** -Interface overview, Importing data from Desktop to Service, Dataset menu, Working on reports, Dashboard overview Collaborating in App Workspace, Sharing the results, Publishing the app

UNIT- IV: TABLEAU AND DATA VISUALIZATION	**(06 Hrs.)**

TABLEAU Overview & Architecture, File Types & Extensions, filtering data, data connections in tableau interface, Dashboard

UNIT- V: DATA SIMPLIFICATION AND CHARTS IN TABLEAU	**(06 Hrs)**

Working with Combined Axis , Charts, Geocoding and Geographic MappingData simplification using Scatter Plots, Text tables and Highlight tables, Heat Maps, Histograms , Pie Charts , Bullet Chart, Advance Chart Types

UNIT-VI: TABLEAU DATA SERVER AND UI	**(06 Hrs)**

Physical architecture overview, User access, Component functions & processes , Tableau server on-premises, Tableau reader ,Tableau server user interface , Users ,Site roles, Groups ,Schedules , Tasks , Tableau server menu , Content display option
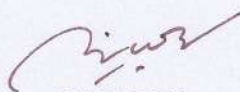
Text Books:
1. Power BI simplified by Reza Rad
2. Tableau Cookbook – Recipes for Data Visualization

Reference Books:
1. Learning Tableau 10, Joshua N. Milligan, Packt Publishing
2. Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen
3. Master, Mastering power BI by chandrisha sinha
4. Introducing Microsoft power BI by alberto ferarri

References:
1. Analytics in Microsoft Power BI | Udacity
2. learn.microsoft.com/en-us/power-bi/transform-model/desktop-quickstart-learn-dax-basics

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Third Year Artificial Intelligence & Data Science (2022Course)
Distributed Systems

Course Code	ADPEC505	Credit	03
Contact Hours	03 Hrs/weeks((L)	Type of Course	Lecture
Examination Scheme	ISE:40Marks ESE: 60 Marks	Total Marks	100

Pre-requisites:
- Operating Systems
- Computer Networks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In Semester Evaluation	Internal	40[#]
2.	End Semester Evaluation	External	60[*]

Course Objectives

1	To explain fundamentals of distributed systems
2	To discuss communication models for a distributed system
3	To explain Distributed File system & transaction Processing
4	To describe Synchronization, Replication & Fault tolerance in Distributed Systems
5	To outline Security issues in Distributed systems
6	To discuss the role of Artificial Intelligence and Data Science in distributed systems

Course Outcomes : Students will be able to

505.1	Explain Distributed System types and architectural styles
505.2	Demonstrate Communication models in Distributed Systems
505.3	Define the components of Distributed File System and transaction processing
505.4	Apply Synchronization, Replication and Fault tolerance concepts in real world
506.5	Identify the Security issues in Distributed systems
507.6	Summarize the Integration of Artificial Intelligence and Data Science in Distributed systems

UNIT-I: INTRODUCTION (06 Hrs)

Introduction to Distributed system, Definition, Goals, Examples of Distributed systems, Types of distributed systems: Distributed Computing System, Distributed Information System, Issues in Designing Distributed System, Architectures: Architectural Styles, Middleware organization, System Architecture. Example architectures – Network File System, External Data Representation & Marshaling, Unmarshalling
Self-Study: World wide web

UNIT-II: COMMUNICATION IN DISTRIBUTED SYSTEM (06 Hrs)

Introduction, IPC, Issues in IPC by Message Passing, Types of Communication, Message Oriented Communication, Multicast Communication, Communication between Distributed Objects. Remote Procedure Call- Basic RPC Operation, Parameter Passing, RPC-based application support, Variations on RPC, Example: DCE RPC, Remote Method Invocation.
Self-Study: Java RMI,CORBA

UNIT- III: DISTRIBUTED FILE SYSTEMS AND TRANSACTION PROCESSING (06 Hrs)
Introduction, Distributed Resource Management, Concepts of File System, Distributed File Systems - Architecture, Mechanisms for building Distributed File System, Design issues, Log-Structured file systems, Distributed Hash Tables (DHTs), Transactions and Nested transactions, Locks, Concurrency Control , Optimistic concurrency control, Timestamp ordering, Atomic Commit protocols ,Distributed deadlocks. Self-Study - The Andrew File System
UNIT- IV: SYNCHRONIZATION, REPLICATION AND FAULT TOLERANCE (06 Hrs)
Introduction, Physical Clock Synchronization, Logical Clock, Mutual exclusion, Election Algorithms, Replication, Consistency: Introduction, Consistency models, Consistency protocols. Fault Tolerance: Introduction, Basic Concepts, Failure Models, Failure Masking by Redundancy, Process Resilience, Distributed Commit, Recovery Self-study – Coda.
UNIT- V: SECURITY (06 Hrs)
Introduction to Security: Security Threats, Policies, and Mechanisms ,Design Issues Cryptography. Security channels: Authentication Message Integrity and Confidentiality Secure Group Communication, Access control : General Issues in Access Control, Firewalls, Secure Mobile Code, Denial of Service, Security Management, Key Management, Secure Group Management, Authorization Management
UNIT- VI: ARTIFICIAL INTELLIGENCE & DATA SCIENCE IN DISTRIBUTED SYSTEMS (06 Hrs)
Introduction to distributed machine learning algorithms, Types of Distributed Machine Learning: Data Parallelism and Model Parallelism, Optimization algorithms: Distributed Gradient Descent, Federated Learning, SGD, Machine Learning for Resource Allocation, Intelligent Resource Management, Integration of AI algorithms in distributed systems.

Text Books:
1. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design",
   Fifth Edition, Pearson Education, 2012.
2. Maarten van Steen, Andrew S. Tanenbaum, "Distributed System", Third edition, version 3.
3. Distributed Artificial Intelligence by Michael Huhns Volume I 1st Edition - January 1, 1987.

Reference Books:
1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
2. Tanenbaum A.S., Van Steen M., "Distributed Systems: Principles and Paradigms", Pearson Education, 2007.
3. Liu M.L., "Distributed Computing, Principles and Applications", Pearson Education, 2004.
4. Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, USA, 2003.
5. Distributed Computing and Artificial Intelligence, 12th International Conference: 373 (Advances in Intelligent Systems and Computing) Paperback by Sigeru Omatu (Editor), Qutaibah M. Malluhi (Editor), Sara Rodríguez Gonzalez (Editor), Grzegorz Bocewicz (Editor), Edgardo Bucciarelli (Editor), Gianfranco Giulioni (Editor), Farkhund Iqba (Editor)

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Third Year Artificial Intelligence & Data Science (2022 Course)
Artificial Intelligence: Search Methods for Problem Solving

Course Code	ADOEC506	Credit	03
Contact Hours	03 Hrs/weeks((L)	Type of Course	NPTEL MOOC
Examination Scheme	ISE:40Marks ESE: 60 Marks	Total Marks	100

Pre-requisites:
1. Programming and Problem Solving
2. Artificial Intelligence

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
3.	In Semester Evaluation	Internal	40$
4.	End Semester Evaluation	External	60$$

Course Objectives

1	To introduce foundation of AI Search Algorithms.
2	To describe search algorithms.
3	To explain heuristic search to solve problems.
4	To introduce classical planning algorithms for given problem instances.

Course Outcomes : Students will be able to

506.1	Explain the foundation of AI Search Algorithms.
506.2	Write and implement search algorithms.
506.3	Describe algorithms like A* and heuristic search to solve problems efficiently by leveraging domain-specific information and compare the performance of different heuristic functions.
506.4	Apply search algorithms to find solutions for CSPs.
506.5	Describe classical planning algorithms, including forward and backward state-space search, to generate feasible plans for given problem instances.

UNIT-I: INTRODUCTION	**(06 Hrs)**
Introduction: History, Can Machines think? Turing Test, Winograd Schema Challenge, Language and Thought, Wheels & Gears, Philosophy, Mind, Reasoning, Computation, Dartmouth Conference, The Chess Saga, Epiphenomena.	
UNIT-II: SEARCH METHODS	**(06 Hrs)**
State Space Search: Depth First Search, Breadth First Search, Depth First Iterative Deepening.Heuristic Search: Best First Search, Hill Climbing, Solution Space, TSP, Escaping Local Optima, Stochastic Local Search.	
UNIT- III: PROBLEM SOLVING METHODS-I	**(06 Hrs)**

Population Based Methods: Genetic Algorithms, SAT, TSP, emergent Systems, Ant Colony Optimization.Finding Optimal Paths: Branch & Bound, A*, Admissibility of A*, Informed Heuristic Functions.

UNIT- IV PROBLEM SOLVING METHODS-II	**(06 Hrs)**

Space Saving Versions of A*: Weighted A*, IDA*, RBFS, Monotone Condition, Sequence Alignment, DCFS, SMGS, Beam Stack Search.
Game Playing: Game Theory, Board Games and Game Trees, Algorithm Minimax, AlphaBeta and SSS*.

UNIT- V: AUTOMATED PLANNING	**(06 Hrs)**

Automated Planning: Domain Independent Planning, Blocks World, Forward &Backward Search, Goal Stack Planning, Plan Space Planning Problem Decomposition: Means Ends Analysis, Algorithm Graph plan, Algorithm AO*

UNIT- VI: CSP AND KNOWLEDGE	**(06 Hrs)**

Constraint Processing: CSPs, Consistency Based Diagnosis, Algorithm Backtracking, Arc Consistency, Algorithm Forward Checking Rule Based Expert Systems: Production Systems, Inference Engine, Match-Resolve-Execute, Rete Ne Deduction as Search: Logic, Soundness, Completeness, First Order Logic, Forward Chaining, Backward Chaining.

Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)
Unit II: Depth First Search, Breadth First Search, Depth First Iterative Deepening.
Unit III: Genetic Algorithms, SAT, TSP, emergent Systems, Ant Colony Optimization. Finding Optimal Paths: Branch & Bound, A*, Admissibility of A*, Informed Heuristic Functions.
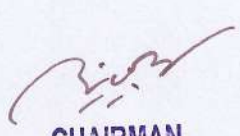
Text Books:
1. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India), 2013.

Reference Books:

1. Stefan Edelkamp and Stefan Schroedl. Heuristic Search: Theory and Applications, Morgan Kaufmann, 2011.
2. John Haugeland, Artificial Intelligence: The Very Idea, A Bradford Book, The MIT Press, 1985.
3. Pamela McCorduck, Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence, A K Peters/CRC Press; 2 edition, 2004
4. Zbigniew Michalewicz and David B. Fogel. How to Solve It: Modern Heuristics. Springer; 2nd edition, 2004.
5. Judea Pearl. Heuristics: Intelligent Search Strategies for Computer Problem Solving, Addison-Wesley, 1984.

MOOC Course URL:
1. https://onlinecourses.nptel.ac.in/noc21_cs79/preview

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Third Year Artificial Intelligence & Data Science (2022 Course)
Machine Learning Laboratory

Course Code	ADPCC507	Credit	02
Contact Hours	04 Hrs/weeks((L)	Type of Course	Practical
Examination Scheme	TW: 25 marks PR: 25 marks	Total Marks	50

Pre-requisites:
- Problem Solving and Programming
- Discrete Mathematics & Statistics

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term-work	Internal	25
2.	Practical	External	25

Course Objectives

1	To enable students to gain hands-on experience in designing, training, and evaluating machine learning using popular libraries.
2	To introduce students to transfer learning and fine-tuning pre-trained models for specific applications.
3	To teach students how to evaluate the performance of machine learning models.

Course Outcomes : Students will be able to

507.1	To experiment on fundamental concepts of regression and principles of machine learning and identify key components of machine learning models.
507.2	To analyze and evaluate the performance of machine learning models and interpret the results.
507.3	Develop novel machine learning solutions for complex problems and applications.
507.4	Explore and experiment with emerging trends and advanced machine learning architectures.

Sr. No.	Name of the program Group (A) (Any Seven)
1.	Write a python program to compute • Central Tendency Measures: Mean, Median, Mode • Measure of Dispersion: Variance, Standard Deviation
2.	Study of Python Basic Libraries such as Statistics, Math, Numpy, Sys and Scipy
3.	Study of Python Libraries for ML application such as Pandas,Matplotlib and Seaborn
4.	Implement a linear regression model with a single neuron model

5.	Implementation of Multiple Linear Regression using sklearn (House price prediction/Loan defaulter etc.)
6.	Implementation of Decision tree using sklearn and its parameter tuning
7.	Implementation of K Nearest Neighbours(KNN) using sklearn
8.	Implementation of K-Means Clustering
Sr. No.	**Group (B) (Any Four)**
9.	Implement Support Vector machines (SVM) classifier for classification of data into two classes. Students can use datasets such as flower classification etc.
10.	Implement simple logic network using Multilayer perceptron (MP) neuron model
11.	Implement the finite words classification system using Back-propagation algorithm
12.	Implement Self-Organizing Feature Maps (SOFM) for character recognition.
13.	Implement and test Radial Basis Function (RBF) network
Sr. No.	**Group (C) Mini Project (Any One)**
14.	Predicting House Prices: **Project Statement:** Build a regression model to predict house prices based on features such as square footage, number of bedrooms, neighborhood, etc. **Dataset:** You can use the "House Prices: Advanced Regression Techniques" dataset from Kaggle.
15.	Classification of Iris Flowers: **Project Statement:** Create a classification model to classify iris flowers into different species (setosa, versicolor, virginica) based on features like sepal length, sepal width, petal length, and petal width. **Dataset:** The Iris dataset is a classic dataset and can be easily accessed from libraries like Scikit-Learn.
16.	Sentiment Analysis for Movie Reviews: **Project Statement:** Develop a sentiment analysis model that determines whether movie reviews are positive or negative based on the text of the reviews. **Dataset:** You can use the IMDb movie reviews dataset available on Kaggle.
17.	Automation of price prediction using machine learning in a large furniture company.

Text Books:
1. Christopher Bishop, ―Pattern Recognition and Machine Learning‖, Springer, 2007.
2. Laurene Fausett ,‖ Fundamentals of Neural Networks: Architectures, Algorithms And Applications, Pearson Education, Inc, 2008.
3. "Probability and Statistics for Engineering and the Sciences", Jay Devore, Eighth Edition
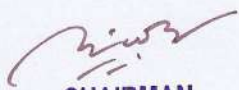
Reference Books:
1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, ―The Elements of Statistical Learning‖, Springer 2009.
3. Phil Kim, ―MATLAB Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence‖,a Press 2017.
4. EthemAlpaydın ―Introduction to Machine Learning‖ Second Edition The MIT Press 2010.
5. SimonHaykin,‖ Neural Networks : A comprehensive foundation, Prentice Hall International Inc. 1999.

EBooks:
1. Machine - Learning - Tom Mitchell
2. Machine Learning (etc.) (z-lib.org)

MOOC Course:
1. Introduction to Machine Learning - Course (nptel.ac.in)

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Third Year Artificial Intelligence & Data Science (2022 Course)
Networking and Web Laboratory

Course Code:	ADPCC508	Credit:	02
Contact Hours:	4 Hrs/weeks((P)	Type of Course:	Practical
Examination Scheme:	TW: 25 PR: 25	Total Marks:	50

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1	Term Work	Internal	25
2	Practical	External	25

Course Objectives

1. To comprehend the connections between JavaScript, HTML, and CSS in web development.
2. To understand and evaluate code samples in order to spot flaws and make improvements.
3. To produce friendly web pages by putting responsive design ideas into practice.
4. To develop an understanding of various protocols, modern technologies.

Course Outcomes: Students will be able to

508.1	Apply the fundamental concepts of HTML, CSS, and JavaScript in web development.
508.2	Implement responsive design principles to adapt web pages for various devices.
508.3	Demonstrate different web development frameworks and tools for specific use cases.
508.4	Develop a complete and functional interactive web application from scratch.
508.5	Demonstrate the subnet formation with IP allocation mechanism and apply various routing algorithms.
508.6	Develop Client-Server architectures and prototypes.

A: Computer Network:

	Group A Group B (Any Four)
1	Demonstrate the different types of topologies and types of transmission media by using a packet tracer tool.
2	Write a program to demonstrate Sub-netting and find subnet masks.
3	Use packet Tracer tool for configuration of 3 router networks using one of the following protocols RIP/OSPF/BGP.
4	Write a program to implement link state routing protocol to find a suitable path for transmission.
5	Implement TCP Socket Programming.
6	Implement UDP Socket Programming.
7	Write a program using TCP socket for wired network for following • Say Hello to Each other

	Group B(Any Three)
8	To study the IPsec (ESP and AH) protocol by capturing the packets using Wireshark tool.
9	To study the SSL protocol by capturing the packets using Wireshark tool while visiting any SSL secured website (banking, e-commerce etc.).
10	Write a program using UDP Sockets to enable file transfer (Script, Text, Audio and Video one file each) between two machines.
11	Write a program using TCP socket for wired network for following • File transfer
12	Study and Analyze the performance of FTP protocol using Packet tracer tool.
13	Use Packet Tracer tool Installing and configuring DHCP server and assign IP addresses to client machines using DHCP server.
	Group C (Any One)
14	Write a program for DNS lookup. Given an IP address input, it should return URL and vice versa
15	Develop a simple Network Intrusion Detection System using AI techniques to identify and respond to potential security threats in a computer network.

Text Books:

1. Andrew S. Tannenbaum, "Computer Networks", Pearson Education,4 th Edition, 2003
2. Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill, 5 th Edition

Reference Books:

1. Wayne Tomasi, "Introduction to Data Communication and Networking", Pearson Education, 1st Edition.
2. Greg Tomsho, Ed Tittel, David Johnson. "Guide to Networking Essentials", Thomson India Learning, 5 th Edition, 2007.

B: Web Technology:

Sr. No	Name of the program / Activity
	Group A
1.	Case Study: 1. How can search engine optimization help people find your websites when they use search engines? 2. How do analytics tools like Google Analytics help you keep track of how many people are visiting your site, how they find it, and what they do when they are there? 3. What are the fundamental conditions, such as acquiring a domain name and web hosting, for putting your website online? 4. In what ways do FTP tools make it easier to move files from your local computer to your web server?
2.	Create a straightforward HTML page with headings, paragraphs, and links as your task. Create a personal biography website using HTML tags as a practice.
3.	The assignment is to style HTML components using CSS. Practice styling your online resume with CSS attributes.
4.	The task is to make a responsive layout using media queries. Create a website that effortlessly switches between several screen sizes as a practice exercise using HTML &

	CSS code.

Group B (Any 03)

5.	Write JavaScript scripts for fundamental math operations. Create a calculator application using HTML, CSS, and JavaScript as a practice exercise.
6.	Develop a contact form: Build a contact form that allows users to send you messages through your website. You can use HTML and PHP to create the form and handle the form submissions.
7.	Connect to a MySQL database using PHP. Display a list of all records from a "products" table.
8.	Develop a webpage that includes a form with input fields. Use JavaScript to validate the form entries and provide real-time feedback to the user. Implement a submit button that triggers a confirmation message.

Group B (Any 04)

9.	Implement user authentication: Create a login and registration system for your website. You can use technologies like PHP and MySQL to store user information and authenticate users.
10	Create a Flask application that responds to the user's name given in the URL by addressing them.
11.	Make a Ruby class for a Person that includes name, age, and email fields. Create procedures for retrieving and setting these characteristics.
12.	Set up a new Rails application and create a simple controller that displays "Hello, Rails!" in a view.
13.	Build a basic contact form that submits user input to a server using PHP. Validate the form data on the server side and send a confirmation email to the user.

Group C (Any 02)

14.	Develop a social media platform: Create a social media platform that allows users to connect with each other and share content. You can use technologies like Ruby on Rails, Django, or Node.js to build the platform.
15.	Build a personal website: Create a website that showcases your skills, interests, and experiences. You can use HTML, CSS, and JavaScript to build the site.
16.	Create a Rails application for a Bookstore. Build the database schema for books, authors, and categories. Generate models, controllers, and views for managing books.

MINI PROJECTS

17.	**Task Manager Application:** **Objective:** Develop a task manager web application. **Features:** • User authentication (signup, login, logout). • Ability to add, edits, and deletes tasks. • Categorize tasks into different projects. • Mark tasks as complete or incomplete. • Dashboard displaying upcoming tasks.
18.	**E-commerce Website:** **Objective:** Build a simple e-commerce website. **Features:** • Product catalog with categories. • User authentication for customers. • Shopping cart functionality.

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	• Checkout process with order confirmation. • Admin panel for managing products and orders.
19.	**Blog Platform:** **Objective:** Develop a blog platform for users to create and share posts. **Features:** • User authentication and authorization. • Create, edit, and delete blog posts. • Commenting system. • Tagging system for posts. • User profiles with the list of authored posts.

References:

1. W3Schools: Web Hosting Tutorial
2. Coursera: Web Design for Everybody: Basics of Web Development & Coding Specialization
3. W3Schools PHP MySQL Tutorial: W3Schools PHP MySQL
4. Rails API Documentation: Rails Controller Documentation

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Third Year Artificial Intelligence & Data Science (2022 Course)
Design and Analysis of Algorithm Lab

Course Code:	ADPEC509A	Credit	1
Contact Hours:	2 Hrs/week (P)	Type of Course:	Practical
Examination Scheme	TW: 25 Marks PR: 25 Marks	Marks	50

Pre-requisites:
- Programming and Problem solving.
- Discrete Mathematics.

Course Objectives

1 To make use of various techniques of algorithms for problem solving

2 Solving the optimal control problem for dynamic.

3 Apply important algorithmic design paradigms and methods of analysis.

Course Outcomes: Students will be able to

509.1 Analyse time complexity of algorithms using asymptotic analysis.

509.2 Apply scheduling algorithms to solve a given problem.

509.3 Make use of Dynamic approach in problem solving.

509.4 Implement Greedy approach to solve real life problems.

List of Experiment:

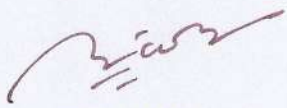| Sr. No.	Name of the Program Group (A) (Any Four)
1.	Program to implement all pairs shortest path using dynamic programming.
2	Implement 'N' Queen's problem using Backtracking.
3	Write a program to implement Huffman coding using Greedy Algorithm.
4	Solve 0/1 Knapsack problem using greedy algorithm.
5	Write a program to demonstrate minimum spanning tree using Prim's algorithm.
6	Implementation of Binary Search using Divide & Conquer Approach. Implement activity selection problem using Greedy method.
7.	Write a program for analysis of quick sort by using deterministic and randomized variant.
	Group (B) (Any Three)
8.	Write a program to solve the travelling salesman problem and to print the path and the cost using Branch and Bound.
9.	Write a program apply Greedy method to solve fractional Knapsack problem.

10	Write a program to demonstrate minimum spanning tree using Kruskal's algorithm.
11	Write a program to generate Fibonacci series using iterative and recursive method.
12	Implement Graph Coloring Problem with Backtracking Approach.
13	Write a compute binomial coefficient using dynamic programming.
	Group (C) (Any One)
14.	Implement the following using Back Tracking a) crossword puzzle b) Hamiltonian cycle
15.	Implement matrix chain multiplication problem using dynamic programming.
16.	Implement Bellman Ford's algorithm to compute shortest path using Dynamic Programming.
17.	Implement Activity selection problem with greedy approach.

Text Books:
1. Horowitch, E., and S. Sahani. "Fundamentals of computer algorithms." *Galgotia, New Delhi* (1978).
2. Kleinberg, Jon, and Eva Tardos. *Algorithm design*. Pearson Education India, 2006.
3. Dasgupta, Sanjoy, and Christos H. Papadimitriou. *Algorithms*. 2006.

Reference Books:
1. Cormen, Thomas H., et al. *Introduction to algorithms*. MIT press, 2022.
2. Motwani, Rajeev, and Prabhakar Raghavan. *Randomized algorithms*. Cambridge university press, 1995.
3. Vazirani, Vijay V. *Approximation algorithms*. Vol. 1. Berlin: springer, 2001.

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PUNE-1.

Third Year Artificial Intelligence & Data Science (2022 Course)
Data Analytics Using Power Bi and Tableau Laboratory

Course Code	ADPEC509B	Credit	01
Contact Hours	02 Hrs/weeks((L)	Type of Course	Practical
Examination Scheme	TW: 25 marks OR: 25 marks	Total Marks	50

Pre-requisites: Problem Solving and Programming.

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term-work	Internal	25
2.	Oral	External	25

Course Objectives	
1	To learn basics of data analysis with power Bi.
2	To review data visualization with power Bi
3	To know different chart representations with visual effects with tableau.
4	To illustrate tableau data server operations.

Course Outcomes : Students will be able to	
509.1	Identify features of power Bi data analysis.
509..2	Identify data visualization techniques.
509.3	Categorize type of charts.
509.4	Implement tableau data server operations .

	GROUP A(any 4)
1.	You are a business analyst working for a retail company. The company has provided you with a dataset containing information about sales transactions over the past year. Your task is to leverage Power BI to create a comprehensive Sales Performance Dashboard that provides actionable insights for the management team.
2.	**Social Media Analytics:** Supply a dataset with social media metrics (likes, shares, comments). Create a Power BI report that analyzes social media engagement, identifies popular content, and tracks performance over time.
3.	**Financial Analysis:** Give students financial data for a company (income statement, balance sheet). Create a Power BI report that provides insights into financial performance, including trends, ratios, and comparisons.
4	**Customer Segmentation:** • Provide a dataset with customer information (demographics, purchase history). • use Power BI to segment customers based on various criteria and create visualizations that highlight key customer segments.

5	**Healthcare Analytics:** • Offer a dataset with healthcare-related information (patient records, treatment outcomes). • use Power BI to visualize healthcare trends, patient demographics, and treatment success rates.
6	**Ad Campaign Analysis:** • Supply data related to an advertising campaign (impressions, clicks, conversions). • Create a Power BI report that analyzes the effectiveness of the campaign and provides recommendations for optimization.

GROUP B (any 6)

7	**Box Plot for Distribution Analysis:** • Provide a dataset with numerical data suitable for distribution analysis (e.g., exam scores by subject). • Create a box plot in Tableau to represent the distribution of scores, including outliers and quartiles.
8	**Stacked Bar Chart:** • Provide a dataset with multiple dimensions (e.g., sales by product category and region). • Create a stacked bar chart in Tableau to represent the contribution of each category to the total sales, broken down by region.
9	**Heat Map for Matrix Data:** • Offer a dataset with matrix-like data (e.g., sales performance matrix). • Create a heat map in Tableau to visualize the matrix data. Customize the color palette and provide insights into patterns.
10	**Line Chart for Time Series Data:** • Offer a dataset with a time dimension (e.g., monthly sales data). • Create a line chart in Tableau to visualize the trends in sales over time. Focus on formatting the time axis and adding annotations if needed.
11	**Bar Chart Creation:** • Provide a dataset with categorical data (e.g., sales by product category). • Create a bar chart in Tableau to represent the sales for each category. Encourage them to customize colors, labels, and tooltips.
12	**Scatter Plot for Correlation Analysis:** • Provide a dataset with numerical variables (e.g., correlation between temperature and ice cream sales). • Create a scatter plot in Tableau to analyze the correlation between the two variables. Include a trend line and provide insights.
13	**Pie Chart for Percentage Distribution:** • Supply a dataset with data that can be represented as percentages (e.g., market share of different products). • Create a pie chart in Tableau to represent the percentage distribution of each category. Emphasize proper labeling and color choices.
14	**Tree map Visualization:** • Supply a hierarchical dataset (e.g., sales hierarchy by product category and sub-category). • Create a tree map in Tableau to visualize the hierarchical structure and the contribution of each category and sub-category.

GROUP C(any one)

In the fast-paced business environment of today, real-time insights are crucial for making informed decisions. Your task is to create a Real-time Data Monitoring dashboard using Power BI for a retail company that wants to monitor key metrics as they happen. The company has a stream of data coming in, including information on sales transactions, website

traffic, and social media mentions.

Data Streams:

The dataset includes real-time streams of the following data:

- Sales transactions (including product ID, quantity, and revenue)
- Website traffic (page views, user interactions)
- Social media mentions and engagement (likes, shares, comments)

Key Objectives:

Real-time Sales Insights:

- Develop a section of the dashboard that provides real-time insights into sales transactions. Include metrics such as total sales, revenue, and top-selling products updated as new transactions occur.

Live Website Analytics:

- Create visuals that monitor website traffic in real-time. Include metrics such as page views, popular pages, and user interactions. Utilize line charts or gauges to represent trends.

Social Media Engagement:

- Incorporate a section that tracks social media mentions and engagement as they happen. Use live counters or charts to show the real-time impact of the company's social media presence.

Alerts and Notifications:

- Implement alerting mechanisms to notify stakeholders when predefined thresholds or anomalies are detected in any of the real-time streams. This could include sudden drops in sales or spikes in website traffic.

Interactive Elements:

- Make the dashboard highly interactive, allowing users to drill down into specific time periods, products, or social media platforms. Include filters and slicers for a personalized user experience.

Performance Metrics:

- Develop visuals that display performance metrics for each data stream, such as conversion rates, click-through rates, and sentiment analysis for social media mentions.

Comparative Analysis:

- Include visuals that compare current real-time metrics with historical data. This helps in identifying trends, seasonality, and performance improvements or deteriorations.

User Authentication and Access Control:

- Implement user authentication to ensure that the real-time dashboard is accessible only to authorized personnel. Consider incorporating role-based access control.

Scalability and Reliability:

- Design the solution to be scalable to handle increasing data volumes and reliable to ensure minimal downtime. Consider the use of appropriate Power BI features and Azure services if necessary.

Documentation:

- Provide clear documentation on how the real-time data streams are processed, integrated into Power BI, and any dependencies on external services.

In the competitive landscape of sales, understanding the sales process is essential for optimizing conversions and maximizing revenue. Your task is to create a Sales Funnel Analysis using Power BI for a company in the e-commerce sector. The company has provided a dataset containing information about leads, opportunities, and conversions.

Dataset:

- The dataset includes the following fields:
- Lead ID
- Lead source
- Opportunity ID

- Opportunity stage (e.g., prospecting, negotiation, closed-won)
- Conversion status
- Revenue associated with each opportunity

Key Objectives:

Sales Funnel Overview:
- Develop a visual representation of the sales funnel, showcasing the various stages from lead generation to closed deals. Use appropriate charts such as funnel charts or bar charts to represent the flow.

Conversion Rates:
- Calculate and visualize conversion rates between different stages of the sales funnel. Identify areas of improvement and bottlenecks in the conversion process.

Opportunity Value:
- Analyze the value associated with opportunities at each stage of the funnel. Create visuals that show the cumulative value of opportunities and revenue generated at each stage.

Lead Source Analysis:
- Break down the sales funnel analysis by lead source. Identify which lead sources contribute the most to successful conversions and revenue.

Time-to-Conversion:
- Calculate and visualize the average time it takes for leads to move through each stage of the sales funnel. Identify stages where the sales process might be slowing down.

Lost Opportunities Analysis:
- Analyze opportunities that did not convert (closed-lost). Identify common characteristics, reasons for non-conversion, and potential areas for improvement.

Sales Team Performance:
- If information about the sales team is available, create visuals that analyze the performance of individual sales representatives or teams in moving opportunities through the funnel.

Interactive Elements:
- Make the dashboard interactive by incorporating slicers, filters, and drill-down options for users to focus on specific time periods, product categories, or sales representatives.

Forecasting:
- If historical data is available, incorporate visuals that provide a forecast of potential revenue based on the current state of the sales funnel.

Recommendations:
- Based on your analysis, provide actionable recommendations for optimizing the sales process, improving conversion rates, and increasing revenue.

Deliverables:
- A Power BI Sales Funnel Analysis Dashboard (.pbix file) that provides a comprehensive view of the sales process. A written report or presentation summarizing key findings, insights, and recommendations

Text Books:
1. Power BI simplified by Reza Rad
2. Tableau Cookbook – Recipes for Data Visualization

Reference Books:
1. Learning Tableau 10, Joshua N. Milligan, Packt Publishing
2 Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master,
3 Mastring power BI by chandrisha sinha
4 Introducing Microsoft power BI by alberto ferarri

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Third Year Artificial Intelligence & Data Science (2022 Course)
Distributed Systems Laboratory

Course Code	ADPEC509C	Credit	01
Contact Hours	02 Hrs/week(P)	Type of Course	Laboratory
Examination Scheme	TW: 25 marks OR: 25 marks	Total Marks	50

Pre-requisites:
- Computer Networks
- Operating Systems

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/Internal	Marks
1.	Term-work	Internal	25
2.	Oral	External	25

Course Objectives

1	To explain Distributed system concepts.
2	To make use of Distributed system algorithms in real world applications
3	To demonstrate the role of Artificial Intelligence and Data Science in distributed computing

Course Outcomes : Students will be able to

509.1	Apply distributed systems concepts to solve real world problems
509.2	Design and Develop Distributed system applications
509.3	Integrate Artificial Intelligence concepts in Distributed systems

Sr. No	[Group A] (Any 4)
1.	Implementation of Clock Synchronization (logical/physical).
2.	Implement synchronization algorithm like Lamport's algorithm or its variants for clock synchronization in distributed system.
3.	Implement Banker's Algorithm for deadlock Detection in python.
4.	Write code to simulate requests coming from clients and distribute them among the servers using the load balancing algorithms.
5.	Write a program to implement edge chasing distributed deadlock detection algorithm.
6.	Design and develop a distributed application to find the coolest/hottest year from the available weather data. Use weather data from the Internet and process it using Map Reduce.

7.	Implementation of Ring Election algorithm.
	[Group B] (Any 3)
8.	Implement bully election algorithm.
9.	Implement a client server model to read/write a file present at single server from multiple clients.
10.	To study the fundamental principles of cryptography(symmetric, asymmetric encryption, hash functions) & their role in secure communication.
11.	Implement rollback mechanisms and data restoration methods to minimize downtime and data loss failures.
12.	Implement JAVA RMI mechanism for accessing methods of remote systems.
13	Implementation of non-token based algorithm for distributed mutual exclusion.
	[Group C] Mini Project(Any one)
14	Configuration of NFS client and server in order to read and write a file present on NFS server.
15	Design and develop a distributed Flight booking application using Java RMI that consists server and the client machines. The server manages flight booking information. A customer can invoke the following operations at his machine i) Book a flight for the specific customer ii) Cancel the booking
16.	Develop an application using a technology from distributed system.

Text Books:
1. Maarten van Steen, Andrew S. Tanenbaum, "Distributed System", Third edition, version 3.
2. Distributed Artificial Intelligence by Michael Huhns Volume I 1st Edition - January 1, 1987.

Reference Books:
1. Distributed Computing and Artificial Intelligence, 12th International Conference: 373 (Advances in Intelligent Systems and Computing) Paperback by Sigeru Omatu (Editor), Qutaibah M. Malluhi (Editor), Sara Rodríguez Gonzalez (Editor), Grzegorz Bocewicz (Editor), Edgardo Bucciarelli (Editor), Gianfranco Giulioni (Editor), Farkhund Iqba (Editor)
2. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.

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AUDIT COURSE 5 – FOREIGN LANGUAGE LEVEL-I GERMAN
(2022 Course)

Course Code :	IOHSM5AC	Credit :	1
Contact Hours :	1 Hr./Week (L)	Type of Course :	Lecture
Examination Scheme :	Term Work Marks		

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25

Course Objective:

1	To get introduced to the Culture, Routine of the German Society through language.
2	To meet the needs of ever growing German industry with respect to language support.

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

5AC.1	Use German language for basic communication.
5AC.2	Apply the knowledge of German script.
5AC.3	Read, write and improve their listening skills.
5AC.4	Develop interest to pursue profession in Indo-German Industry.
5AC.5	Grasp the basic sentence structure and build a good foundational vocabulary.

Unit 01	:	Introduction to the German Language-I	(04 Hrs)

Introduction of German Alphabets,
- Spell the names
- Addresses
- Numbers,
- Telephone numbers
- Ordinal Numbers
- Pin code Numbers
- Dates
- Birthdates
- Age
- days of the week
- Months

Unit 02	:	Introduction to the German Language-II	(04 Hrs)

- Basic Greetings
- Personal Pronouns
- Possessive Pronouns

Unit	:	Introduction to the German Language-II	(04 Hrs)

03		

- Self-Introduction
- Introducing other people, about family, friends, course mates
- Introduction to seasons, and seasons in Germany and in neighboring countries.

Text Books:

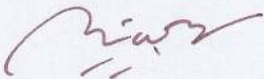| [T 1]	" Netzwerk A-1 (Deutsch als Fremdsprache) " Goyal Publishers & Distributors Pvt. Ltd

Reference Books:

[R 1]	Tipps und Uebungen A1

Online Resources:

1. Practice Material like Listening Module, reading Texts
2. NPTEL COURSE ON GERMAN -I LANGUAGE
3. ONLINE GERMAN-ENGLISH DICTIONARY www.leo.org

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Third Year Artificial Intelligence & Data Science (2022 Course)
Deep Learning

Course Code	ADPCC602	Credit	03
Contact Hours	03 Hrs/weeks((L)	Type of Course	Lecture
Examination Scheme	ISE:40Marks ESE: 60 Marks	Total Marks	100

Pre-requisites:
- Exploratory Data Analysis
- Machine Learning

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In Semester Evaluation	Internal	40*
2.	End Semester Evaluation	External	60 *

Course Objectives

1	To introduce the concept of deep learning.
2	To describe the significance of convolutional neural networks.
3	To explore the purpose and functionality of recurrent neural network.
4	To describe the different types of auto encoders.
5	To explain the fundamental concepts of deep generative models.
6	To explain the fundamental concepts of reinforcement learning, including Markov Decision Processes (MDPs), rewards, policies, and value functions.

Course Outcomes : Students will be able to

602.1	Summarize the concept of deep learning and its importance in the field of artificial intelligence.
602.2	Explain the purpose and functionality of convolutional layers, pooling layers, and activation functions in CNNs.
602.3	Apply different types of RNN architectures and their suitability for specific tasks.
602.4	Analyze the different types of auto encoders.
602.5	Implement generative models using programming languages and frameworks.
602.6	Describe deep reinforcement learning concept and algorithms.

Topics covered:

UNIT-I: INTRODUCTION TO DEEP LEARNING (06 Hrs)

Overview and Performance of Machine Learning Algorithm, Need of Deep Learning, Introduction to Deep Learning, Relation between Artificial intelligence, Machine Learning, and Deep Learning, Building Blocks of Deep Networks, Understanding How Deep Learning Works in Three Figures, Deep Learning Models, Application of Deep Learning.

Self-Study: Deep Mind, Alpha Go, Boston Dynamics, Amazon go store

UNIT-II: CONVOLUTIONAL NEURAL NETWORK (06 Hrs)

Kernels and Filters, Convolution, Properties of CNN, CNN Architecture Overview, Components of CNN Architectures: Convolutional Layer, Pooling Layer, Fully Connected (FC) Layer, Loss Layer, Training a Convolutional Network, CNN in TensorFlow, Popular CNN Architectures: LeNet, ResNet, AlexNet, Applications.

Self-Study: VGG

UNIT- III: RECURRENT NEURAL NETWORK (06 Hrs)

Introduction to RNN, Schematic Representation of an RNN, Varieties of Recursive Neural Networks, Training RNN with Back Propagation Through Time (BPPT), Elman Neural Networks, Practical example of RNN: Pattern Detection, Long Short-Term Memory (LSTM), Traditional LSTM, Modes of LSTM, Properties of LSTM Networks, LSTM Network Architecture, Training LSTM, Time-Series Forecasting with the LSTM model.

Self-Study: Multi-Digit Number Recognition, Google, bing, DuckDuckGo

UNIT- IV: AUTOENCODERS (06 Hrs)

Introduction to Autoencoders, Undercomplete Autoencoders, Regularized Autoencoders, Stochastic Encoders and Decoders, Denoising Autoencoders, Contractive Autoencoders, Predictive Sparse Decomposition, Applications of Autoencoders, Fast Learning Algorithms.

Self-Study: Autoencoder in Pytorch with MNIST, Anomaly detection in ECG with LSTM Autoencoders

UNIT- V: DEEP GENERATIVE MODELS (06 Hrs)

Introduction to Deep Generative Model, Boltzmann Machine, Deep Belief Networks, Deep Boltzmann Machines, Generative Adversarial Network (GAN), Discriminator Network, Generator Network, Types of GAN, Applications of GAN networks.

Self-Study: GAN for detection of real or fake images, chatGPT

UNIT- VI: DEEP REINFORCEMENT LEARNING (6 HRS)

Introduction of Deep Reinforcement Learning, Markov Decision Process, Basic Framework of Reinforcement Learning, Challenges of Reinforcement Learning, Dynamic Programming Algorithms for Reinforcement Learning, Simple Reinforcement Learning for Tic-Tac-Toe, Limitations of Deep Learning.

Self-Study: Self driving cars, Deep learning for chatbots

Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)
Not Required

Text Books:
1. Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville
2. Deep Learning A Practitioner's Approach, Josh Patterson and Adam Gibson, O'Reilly
3. Fundamentals of Deep Learning Designing Next-Generation Machine Intelligence Algorithms, Nikhil Buduma with contributions by Nicholas Locascio, O'Reilly

Reference Books:
1. Deep Learning with Applications Using Python, Navin Kumar Manaswi Bangalore, Karnataka, India, ISBN-13 (pbk): 978-1-4842-3515-7
2. Introduction to Deep Learning Using R A Step-by-Step Guide to Learning and Implementing Deep Learning Models Using R, Taweh Beysolow II San Francisco, California, USA ISBN-13 (pbk): 978-1-4842-2733-6
3. Applied Deep Learning: A Case-Based Approach to Understanding Deep Neural Networks, Umberto Michelucci toelt.ai, Dubendorf, Switzerland, ISBN-13 (pbk): 978-1-4842-3789-2
4. Introduction to Deep Learning, Mrs. Mayura V. Shelke, Dr. S. Padmaja, Dr. Rakesh Bapu Dhumale, Dr. S.H. Abbas, India, ISBN:978-93-5515-954-0
5. Reinforcement Learning: An Introduction, Richard S. Sutton and Andrew G. Barto, The MIT Press Cambridge, Massachusetts London, England

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Third Year Artificial Intelligence & Data Science (2022Course)
Cloud Computing

Course Code	ADPCC603	Credit	03
Contact Hours	03 Hrs/weeks((L)	Type of Course	Lecture
Examination Scheme	ISE:40Marks ESE: 60 Marks	Total Marks	100

Pre-requisites: Computer Networks

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In Semester Evaluation	Internal	40[#]
2.	End Semester Evaluation	External	60[*]

Course Objectives

1	To **Introduce** fundamental concepts of Cloud Computing
2	To **Explore** different types of data storage and access methods.
3	To **Explore** various virtualization types including server, storage, network, data, application, and desktop.
4	To **Understand** Amazon Simple DB, Elastic Cloud Computing, and other Amazon storage systems.
5	To **Explain** data security and storage considerations in the cloud.
6	To **Explore** modern computing paradigms such as Edge Computing and the Internet of Things

Course Outcomes : Students will be able to

302.1	Define and differentiate cloud computing models and deployment options
302.2	Describe various storage technologies and their use cases.
302.3	Choose the appropriate type of virtualization for specific use cases.
302.4	Design and implement solutions using cloud platforms.
302.5	Apply the Security principles in the cloud platforms
302.6	Describe modern computing paradigms

Topics covered:

UNIT-I: INTRODUCTION TO CLOUD COMPUTING (06 Hrs)
Grid Computing, Cluster Computing, and distributed computing, Introduction to Cloud Computing: Characteristics, Pros and cons of Cloud Computing, Types of scalability - Vertical and Horizontal, Migrating into the cloud, seven step model of migration into a cloud; Cloud Service models: SaaS, PaaS, IaaS, and Deployment models Private: Public, Hybrid, Community; Cloud Computing Architecture; NIST Cloud Computing, Cloud resources: Network and API, Virtual and Physical computational resources, Data-storage; Issues in cloud computing
Self-Study: creating virtual machines and setting up databases

UNIT-II: DATA STORAGE AND CLOUD COMPUTING (06 Hrs)
Data and Storage access: Direct attached storage (DAS), Network attached storage (NAS), Network storage: Storage Area network (SAN), File system: Google file system (GFS) HDFS. BigTable, HBase and Dynamo cloud data storage, Data Intensive computing, Map Reduce
Self-Study: NoSQL Databases

UNIT-III :VIRTUALIZATION (06 Hrs)

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Definition of Virtualization , Characteristics of Virtual Environment;
Types of Virtualization: server virtualization, storage virtualization, Network virtualization, Data virtualization, application and desktop ,paravirtualization, and full virtualization
Introduction to hypervisors, types of hypervisor-type I and Type II
Self-Study: Xen VmWare , MS hyper V, KVM

UNIT- IV: CLOUD PLATFORM IN INDUSTRY AND APPLICATIONS (06 Hrs)

Amazon Web Service: Amazon Web Services and Components, Amazon Simple DB, Elastic Cloud Computing (EC2), Amazon Storage System, Amazon Database services (Dynamo DB);
Microsoft Cloud Services: Azure core concepts, SQL Azure, Windows Azure platform;
Cloud Computing Applications: Healthcare: ECG analysis in the cloud, Biology: Protein Structure Prediction, Geosciences: Satellite Image Processing, Business and Consumer Applications: CRM and ERP, Social Networking, Google Cloud Application: Google App Engine; SLA.
Self-study: Adoption of Amazon ECS (Elastic Container Service) for containerorchestration

UNIT- V: SECURITY IN CLOUD COMPUTING (06 Hrs)

Virtualization System specific Attacks: Guest hopping, VM migration attacks, hyperjacking.
Data Security and Storage;
Identity and Access Management (IAM): IAM Architecture and Practice, IAM Challenges, Digital Forensics in the Cloud
Cloud Access: authentication, authorization and accounting, Cloud Reliability and fault-tolerance - Cloud Security, privacy, policy and compliance- Cloud federation, interoperability and standards.
Self-Study: CloudSim

UNIT-VI: MODERN COMPUTING PARADIGMS (06 Hrs)

EDGE Definition and significance, Characteristics of edge computing, IOT, Overview of IoT in the context of cloud computing, Cloud integration with IoT, Introduction to green Computing, Requirements of Jungle Computing ,Introduction to sustainable cloud Computing , Introduction to Docker , Introduction to Kubernetes , Basic Architecture of Kubernetes , Minikube
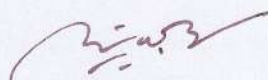**Self-Study:**AI in Cloud

Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)

Text Books:
1. Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl, Ricardo Puttini, and Zaigham Mahmood
2. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, —Mastering Cloud Computing, Tata Mcgraw Hill, 2013
3. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and cloud computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier – 2012.

Reference Books:

1. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg,Andrzej Goscinski, John Wiley & Sons, Inc. 2011

2. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly, 2009.

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Third Year Artificial Intelligence & Data Science (2022 Course)
MLOPs

Course Code	ADPCC604	Credit	03
Contact Hours	03 Hrs/weeks((L)	Type of Course	Lecture
Examination Scheme	ISE:40Marks ESE: 60 Marks	Total Marks	100

Pre-requisites:
1. Artificial Intelligence
2. Machine Learning

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In Semester Evaluation	Internal	40#
2.	End Semester Evaluation	External	60**

Course Objectives

1	To introduce the fundamentals of MLOps and its significance in the ML lifecycle.
2	To give an explanation of feature selection impacts on MLOps strategy with ML pipeline.
3	To describe techniques for model training, evaluation and Preparation for Production.
4	To explain importance of model monitoring with model performance.
5	To familiarize students with ML models and will explore methods for reproducibility, version control, and model governance.
6	To discuss different knowledge of MLOps for AWS on cloud platform.

Course Outcomes: Students will be able to

604.1	Explain the fundamentals of MLOps and its significance in the ML lifecycle.
604.2	Explain feature engineering selection with ML pipeline and impacts MLOps Strategy.
604.3	Analyze MLOps techniques for model training to preparing for Production.
604.4	Implement Techniques for monitoring model performance with Functional and Operational monitoring.
604.5	Analyze data governance and process governance in MLOps and their impact on model development.
606.6	Determine transfer learning for ML Model deployment on cloud platforms.

Topics covered:

UNIT-I: INTRODUCTION TO MACHINE LEARNING OPERATIONS (06 Hrs)
Introduction to the concept of MLOps, Importance of MLOps in Machine Learning, MLOps for responsible AI, MLOps to Mitigate Risk, MLOps Life Cycle, Application of MLOps, Key MLOps Features, Difference between traditional software development and MLOps.
Self-Study: Enhancing Healthcare Outcomes through ML Ops Implementation: A Holistic Approach

UNIT-II: DATA MANAGEMENT IN MLOps(06 Hrs)
Introduction to data management in MLOps, How Feature Selection Impacts MLOps Strategy, Data Augmentation, Handling Imbalanced Data, Data Versioning, Data Privacy and Security,

Data Quality Assurance and Governance, Hyperparameter tuning and model selection, Model evaluation and validation techniques.

ML pipeline: Collecting, cleaning, preparing data, training models and deploying.

Self-Study: Optimizing Fraud Detection in Financial Transactions through Advanced Data Management in ML Ops.

UNIT-III: TRAINING, EVALUATION AND DEPLOYMENT OF MODEL   (06 Hrs)

Deploying ML model into production environment, CI/CD Pipelines, Model packaging and containerization (e.g., Docker), Infrastructure provisioning and orchestration (e.g., Kubernetes), Deploying models as scalable services, managing model endpoints and versioning, Version control and collaboration (e.g., Git), Kubernetes Building reproducible ML pipelines, Automated testing and code quality checks, Continuous integration and deployment strategies.

Self-Study: Smart Manufacturing: Enhancing Operational Efficiency through ML Model Deployment and Management.

UNIT- IV:MODEL MONITORING AND IMPROVEMENT   (06 Hrs)

Introduction to monitoring and improving model performance, Needs to monitor Machine Learning models in production ,Understanding Model Degradation, Techniques for monitoring model performance, Methods to improve model performance, Functional Monitoring and Operational monitoring.

Self-Study: Enhancing E-commerce Recommendations: A Model Monitoring and Improvement Journey.

UNIT- V: GOVERNANCE AND COMPLIANCE IN MLOps   (06 Hrs)

Model versioning and governance, Retraining and revalidation strategies, Model deployment and retirement, Ensuring fairness, transparency, and accountability.

Governance- Data governance, Process governance Data privacy and protection in ML systems, Access control and authentication mechanisms, Security considerations for model deployment, Compliance with industry regulations (e.g., GDPR, HIPAA)

Self-Study: Financial Risk Assessment: Achieving Model Governance and Compliance in ML Ops.

UNIT- VI: MLOps for AWS   (06 Hrs)

Introduction to cloud platforms (e.g., AWS, Azure, GCP), Deploying ML models on cloud infrastructure, Cloud Architecture, **Services,** MLOps on AWS, Amazon Sage Maker, AWS Code Pipeline, Amazon ECS/EKS, MLOps Cookbook on AWS, CLI Tools , Flask ML Micro service.

Applying AWS Machine Learning to the Real World: CaaS, SageMaker.

Self-Study: Revolutionizing Healthcare Diagnostics: ML Ops for AWS in Medical Imaging.

Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)*(if complete unit is applicable then write only "unit 1/2/.." or write the contents from that unit):*
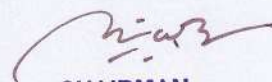
Unit 1 – Unit 2 – Unit 3 – Unit 5 – Unit 6 -

Text Books:
1. Mark Treveil and the Dataiku Team "Introducing MLOps" O'Reilly Publications.
2. Andrew P. McMahon "Machine Learning Engineering with Python", ISBN 978-1-80107-9259
3. Noah Gift & Alfredo Deza "Practical MLOps Operationalizing Machine Learning Models" O'Reilly Publications, 2021 ISBN 978-1-098-10301-9

Reference Books:
1. Mirza Rahim Baig , Chandrashekar Ramanathan, Executive PG Programme in "Machine Learning Artificial Intelligence", IIIT Bangalore

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Third Year Artificial Intelligence & Data Science (2022 Course) Natural Language Processing			
Course Code	ADPEC605	Credit	03
Contact Hours	03 Hrs./weeks((L)	Type of Course	Lecture
Examination Scheme	ISE:40Marks ESE:60 Marks	Total Marks	100

Pre-requisites:

- Finite Automata Theory
- Machine Learning

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In Semester Evaluation	Internal	40[#]
2.	End Semester Evaluation	External	60[*]

Course Objectives

1	To introduce the basics of NLP fundamentals.
2	To explain Morphological Analysis, Syntax Analysis and Semantics Analysis.
3	To make use of word embedding's.
4	To discuss text classification pipeline.
5	To explore the name entities for Information Retrieval.
6	To study some advance application of NLP.

Course Outcomes: Students will be able to

605.1	Summarize fundamentals of NLP.
605.2	Apply the morphological analysis on natural language text.
605.3	Identify semantic relationship between words.
605.4	Apply text classification pipeline.
605.5	Identify named entities for Information Retrieval.
605.6	Demonstrate the use of different NLP applications.

Topics covered:

UNIT-I: Introduction to Natural Language Processing (6 Hrs)
Cover Linguistics Resources: Introduction to corpus, elements in balanced Corpus, pipeline, TreeBank, PropBank, WordNet, VerbNet etc. Definition of NLP, History of NLP, NLP Advantages of NLP, Disadvantages of NLP, Components of NLP, Applications of NLP, classical problems. NLP Libraries: Natural Language Tool Kit (NLTK), spaCy, TextBlob, Gensim ,CoreNLP, Pattern., PyNLPl. TreeBank,PropBank,WordNET,

UNIT-II: Language Syntax and Semantics (6 Hrs)
Morphological Analysis: Morphology, Types of Morphemes, Inflectional morphology & Derivational morphology, Morphological parsing with Finite State Transducers (FST).
Syntactic Analysis: Syntactic Representations of Natural Language, Parsing Algorithms, Probabilistic context-free grammars and Statistical parsing.
Semantic Analysis: Lexical Semantic, Relations among lexemes & their senses – (WSD), Dictionary based approach, Latent Semantic Analysis.
Part Of Speech Tagging: Rule based, stochastic and transformation-based tagging, issues in pos tagging-hidden mad maximum entropy models.

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Self-Study:
Study of Stanford Parser and POS Tagger
https://nlp.stanford.edu/software/tagger.html

(6 Hrs)

UN IT- III: Word Level Analysis
Word Embedding: Word Embedding, Tokenization, Lemmatization, Bag of words, TFIDF, word2vec, doc2vec, Contextualized representations (BERT), GloVe.
Language Modeling: Introduction, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling.
N-gram models: Simple n-gram models, Estimation parameters and smoothing, Evaluating language models, Bag of N-gram, N-gram for spelling correction.

(6 Hrs)

UNIT- IV: Text Classification
A pipeline for building text classification system, one pipeline, many classifiers, support Vector machine, neural embedding's using text classification, Deep learning for text assification, interpreting text classification models.

(6 Hrs)

UNIT-V: Information Retrieval using NLP
Information Retrieval: Introduction, Vector Space Model.
Named Entity Recognition: NER System Building Process, Evaluating NER System Entity Extraction, Relation Extraction, Reference Resolution, Coreference resolution, Cross Lingual Information Retrieval

Self-Studies:
Natural Language Processing based Information Extraction & Retrieval:
https://www.cdac.in/index.aspx?id=mc_cli_cross_lingual_info

(6 Hrs)

UNIT- VI: Applications of NLP
Introduction to NLP application,
Applications- Machine translation, Information retrieval, Question answers system, categorization, summarization, sentiment analysis, Prompting Pre-Trained Language Models Network Embedding.

Self-Studies:
Study working of Google Translate
Study working of IBM Watson Natural Language Processing

Syllabus contents required for competitive exams (GATE, UPSC, MPSCetc)
UNIT I: Introduction to NLP, Goals of NLP.
UNIT II: Morphological Analysis, Syntactic Analysis, Semantic Analysis.
UNIT III: Tokenization, Lemmatization, Word Frequency Analysis, Word Sense Disambiguation, Bag-Of-Words, Part of speech tagging.
UNIT IV: Support vector machine, neural embedding's using text classification, interpreting text classification models.
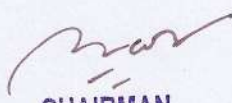**UNIT V:** Named Entity Recognition.

Reference Books:
1. "Natural Language Processing with Python ,Steven Bird", Ewan Klein and Edward Loper.
2. "Neural Network Methods for Natural Language Processing",Yoav Goldberg
3. "Practical Natural Language Processing" ,Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, and Harshit Surana
4. "Deep Learning for Natural Language Processing", Palash Goyal, Sumit Pandey, Karan Jain, and Karan Nagpal
5. "Speech and Language Processing", Daniel Jurafsky and James H. Martin
6. "Natural Language Processing: A Practitioner Guide to NLP",Lane, Howard and Hapke.
7. "Foundations of Statistical Natural Language Processing",Christopher Manning and Hinrich Schütze
8. "Natural Language Processing",Nitin indurkhya, Fred damerau

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9. "James A. Natural language Understanding 2e",Pearson Education, 1994
10. "Natural language processing and Information retrieval", Siddiqui T., Tiwary U. S. OUP,2008

Link References:
- Practical Natural Language Processing - Google Books
- Handbook of Natural Language Processing - Google Books
- https://www.google.co.in/books/edition/Practical_Natural_Language_Processing/hPrrDwAA QBAJ?hl=en&gbpv=1&printsec=frontcover
- https://web.stanford.edu/~jurafsky/slp3/ed3book.pdf
- https://www.tutorialspoint.com/natural_language_processing/natural_language_processing_ word_level_analysis.htm
- https://nlp.cs.nyu.edu/meyers/montclair-class/
- James A.. Natural language Understanding 2e, Pearson Education, 1994
- Siddiqui T., Tiwary U. S.. Natural language processing and Information retrieval, OUP,2008.

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Third Year Artificial Intelligence & Data Science (2022 Course)
High Performance Computing

Course Code	ADPEC605B	Credit	03
Contact Hours	03 Hrs/weeks((L)	Type of Course	Lecture
Examination Scheme	ISE: 40 Marks ESE: 60 Marks	Total Marks	100

Pre-requisites:
- Operating System
- Data structure

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In Semester Evaluation	Internal	40#
2.	End Semester Evaluation	External	60*

Course Objectives

1	To introduce fundamental concepts of High Performance Computing.
2	To describe network & software infrastructure for high performance computing
3	To explore real time analytics using high performance computing.
4	To Design and implement compute intensive applications on HPC platform.
5	To describe the different ways of security perspectives and technologies used in HPC.
6	To explain the emerging big data applications

Course Outcomes : Students will be able to

605.1	Summarize the basics concepts of High Performance computing systems.
605.2	Explain the concepts of network and software infrastructure for high performance computing.
605.3	Apply real time analytics using high performance computing.
605.4	Develop intensive applications on the HPC platform.
605.5	Analyze the security models and big data applications in high performance computing.
605.6	Implement the emerging big data applications.

Topics covered:

UNIT-I: Introduction   **(06 Hrs)**
The Emerging IT Trends- IOT/IOE, Apache Hadoop for big data analytics, Big data into big insights and actions, Emergence of BDA discipline, strategic implications of big data, BDA Challenges, HPC paradigms, Cluster computing, Grid Computing, Cloud computing,Heterogeneous computing, Mainframes for HPC,Supercomputing for BDA, Appliances for BDA.

UNIT-II: Network & Software Infrastructure for High Performance BDA   **(06 Hrs)**
Design of Network Infrastructure for high performance BDA, Network Virtualization, Software Defined Networking, Network Functions Virtualization, WAN optimization for transfer of big data, started with SANs, storage infrastructure requirements for storing big data -FC SAN, IP SAN, NAS, GFS, Panasas, Luster file system,Introduction to cloud storage.

UNIT- III: Real Time Analytics Using High Performance Computing   **(06 Hrs)**
Technologies that support Real time analytics, MOA: Massive online analysis, GPFS: General parallel file system, Client case studies, Key distinctions, Machine data analytics, operational analytics, HPC Architecture models,In Database analytics, In memory analytics

UNIT- IV: Parallel Programming Technologies   **(06 Hrs)**

OpenCL Programming: Introduction to OpenCL, OpenCL Setup, Basic OpenCL, Advanced OpenCL. Shared-memory programming-OpenMP: Introduction to OpenMP, Parallel Programming using OpenMP, OpenMPI.

UNIT- V: Security & Technologies	(06 Hrs)

Security, Privacy and Trust for user, generated content: The challenges and solutions, Role of real time big data processing in the IoT, End to End Security Framework for big sensing data streams, Clustering in big data, Quantum cryptography.

UNIT- VI: Emerging Big Data Applications	(06 Hrs)

Deep learning Accelerators – Accelerators for clustering applications in machine learning - Accelerators for classification algorithms in machine learning – Accelerators for Big data Genome Sequencing.

Syllabus contents required for competitive exams (GATE, UPSC, MPSC etc.)

Text Books:
1. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, "Introduction toParallel Computing", 2nd edition, Addison-Wesley, 2003, ISBN: 0-201-64865-2
2. Seyed H. Roosta, "Parallel Processing and Parallel Algorithms Theory and Computationl", Springer-Verlag 2000 ,ISBN 978-1-4612-7048-5 ISBN 978-1-4612-1220-1
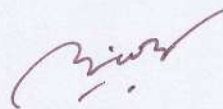
Reference Books:
1. "High Performance Computing for Big Data: Methodologies and Applications", Chao wang ,CRC Press,1st Edition,2018
2. "High-Performance Data Mining And Big Data Analytics" , Khosrow Hassibi, Create Space Independent Publishing Platform,!st Edition,2014

EBooks:
1. http://prdrklaina.weebly.com/uploads/5/7/7/3/5773421/introduction_to_high_performance_co mputing_for_scientists_and_engineers.pdf
2. https://www.vssut.ac.in/lecture_notes/lecture1428643084.pdf

MOOC Course:
1. https://nptel.ac.in/courses/106108055
2. https://www.digimat.in/nptel/courses/video/106104120/L01.html

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Third Year Artificial Intelligence & Data Science (2023 Course)
Intelligent Robotics Process Automation

Course Code	ADPEC605	Credit	03
Contact Hours	03 Hrs/weeks((L)	Type of Course	Lecture
Examination Scheme	ISE: 40 Marks ESE: 60 Marks	Total Marks	100

Pre-requisites : Basic Programming Concepts

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/Internal	Marks
1.	In Semester Evaluation	Internal	40#
2.	End Semester Evaluation	External	60*

Course Objectives

1	To introduce fundamental definition of Robotic Process Automation (RPA) and its key components.
2	To illustrate basic programming concepts and the underlying structure related to RPA with different platforms.
3	To explain UiPath software system.
4	To describe the different types of variables, Control Flow and data manipulation techniques in a RPA platform.
5	To explain automation of PDF and Email.
6	To explore debugging techniques and handling the exceptions.

Course Outcomes: Students will be able to

605.1	Explain the basics of robot RPA concepts and challenges with RPA.
605.2	Exemplify different platforms for RPA to gain skills in building workflows in a RPA platform.
605.3	List the primary features and functionalities of UiPath software system.
605.4	Implement different types of variables, Control Flow and data manipulation techniques.
605.5	Design and develop automation of PDF and Email.
605.6	Demonstrate how to handle the exceptions and will troubleshoot towards the solution.

Topics covered:

UNIT-I: Introduction to Robotic Process Automation (06 Hrs.)
Introduction, Benefits, Components, Platforms. History of Automation, RPA vs. Automation, Processes & Flowcharts, Programming Constructs in RPA, Types of Bots, Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team, Process Design Document, Solution Design Document, Risks & Challenges with RPA.

UNIT-II: Robotic Process Automation Tools (06Hrs.)
Introduction to RPA Tools, Basic components in a RPA platform, Installation details of RPA tools, Types of Templates, User Interface, Domains in Activities, Workflow Files in the RPA platform. Process Components and Activities- User Interface Automation Activities, System Activities, Variables, Arguments, Imports Panel and User Events.

UNIT-III: UiPath and Commands (06 Hrs.)
Introduction of UiPath, Preliminaries, Log Message, Variables Loops and Conditionals For Each Loop, Do While Loop and While Loop, IF/THEN/ELSE Conditionals Switch Debug Common

UiPath Functions, The UiPath Orchestrator, Overview, Orchestrator activities, Introduction to Orchestrator Community Edition (CE). Best Practices for Bot Development.

UNIT- IV: Advanced Automation Concepts & Techniques	**(06 Hrs.)**

Introduction of Recording - Basic and Desktop Recording - Web Recording, Scraping, Selector, Workflow Activities. Example of Automate login to your (web) Email account, Recording mouse and keyboard actions to perform an operation, Scraping data from website and writing to CSV.

UNIT- V: PDF and Email Automation	**(06 Hrs.)**

Introduction of Data Manipulation, Automation of Virtual Machines, Introduction to Native Citrix Automation, Text and Image Automation, PDF Automation
Email Automation - Incoming Email automation - Sending Email automation - Debugging and Exception Handling - Strategies for solving issues - Catching errors.

UNIT- VI: Debugging, Logging and Exception Handling	**(06 Hrs.)**

Introduction of Exception handling- Business Exception, System Exception Common exceptions and ways to handle them, Logging and taking screenshots. Debugging Tools, Debugging techniques- Collecting crash dumps- Error reporting, Future of RPA
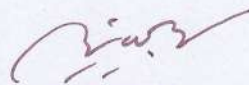
Text Books:
1. Alok Mani Tripathi, "Learning Robotic Process Automation", Packt Publishing, 2018.
2. Tom Taulli , "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", Apress publications, 2020

Reference Books:
1. Murdoch, Richard, "Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant" (1st Edition), independently published, 2018. ISBN 978-1983036835
2. Primer, A. "Introduction To Robotic Process Automation." Institute for Robotic Process Automation (2015): 1-35.

Web Links:
https://www.soais.com/uipath-exception-handling-techniques/
https://www.uipath.com/rpa/robotic-process-automation

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Third Year Artificial Intelligence & Data Science (2022 Course)
Deep Learning and ML Ops Laboratory

Course Code	ADPCC607	Credit	02
Contact Hours	4 Hrs/weeks((P)	Type of Course	Practical
Examination Scheme	TW: 25 PR:50	Total Marks	75

Pre-requisites:
- Exploratory Data Analysis
- Machine Learning

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1	Term Work	Internal	25
2	Practical	External	50

Course Objectives

1	To enable students to gain hands-on experience in designing, training, and evaluating deep learning models using popular frameworks.
2	To introduce students to transfer learning and fine-tuning pre-trained models for specific applications.
3	To understand practical approach fundamentals of MLOps.
4	To learn various feature selection impacts on MLOps strategy with ML pipeline.

Course Outcomes: Students will be able to

607.1	recall the fundamental concepts and principles of deep learning and identify key components of deep learning models.
607.2	analze and evaluate the performance of deep learning models and interpret the results.
607.3	develop novel deep learning solutions for complex problems and applications.
607.4	demonstrate MLOps techniques for model training to preparing for Production.
607.5	design ML pipeline strategies to handle feature selection.

Topics covered:
(Deep Learning) **Group A**
1. Develop a program to build and train a feedforward neural network from scratch using a deep learning framework like TensorFlow, keras etc.
2. Multiclass classification using Deep Neural Networks: Example: Use the OCR letter recognition dataset
3. Binary classification using Deep Neural Networks Example: Classify movie reviews into positive" reviews and "negative" reviews, just based on the text content of the reviews. Use IMDB dataset
4. Develop a program to recognize digits using CNN.
5. Build a CNN model to classify images from popular datasets like MNIST, CIFAR-10, or ImageNet.

Group B (Any 3)

6. Create an RNN-based sentiment analysis system to classify text reviews (such as movie reviews or product reviews) into positive, negative, or neutral sentiments. Use datasets containing labeled text data for training and testing the model's accuracy in sentiment classification

7. Utilize pretrained deep learning models like VGG, ResNet, or Inception to perform transfer learning on a new dataset. Fine-tune the model and evaluate its performance.

8. Develop a program to forecast future values in time series data, such as weather patterns, using RNN models like LSTM or GRU.

9. Implement Auto-encoders for any of the task including: a) Data Compression b) Image de-noising c) Dimensionality reduction

10. Implement a basic GAN to generate synthetic images, starting with a simple dataset like random noise.

11. Implement Q-learning algorithm for a simple game or environment.

Group C (Any one)

12. **Mini Project:** Use an RNN to generate new text based on a training corpus.

13. **Mini Project:** Implement CNN object detection on any data. Discuss numerous performance evaluation metrics for evaluating the object detecting algorithms' performance, Take outputs as a comparative result of algorithm.

14. **Mini Project:** Stock Price Prediction using RNN/LSTM.

Topics covered:

(ML Ops)
Group A

1. **Setting Up a Version Control System(VCS) :** Create a GitHub repository for a machine learning project.

Task to Perform:
1. Initialize the repository with a README file explaining the project's goals and dataset.
2. Push a sample dataset (e.g., CSV file) to the repository.
3. Collaborate to clone the repository, make changes, and submit a pull request.

2. **Model Training and Versioning:**
1. Choose a simple dataset (e.g., Iris dataset) and a machine learning algorithm.
2. Write code to preprocess the data and train a model using your chosen algorithm.
3. Implement a versioning system for your trained models (e.g., using Git tags or a dedicated model versioning tool).
4. Train the model multiple times with variations in hyperparameters and track these versions.

3. **Containerizing the Model :**
1. Dockerize your trained model and its dependencies.
2. Write a Dockerfile that sets up the environment and includes the model training code.
3. Build a Docker image and test it locally to ensure it works as expected.

4.**Building an ML Pipeline :**
1. Use a tool like Apache Airflow or Prefect to create a simple ML pipeline.
2. Define tasks for data preprocessing, model training, and model evaluation.
3. Set up dependencies between tasks and run the pipeline.
4. Monitor the pipeline's progress and visualize its execution.

5. **Deployment with Kubernetes :**
1. Deploy your Dockerized model using Kubernetes.

2. Set up a Kubernetes cluster (you can use tools like Minikube or managed Kubernetes services).
3. Create Kubernetes manifests (YAML files) to define pods, services, and deployments.
4. Deploy the model as a service and expose it with a LoadBalancer or Ingress.

6   **Continuous Integration and Continuous Deployment (CI/CD):**
1. Set up a CI/CD pipeline using tools like Jenkins/GitLab CI/CD/GitHub Actions.
2. Configure the pipeline to trigger on every push to the main branch.
3. Include steps to build the Docker image, run tests, and deploy the model to a testing environment.

Group B (Any 3)

7.   **Model A/B Testing :**
1. Implement a basic A/B testing framework for your model using feature flags.
2. Deploy two different versions of your model (e.g., one with new features or hyperparameters).
3. Route a percentage of incoming requests to each model version and gather performance metrics to compare them.

8.   **Auto-scaling and Load Balancing:**
1. Set up auto-scaling for your Kubernetes deployment based on resource usage (CPU/memory).
2. Configure a load balancer to distribute incoming requests across multiple instances of your model.
3. Simulate varying levels of traffic to observe how auto-scaling and load balancing behave.

9.   **Monitoring and Logging:**
1. Integrate monitoring tools like Prometheus and Grafana to track the performance of your deployed model.
2. Set up logging using tools like Elasticsearch, Fluentd, and Kibana (EFK stack) to capture application logs.
3. Generate some simulated requests to your deployed model and observe how the monitoring and logging systems capture the activity.

10.   **Model Retraining and Updating:**
1. Implement a mechanism to periodically retrain your model with new data.
2. Automate the process of updating the deployed model with the latest trained version.
3. Ensure that the updated model is seamlessly transitioned into production.
4. Remember that MLOps is a vast field, and these assignments cover only a subset of the concepts and practices involved. As you work on these assignments, you'll gain practical experience and a deeper understanding of how to effectively manage machine learning models in production environments.

11.   **Infrastructure as Code (IaC) for ML:**
1. Use tools like Terraform or AWS CloudFormation to manage ML infrastructure.
2. Experiment with provisioning and automating the setup of ML environments.

Group C (Any one)

12.   **Mini Project: Continuous Delivery of Flask/FastAPI Data**
Statement: Engineering API on a PaaS Platform
Task to Perform:
1. Create a Flask or Fast application on a cloud platform and push source code to GitHub.
2. Configure a cloud native build server (AWS App Runner, AWS Code Build, etc.,) to deploy changes to GitHub.
3. Create a realistic data engineering API.
Note: (Can refer to this O'Reilly walkthrough of using functions with FastAPI to

build Microservices for more ideas, or this sample Github project for a complete working AWS App Runner starter project for FastAPI.)

13.	**Mini Project: Docker and Kubernetes Container Project**

Statement: Many cloud solutions involve Docker format containers. Let's leverage Docker format containers in the following project.

Task to Perform:
1. Create a customized Docker container from the current version of Python that deploys a Python ML application.
2. Push the image to DockerHub, Amazon ECR, Google Container Registry, or some other Cloud Container Registry.
3. Pull the image down and run it on a cloud platform cloud shell: Google Cloud Shell or AWS Cloud9.
   Deploy an application to a cloud-managed Kubernetes cluster, like GKE (Google Kubernetes Engine), or EKS (Elastic Kubernetes Service), etc.

14.	**Mini Project: MLOps Pipeline for Image Classification**

Statement: Teams can choose a dataset and a machine learning model for image classification.

Task to Perform:
1. Create a Docker image with the model and necessary dependencies.
2. Set up a CI/CD pipeline to automate model training and deployment,
3. Implement monitoring and logging for the deployed model.
   Note: (This project covers containerization, CI/CD, and monitoring aspects of MLOps.)

15.	**Mini Project: Financial Fraud Detection Platform**

Statement: Create a platform that detects fraudulent transactions in financial data.
Task to Perform:
1. Containerize the fraud detection model.
2. Set up a CI/CD pipeline.
3. Implement robust monitoring and alerting mechanisms to ensure timely identification of potential fraud.

Text Books:
1. Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville
2. Deep Learning A Practitioner's Approach, Josh Patterson and Adam Gibson, O'Reilly
3. Fundamentals of Deep Learning Designing Next-Generation Machine Intelligence Algorithms, Nikhil Buduma with contributions by Nicholas Locascio, O'Reilly
4. Noah Gift , "Practical MLOps: A Guide to Building Real-World Machine Learning Systems", O'Reilly, First Edition, September 2021.
5. Mark Treveil, Nicolas Omont, "Introducing MLOps: How to Scale Machine Learning in the Enterprise", O'Reilly Media, First Edition, January 5, 2021
6. Emmanuel Raj, "Engineering MLOps: Rapidly build, test, and manage production-ready machine learning life cycles at scale", Packt Publishing Limited, 1st edition, 19 April 2021

Reference Books:
1. Deep Learning with Applications Using Python, Navin Kumar Manaswi Bangalore, Karnataka, India, ISBN-13 (pbk): 978-1-4842-3515-7
2. Introduction to Deep Learning Using R A Step-by-Step Guide to Learning and Implementing Deep Learning Models Using R, Taweh Beysolow II San Francisco, California, USA ISBN-13 (pbk): 978-1-4842-2733-6
3. Applied Deep Learning:A Case-Based Approach to Understanding Deep Neural Networks, Umberto Michelucci toelt.ai, Dübendorf, Switzerland, ISBN-13 (pbk): 978-1-4842-3789-2
4. Hannes Hapke and Catherine Nelson, "Building Machine Learning Pipelines: Automating Model Life Cycles with TensorFlow", O'Reilly, First Edition, 19 July 2020.

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5. Chris Fregly, Antje Barth, "Data Science on AWS: Implementing End-to-End Continuous Machine Learning Pipelines", O'Reilly, First Edition, 9 May 2021.
6. Sridhar Alla, Suman Kalyan Adari, "Beginning MLOps with MLFlow: Deploy Models in AWS SageMaker, Google Cloud, and Microsoft Azure", Apress publication, 1st edition, 8 December 2020
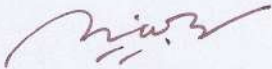
Web Resources

Blogs and Websites:

    1.   MLflow Blog: MLflow is an open-source platform for managing the ML lifecycle. The blog covers topics related to MLOps, model deployment, and reproducibility.

    2.   Towards Data Science: A popular online publication with a dedicated section on MLOps, featuring articles and tutorials on topics like model deployment, monitoring, and CI/CD pipelines.

Online Courses and Tutorials:

    1.   Coursera: "Machine Learning Engineering for Production (MLOps)" by deeplearning.ai. This course provides a comprehensive introduction to MLOps, covering topics like data and model versioning, deployment, monitoring, and more.

    2.   Udacity: "Machine Learning Deployment" by Google Cloud. This course focuses on deploying and scaling machine learning models using Google Cloud technologies and covers MLOps principles

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Third Year Artificial Intelligence & Data Science (2023 Course)			
Natural Processing Language Laboratory			
Course Code	ADPEC609	Credit	01
Contact Hours	02 Hrs./week (PR)	Type of Course	Laboratory
Examination Scheme	PR: 25 marks	Total Marks	25

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/Internal	Marks
1.	Practical	External	25

Course Objectives	
1	To learn the NLP concepts and to learn how to apply basic algorithm in this field.
2	To explain the concepts of morphology.
3	To design and implement applications based on natural language processing.
4	To design system that uses NLP techniques.

Course Outcomes: Students will be able to	
609.1	Summaries NLP concepts and basic algorithms.
609.2	Apply morphological analysis on natural processing language.
609.3	Identify semantic relationship between words.
609.4	Identify named entities in information extraction.
609.5	Develop system that uses NLP techniques.

Sr. No	Name of the program
	Group A (Any Four)
1	Morphology is the study of the way words are built up from smaller meaning bearing units.
2	Study and understand the concepts of morphology by the use of add delete table
3	Implement Part-of-Seech Tagging.
4	Identify semantic relationship between words from given text (use word net dictionary).
5	Perform tokenization (Whitespace, Punctuation-based, Treebank, Tweet, MWE) using nltk library. Use porter stemmer and snowball stemmer for stemming. Use any technique for lemmatization. Input / Dataset –use any sample sentence
	Group B (Any Three)
6	Perform bag-of-words approach (count occurrence, normalized count occurrence), tf-idf on data. Create embeddings using Word2Vec. Dataset to be used: https://www.kaggle.com/datasets/CooperUnion/cardataset
7	Implement N-Gram model.
8	Build and evaluate a named entity recognition system using existing NER libraries or frameworks.
9	Perform named entity recognition (NER) on given text.
	Group C
10	Mini Project- One real life natural language application to be implemented (use standard dataset)

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Department of Artificial Intelligence & Data Science (2023 Course)
Cloud Computing Laboratory

Course Code:	ADPCC608	Credit:	2
Contact Hours:	4 Hrs/weeks (P)	Type of Course:	Practical
Examination Scheme:	TW: 25 PR:25	Total Marks:	50

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1	Term Work	Internal	25
2	Practical	External	25

Course Objectives

1	To Enable students to gain hands-on experience in on Amazon AWS and doing basic settings.
2	To Perform hands-on exercises to manage data in different AWS storage solutions.
3	To Configure various networking options available on AWS
4	Learn to Configure high availability and scalability services on AWS

Course Outcomes: Students will be able to

608.1	Apply the fundamental concepts of virtualization and its application in cloud computing.
608.2	Evaluate the effectiveness of different configuration settings such as networking and security in AWS virtual Machine
608.3	Implement a project that integrates all the services studied for a given application on Amazon AWS and Google app Engine
608.4	Design and implement a multi-tier architecture for a complex application on the cloud.

List of Experiment:

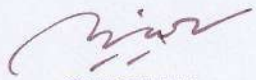|	Group A
1	Virtual Machine on AWS-Launching the virtual machine on Amazon AWS and doing basic settings
2	Storage Configuration-Configuring various storages available on AWS and storing, retrieving, deleting the data from those storage applications
3	Database Configuration-Configuring and using various databases available on Amazon AWS
4	Networking and Security Services Configuration-Configuring various networking and security options
5	High availability and scalability services- Configuration of high availability and scalability services (AWS)
6	AWS EC2 Windows Instance -To launch and connect to a Windows instance and to remotely connect to the windows instance
7	Provision a web server on Linux instance with bootstrapping script-To install an Apache web server on EC2 Linux Instance and to run user data shell script to install Apache web server.

8	AWS EC2 Elastic IP Address-Learn to allocate EIP to your account for dynamic cloud computing And To associate EIP address to Amazon EC2 instance running web server
Group B (Any 4)	
9	Mini Project-Implement a project based on all the services studied for a given application on Amazon AWS
10	Install and configure google app engine
11	Creating an application in salesforce.com using Apex programming language
12	Install and configuration of virtualization using KVM
13	Mini Project : Design and develop custom application using sales force cloud

Text Books:

1. Wittig, Michael, Andreas Wittig, and Ben Whaley. Amazon web services in action. Manning,,2018.
2. Murty, James. Programming amazon web services: S3, EC2, SQS, FPS, and SimpleDB. " O'ReillyMedia, Inc.", 2008.
3. Piper, Ben, and David Clinton. AWS Certified Solutions Architect Study Guide: Associate SAA-C02 Exam. John Wiley Sons, 2020.

Reference Books:

1. Anthony, Albert. Mastering AWS Security: Create and maintain a secure cloud ecosystem. Packt Publishing Ltd, 2017.
2. van Vliet, Jurg, Flavia Paganelli, and Jasper Geurtsen. Resilience and Reliability on AWS: Engineering at Cloud Scale. " O'Reilly Media, Inc.", 2013.
3. Sarkar, Aurobindo, and Amit Shah. Learning AWS: Design, build, and deploy responsive applications using AWS Cloud components. Packt Publishing Ltd, 2018

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Third Year Artificial Intelligence & Data Science (2022 Course)
High Performance Computing Laboratory

Course Code	ADPEC609	Credit	01
Contact Hours	02 Hrs/weeks((L)	Type of Course	Laboratory
Examination Scheme	PR: 25 marks	Total Marks	50

Pre-requisites:
- Operating System
- Data structure

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Practical	External	25

Course Objectives
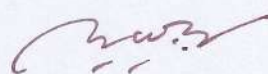
1	To discuss the basics of high performance computing with BDA.
2	To review Hadoop Framework with its components.
3	To know different algorithms using any Programming Language.
4	To illustrate Streaming Data Analysis using flume for data capture operations.

Course Outcomes : Students will be able

302.1	Apply features of high performance computing.
302.2	Demonstrate Hadoop Framework techniques.
302.3	Explain type of algorithms.
302.4	Implement Streaming Data Analysis operations .

Sr. No	Name of the program Group (A) (Any four)
1.	Installation of Hadoop Framework, its components and study of the HADOOP ecosystem.
2.	Write a program to implement word count program using MapReduce
3.	Experiment on Hadoop Map-Reduce / PySpark: -Implementing simple algorithms in Map-Reduce: Matrix multiplication.
4.	Install and configure MongoDB/ Cassandra/ HBase/ Hypertable to execute NoSQL Commands.
5.	Implementing DGIM algorithm using any Programming Language/ Implement Bloom Filter using any programming language
6.	Implement and Perform Streaming Data Analysis using flume for data capture, PYSpark / HIVE for data analysis of twitter data, chat data, weblog analysis etc.
7.	Implement clustering techniques using SPARK.
Sr. No	Name of the program Group (B) (Any Three)
8.	Implement any one Clustering algorithm (K-Means/CURE) using Map-Reduce

9.	Implement Page Rank Algorithm using Map-Reduce.
10.	Visualize data using basic plotting techniques in Python
11.	Implement NoSQL Database Operations: CRUD operations, Arrays using MongoDB).
12.	Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB.
13.	Implement an application that stores big data in MongoDB / Pig using Hadoop / R.
Sr. No	**Name of the program** **Group (B) (Any one)**
14.	Mini Project: Evaluate performance enhancement of parallel Quicksort Algorithm using MPI
15.	Mini Project: Implement Parallelization of Database Query optimization
16.	Write a Hadoop program that counts the number of occurrences of each word in a text file.

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Third Year Artificial Intelligence and Data Science (2022 Course)
Intelligent Robotics Process Automation Laboratory

Course Code	ADPEC609	Credit	01
Contact Hours	2 Hrs/week (P)	Type of Course	Practical
Examination Scheme	PR: 25	Total Marks	25

Pre-requisites:
- Basic Programming Concepts

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1	Practical	External	25

Course Objectives

1	Explain practical approach of RPA Tools (UiPath).
2	Illustrate advanced technology in robotic process automation (RPA).
3	Explore various types of Exceptions and strategies to handle.
4	To develop various orchestrator-driven intelligent bots.

Course Outcomes: Students will be able to

609.1	Implement basic concepts of RPA Tools (UiPath).
609.2	Demonstrate different automation like Email, Scraping, PDF, Website etc.
609.3	Design various types of exceptions and strategies to handle.
609.4	Design and deploy an orchestrator-driven bot intelligent bots.

List of Experiment:

Topics covered:

	Group A
1.	Setup and Configure a RPA tool and understand the user interface of the tool: • Create a Sequence to obtain user inputs display them using a message box. • Create a Flowchart to navigate to a desired page based on a condition. • Create a State Machine workflow to compare user input with a random number.
2.	Build a process in RPA platform using UI Automation Activities. • Create an automation process using key System Activities, Variables and Arguments. • Implement Automation using System Trigger.
3.	Implement the RPA solution to compare two columns of a spreadsheet.
4.	Implement the RPA solution for filling a web form from an excel sheet.
5.	Implement the RPA solution for filling a web form from a true PDF file.

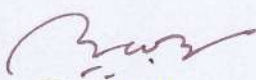| 6.	Develop an RPA solution to Automate login to (web) Email account.
Group B (Any 3)	
7.	Implement the RPA solution for extracting and storing the subject of emails.
8.	Implement recording mouse and keyboard actions to perform an operation Scraping data from website and writing to CSV.
9.	Design an RPA solution that can automatically identify and access relevant PDF documents from specified sources (e.g. folders, emails, databases).
10.	Perform different ways of Error Handling in RPA platform by browsing through the log files related to a RPA Project.
11.	Develop an orchestrator-driven RPA bot to automatically extract data from various invoice formats, including supplier information, invoice numbers, dates, line items, and amounts.
Group C (Any one)	
12. 13. 14. 15.	**Mini Project** Bot Creation using recorders Bot Creation for automating excel operations Bot Creation to invoke database automation Bot Creation for PDF Integrations 5.

Text Books
1. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithms", Prentice Hall of India,
Text Books:

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath by Alok Mani Tripathi, Packt Publishing, Mumbai, 2018.
2. Tom Taulli, "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", Apress publications, 2020.
3. Horowitz, Sahni and Rajasekaran, "Fundamentals of ComputerAlgorithms",

Reference Books:

1. Richard Murdoch, "Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant" (1st Edition), Independently published, 2018. ISBN 978-1983036835.
2. A Gerardus Blokdyk, "Robotic Process Automation Rpa A Complete Guide ", 2020.
3. Frank Casale, Rebecca Dilla, Heidi Jaynes and Lauren Livingston, "Introduction to Robotic Process Automation: A Prime

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Year : TY B.Tech	Semester : VI
Seminar and Technical Paper writing (IOHSM601)	

Teaching Scheme Theory : 01 Hr/Week Practical : 02 Hrs/Week	Credits 02	Examination Scheme [50 Marks] Term Work : 50 Marks

Course Objectives:
1. To prepare students to communicate effectively as professionals.
2. To train students to use visual aids effectively.
3. To implant technical writing skills.
4. To develop presentation and technical writing skill.

Course Outcomes :
Upon successful completion of this course, the students will be able to:
1. Analyze communication-related problems and improve communication skill
2. Use various types of technical communication as per need.
3. Write proposals and reports
4. Develop key skills in research, dissemination and documentation.

Unit 01	:	Technical Communication : Oral	(06 Hrs)

Basics of Technical Communication, different forms of communication and advanced communication skills, dynamics of professional presentations , group discussions, etiquettes and mannerisms, job interviews (online/offline mode), public speaking, oral presentation.

Unit 02	:	Technical Communication : Written	(06 Hrs)

Technical proposal, technical writing: efficient process to create a report, research paper, report writing and documentation style-LaTex, use of visual aids, ethics in writing using plagiarism tools, resume writing.

Text Books:

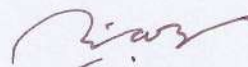| [T1]	Sunita Mishra, "Communication Skills for Engineers" Pearson Education
[T2]	Prof. K. R. Laxminarayanan and Dr. T. Murugavel "Communication Skills for Engineers" SCITECH.
[T3]	Sharon J Gerson and Steven Gerson "Technical Writing – Process& Product", Pearson Education.
[T4]	Danial Riordan, Steven E. Pauley Technical Report Writing Today
[T5]	Krishna Mohan, Meera Banerji "Developing Communication skills", Laxmi Publications.
[T6]	Meenakshi Raman and Sangeeta Sharma," Technical Communication Principles and Practice", Oxford University Press.

Reference Books:

[R1]	Sanjay Kumar and Pushp Lata, "Communication Skills" Oxford University Press.
[R2]	Davies J.W. "Communication for engineering students", Longman
[R3]	Eisenberg, "Effective Technical Communication", Mc. Graw Hill.
[R4]	Robert A. Day, "How To Write and Publish a Scientific Paper", Fifth Edition, Oryx Press, Phoenix, AZ, 1998.

Note: The assessment for the subject shall be based on presentation and report submission.

List of Assignments / Activities :
Any eight of the following

1. Introduction to technical communication
2. Group Discussion
3. Official/Public Speaking
4. Communication ethics
5. Conversational skills for job interviews
6. Theme based seminar/ oral presentation /poster presentation
7. Writing ethics-letter of application, resume e-mails.
8. Develop proposal in LaTex for selected research project
9. Publication process: How to write and submit paper for conference, journal, the evaluation process, how to communicate with the editors, copyright, plagiarism.

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AUDIT COURSE 6 – FOREIGN LANGUAGE LEVEL-II GERMAN

Course Code :	IOHSM6AC	Credit :	
Contact Hours :	1 Hr./Week (L)	Type of Course :	Lecture
Examination Scheme :	Term Work 25 Marks		

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Te Term Work	Internal	25

Course Objective:

1	To get introduced to the Culture, Routine of the German Society through language.
2	To meet the needs of ever growing German industry with respect to language support.

Course Outcomes : Students will be able to:

6AC.1	Communicate using advanced level of German Language.
6AC.2	Develop reading, writing and listening skills.
6AC.3	Use tenses in German Language.
6AC.4	Develop interest to pursue a German language course.
6AC.5	Get an comprehensive understanding of basic German Language and build a good enough vocabulary to articulate themselves in any given daily life situation.

Unit 01	:	Introduction of Cases	(04 Hrs)
		Introduction of Cases: Nominative, Akkusative, Dative. Personal & Possessive Pronouns in Nominative, Akkusative, Dative	
Unit 02	:	Prepositions	(04 Hrs)
		Prepositions:- Akkusative & Dative	
Unit 03	:	Tenses	(04 Hrs)
		Tenses:- Past tense of sein & haben Verbs, Perfect tense	

Text Books:	
[T 1]	" Netzwerk A-1 (Deutsch als Fremdsprache) " Goyal Publishers & Distributors Pvt. Ltd

Reference Books:	
[R 1]	Tipps und Uebungen A1

Online Resources:
1. Practice Material like online Worksheets regarding the Grammar.

2. NPTEL COURSE ON GERMAN -II LANGUAGE
3. ONLINE GERMAN-ENGLISH DICTIONARY www.leo.org

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