

CO301N Object Oriented Programming using Java

Teaching Scheme :04L + 00T, Total: 04

Credit :04

Evaluation Scheme :10 ISA + 30 MSE + 60 ESE

Total Marks :100

Duration of ESE :03 Hrs

COURSE DESCRIPTION:

This course of study builds on the skills gained by students in Java Fundamentals or Java Foundations to help advance Java programming skills. Students will design object-oriented applications with Java.

DESIRABLE AWARENESS/SKILLS:C, C++ language basics

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Use the syntax and semantics of java programming language and basic concepts of OOP.
2. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
3. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
4. Design event driven GUI and web related applications which mimic the real world scenarios.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1		3		2	1		1	2	2	3		2	2	3
CO2	1		3		2	1		2	2	1	3		2	3	3
CO3	2		3		3	2		2	2	2	3		2	2	3
CO4	2		3		3	2		2	2	2	3		2	3	3

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlate

COURSE CONTENTS:

An overview of Java:

[7 Hrs]

Object oriented Programming,a first simple program,io streams,Data Types,Primitive types,Integers,Floating point types,characters,booleans,variables,type conversions and casting,arrays

Operators:

[7 Hrs]

Arithmetic operators,the bitwise operator, relational operators,boolean logical operators,the assignment operator,the? Operator,operator precedence,using parenthesis,control statements,java selection statements, iteration statements,jump statements

Introducing classes: [8 Hrs]
Class fundamentals, declaring objects, assigning object reference variables, introducing methods, constructors, this pointer, garbage collection, the finalize method, Methods and classes, overloading methods, using object as parameters, argument passing, returning objects

Inheritance: [5 Hrs]
Inheritance basics, using super, method overriding, dynamic dispatch method, using abstract classes, using final with inheritance

Packages and inheritance: [5 Hrs]
Packages, access protection, importing packages, interfaces

Multithreaded programming: [6 Hrs]
The java thread model, main thread, creating thread, synchronization String handling: string constructors, string length, special string operations, character extraction, string comparison, searching string, modifying string, exceptional handling.

Event handling using Swing Components: [6 Hrs]
The delegation event model, event classes, event listener classes, sources of events, adapter classes and inner classes.

Layout managers and menus [6 Hrs]
Control fundamentals. Labels, buttons, checkboxes, checkbox group, choice controls, lists, scrollbars, text fields, textarea, layout managers, menu bars and menus, dialogue boxes, fileDialog, Introduction to Spring Boot Framework

TEXT BOOKS:

1. Core Java™ 2, Volume I--Fundamentals: 001 (The Sun Microsystems Press Java Series), 12th edition by Cay S. Horstmann, Gary Cornell
2. Thinking in Java ,4th edition, Pearson publications by Bruce Eckel.

REFERENCE BOOKS:

1. Java: The Complete Reference, Thirteenth Edition, 13th Edition by Herbert Schildt, Dr. Danny Coward, Released January 2024, Publisher(s): McGraw-Hill ISBN: 9781265062705.
2. Head First Java, third Edition by Kathy Sierra, Bert Bates, Trisha Gee: ISBN: 9781491910771.

CO302N Computer Networks

Teaching Scheme :03L + 00T, Total: 03

Credit :03

Evaluation Scheme :10 ISA + 30 MSE + 60 ESE

Total Marks :100

Duration of ESE :03 Hrs

COURSE DESCRIPTION:

This course introduces data communication techniques and concepts of computer network technology. Provide knowledge of networking and different protocols of network at different layers. It also provides wired and wireless network concepts. Provides the concept of Network security.

DESIRABLE AWARENESS/SKILLS: Data communication, data structure, discrete structure.

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Explain fundamentals of wireless communication and TCP IP protocol suite
2. Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism.
3. Explain the different Transport Layer functions i.e. Port addressing, Connection Management, Error control and Flow control mechanism.
4. Design secure communication over the network.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO2	1	1	3	1	2	1	1	2	2	1	3	1	2	3	3
CO3	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3
CO4	2	1	3	1	3	2	1	2	2	2	3	1	2	3	3

1- Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENTS:

Wireless LANs and WANs:IEEE 802.11-

[7 Hrs]

Architecture, addressing mechanism, wired LAN, Ethernet:data link layer, physical layer standard Ethernet: MAC sublayer, physical layer changes in the standard: bridged ethernet, switched ethernet, full-duplex ethernet fast Ethernet: MAC sublayer, physical layer gigabit ethernet: MAC sublayer, physical layer, ten-gigabit ethernet

TCP/IP protocol suite:**[5Hrs]**

Physical and data link layers, network layer, transport layer, application layer addressing: physical addresses, logical addresses, port addresses, specific addresses.

Network Layer:**[9 Hrs]**

IPv4 Addresses- address space, notations, classful addressing, classless addressing, network address translation, IPv4- datagram, fragmentation, checksum, options IPv6 addresses: structure, address space IPv6- advantages, packet format, extension headers transition from IPV4 to IPV6- dual stack, tunnelling, header translation address mapping: mapping logical to physical address- ARP, mapping physical to logical address- RARP, BOOTP, and DHCP ICMPtypes of messages, message format, error reporting, query, debugging

Transport Layer:**[5 Hrs]**

Process-to-process delivery- client/server paradigm, multiplexing and demultiplexing, connectionless versus connection-oriented service, reliable versus unreliable, three protocols user datagram protocol (UDP)- well-known ports for UDP, user datagram, checksum, UDP operation use of UDP, TCP- TCP services, TCP features.

Application Layer:**[12 Hr]**

Name space: flat name space, hierarchical name space, domain namespace-label, domain name, domain distribution of namespace- hierarchy of name servers, zone, root server, primary and secondary servers. DNS in the internet- generic domains, country domains, inverse domain resolution- resolver, mapping names to addresses, mapping address to names, recursive resolution, iterative resolution, caching. remote logging- telnet, electronic mail- architecture, user agent, message transfer agent- SMTP, message access agent- pop and imap, web- based mail, file transfer- file transfer protocol (ftp), anonymous ftp architecture- client (browser), server, uniform resource locator, cookies.

Network Security:**[5Hrs]**

Introduction to cryptography, symmetric-key and asymmetric key Cryptography, RSA algorithm, Firewall.

TEXT BOOKS:

1. A.S.Tanenbaum, "Computer Networks", 4th Edition, Pearson Education, 2005, ISBN-817758165

REFERENCE BOOKS:

2. B.A.Forouzan, "Data Communications and Networking", 4th Edition, TMH, 2009, ISBN-13- 9780070634145.
3. Computer Networking: A Top-Down Approach by James Kurose and Keith Ross is the 8th edition, published by Pearson on July 23–24, 2020. ISBN: 978-0-13-592861-5

CO303N Formal Language and Automata Theory

Teaching Scheme :03L + 01T, Total: 04

Credit :03

Evaluation Scheme :10 ISA + 30 MSE + 60 ESE

Total Marks :100

Duration of ESE :03 Hrs

COURSEDESCRIPTION:

This course explores the fundamental concepts of automata theory, including formal languages, grammars, and computational models. It covers finite automata (DFA, NFA), regular expressions, and context-free grammars (CFGs) with their applications. Students will learn about pushdown automata (PDA), Turing machines (TM), and computability theory. The course also introduces complexity classes (P, NP, NP-Complete) and undecidability concepts in theoretical computer science.

DESIRABLE AWARENESS/SKILLS:

Basic Knowledge of Logic Programming, flow diagram, algorithms, computation.

COURSEOUTCOMES:

On the successful completion of this course, students shall be able to:

1. Explain fundamental concepts of formal languages and automata theory.
2. Analyze and design finite automata and regular expressions for language recognition
3. Develop context-free grammars (CFGs) and pushdown automata (PDA) for context-free languages
4. Explore the foundations of Turing machines, computability, and complexity theory

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO2	1	1	3	1	2	1	1	2	2	1	3	1	2	3	3
CO3	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3
CO4	2	1	3	1	3	2	1	2	2	2	3	1	2	3	3

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlate

COURSECONTENTS:

Introduction to Automata Theory:

Introduction to formal languages, grammar, and automata, Alphabets, Strings, and Languages
Finite Automata (FA): DFA & NFA, NFA with ϵ , Equivalence of DFA and NFA, Finite Automata with Output (Moore & Mealy Machines), Applications of Finite Automata (Lexical Analysis, Pattern Matching)

Regular Languages & Expressions:

Regular Expressions (REs) and their equivalence to FA, Arden's Theorem, Properties of Regular Languages, Pumping Lemma for Regular Languages, Minimization of DFA, Right linear and left linear grammars, equivalence of right linear and left, linear grammar, equivalence of regular grammar and FA.

Context Free Languages:

Context-Free Grammars (CFGs) & Context-Free Languages (CFLs), Derivations & Parse Trees, Ambiguity in Grammars, Simplification of CFG, Chomsky Normal Form (CNF) & Greibach Normal Form (GNF), Pumping Lemma for CFLs, Closure properties of context free languages.

Push Down Automata:

Definition of the pushdown automaton, PDA for context free languages, equivalence of PDA's and CFG's, deterministic push down automata, Non deterministic PDA.

Turing machine:

Definition & Components of Turing Machines (TM), Designing Turing Machines for Simple Problems, Variations of TM (Multi-Tape, Non-Deterministic TM, Universal TM), Church-Turing Thesis, Undecidability & Halting Problem.

Computability & Complexity Theory:

Recursive & Recursively Enumerable Languages, Decidable & Undecidable Problems, Reducibility & Rice's Theorem, Time Complexity & Complexity Classes (P, NP, NP-Complete, NP-Hard).

TETBOOKS:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and Computation", 3rd Edition, Addison-Wesley Publishing Co., 2007, ISBN-9788131720479.
2. Peter Linz, "An Introduction to Formal Languages and Automata", 4th Edition, Jones and Bartlett Publication, 2006, ISBN:13: 9780763737986.

REFERENCEBOOKS:

1. John C. Martin, "Introduction to Languages and the Theory of Automata", 2nd Edition, McGraw-Hill Publication, 2003, ISBN:9780072322002.
2. K.L.P. Mishra, N. Chandrasekaran, "Theory of Computer Science Automata, Languages and Computation", 2nd Edition PHI, 2007, ISBN- 9788120329683.
3. Lewis H.P. and Papadimitriou C.H., "Elements of Theory of Computation", 2nd Edition, Prentice Hall Publication, 1997, ISBN:0132624788

CO304NA Data Mining and Data Warehousing

Teaching Scheme :03L + 00T, Total: 03

Credit :03

Evaluation Scheme :10 ISA + 30 MSE + 60 ESE

Total Marks :100

Duration of ESE :03 Hrs

COURSE DESCRIPTION:

This course will introduce the concepts of data warehouse and data mining, which gives a complete description about the principles, used, architectures, applications, design and implementation of data mining and data warehousing concepts.

DESIRABLE AWARENESS/SKILLS: Fundamentals of Data Structures and Data science

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Explain the fundamentals of data mining.
2. Arrange basic, intermediate and advanced techniques to mine the data.
3. Measure the output generated by the process of data mining
4. Evaluate the hidden patterns in the data

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2	3	-	-	-	-	-	1	-	3	1	2	1	1
CO2	1	-	3	-	2	-	-	-	2	1	3	1	3	1	2
CO3	2	-	3	-	-	-	-	-	2	-	3	1	2	1	1
CO4	2	-	3	-	-	-	-	-	1	-	3	1	2	1	1

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlate

Course Contents:

Introduction of Data Mining-

[7 Hrs]

Data Mining Task Primitives, Data: Data, Information and Knowledge; Attribute Types: Nominal, Binary, Ordinal and Numeric attributes, Discrete versus Continuous Attributes; Introduction to Data Preprocessing, Data Cleaning: Missing values, Noisy data; Data integration: Correlation analysis; transformation: Min-max normalization, z-score, normalization and decimal scaling; data reduction: Data Cube Aggregation, Attribute Subset Selection, sampling; and Data Discretization: Binning, Histogram Analysis.

Data Warehouse-

[7 Hrs]

Operational Database Systems and Data Warehouses(OLTP Vs OLAP), A Multidimensional Data Model: Data Cubes, Stars, Snowflakes, and Fact Constellations Schemas; OLAP

Operations in the Multidimensional Data Model, Concept Hierarchies, Data Warehouse Architecture, The Process of Data Warehouse Design, A three-tier data warehousing architecture, Types of OLAP Servers:ROLAP versus MOLAP versus HOLAP.

Measuring Data Similarity and Dissimilarity-

[8 Hrs]

Proximity Measures for Nominal Attributes and Binary Attributes, interval scaled; Dissimilarity of Numeric Data: Minkowski Distance, Euclidean distance and Manhattan distance; Proximity Measures for Categorical, Ordinal Attributes, Ratio scaled variables; Dissimilarity for Attributes of Mixed Types, Cosine Similarity.

Association Rules Mining-

[10 Hrs]

Market basket Analysis, Frequent item set, Closed item set, Association Rules, a-priori Algorithm, Generating Association Rules from Frequent Item sets, Improving the Efficiency of a-priori, Mining Frequent Item sets without Candidate Generation: FP Growth Algorithm; Mining Various Kinds of Association Rules: Mining multilevel association rules, constraint based association rule mining, Meta rule-Guided Mining of Association Rules.

Classification-

[10 Hrs]

Introduction to: Classification and Regression for Predictive Analysis, Decision Tree Induction, Rule-Based Classification: using IF-THEN Rules for Classification, Rule Induction Using a Sequential Covering Algorithm. Bayesian Belief Networks, Training Bayesian Belief Networks, Classification Using Frequent Patterns, Associative Classification, Lazy Learners-k-NearestNeighbor Classifiers, Case-Based Reasoning.

Multiclass Classification-

[8 Hrs]

Semi-Supervised Classification, Reinforcement learning, Systematic Learning, Wholistic learning and multi-perspective learning. Metrics for Evaluating Classifier Performance: Accuracy, Error Rate, Precision, Recall, Sensitivity, Specificity; Evaluating the Accuracy of a Classifier: Holdout Method, Random Sub sampling and Cross-Validation, Introduction to web mining.

Text Books:

1. Han, Jiawei Kamber, Micheline Pei and Jian, —Data Mining: Concepts and Techniques, Elsevier Publishers, ISBN:9780123814791, 9780123814807.
2. Parag Kulkarni, —Reinforcement and Systemic Machine Learning for Decision Making by Wiley-IEEE Press, ISBN: 978-0-470-91999-6

Reference Books:

1. Matthew A. Russell, "Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Google+, GitHub, and More" , Shroff Publishers, 2nd Edition, ISBN: 9780596006068
2. Maksim Tsvetovat, Alexander Kouznetsov, "Social Network Analysis for Startups: Finding connections on the social web", Shroff Publishers , ISBN: 10: 1449306462

CO304NB INTERNET OF THINGS

Teaching Scheme :03L + 00T, Total: 03

Credit :03

Evaluation Scheme :10 ISA + 30 MSE + 60 ESE

Total Marks :100

Duration of ESE :03 Hrs

COURSE DESCRIPTION:

This course covers the fundamental IoT concepts, architecture, protocols, communication technologies, and case studies of IoT. Additionally, the course covers designing and implementing IoT solutions with Raspberry pi & Arduino.

DESIRABLE AWARENESS/SKILLS:Digital Electronics, Computer Networks

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Explain the fundamental concepts and principles of IoT
2. Discuss enabling technologies, case studies and applications related to IoT
3. Analyze communication technologies and protocols essential for the development and implementation of IoT systems.
4. Design and develop practical IoT-based solutions to address real-world challenges.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	2	-	-	-	-	-	-	-	1	2	2	3
CO2	3	1	2	1	2	-	-	-	-	-	-	-	2	3	3
CO3	2	3	3	1	1	1	1	1	1	1	-	-	2	2	3
CO4	2	2	3	1	2	2	2	2	2	1	2	1	2	3	3

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlate

COURSE CONTENTS:

Introduction to IoT :

[10 Hrs]

Definition and Characteristics of IoT, Building Blocks of IoT , IoT Layered Architecture, IoT technology stack, Role of cloud in IoT, Physical Design of IoT- IoT Devices, IoT protocols , Logical design of IoT- IoT functional blocks, IoT communications models, IoT communication APIs, , Sensors and Actuators, IoT and M2M- Applications of M2M, Difference between IoT and M2M , Industry 4.0.

Network and Communication Aspects:

[10 Hrs]

IoT protocols and Communication Technologies, Wireless medium access issues, MAC protocols in WSN, Classification of MAC protocols, Routing Protocols, Emerging Technologies- Software Defined Network, Wireless Sensor Network, Edge computing, Fog

computing.

Resource Management in the IoT: [08 Hrs]

Clustering, Software Agents, design guidelines and software agents for object representation, Data synchronization.

Building IoT with Raspberry Pi & Arduino : [06 Hrs]

Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details, Implementing IoT concepts with Python.

Business model for the IoT: [05 Hrs]

Business model and Business Model Innovation, value creation in IoT, Business model scenarios for the IoT, Challenges in IoT: Design Challenges, Development Challenges, Security Challenges and other Challenges.

Case Studies and Applications: [03 Hrs]

Smart Metering Infrastructure, e-Health, Body Area Networks, CityAutomation, Automotive Application, Home Automation and Smart Cards

TEXT BOOKS:

1. Daniel Minoli, Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, ISBN: 978-1-118-47347-4, Willy Publications.
2. Bernd Scholz-Reiter, Florian Michahelles, Architecting the Internet of Things, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer.
3. Parikshit N. Mahalle & Poonam N. Railkar, Identity Management for Internet of Things, River Publishers, ISBN: 978-87-93102-90-3 (Hard Copy), 978-87-93102-91-0 (ebook).

REFERENCES:

1. Sudip Misra, Chandana Roy And Anandarup Mukherjee Introduction to Industrial Internet of Things and Industry 4.0 , CRC Press (Taylor & Francis Group)
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatias Karnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014, ISBN: 978-0-12-407684 6
3. Vijay Madiseti and Arshdeep Bahga, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014, ISBN: 978-0996025515

CO305NX Professional Ethics and Cyber Security

Teaching Scheme :02L + 00T, Total: 02

Credit :02

Evaluation Scheme :10 ISA + 30 MSE + 60 ESE

Total Marks :100

Duration of ESE :03 Hrs

COURSE DESCRIPTION:

This course introduces fundamental concepts of computer ethics. It will examine the ethical issues that arise as a result of increasing use of computers, and the responsibilities of those who work with computers, either as computer science professionals or end users. It will summarize Cyber Crimes and its associated investigation and forensics with relation to Cyber law. Students will have a new dimension to look towards their day to day computer activities with security concepts.

DESIRABLE AWARENESS/SKILLS:

Learn the basics of IT Security, Ethical Hacking and its various concepts.

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Explain professional ethics to solve ethical dilemmas & identify their professional responsibilities.
2. Evaluate the impact of globalization on ethical decision making.
3. Comprehend various cyber crimes and cyber attacks responses.
4. Use various network defense tools and perform vulnerability assessments.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO2	1	1	3	1	2	1	1	2	2	1	3	1	2	3	3
CO3	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3
CO4	2	1	3	1	3	2	1	2	2	2	3	1	2	3	3

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlate

COURSE CONTENTS:

Engineering Ethics:

[8 Hrs]

Introduction, history of ethics, engineering ethics, purpose, professional and professionalism, use of ethical theories, professional ethics, Engineering as social experimentation-Engineering responsibilities, learning from past, code of ethics, the challenger, safety responsibilities and rights-assessment of safety and risks, knowledge of risk, safety and risk analysis, ethics and risk management, reducing risk, professional rights, employee rights, engineer responsibility.

The principle of global Ethics:**[7 Hrs]**

Introduction, ethical problems its issues, consulting engineers, engineers as managers, engineering role and responsibilities -IEEE, ASME, ASCE, multinational co-operations, computer Ethics, True Professionalism-Introduction, professionalism, Case study-Ethics in technical presentation BART

Introduction to Cybercrime:**[8 Hrs]**

Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cyber Crimes: E-Mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/Salami Technique, Data Diddling, Forgery, Web Jacking, Newsgroup Spam/Crimes Emanating from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses, Software Piracy, Computer Sabotage, E-Mail Bombing/Mail Bombs, Usenet Newsgroup as the Source of Cybercrimes, Computer Network Intrusions, Password Sniffing, Credit Card Frauds, Identity Theft, ITA 2000

Introduction to Cyber Crime Investigation:**[7 Hrs]**

Firewalls and Packet Filters, password Cracking, Keyloggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks .

Systems Vulnerability Scanning:**[8 Hrs]**

Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Publication Wiley
2. Mike Shema, Anti-Hacker Tool Kit (Indian Edition), Publication McGraw Hill.
3. Hamid Nemati, Information Security and Ethics: Concepts, Methodologies, tools and application, 2007

REFERENCE BOOKS:

1. Mike Shema "Anti-Hacker Tool Kit" (Indian Edition), Publication McGraw Hill. ISBN 9789339212155
2. Nina Godbole and Sunit Belpure "Cyber Security : Understanding Cyber Crimes Computer Forensics and Legal Perspectives", Publication Wiley ISBN 10-8126521791.

CO305NY Human Computer Interaction

Teaching Scheme :03L + 00T, Total: 03

Credit :03

Evaluation Scheme :10 ISA + 30 MSE + 60 ESE

Total Marks :100

Duration of ESE :03 Hrs

COURSE DESCRIPTION:

This course provides an introduction to and overview of the field of human-computer interaction (HCI). HCI is an interdisciplinary field that integrates theories and methodologies from computer science, cognitive psychology, design, and many other areas. Course readings will span current theory and practice in interface specification, design and evaluation, as well as current and classic research papers in HCI.

DESIRABLE AWARENESS/SKILLS:Internet basics

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Explain effective and usable graphical computer interfaces.
2. Discuss current trends in the field of HCI
3. Apply core theories, models and methodologies from the field of HCI.
4. Design suitable GUI.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	3	1	2	2	1	2	1	1	2	1	2	2	3
CO2	1	1	3	1	2	2	2	2	2	1	2	1	2	3	3
CO3	1	1	3	1	3	2	1	1	2	1	3	1	2	2	3
CO4	1	1	3	1	3	2	2	1	2	1	2	1	2	3	3

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlate

COURSE CONTENTS:

Introduction:

[5 Hrs]

Introduction to User centric design, User centric design – what and why, Genesis of the Field, Issues and challenges, Research trends.

User Centric:

[4 Hrs]

An engineering perspective, Introduction, Engineering a software system, Introduction to usability, User-centric design.

User Centric:

[5 Hrs]

A Computational perspective, A framework for user-centric computing, user-centric models, models for user-centric computing, Broad taxonomy of user-centric computing models.

Computational Models of users: [5 Hrs]
Classical models- Introduction, the GOMS models, models of specific user behavior, the models and the computational framework

Computational Models of users: [5 Hrs]
Contemporary Interfaces and Interactions- introduction, WIMP Interactions-2D Pointing and Scrolling, Constrained Navigation on Interfaces, Mobile Typing, Touch Interaction.

Computational Models of users: [4 Hrs]
Design Implications and Present State- Introduction, Design case study-virtual keyboard, Models for Non-Traditional Interactions, Learning-based Models, Emerging Trend in Interactive Systems

Empirical Research for User-Centric Computing: [5 Hrs]
Introduction, Research Questions, Identification of Variables, Experiment Design, Data Analysis, Use of Empirical Data for Models Building

Formal Models in User- Centric Computing: [4 Hrs]
Introduction, User-Centric Computing with Matrix Algebra, Use of Formal Models and Issues, Formal Modelling of Dialog, Other Formal Models and Trends-An overview.

User-Centric Computing for Evaluation: [3 Hrs]
Introduction, Evaluation with Experts, Evaluation with users, Model-Based Evaluation, A Framework for Usability Evaluation and Design

User-Centric Computing beyond GUI: [5 Hrs]
Ubiquitous Systems: Introduction, Recent Trends- GUI and Beyond, User-Centric Issues and Challenges, Enabling Technologies, User-Centric Computing Challenges

TEXT BOOKS:

1. Samit Bhattacharya, “Human Computer Interaction, User Centric computing for design”2nd Edition, Tata McGraw-Hill, ISBN-10: 93-5316-804-X

REFERENCE BOOKS:

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, “Designing the User Interface: Strategies for Effective Human-Computer Interaction”, 5th Edition, 2009, Pearson; ISBN-13: 978-0321537355
2. Alan Cooper, Robert Reimann, David Cronin, “The Essentials of Interaction Design”, Wiley; 3rd edition (May 7, 2007), ISBN-13: 978-0470084113

DCM306N Data Analytics and Visualization

Teaching Scheme :04L + 00T, Total: 04

Credit :04

Evaluation Scheme :10 ISA + 30 MSE + 60 ESE

Total Marks :100

Duration of ESE :03 Hrs

COURSE DESCRIPTION:

This course introduces students to the principles and techniques of data analytics and visualization. Students will learn how to analyze, interpret, and visualize data using various tools and techniques, developing a practical understanding of data analysis in real-world scenarios.

DESIRABLE AWARENESS/SKILLS:Basics of python

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Explain the core concepts of data analytics, including data collection, cleaning, transformation, and analysis.
2. Utilize popular data visualization tools and libraries such as Tableau, Power BI, Matplotlib, Seaborn, Plotly to create interactive and informative visual representations of data.
3. Design clear, accurate, and compelling visualizations by applying best practices in visualization theory and accessibility and choose appropriate chart types based on data characteristics.
4. Analyze and interpret data insights to inform decision-making by identifying patterns, trends, outliers, and relationships in the data.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	2	2	-	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	3	-	2	-	-	-	-	-	-	-	-	-	2
CO4	3	3	-	2	-	-	-	-	-	-	-	-	-	1	-

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENTS:

Introduction to Data Analytics:

[8 Hrs]

Overview of Data Analytics: Definition, scope, and significance, Types of Data: Structured vs Unstructured, Introduction to Big Data, Data Mining, and Machine Learning Data Analytics Life Cycle: Problem definition, Data collection and exploration, Data preprocessing and cleaning, Analysing and interpreting data, Reporting and visualization

Data Preprocessing and Cleaning: [8 Hrs]

Understanding Raw Data: Types of data formats (CSV, JSON, SQL, etc.), Handling missing data (imputation, deletion, etc.), Data normalization and transformation, Feature selection and extraction Data Cleaning Techniques: Identifying and handling outliers, Dealing with noisy data, Data consistency and integrity checks

Statistical Foundations for Data Analysis: [10 Hrs]

Descriptive Statistics: Measures of central tendency (mean, median, mode), Measures of dispersion (variance, standard deviation, range), Skewness and Kurtosis, Inferential Statistics: Hypothesis testing (t-test, chi-square, etc.), Confidence intervals, p-values and significance testing

Introduction to Data Visualization: [8 Hrs]

Importance of Data Visualization, Types of data visualizations: bar charts, histograms, scatter plots, etc. Basic Visualization Tools: Introduction to libraries: Matplotlib, Seaborn, Plotly. Visualizing univariate and multivariate data, Interactive visualizations and dashboards

Advanced Data Visualization Techniques: [8 Hrs]

Advanced Charts and Plots: Heatmaps, Box plots, Violin plots, Pair plots. Time Series Data Visualization. Geospatial data visualization (maps) Storytelling with Data: Principles of effective data storytelling, combining charts to tell a coherent narrative, Using dashboards for dynamic reporting

Introduction to Data Analytics Tools: [8 Hrs]

Python for Data Analytics: Python libraries: Pandas, NumPy, Matplotlib, Seaborn. Data manipulation with Pandas, Visualizing data with Seaborn and Matplotlib Data Analytics with Excel: Excel functions for data analysis, Pivot tables and charts, Basic data modelling in Excel

TEXT BOOKS:

1. Data Science for Business by Foster Provost and Tom Fawcett, O'Reilly Media, 1st edition.
2. Python for Data Analysis by Wes McKinney, O'Reilly, 3rd edition.
3. Storytelling with Data by Cole Nussbaumer Knaflic, Wiley, ISBN: 978-1-119-00225-3, November 2015.
4. Data Visualization: A Practical Introduction by Kieran Healy, Princeton University Press, ISBN-13 978-0691181622.

REFERENCE BOOKS:

1. "Fullstack D3 and Data Visualization" Amelia Wattenberger
2. React and D3.js: Build Data Visualizations with React and D3" by Elad Elrom, Apress Publications ISBN-13: 978-1484262255, 2020

CPM306N PYTHON PROGRAMMING

Teaching Scheme :04L + 00T, Total: 04

Credit :04

Evaluation Scheme :10 ISA + 30 MSE + 60 ESE

Total Marks :100

Duration of ESE :03 Hrs

COURSE DESCRIPTION:

This course introduces the student to basic python programming.

DESIRABLE AWARENESS/SKILLS:Basics of C,C++ programming languages.

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Explain python concepts and their functions.
2. Use strings,list and files to solve real world problems
3. Apply OOP features to develop python applications.
4. Use different suitable python libraries.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	3	1	2	-	-	-	-	-	-	-	2	2	1
CO2	1	1	3	1	2	-	-	-	-	-	-	-	2	3	2
CO3	1	1	3	1	3	-	-	-	-	-	-	-	2	1	1
CO4	1	1	3	1	3	-	-	-	-	-	-	-	2	2	2

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlate

COURSE CONTENTS:

Introduction to Python:

[07 Hrs]

Introduction, python overview, getting started with python - installing python interpreter, simple python program, comments, python identifiers, reserved keywords, variables, standard data types, operators, statements and expressions, string operations, boolean expressions, control statement, iteration, input from keyboard.

Functions:

[06 Hrs]

Built-in-functions, composition of functions, user defined functions, parameters and arguments, functions calls, the return statement, python recursive functions, the anonymous functions, writing python scripts.

Strings and Lists :

[06 Hrs]

Strings- compound data type, len function, string slices, strings are immutable, strings traversal, escape characters, string formatting operator, string formatting functions and Lists- value and accessing elements, lists are mutable, built-in list operators, built-in methods.

Tuples and Dictionaries :**[06 Hrs]**

Tuples-creating tuples, accessing values in tuples, tuples are immutable, tuple assignment, tuples as return value, variable-length argument tuples, basic tuples operations, built-in tuple functions and Dictionaries- creating a dictionary, accessing values in a dictionary, updating dictionary, deleting elements from dictionary, properties of dictionary keys, operations in dictionary, built-in dictionary methods.

Files and Exceptions :**[06 Hrs]**

Files- Text files, directories, exceptions- built-in exceptions, handling exceptions, exceptions with arguments, user defined exceptions.

Classes and Objects :**[08 Hrs]**

Overview of OOP, class definition, creating objects, objects as arguments, objects as written values, built-in class attributes, inheritance, method overriding, data encapsulation, data hiding.

Python Libraries:**[09 Hrs]**

Pillow, Matplotlib, Numpy, OpenCV, Deepface. Handling Files, Cameras: basic IO scripts, Reading/writing Images Files, Reading/writing Video Files, Capturing Camera frames. Detecting Edges and Applying Image filter: Blurring, sharpening, embossing, erosion and dilation. Detecting and tracking different body parts: detecting face, detecting eyes, detecting ears, detecting nose, detecting pupils

TEXT BOOKS:

1. Introduction to computing and Problem Solving Using Python, E Balagurusamy McGraw Hill Education Pvt. Ltd, ISBN-13: 978-93-5260-258-2
2. Programming and Problem Solving with Python , Kamthane, McGraw Hill Education Pvt. Ltd, ISBN: 9789387067578
3. Joseph Howse, Prateek Joshi, OpenCV: Computer Vision Projects with Python 1st Edition, Kindle Edition

REFERENCE BOOKS:

1. Python Programming: An introduction to Computer Science, John Zelle, Franklin, Beedle and Associates, Inc.
2. Learning Python , Mark Lutz, O'reilly, 5e ISBN 13: 9781449355739 ISBN: 1449355730
3. Python the complete reference, Brown, McGraw Hill Education Pvt. Ltd, ISBN: 9789387572942.
4. Programming in Python, Dr. Pooja Sharma, BPB publications, ISBN: 978-93-8655-127-6

AIM 306N Machine Learning

Teaching Scheme :04L + 00T, Total: 04

Credit :04

Evaluation Scheme :10 ISA + 30 MSE + 60 ESE

Total Marks :100

Duration of ESE :03 Hrs

COURSE DESCRIPTION:

A Machine Learning course typically explores the principles and algorithms that enable computers to "learn" from data, improving their performance on tasks without explicit programming, covering concepts like supervised learning, unsupervised learning, reinforcement learning, and applying these techniques to real-world datasets using programming languages like Python, often including hands-on practice building and evaluating machine learning models across various applications like image recognition, natural language processing, and predictive analytics.

DESIRABLE AWARENESS/SKILLS:Data Structures and Algorithms, Data Science.

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Formulate algorithms for solving Machine Learning Applications
2. Apply Bayesian Decision Theory and Parametric Methods.
3. Use appropriate Clustering and Nonparametric Methods
4. Apply Decision Trees and Linear Discrimination and Reinforcement Learning

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO2	1	1	3	1	2	1	1	2	2	1	3	1	2	3	3
CO3	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3
CO4	2	1	3	1	3	2	1	2	2	2	3	1	2	3	3

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlate

COURSE CONTENTS:

Foundations of Machine Learning:

[6 Hrs]

Introduction to Machine Learning, What Is Machine Learning?, Examples of Machine Learning Applications, Types of Machine Learning, Supervised Learning, Learning a Class from Examples.

Theoretical Concepts and Advanced Topics:

[5 Hrs]

Vapnik-Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Learning Multiple Classes Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm

Bayesian Decision Theory and Parametric Methods: Bayesian Decision Theory: [4 Hrs]
Introduction, Classification, Losses and Risks, Discriminant Functions, Utility Theory, Association Rules

Parametric Methods: [5 Hrs]
Maximum Likelihood Estimation, Evaluating an Estimator: Bias and Variance, The Bayes' Estimator, Parametric Classification, Tuning Model Complexity, Model Selection Procedures,

Clustering and Nonparametric Methods: [7 Hrs]
Clustering Introduction, Mixture Densities, k-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models, Supervised Learning after Clustering, Hierarchical Clustering, Choosing the Number of Clusters.

Nonparametric Methods: [7 Hrs]
Introduction, Nonparametric Density Estimation, Generalization to Multivariate Data, Nonparametric Classification, Condensed Nearest Neighbor, Nonparametric Regression: Smoothing Models, How to Choose the Smoothing Parameter.

Decision Trees and Linear Discrimination: [5 Hrs]
Introduction, Random Forest and K-Nearest Neighbors (KNN), Univariate Trees, Pruning, Rule Extraction from Trees, Learning Rules from Data, Multivariate Trees

Linear Discrimination: [5 Hrs]
Introduction, Generalizing the Linear Model, Geometry of the Linear Discriminant, Pairwise Separation, Parametric Discrimination Revisited, Gradient Descent, Logistic Discrimination, Discrimination by Regression.

Reinforcement Learning and Machine Learning Experiments: [4 Hrs]
Introduction, Single State Case: K-Armed Bandit, Elements of Reinforcement Learning, Model-Based Learning, Temporal Difference Learning, Generalization, Partially Observable States.

Machine Learning Experiments: [7 Hrs]
Factors, Response, and Strategy of Experimentation, Response Surface Design, Randomization, Replication, and Blocking, Guidelines for Machine Learning Experiments, Cross-Validation and Resampling Methods, Measuring Classifier Performance, Interval Estimation, Hypothesis Testing, Assessing a Classification Algorithm's Performance, Comparing Two Classification Algorithms.

TEXT BOOKS:

1. Introduction to Machine Learning by Ethem Alpaydm, The MIT Press Cambridge, Massachusetts London, England, Second Edition.
2. Tom Mitchell: Machine Learning an Artificial Intelligence Approach, Vol.-II; Morgan Kaufmann.

REFERENCE BOOKS:

1. A. K. Jain and R. C. Dubes, Algorithms for Clustering Data; Prentice Hall. ISBN 10, 013022278X
2. Shalev-Shwartz, S., Ben-David, S., 2014, Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press ISBN 978-1-107-05713-5
3. Christopher Bishop, Pattern Recognition and machine learning; Springer Verlag. ISBN-10: 0387310738

CO307N Computer Network Lab

Teaching Scheme :02P + 00T, Total: 02
Evaluation Scheme :30 ICA + 20 ESE
Duration of ESE :02Hrs

Credit :01
Total Marks :50

EXPERIMENTS

Minimum 10 experiments (five from group A and five from group B) shall be performed to cover the entire curriculum of course CO302N). The list given below is just a guideline. All assignments are to be implemented using open source technology (preferably). Every assignment should include use of syntax, use of command/function used for coding and printout of code with proper comment and output.

COURSE OUTCOMES:

1. Describe the fundamental concepts and models of computer networks, including the OSI and TCP/IP architectures.
2. Demonstrate practical knowledge of client-server architecture, socket programming.
3. Evaluate the performance of different routing algorithms.
4. Analyze various network layers and protocols such as IP, TCP, UDP, ARP, ICMP, DNS, and HTTP.
5. Calculate network parameters such as IP addressing schemes (IPv4/IPv6), subnetting, and routing metrics.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO													PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	13	1	2	3
1	3	-	-	-	2	-	-	-	2	-	-	-	-	3	2	1
2	-	-	-	-	3	3	-	-	-	-	-	-	-	3	3	2
3	-	3	-	3	-	-	2	-	-	2	-	-	-	2	1	3
4	-	3	-	3	-	-	-	-	2	-	2	2	-	3	2	1
5	3	-	-	-	2	-	-	-	2	-	-	-	-	3	2	1

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlate

GROUP A:

1. UNIX Sockets: WAP program in C/C++ /Python/Java sockets API.
 - a. TCP sockets
 - b. UDP sockets

Server accepts operation and floating point numbers from the clients; performs arithmetic operations and sends the result back to the client. Server applications must handle at least five clients simultaneously. Both the server and client should display input and output numbers as well as the operation. The server and client processes should be run on different machines.

During evaluation, students will demonstrate via creating multiple client processes on different machines.

2. Using Packet Tracer configure
 - a. Static Routing
 - b. RIPv2 routing protocol
 - c. OSPF
3. Simulate the Ethernet LAN/WLAN for wired networks.
4. Install and configure FTP server and access it using ftp client from another machine.
5. Implement Client-server application for chat.
6. Develop a Client that contacts a given DNS Server to resolve a given host name.
7. Write a HTTP web client program to download a web page using TCP sockets.
8. Study and implement address resolution protocol.

GROUP B:

1. Write a program to find the internet address of a remote computer.
2. Write a program to trace the port of a particular host.
3. Write a program to implement the echo client.
4. Write a program to implement the finger client.
5. Write a program to implement who the client is..
6. Implement a chat server using TCP/IP protocol
7. To implement an RSA algorithm.
8. Write a program to implement subnetting and find the subnet masks.

NOTE:

ICA – Internal Continuous Assessment shall support regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skills acquired and the record submitted by the student (journal) based on practical performance by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE – The End Semester Examination (PR) for this laboratory course shall be based on performance in one of the experiments performed by students in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of the institution.

CO308N Software Lab-II

Teaching Scheme :02P + 00T, Total: 02

Credit :01

Evaluation Scheme :30 ICA + 20 ESE

Total Marks :50

Duration of ESE :02Hrs

EXPERIMENTS

Minimum 10 experiments (five from group A and five from group B) shall be performed to extend your existing JavaScript skills to write code for your web applications. . The list given below is just a guideline. All assignments are to be implemented using open source technology (preferably). Every assignment should include use of syntax, use of command/function used for coding and printout of code with proper comment and output.

COURSE OUTCOMES:

1. Understanding the core concepts of Node.js, including modules, event-driven architecture, asynchronous programming, and the event loop.
2. Developing RESTful APIs using Node.js and frameworks like Express.js, covering routing, request handling, middleware, and response formatting.
3. Learning to interact with databases (both SQL and NoSQL, like MongoDB or PostgreSQL) to store and retrieve data for API operations.
4. Understanding the process of deploying Node.js applications and APIs to various environments, including cloud platforms.
5. Writing unit tests and integration tests to ensure API functionality and reliability, along with debugging techniques for identifying and resolving issues.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO													PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	13	1	2	3
1	3	-	-	-	-	-	-	-	-	-	-	-	-	3	2	1
2	-	3	-	3	-	3	3	3	3	3	3	3	-	3	3	2
3	-	1	3	-	-	-	-	2	2	2	2	3	-	2	1	3
4	-	-	-	-	-	-	-	-	2	-	2	2	-	3	2	1
5	3	-	-	-	-	-	-	-	-	-	-	-	-	3	2	1

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlate

GROUP A:

1. Installation of Node.js, npm, create node isproject using npm, install yarn, create node js project using yarn.
2. Write a javascript program that reads the local file and prints the content of the file on console and executes it on the command line using node command.

3. Create a simple **HTTP server** using Node.js' built-in http module that should respond with hello world for every request.
4. Build a Restful API using Express JS with following endpoints
 - a. GET /api/users: Fetch all users (return mock data).
 - b. GET /api/users/:id: Fetch a specific user by ID (return mock data).
 - c. POST /api/users: Add a new user (mock data, no database required).
 - d. PUT /api/users/:id: Update a user's information (mock data).
 - e. DELETE /api/users/:id: Delete a user.
5. Test the APIs using postman.
6. Create an HTML form with name, email, and message fields. Create an Express server to handle form submissions, then print the form data to the console.
7. Create a RESTful API to perform basic calculator operations (addition, subtraction, multiplication, division). The API should accept numbers as parameters and return the result.

GROUP B:

1. Implement 2 Rest API that returns the current date and time of the system.
2. Create a 2 APIs that takes a string as input and returns the string reversed, string uppercase respectively.
3. Develop a real time chat application using express js and socket.io.
4. Create an Express app that provides the following API: GET /api/products: Return an array of products in JSON format. GET /api/products/:id: Return a specific product by its ID.
5. Create a Node.js application using Express and MySQL to build the following API endpoints:
Create a mysql database, create users table that contain id, name, email
 - GET /users: Fetch all users from the database.
 - GET /users/:id: Fetch a user by id.
 - POST /users: Add a new user to the database.
 - PUT /users/:id: Update an existing user.
 - DELETE /users/:id: Delete a user by id.
6. Implement JWT-based authentication and authorization in the following manner:
 - POST /register: Register a new user (hash the password before storing it).
 - POST /login: Log in a user and generate a JWT token.
 - GET /profile: Fetch the authenticated user's profile (this should be a protected route).

TEXT BOOKS:

1. "Beginning Node.js" by Basarat Ali Syed: ISBN: 978-1680837440
2. "Beginning Node.js, Express & MongoDB Development" by Greg Lim: ISBN: 978-1680836477
3. "Getting MEAN with Mongo, Express, Angular, and Node" by Chris Jackson: ISBN: 978-1680836477
4. "Get Programming with Node.js" by Jonathan Wexler, ISBN 9781617294747

NOTE:

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The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE – The End Semester Examination (PR) for this laboratory course shall be based on performance in one of the experiments performed by students in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of the institution.

CO310NA Data Mining and Data Warehousing Lab

Teaching Scheme :02P + 00T, Total: 02

Credit :01

Evaluation Scheme :30 ICA + 20 ESE

Total Marks :50

Duration of ESE :02Hrs

EXPERIMENTS

Minimum 10 experiments (five from Group A and five from Group B) shall be performed to cover the entire curriculum of course CO305NA. The list given below is just a guideline. All assignments are to be implemented using open source technology (preferably). Every assignment should include use of syntax, use of command/function used for coding and printout of code with proper comment and output.

COURSE OUTCOMES:

1. Apply data generalization and summarization methods for knowledge discovery.
2. Apply data preprocessing and integration techniques to prepare datasets for analysis.
3. Implement frequent itemset mining using the Apriori algorithm.
4. Perform clustering on datasets using K-Means and other clustering techniques.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	2	3	-	-	-	-	-	1	-	3	1	2	1	1
2	1	-	3	-	2	-	-	-	2	1	3	1	3	1	2
3	1	-	3	-	-	-	-	-	2	-	3	1	2	1	1
4	1	-	3	-	-	-	-	-	1	-	3	1	2	1	1

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

GROUP A:

1. Develop a program to construct a multidimensional data model (Starflakes)
2. Develop a program to construct a multidimensional data model (Snowflake or Fact constellations)
3. Develop a program to implement data pre-processing techniques.
4. Develop a program to implement data integration techniques.
5. Implement Apriori algorithm for frequent item sets.
6. Perform clustering using K-Means.

GROUP B:

1. Develop a program to implement data generalization and summarization techniques.
2. Develop a program to extract association mining rules.
3. Develop a program for classification of data.
4. Develop a program for implementing one of the clustering techniques.

5. To apply the Naive Bayes Classification for testing the given dataset.
6. Implement ETL process using SQL or Pentaho.

NOTE:

ICA – Internal Continuous Assessment shall support regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skills acquired and the record submitted by the student (journal) based on practical performance by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE – The End Semester Examination (PR) for this laboratory course shall be based on performance in one of the experiments performed by students in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of the institution.

CO310NB INTERNET OF THINGS LAB

Teaching Scheme :02P + 00T, Total: 02

Credit :01

Evaluation Scheme :30 ICA + 20 ESE

Total Marks :50

Duration of ESE :02Hrs

EXPERIMENTS

Minimum 10 experiments (five from group A and five from group B) shall be performed to cover the entire curriculum of course CO304NB. The list given below is just a guideline. Every assignment should include use of syntax, use of command/function used for coding and printout of code with proper comment and output. Use of Open-source tools/ technology is recommended for laboratory assignments.

COURSE OUTCOMES:

1. Set up and use Arduino and Raspberry Pi for basic I/O operations.
2. Interface sensors and actuators with Arduino/Raspberry Pi.
3. Implement PWM and serial communication using Arduino.
4. Develop simple IoT applications using MIT App Inventor and Google Assistant.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
3	2	-	2	-	-	2	2	-	-	-	-	-	2	-	-
4	3	-	3	-	-	3	3	-	-	-	-	3	-	2	3

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

GROUP A:

1. Introduction to Arduino board, Arduino IDE Installation.
2. Interfacing LED's with Arduino board.
3. Implement interfacing of ultrasonic sensors with Arduino.
4. Implement a Program for foe monitor temperature using Arduino.
5. Interfacing LDR with Arduino - Measure Light Intensity using Photoresistor
6. Working with Analog I/O's of Arduino board
7. Working with Digital I/O's of Arduino board

GROUP B:

1. Working with PWM outputs of Arduino.
2. Serial Communication using Arduino.
3. Designing an App with MIT App Inventor.
4. LED blinking Using Raspberry Pi.
5. Interfacing Push Button with Raspberry pi.

6. Build Google Assistant with Raspberry Pi.
7. Create an application using Raspberry Pi/Arduino.

NOTE:

ICA – Internal Continuous Assessment shall support regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skills acquired and the record submitted by the student (journal) based on practical performance by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE – The End Semester Examination (PR) for this laboratory course shall be based on performance in one of the experiments performed by students in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of the institution.

CO311N UI Design using React and Angular

Teaching Scheme :03L + 00T, Total: 03

Credit :03

Evaluation Scheme :10 ISA + 30 MSE + 60 ESE

Total Marks :100

Duration of ESE :03 Hrs

COURSE DESCRIPTION:

This course introduces students to the principles and practices of UI design using two of the most widely used front-end frameworks: React and Angular. The course provides a hands-on approach to building dynamic and responsive user interfaces while focusing on the core concepts of component-based design, state management, and routing. Students will learn to create visually appealing, user-friendly web applications that are both functional and efficient.

DESIRABLE AWARENESS/SKILLS:

Basic knowledge of HTML, CSS, and JavaScript and understanding of the fundamentals of web development and design concepts.

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

5. Explain the core UI/UX principles for web development.
6. Build reusable and scalable UI components using React and Angular and master responsive design techniques to ensure applications work on various screen sizes.
7. Apply responsive design techniques.
8. Apply modern CSS frameworks and component libraries.
9. Develop dynamic, accessible, and user-friendly interfaces.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
2	3	-	-	-	3	-	-	-	-	-	-	-	2	-	-
3	2	-	3	-	3	-	-	-	-	-	-	-	3	2	-
4	3	-	-	-	3	-	-	-	-	-	-	-	3	3	-
5	3	-	-	-	-	2	-	-	-	-	-	-	2	-	-

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENTS:

Introduction to UI Design and Front-End Frameworks:

[7 Hrs]

UI/UX Fundamentals: Basic principles of user interface and user experience design, The importance of usability, accessibility, and performance in design, Key elements of UI design (layouts, typography, color theory, etc.). Overview of Front-End Frameworks: Introduction to React and Angular in the context of UI development, Why use React and Angular for UI design?

Introduction to React for UI Design: [6 Hrs]
React Overview: Setting up a React project using Create React App, React components and JSX, Handling props and state in React components. UI Design with React: Structuring and styling React components, CSS styles, inline styles, and CSS-in-JS (Styled-components), Responsive design with media queries.

Advanced React for UI Design: [5 Hrs]
Handling Events and State Management: Working with user interactions and managing state, Managing component state and lifting state up, React hooks (useState, useEffect, etc.). Component Reusability and Composition: Creating modular and reusable UI components, Breaking down complex interfaces into smaller components, Using props to pass data and interact between components.

React Routing and Navigation: [5 Hrs]
React Router: Setting up React Router for navigating between different views, Creating multiple pages and linking between them, Managing dynamic routes and query parameters. UI Patterns with React: Implementing navigation menus, tabs, and breadcrumbs.

Styling in React with Material UI: [5 Hrs]
Material UI: Introduction to Material UI for building attractive UIs in React, Installing and using Material UI components. Customizing Material UI themes and styling. UI Design with Pre-built Components: Using pre-built components like buttons, dialogs, grids, and forms.

Introduction to Angular for UI Design: [5 Hrs]
Angular Overview: Setting up an Angular project with Angular CLI. Angular components and templates. Binding data and handling events in Angular. UI Design in Angular: Styling Angular components with CSS and Angular Material.

Advanced Angular UI Design: Angular Forms: [4 Hrs]
Working with template-driven and reactive forms in Angular. Handling form validation and submission. Component Styling in Angular: Using Angular's scoped styles and CSS preprocessors (SCSS). Designing reusable UI components in Angular.

Angular Routing and Navigation: [4 Hrs]
Angular Routing: Configuring and using Angular Router for navigation. Lazy loading routes for better performance. Advanced UI Components: Implementing dynamic routes and views. Designing navigation bars, sidebars, and modals.

Styling with Angular Material: [5 Hrs]
Angular Material: Introduction to Angular Material for responsive UI design. Using pre-built Material Design components in Angular apps. Customizing themes and component styling. Responsive Design in Angular: Creating mobile-first layouts using Angular Material Grid system.

Responsive UI Design Principles: [4 Hrs]
Responsive Web Design: Techniques for designing for multiple screen sizes (Mobile-first approach). Using Flexbox, CSS Grid, and media queries. Design breakpoints for mobile, tablet, and desktop views. Advanced Layouts in React and Angular: Using Flexbox and Grid systems in

React and Angular. Implementing responsive navigation bars and footers.

UI/UX Design Patterns:

[4 Hrs]

Design Patterns: Common UI design patterns such as cards, modals, and sidebars. Choosing the right design pattern based on use case. Implementing grids, tables, and lists. UI/UX Best Practices: Creating intuitive user interfaces with clear navigation and interaction flows.

TEXT BOOKS:

1. “Learning React: Functional Web Development with React and Redux”, by Alex Banks & Eve Porcello
2. “React Up and Running: Building Web Applications”, by Stoyan Stefanov
3. “Material-UI Cookbook: Build responsive and customizable user interfaces with Material-UI”, Author: Adam Boduch
4. “Angular: Up and Running: Learning Angular, Step by Step”, by Shyam Seshadri & Brad Green
5. “Pro Angular 9”, by Author: Adam Freeman
6. “Angular Material Design”, by Author: Valeriu Lupu.

CO312N UI Design using React and Angular Lab

Teaching Scheme :02P + 00T, Total: 02

Credit :01

Evaluation Scheme :30 ICA + 20 ESE

Total Marks :50

Duration of ESE :02Hrs

EXPERIMENTS

Minimum 10 experiments (five from group A and five from group B) shall be performed to cover the entire curriculum of course CO312N. The list given below is just a guideline.

COURSE OUTCOMES:

1. Set up development environments and create basic applications in both React and Angular.
2. Build dynamic React applications using components, state, props, and routing.
3. Integrate Material UI components and implement global state management in React.
4. Handle asynchronous data fetching and side effects in React using hooks such as use effect.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
2	3	-	-	-	3	-	-	-	-	-	-	-	2	-	-
3	2	-	3	-	3	-	-	-	-	-	-	-	3	2	-
4	3	-	-	-	3	-	-	-	-	-	-	-	3	3	-

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

GROUP A:

1. Set up development environments for both React and Angular.
2. Create a basic "Hello World" app in both React and Angular.
3. Build a basic React application (e.g., a to-do list).
4. Implement state and props for managing dynamic content.
5. Build a multi-page React app using React Router.
6. Implement Material UI components (e.g., buttons, cards, forms) in React.
7. Implement global state using React Context API.
8. Use useEffect to handle asynchronous data fetching in React.

GROUP B:

1. Create a basic Angular app (e.g., a simple form).
2. Implement data binding and events in Angular.
3. Create a multi-page Angular app with Angular Router.
4. Use Angular Material components (e.g., input fields, buttons, dialogs) in Angular.
5. Build a form with validation in Angular.

6. Use Angular services to fetch and display data from an API.
7. Build a responsive layout using Flexbox and CSS Grid in both React and Angular.
8. Apply mobile-first design principles to enhance the user experience.

NOTE:

ICA – Internal Continuous Assessment shall support regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skills acquired and the record submitted by the student (journal) based on practical performance by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE – The End Semester Examination (PR) for this laboratory course shall be based on performance in one of the experiments performed by students in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of the institution.

CO351N Design and Analysis of Algorithm

Teaching Scheme: 03L+00T Total: 03
Evaluation Scheme: 30 MSE+10 ISA + 60 ESE
Duration of ESE: 03 Hrs.

Credit:03
Total Marks: 100

Teaching Scheme :03L + 00T, Total: 03
Evaluation Scheme :10 ISA + 30 MSE + 60 ESE
Duration of ESE :03 Hrs

Credit :03
Total Marks :100

COURSE DESCRIPTION:

The primary objective of this course is to introduce the concept of algorithm as a precise mathematical concept, and study how to design algorithms, establish their correctness, study their efficiency and memory needs. The course consists of a strong mathematical component in addition to the design of various algorithms.

DESIRABLE AWARENESS/SKILLS:

Programming Language, Discrete Mathematical Structure and Data Structures

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

5. Identify various Time and Space complexities of various algorithms.
6. Implement different performance analysis methods for non deterministic algorithms
7. Choose the best possible model from a set of different algorithms and data
8. Structures so as to minimize the overall cost incurred.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1	2	-	-	-	-	-	1	-	1	1	2	1	1
2	3	2	1	-	1	-	-	-	2	1	1	1	3	1	2
3	2	3	2	-	2	-	-	-	2	-	1	1	2	1	1

1 – Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENTS:

Introduction to Algorithms:

[4 Hrs]

What is an algorithm, performance analysis- space complexity, time complexity, asymptotic notation.

Divide and Conquer:

[10 Hrs]

Introduction, binary search-iterative and recursive, finding the maximum and minimum, merge sort, quick sort, heap sort, radix sort.

Greedy Method:**[10 Hrs]**

Introduction, fractional knapsack problem, minimum cost spanning trees- prim's algorithm, kruskal's algorithm, optimal merge patterns, job sequencing with deadline, single source shortest path.

Dynamic Programming:**[5 Hrs]**

Multistage graphs, all pairs shortest path, single source shortest path, optimal binary search tree, floyd-warshall algorithm.

Backtracking:**[5 Hrs]**

Introduction, the 8 queens problem, sum of subset, graph coloring, hamiltonian cycles.

Branch and bound:**[7 Hrs]**

Traveling salesman problem, Basic Traversal and Search Techniques: binary trees, Binary Search Tree, Display of binary search trees, Graph Searching, NP-hard and NP-complete problems.

TEXT BOOKS:

3. Horowitz, Sahani, Rajasekaran, "Fundamentals of Computer Algorithm", 2nd Edition, Galgotia Publication universities of press. 2008, ISBN: 9788173716126.
4. Coreman, Leiserson, Rivest, Stein, "Introduction to Algorithms", 2nd Edition, PHI,2001, ISBN- 9788120321410.
5. "The art of Computer Programming" by Donal Knuth ISBN-13: 978-0137935109,Publisher: Addison-Wesley / Pearson,Publication Year: 2022–2023.

REFERENCE BOOKS:

5. Aho Ulman, Hopcroft, "Design and Analysis of Algorithms", Pearson Edition, Addison Wesley, 2009, ISBN- 9788131702055.
6. Anay Levitin, "Introduction to design and Analysis of algorithms", 2ns Edition, Pearson Education, 2008, ISBN- 978813118377.
7. R.C.T. Lee, S.S. Tseng, R.C. Chang, "Introduction to the Design and Analysis of Algorithms, A Strategic Approach", TMH, 2005, ISBN- 13: 978-1259025822.

CO352N Software Engineering

Teaching Scheme: 02+00T Total: 02
 Evaluation Scheme: 30 MSE+10 ISA + 60 ESE
 Duration of ESE: 03 Hrs.

Credit:02
 Total Marks: 100

COURSE DESCRIPTION:

This course introduces students to the knowledge of Software Development Life Cycle, Software Engineering Process, Agile development process, SCRUM process, requirement engineering, software design, software testing principles and project planning & management concepts to develop quality software economically, automation and trends in software engineering.

Desirable awareness/skills:

Knowledge of programming languages and data structures.

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Identify unique features of various software application domains and classify software applications.
2. Apply an appropriate lifecycle model of software development.
3. Identify user needs and formulate software specifications.
4. Analyze software requirements by applying various modeling techniques.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO2	1	1	3	1	2	1	1	2	2	1	3	1	2	3	3
CO3	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3
CO4	2	1	3	1	3	2	1	2	2	2	3	1	2	3	3

1-
Weakly
correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENTS:

Introduction to Software Engineering:

[7 Hrs]

The evolving role of software, changing nature of software, software myths. **A Generic view of process:** Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models.

Process models:

[6 Hrs]

The waterfall model, incremental process models, evolutionary process models, the unified process, agile models.

Requirements engineering: [10 Hrs]

Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

System models: Context models, behavioral models, data models, object models, structured methods.

Design Engineering: [8 Hrs]

Design process and design quality, design concepts, the design model.

Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

Testing Strategies: [8 Hrs]

A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

Agile Development Process: [10 Hrs]

Agility, agility and cost of change, agility principles, The Politics of Agile Development, Human Factors. Extreme Programming – XP values, XP process, industrial XP. Other Agile Process Models- Adaptive Software Development (ASD), Scrum, Dynamic Systems Development Method (DSDM), Crystal, Feature Driven Development (FDD), Lean Software Development (LSD), Agile Modelling (AM), Agile Unified Process (AUP).

TEXT BOOKS:

1. Pressman, R, “Software Engineering: A Practitioner's Approach”, 7th or 8th Edition, Singapore: McGraw Hill, 2010, ISBN- 9780071267823
2. Somerville, “Software Engineering”, 9th Edition, New Jersey: Pearson Education, 2010, ISBN- 9788131762165.

REFERENCE BOOKS :

1. Schwaber, K. and Beedle, M., “Agile Software Development with SCRUM” , 1st Edition, New Jersey : Pearson, 2001, ISBN- 9780130676344.
2. Jalote P, “An Integrated Approach to Software Engineering”, 3rd Edition, Narosa Publishing House, 2011, ISBN- 9788173197024.
3. Al, Pragmatic, “Agile Web Development with Rails” Ruby, ISBN- 9789350234303.
4. Object Oriented Modeling and Design with UML, 2e by RUMBAUGH / BLAHA.

CO353N Compiler Construction

Teaching Scheme: 02+00T Total: 02
Evaluation Scheme: 30 MSE+10 ISA + 60 ESE
Duration of ESE: 03 Hrs.

Credit:02
Total Marks: 100

COURSE DESCRIPTION:

This course gives the introduction to system programming and compiler construction. It also gives the knowledge of the role of a lexical analyzer, specification of tokens, recognition of tokens, Lexical analyzer generator LEX, role of parser, context free grammars, eliminating ambiguity, eliminating left recursion, Top-Down parser. This course also gives the idea about Syntax Directed Translation and Intermediate Code Generation using different techniques such as DAG, Three address codes, etc. At the end this course gives the information about the runtime environment and issues in code generation.

Desirable awareness/skills:

Discrete Structure and Graph Theory, Theory of Computation

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Assess the functionalities & components of system software & tools into different layers for efficient code generation.
2. Revise the knowledge & technique to develop solutions to real world problems by compiling application programs.
3. Evaluate computer engineering problems with proper systematic & semantic approach

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	3	-	-	-	1	-	-	-	2	-	3	2	1
2	-	-	-	-	3	-	1	1	2	-	-	-	2	-	1
3	1	2	-	-	2	1	-	-	2	-	-	-	2	2	1

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENTS:

Introduction:

[7 Hrs]

Introduction to compiler, translators, interpreter, single and multi-pass compilers, phases of compilers, compiler construction tools, cross compilers

Lexical Analyzer:

[8 Hrs]

Role of lexical analyzer, specification of tokens, recognition of tokens, regular expression, tool for lexical analyzer LEX.

Syntax Analysis and Parsing Techniques:

[10 Hrs]

Introduction to parsing techniques, bottom-up parsing and top down parsing. top down parsing , recursive descent parsing, predictive parsing ,bottom up parsing : operator precedence parsing, LR parsers, construction of SLR, canonical LR and LALR parsing tables, construction of SLR parse tables for ambiguous grammar, the parser generator tools – YACC, error recovery in top down and bottom up parsing.

Syntax Directed Translation & Intermediate Code Generation:**[9 Hrs]**

Syntax directed definitions, synthesized and inherited attributes, dependency graph, construction of syntax trees, bottom up and top down evaluation of attributes, s-attributed and l-attributed definitions, postfix notation, three address codes, quadruples, triples and indirect triples, translation of assignment statements, control flow, boolean expression, case statements and procedure calls.

Type Checking and Runtime Environments:**[8 Hrs]**

Introduction, simple type checker, type conversions, overloading of functions and operators, source language issues, storage organization, storage allocation strategies, parameter passing, symbol tables, dynamic storage allocation techniques

Code Optimization & Code Generation:**[9 Hrs]**

Basic blocks and flow graphs, optimization of basic blocks, loop optimization, global data flow analysis, loop invariant computations, DAG representation of basic blocks, peephole optimization, issue in the design of code generator, register allocation, the target machine, and simple code generator.

TEXT BOOKS:

1. Compilers-Principles, Techniques and Tools, Alfred V. Aho, Ravi Sethi and Ullman J.D., Addison Wesley.
2. Principle of Compiler Design, Alfred V. Aho, and J.D. Ullman, Narosa Publication.
3. K C. Louden —Compiler Construction—Principles and Practice|| India Edition, CENGAGE

REFERENCE BOOKS:

1. Compiler design in C, A.C. Holub, PHI. ISBN 0-13-155045-4
2. Compiler construction (Theory and Practice), A.Barrett William and R.M. Bates, Galgotia Publication. ISBN 0-574-21335-X
3. D. M. Dhamdhare, Compiler Construction—Principles and Practice, (2/e), Macmillan India ISBN 0534939724

CO355NA Cloud Computing

Teaching Scheme: 03+00T Total: 03

Credit:03

Evaluation Scheme: 30 MSE+10 ISA + 60 ESE

Total Marks: 100

Duration of ESE: 03 Hrs.

COURSE DESCRIPTION:

This course introduces cloud computing concepts, including service and deployment models, virtualization, and cloud storage. It covers containerization with Docker and Kubernetes, along with resource management techniques. Students will explore serverless computing and cloud security best practices, including IAM and compliance regulations.

Desirable awareness/skills:

Basic understanding of networking, operating systems, and software development.

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Understand the fundamental concepts and models of cloud computing
2. Explore virtualization and cloud resource management techniques
3. Apply cloud storage, database, and containerization technologies
4. Analyze cloud security challenges and best practices

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	1		1							1	2	2	-
2	2	2	2									1	2	2	
3	2	1	2		2								2	2	
4	1	1	2					1				1	1	1	2

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENTS:

Introduction: Definitions and Key characteristics of cloud computing, Distributed computing, Grid computing, Evolution of Cloud Computing, Cloud Service Models: IaaS, PaaS, SaaS, Serverless computing, FaaS, Advantage and challenges of each model. Cloud Deployment Models: Private, Public, Hybrid, Multi Cloud, Overview of Cloud Providers (AWS, Microsoft Azure, Google Cloud), Application of cloud computing

Virtualization: Need of Virtualization, Types of virtualization, Hypervisors (Type-1 and Type-2), Case study: Xen Hypervisor, Hardware assistance at hardware level, Case Study: Intel VT-x, AMD-V technologies, Paravirtualization, Containerization, KVM, Case study: AWS virtualization, Load balancing, algorithms for load balancing, resource management.

Cloud Storage systems: Cloud Storage Models: Block Storage, Object Storage, File Storage, Cloud Storage Architectures: Amazon S3, Google Cloud Storage, Amazon Elastic Block Store, Google Cloud Filestore, Google Cloud Persistent Disks, Ceph unified storage system, Data Replication and Consistency, Backup and recovery in Cloud Storage

Cloud Database and warehouse services: Introduction to GCP: Bigtable, Cloud SQL, AWS: RDS, Aurora, Dynamodb, Bigquery, Amazon Redshift, Amazon EMR, Amazon Glue, Amazon Kinesis

Docker and Kubernetes: What is container? **Namespaces in Cloud Environments**, Docker Architecture (Docker Engine, Client, Daemon, Registry), Basic Docker Commands (run, ps, stop, rm, exec), Pulling and Running Images. Creating Custom Images (Dockerfile), Managing Volumes and Persistent Storage, Networking in Docker, Running a simple containerized application, Writing and building a Dockerfile, Kubernetes: Introduction, Key Components: Nodes, Pods, Deployments, Services, Kubernetes Architecture (Master Node, Worker Nodes), kubectl: Basic Commands, Managing Pods and Services

Serverless computing: AWS Lambda, AWS Fargate, GCP App engine, GCP Cloud run

Cloud Security: Cloud Security Challenges & Threats, Identity and Access Management (IAM), Data Security in the Cloud, Compliance & Legal Considerations (GDPR, HIPAA, ISO 27001), Cloud Security Best Practices

TEXT BOOKS:

1. Cloud Computing: Principles and Paradigms – Rajkumar Buyya, James Broberg, Andrzej Goscinski

REFERENCE BOOKS:

1. Cloud Computing: Principles, Systems, and Applications-Lizhe Wang, Liusheng Huang, and Song Wu ISBN 9781439856413
2. Mastering Cloud Computing – Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi ISBN: 9332900949
3. Cloud Computing Bible – Barrie Sosinsky ISBN: 9780470903568
4. Architecting the Cloud – Michael J. Kavis
5. Docker Deep Dive – Nigel Poulton
6. Docker in Action (2nd Edition) – Jeff Nickoloff & Stephen Kuenzli
7. Kubernetes Up & Running (3rd Edition) – Kelsey Hightower, Brendan Burns, Joe Beda
8. The Kubernetes Book – Nigel Poulton

CO355NB Professional Ethics and Cyber Security

Teaching Scheme: 03+00T Total: 03

Credit:03

Evaluation Scheme: 30 MSE+10 ISA + 60 ESE

Total Marks: 100

Duration of ESE: 03 Hrs.

COURSE DESCRIPTION:

This course introduces fundamental concepts of computer ethics. It will examine the ethical issues that arise as a result of increasing use of computers, and the responsibilities of those who work with computers, either as computer science professionals or end users. It will summarize Cyber Crimes and its associated investigation and forensics with relation to Cyber law. Students will have a new dimension to look towards their day to day computer activities with security concepts.

Desirable awareness/skills:

Learn the basics of IT Security, Ethical Hacking and its various concepts.

COURSE OUTCOMES:

1. Explain professional ethics to solve ethical dilemmas & identify their professional responsibilities.
2. Evaluate the impact of globalization on ethical decision making.
3. Comprehend various cyber crimes and cyber attacks responses.
4. Use various network defense tools and perform vulnerability assessments

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

1- CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO 2	1	1	3	1	2	1	1	2	2	1	3	1	2	3	3
CO 3	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3
CO 4	2	1	3	1	3	2	1	2	2	2	3	1	2	3	3

Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

Course Contents:

Engineering Ethics:

[8 Hrs]

Introduction, history of ethics, engineering ethics, purpose, professional and professionalism, use of ethical theories, professional ethics, Engineering as social experimentation-Engineering responsibilities, learning from past, code of ethics, the challenger, safety responsibilities and rights-assessment of safety and risks, knowledge of risk, safety and risk analysis, ethics and risk management, reducing risk, professional rights, employee rights, engineer responsibility.

The principle of global Ethics:**[7 Hrs]**

Introduction, ethical problems its issues, consulting engineers, engineers as managers, engineering role and responsibilities IEEE, ASME, ASCE, multinational co-operations, computer Ethics, True Professionalism-Introduction, professionalism, Case study-Ethics in technical presentation BART

Introduction to Cybercrime:**[8 Hrs]**

Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cyber Crimes: E-Mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/Salami Technique, Data Diddling, Forgery, Web Jacking, Newsgroup Spam/Crimes Emanating from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses, Software Piracy, Computer Sabotage, E-Mail Bombing/Mail Bombs, Usenet Newsgroup as the Source of Cybercrimes Computer Network Intrusions, Password Sniffing, Credit Card Frauds, Identity Theft, ITA 2000.

Introduction to Cyber Crime Investigation:**[7 Hrs]**

Firewalls and Packet Filters, Password Cracking, Keyloggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks .

Systems Vulnerability Scanning:**[8 Hrs]**

Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Nmap, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpcap and Windump, Wireshark, Ettercap, Hping Kismet

Network Defense tools: Firewalls and Packet Filters:**[5 Hrs]**

Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System

Text Books:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Publication Wiley.
2. Mike Shema, Anti-Hacker Tool Kit (Indian Edition), Publication McGraw Hill.
3. Hamid Nemati, Information Security and Ethics: Concepts, Methodologies, tools and application, 2007

Reference Books:

1. Mike Shema” Anti-Hacker Tool Kit” (Indian Edition), Publication McGraw Hill. ISBN9789339212155
2. Nina Godbole and Sunit Belpure”Cyber Security :Understanding Cyber Crimes Computer Forensics and Legal Perspectives”, Publication Wiley ISBN 10-8126521791

CO356NA Artificial Intelligence and Machine Learning

Teaching Scheme: 03+00T Total: 03

Credit:03

Evaluation Scheme: 30 MSE+10 ISA + 60 ESE

Total Marks: 100

Duration of ESE: 03 Hrs.

COURSE DESCRIPTION:

This course aims to introduce the fundamental concepts of artificial intelligence (AI) to individuals from all academic backgrounds. It aims to equip students with the knowledge and skills to develop intelligent systems and solve complex problems using data-driven approaches.

Desirable awareness/skills:

fundamental concepts of artificial intelligence

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Formulate algorithms for solving AI and ML Applications
2. Inculcate and apply Decision Trees and Artificial Neural Networks
3. Choose most appropriate Bayesian Learning Method
4. Inculcate and apply Instance-Based Learning
5. Inculcate and apply Reinforcement Learning

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO 2	1	1	3	1	2	1	1	2	2	1	3	1	2	3	3
CO 3	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3
CO 4	2	1	3	1	3	2	1	2	2	2	3	1	2	3	3

1-

Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENTS:

Introduction to Artificial Intelligence

[7 Hrs]

What is Artificial Intelligence (AI) ? Turing test, Foundations of AI, History of AI, State of the art, Intelligent agent and environment, Good behaviour, Nature of environment, structure of agent, problem solving by searching, uninformed search, informed search, heuristic search.

Introduction to Machine Learning and Concept learning [10 Hrs]

What is Machine Learning (ML)?, types of ML, Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning

Concept learning: Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm,

Decision Tree and Artificial Neural Networks [7 Hrs]

Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning

Artificial Neural Networks: [6 Hrs]

Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, An illustrative example face recognition.

Bayesian learning [6 Hrs]

Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypothesis for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm

Instance-Based and Reinforcement Learning [10 Hrs]

Instance-Based Learning: Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning

Reinforcement Learning: Introduction, the Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming

TEXT BOOKS:

1. Stuart J. Russell and Peter Norvig, “Artificial Intelligence A Modern Approach” Prentice Hall imprints of Pearson, Third Edition
2. Tom M. Mitchell, “Machine Learning”, - MGH
3. Stephen Marsland, “Taylor & Francis, Machine Learning: An Algorithmic Perspective”

REFERENCE BOOKS:

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

CO356NB Software Metrics and Quality Assurance

Teaching Scheme: 03+00T Total: 03

Credit:03

Evaluation Scheme: 30 MSE+10 ISA + 60 ESE

Total Marks: 100

Duration of ESE: 03 Hrs.

COURSE DESCRIPTION:

This course introduces the students about the concepts of software measurement and metrics. It includes scope of software metrics, internal product attributes, and external product attributes Software quality and quality assurance techniques. This course also describes cost estimation, documentation and testing tools, etc.

Desirable awareness/skills:Software Engineering

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to

1. Explain the basics of software measurement.
2. Evaluate cost estimation of software.
3. Explain different quality assurance techniques for software.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO 2	1	1	3	1	2	1	1	2	2	1	3	1	2	3	3
CO 3	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3

1-

Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENTS:

Introduction to Software Measurement:

[9 Hrs]

measurement in everyday life, measurement in Software Engineering, the scope of software metrics, the representational theory of measurement, measurement and Models, measurement scales and scales types, meaningfulness in measurement, classifying software measures and determining what to measure.

Measuring internal product attributes:

[8 Hrs]

measuring internal product attributes: size, aspects of software size, length & reuse, functionality & complexity, measuring internal product attributes: Structure, types of structural measures - control flow structures, modularity and information flow attributes & data structures, difficulties with general complexity measures.

Measuring external product attributes:**[7 Hrs]**

software quality - modelling software quality & measuring aspects of quality, software reliability:basics of reliability theory, the software reliability problem, parametric reliability growth models, predictive accuracy, the importance of the operational environment

Cost estimation & Documentation:**[7 Hrs]**

making Process Predictions - Good Estimates,cost estimation Problems and approaches,models of Effort and cost,software Documentation

Quality Assurance Techniques:**[7 Hrs]**

quality assurance techniques- testing principles, goals, testing life cycle, phases of testing manual testing- test case design criteria, automated testing introduction of testing tools- Jmeter, Win Runner, QTP, selenium etc..ISO-9000 model, SEI's CMM Model, comparison of the ISO-9000 model with SEI's CMM model.

TEXT BOOKS:

1. Flanton, Pfleeger, Software Metrics- A Rigorous and Practical Approach Thompson Learning.
2. Mordechai Ben-menachem/Garry S.Marliss, Software Quality , Thompson Learning.
3. Software Testing, Second Edition By: Ron Patton,Pearson Education ISBN -13: 978-0-672 32798-8.

REFERENCE BOOKS:

1. Roger S. Pressman, Software Engineering- A Practitioner's Approach, TMH. ISBN: 9781259872976
2. Paul C. Jorgensen, "Software Testing", IVth Edition, O'REILLY. ISBN 978-1-4665-6069-7

CO357N Design and Analysis of Algorithm Lab

Teaching Scheme: 02P + 00T, Total: 02

Credit:01

Evaluation Scheme: 30ICA + 20 ESE

Total Marks: 50

Duration of ESE: 02 Hrs

Minimum 10 experiments (five from Group A and five from Group B) shall be performed to cover the entire curriculum of course CO351N. The list given below is just a guideline. All assignments are to be implemented using open source technology (preferably).

COURSE OUTCOME:-

CO1: Implement and analyze linear and binary search using iterative and recursive methods.

CO2: Design and implement divide-and-conquer algorithms like Merge Sort and Quick Sort and evaluate their performance.

CO3: Apply the greedy method to solve optimization problems such as the fractional knapsack and justify the approach.

CO4: Develop and implement algorithms to find a minimum cost spanning tree using Prim's or Kruskal's algorithm.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	-	-	-	-	-	-	-	-	2	2	-	1	-	-
2	3	-	-	-	3	-	2	2	2	3	3	-	2	-	-
3	2	-	3	-	3	-	3	3	3	3	3	-	3	2	-
4	3	-	-	-	3	-	3	3	3	-	-	-	3	3	-

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Group A

1. Implementation and Time analysis of linear and binary search algorithms using recursive and iterative methods.
2. Implement any algorithms using divide and conquer approach (merge sort, quick sort).
3. Write a program to solve fractional knapsack problem using greedy method
4. Implement a minimum cost spanning tree for a given undirected graph using Prim's algorithm or Kruskal's algorithm
5. Write a program to find a single source shortest path for a multistage graph problem using dynamic programming .

6. Implement a programme using Depth first Search technique to Check whether a graph is connected.
7. Implement N-Queens problem using backtracking.

Group B

1. Implement Min-max algorithm using Divide and conquer approach.
2. Apply Heap sort technique on a given set of elements.
3. Write a program to find shortest paths to other vertices using Dijkstra's algorithm.
4. Apply Greedy method to compress the given data using Huffman encoding.
5. Apply dynamic programming methodology to implement 0/1 Knapsack problem.
6. Apply dynamic programming methodology to find all pairs shortest path of a directed graph using Floyd's algorithm.
7. Print all the nodes reachable from a given starting node in a digraph using Breadth first search technique
8. Write a program to solve the Traveling Salesman problem.

TEXT BOOKS:

1. Alan Cooper, Robert Reimann, David Cronin, "Fundamental of Computer Algorithm" by Horowitz, Sahani, Rajasekaran, Galgotia publication.
2. Coreman, Leiserson, Rivest, "Introduction to Algorithms", Stein, 2nd Edition, PHI, 2001, ISBN- 9788120321410

REFERENCE BOOKS:

1. Aho Ulman, Hopcroft, "Design and Analysis of Algorithms", Pearson Edition, Addison Wesley, 2009, ISBN- 9788131702055.
2. by Anay Levitin, "Introduction to design and Analysis of algorithms", 2nd Edition, Pearson Education, 2008, ISBN- 978813118377.
3. R.C.T. Lee, S.S. Teseng, R.C. Chang, "Introduction to the Design and Analysis of Algorithms, A Strategic Approach", TMH, 2005, ISBN- 13: 978-1259025822.

NOTE:

ICA – Internal Continuous Assessment shall support regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by the student (journal) based on practical performance by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE – The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CO358N Compiler Construction Lab

Teaching Scheme: 02P + 00T, Total: 02

Evaluation Scheme: 30ICA + 20 ESE

Duration of ESE: 02 Hrs

Credit:01

Total Marks: 50

Course Description: Minimum 10 experiments (five from group A and five from group B) shall be performed to cover the entire curriculum of course CO401U. The list given below is just a guideline. All assignments are to be implemented using open source technology (preferably). Every assignment should include use of syntax, use of command/function used for coding and printout of code with proper comment and output.

COURSE OUTCOME:-

CO1: Design and implement a lexical analyzer for a given language that efficiently handles redundant spaces, tabs, and newlines.

CO2: Develop programs to identify comments and to recognize strings belonging to regular expressions such as a^* , a^*b^+ , and abb .

CO3: Simulate a lexical analyzer capable of validating and classifying operators in a given source program.

CO4: Construct and analyze FIRST and FOLLOW sets of a grammar and implement LL(1) parsing techniques.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	-	-	-	-	-	-	-	-	2	2	-	1	-	-
2	3	-	-	-	3	-	2	2	2	3	3	-	2	-	-
3	2	-	3	-	3	-	3	3	3	3	3	-	3	2	-
4	3	-	-	-	3	-	3	3	3	-	-	-	3	3	-

1-

Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Group A

1. Design a lexical analyzer for a given language and the lexical analyzer should ignore redundant spaces, tabs and newlines.
2. Write a program to identify whether a given line is a comment or not.
3. Write a program to recognize strings under ' a^* ', ' a^*b^+ ', ' abb '.
4. Write a program to simulate lexical analyzer for validating operators.

5. Simulate First and Follow of a Grammar.
6. Write a program for constructing LL (1) parsing.
7. Write a program to Design LALR Bottom up Parser.

Group B

1. Write a program to implement operator precedence parsing
2. Design of a Predictive parser of given language
3. Write a program to generate machine code from abstract syntax tree generated by the parser
4. Write a program to check whether a string belongs to a grammar or not
5. Implement Deterministic Finite Automata
6. Implementation of shift reduce parsing algorithm

NOTE:

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ESE – The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CO359N Software Lab-III

Teaching Scheme: 02P + 00T, Total: 02

Evaluation Scheme: 30ICA + 20 ESE

Duration of ESE: 02 Hrs

Credit:01

Total Marks: 50

Minimum 10 experiments (five from group A and five from group B) shall be performed to equip learners with the skills to build interactive and dynamic user interfaces using the React JavaScript library, covering fundamental concepts, component-based architecture, and advanced techniques for creating efficient web applications. The list given below is just a guideline. All assignments are to be implemented using open source technology (preferably). Every assignment should include use of syntax, use of command/function used for coding and printout of code with proper comment and output.

COURSE OUTCOME:-

CO1: Developing dynamic and interactive user interfaces by creating and managing reusable React components.

CO2: Implementing event handling and form management to enable user interaction within React applications.

CO3: Utilizing React Router or similar libraries to manage client-side routing and navigation within single-page applications.

CO4: Gaining practical experience by building real-world React projects, often including features like user authentication, data display, interactive elements and deploying React applications

CO5: Familiarity with concepts related to database interaction, including data modeling, CRUD operations (Create, Read, Update, Delete), and data validation.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

C O	PO													PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	13	1	2	3
1	3	3	-	-	-	-	-	-	-	-	-	-	-	3	2	1
2	-	-	3	3	-	3	-	-	-	-	-	-	-	3	3	2
3	-	-	-	-	3	-	-	-	-	-	-	-	3	2	1	3
4	-	-	-	-	-	-	3	-	3	3	-	3	-	3	2	1
5	-	-	-	-	-	-	-	3	-	-	3	-	-	3	1	2

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

Group A

1. Installation of react js framework. Create a react project using command line utility create-react-app. Create a simple hello world page using react.
2. Implement a simple hello world component using react.
3. Implement a counter that can be increased or decreased by clicking buttons.
4. Build a simple form where users can input their name and email, with basic validation.
5. Create a simple to-do list where users can add tasks.
6. Create a component that conditionally renders content based on a boolean value.

Group B

1. Implement react application for User List management with support for only Search and Pagination. Note: Assume 5 User information per page with a button to navigate through pages.
2. Develop an authentication and authorization application using react, express js and mysql as a database.
3. File Uploader: Develop a file uploader component that allows users to upload images only.
4. Create a simple shopping cart that allows users to add and remove items.(use hard coded data, each with a name and price)
5. Create a contact list that can be searched by name. Use a mysql database and create table contacts for maintaining data.
6. Timer: Create a timer that counts down from a specified time.
7. Create a simple multi-page website with React Router.

TEXT BOOKS:

1. React in Action by Mark Thomas: ISBN-13: 978-1617294905
2. React: Up & Running by Michael Jackson: ISBN-13: 978-1617294905
3. Learning React: Functional Web Development with React and Redux by Brad Dayley: ISBN-13: 978-1617294905
4. React. Js Book: Learning React JavaScript Library from Scratch by Alex Banks: ISBN-13: 978-1617294905
5. Learning React: A Hands-On Guide to Building Web Applications Using React and Redux by Kirupa Chinnathambi :ISBN-13 978-0134843551

NOTE:

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ESE – The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CO360NA Cloud Computing Lab

Teaching Scheme: 02P + 00T, Total: 02

Evaluation Scheme: 30ICA + 20 ESE

Duration of ESE: 02 Hrs

Credit:01

Total Marks: 50

Course Description: Minimum 10 experiments (five from group A and five from group B) shall be performed to cover the entire curriculum of course CO355NA. The list given below is just a guideline. All assignments are to be implemented using open source technology (preferably). Every assignment should include use of syntax, use of command/function used for coding and printout of code with proper comment and output.

Group A

1. Develop a news feed application using django/php laravel/spring boot which supports signup, login and posting news feed .
2. Launch cloud instance on AWS/GCP and install apache/nginx, mysql. Also add inbound and outbound rules so that apache/nginx default page becomes accessible to the outside world.
3. Deploy application developed in assignment no 1 on instance launched in assignment no 2.
4. Launch simple hello world application using GCP app engine.
5. Launch hello world application using AWS Lambda.
6. Create S3 bucket and push objects to bucket using python api.
7. Create IAM users and assign roles in AWS IAM or GCP IAM.

Group B

1. Create an AWS Lambda function using Python which inserts data to dynamodb.
2. Deploy a MySQL database using AWS RDS or GCP Cloud SQL. Create tables, insert data, and run basic SQL queries.
3. Load a sample dataset into Amazon Redshift or BigQuery.
4. Write a Dockerfile to containerize a Python Flask application
5. Set up Minikube on local machines
6. Deploy post api using API gateway and integrate it with lambda function written in python.
7. Containerize a Node.js app and deploy it using Cloud Run.

NOTE:

ICA – Internal Continuous Assessment shall support regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by the student (journal) based on practical performance by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE – The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CO360NB Professional Ethics and Cyber Security Lab

Teaching Scheme: 02P + 00T, Total: 02

Credit:01

Evaluation Scheme: 30ICA + 20 ESE

Total Marks: 50

Duration of ESE: 02 Hrs

Minimum 10 experiments (Five from group A and Five from group B) shall be performed to cover the entire curriculum of course CO355NB. The list given below is just a guideline. All assignments are to be implemented using open source technology (preferably). Every assignment should include use of syntax, use of command/function used for coding and printout of code with proper comment and output.

COURSE OUTCOME:-

CO1: Apply **ethical decision-making models** to evaluate and address security issues in practical scenarios as per assessment criteria.

CO2: Demonstrate the ability to create **strong passwords** and analyze **password-cracking techniques** for mobile and computer systems.

CO3: Perform **wireless network security testing** by cracking WEP/WPA keys and decoding stored wireless passwords on Windows systems.

CO4: Analyze **email spoofing techniques** and implement detection/prevention measures using the latest security tools.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO2	1	1	3	1	2	1	1	2	2	1	3	1	2	3	3
CO3	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3
CO4	2	1	3	1	3	2	1	2	2	2	3	1	2	3	3

Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

Group A

1. Practical Ethical decision making model as per the assessment criteria.

2. Perform “How to make strong passwords” and “passwords cracking techniques” for mobile/computer systems.
3. Perform Cracking Wireless network WEP/WPA keys and decoding Wireless network passwords stored in Windows.
4. To study Email spoofing.Detect/prevent spoofing using the latest security tools.
5. To study on Windows Firewall:System Defence System.
6. Implement online fraud/vulnerability scanning tools.

Group B

1. Practical Identification of SQL Injection Vulnerabilities.
2. Steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome)
3. Perform an experiment for port scanning with NMAP,SUPERSCAN or any other software.
4. TCP / UDP connectivity using Netcat .
5. Network vulnerability using OpenVAS.
6. Study of Federated Data types such as JSON and Pickle.
7. Practical for XSS using DVWA

TEXT BOOK:

1. Mike Shema, “Anti-Hacker Tool Kit (Indian Edition)”, Publication McGraw Hill.
2. Nina Godbole and Sunit Belpure, “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Publication Wiley.

REFERENCE BOOKS:

1. Mike Shema” Anti-Hacker Tool Kit” (Indian Edition), Publication McGraw Hill.
ISBN9789339212155
2. Nina Godbole and Sunit Belpure”Cyber Security :Understanding Cyber Crimes Computer Forensics and Legal Perspectives”, Publication Wiley ISBN 10-8126521791

NOTE:

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skills acquired and recorded by a student (journal) based on practical performance by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S10)

CO361NA Artificial Intelligence and Machine Learning Lab

Teaching Scheme: 02P + 00T, Total: 02

Credit:01

Evaluation Scheme: 30ICA + 20 ESE

Total Marks: 50

Duration of ESE: 02 Hrs

Minimum nine experiments (five from Group A and four from Group B) shall be performed to cover the entire curriculum of the course CO356NA. The list given below is just a guideline. All assignments are to be implemented using open source technology (preferably). Group A assignment should include documentation and group B use of command/function used for coding and printout of code with proper comment and output. Use of Open source tools/ technology is recommended for laboratory assignments.

COURSE OUTCOME:-

CO1: Apply and analyze different machine learning algorithms to solve real-world problems.

CO2: Implement the Candidate-Elimination algorithm to determine all hypotheses consistent with given training examples.

CO3: Design and implement an Artificial Neural Network using the Backpropagation algorithm for given datasets.

CO4: Implement a Naïve Bayes classifier, evaluate its accuracy on training and test datasets, and perform text preprocessing for document classification.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO2	1	1	3	1	2	1	1	2	2	1	3	1	2	3	3
CO3	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3
CO4	2	1	3	1	3	2	1	2	2	2	3	1	2	3	3

1-

Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

Group A

The programs can be implemented in either JAVA or Python.

1. Study on machine learning with various learning algorithms.

2. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
3. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
4. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample
5. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
6. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
7. Implementation of Text Preprocessing Pipeline

Group B

1. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
2. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using the standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
3. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using the k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
4. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
5. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data sets for your experiment and draw graphs.
6. Implementation of Chatbot using Rule-Based or ML Techniques.
7. Case study: Real world case study on the latest computer application using machine learning with python.

TEXT BOOKS:

1. Tom M. Mitchell, Machine Learning, - MGH
2. Stephen Marsland, Taylor & Francis (CRC), Machine Learning: An Algorithmic Perspective.

REFERENCE BOOKS :

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

4. Peter Flach, Machine Learning, Cambridge

NOTE:

ICA – Internal Continuous Assessment shall support regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by the student (journal) based on practical performance by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE – The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CO361NB Software Metrics and Quality Assurance Lab

Teaching Scheme: 02P + 00T, Total: 02

Credit:01

Evaluation Scheme: 30ICA + 20 ESE

Total Marks: 50

Duration of ESE: 02 Hrs

COURSE DESCRIPTION:

Minimum Ten experiments (five from Group A and five from Group B) shall be performed to cover the entire curriculum of course CO356NB. The list given below is just a guideline. All assignments are to be implemented using open source technology (preferably). Every assignment should include use of syntax, use of command/function used for coding and printout of code with proper comment and output. Use of Open source tools/ technology is recommended for laboratory assignments

Group A

1. Write a program to calculate length of a program using Halstead's metrics.
2. Program for finding Length of program.
3. Implementation of program for finding Length of program using Lines of Code.
4. Write a program to calculate Function Points (FP) based on the Albrecht Function Point Analysis method
5. Write a program to calculate Effort, Development Time, and Average Staff Required using the Basic COCOMO (Constructive Cost Model) for software project estimation.
6. Create a test plan document for any application.

Group B

1. Study of any testing tool.
2. Study of any web testing tool.
3. Study of any test management tool. Schedule estimation using Gantt chart.
4. Write a program in c for calculate object point, new object point and effort for COCOMO II
5. Write a program to calculate Feature Points (FP) based on various components such as the number of inputs, outputs, inquiries, files, interfaces, and algorithmic complexity
6. Write a program to calculate effort, development time for intermediate COCOMO.
7. Write a program to calculate the Cyclomatic Complexity of a given control flow graph or source code.

NOTE:

ICA – Internal Continuous Assessment shall support regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by the student (journal) based on practical performance by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE – The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CO362N-Mini Project

Teaching Scheme: 04P + 00T, Total: 04

Credit:02

Evaluation Scheme: 30ICA + 20 ESE

Total Marks: 50

Duration of ESE: 02 Hrs

COURSE DESCRIPTION:

This course provides students with an opportunity to apply their technical knowledge and problem-solving skills to solve real-world problems. The course also helps students to develop essential professional and leadership skills while collaborating efficiently in a team environment

Desirable awareness/skills:

Knowledge of concepts, principles and techniques studied in all earlier courses.

COURSE OUTCOMES:

On the successful completion of this course student shall be able to

1. Identify problem statements for mini project.
2. Utilize appropriate tools, technologies and methodologies.
3. Develop functional prototype or software application based on project objectives.
4. Prepare technical documentations and project reports.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
1	-	-	-	-	-	-	-	-	1	1	-	-
2	-	3	-	-	-	-	-	-	-	-	-	-
3	3	2	-	-	2	-	-	-	-	-	1	-
4	2	-	3	-	3	-	-	-	-	-	-	-
5	2	-	-	-	-	1	1	-	-	-	-	3

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT:

1. Every student shall undertake the Mini Project
2. Each student shall work on an approved project, a group of 04 students (maximum) shall be allotted for each mini project.
3. Mini projects may involve design or investigation of a technical problem (industrial/ domestic/social)that may take design, experimental or analytical character or combined elements of

these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of design and analysis.

4. Each student is required to maintain a separate logbook for documenting various activities of mini projects.

5. Before the end of semester, student shall deliver a presentation and submit the mini project report (paper bound copy) in following format:

a. Size of report shall be of justified size.

a. Students should preferably refer to at least five reference books/ magazines/standard research papers.

b. Format of report

- i. Introduction.
- ii. Literature survey.
- iii. Design and Implementation
- iv. Results and Discussion
- v. Conclusion.
- vi. Future scope.
- vii. References

Use of Open source tools/ technology is recommended.

Assessment of Mini Project(ICA)

Name of the Project:

_____ **Name of**
the Guide: _____

Table-A

Sr. No.	PRN	Name of Project	Design	Hardware/ programming	Result Verification	Demonstration and Presentation	Total
			10M	05M	05M	10M	30

NOTE:

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Assessment of Mini Project shall be done as per **Table-A**.

ESE:

The End Semester Examination(PRESE) for this course shall be based on demonstration of the system or sub system developed by **the group of students**, deliverables of mini project and depth of

understanding. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CO363N- Hon III Full Stack Development using Java

Teaching Scheme: 03L + 00T, Total: 03

Credit:03

Evaluation Scheme: 30 MSE + 10 ISA+60 ESE

Total Marks: 100

Duration of ESE: 03 Hrs

COURSE DESCRIPTION:

This course provides an in-depth understanding and practical skills for designing and developing robust, scalable, and secure full-stack web applications using the Java ecosystem. Students will learn to develop server-side applications using **Core Java**, **Spring Framework**, **Spring Boot**, and **Hibernate/JPA** for backend development, and integrate them with dynamic and responsive front-end applications built with **HTML5**, **CSS3**, **JavaScript**, and modern front-end frameworks such as **Angular** or **React**.

Desirable awareness/skills:

Learn the basics of OOP principles, exception handling, collections, threads.

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Apply core and advanced Java programming concepts to build robust and reusable server-side modules.
2. Develop and consume RESTful web services using Spring Boot for building scalable back-end applications.
3. Design and manage database operations using JDBC and Hibernate/JPA, including CRUD functionalities and transaction handling.
4. Create responsive and dynamic front-end user interfaces using HTML5, CSS3, JavaScript, and modern JavaScript frameworks (e.g., Angular or React).

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO 2	1	1	3	1	2	1	1	2	2	1	3	1	2	3	3
CO 3	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3

C O 4	2	1	3	1	3	2	1	2	2	2	3	1	2	3	3
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1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENTS:

Core and Advanced Java Review:

[9 Hrs]

Object-Oriented Programming (OOP) principles: inheritance, polymorphism, encapsulation, Exception handling, multi-threading, collections framework, Input/output streams and file handling, JDBC: database connectivity and operations, Java networking basics (sockets, HTTP requests).

Back-End Development with Spring Framework:

[10 Hrs]

Introduction to Spring Framework and its architecture, Spring Core: IoC, Dependency Injection, Spring MVC: controllers, request mapping, form handling, Spring Boot: configuration, auto-configuration, starter projects, RESTful web services: creating, testing, and consuming APIs, Data persistence: Spring Data JPA, Hibernate ORM, CRUD operations.

Front-End Web Development:

[9 Hrs]

HTML5 structure and semantic tags, CSS3 styling: selectors, layout, responsive design (Bootstrap), JavaScript fundamentals: syntax, DOM manipulation, event handling, Introduction to modern JS frameworks: Angular or React.

Integration and Security:

[8 Hrs]

Connecting front-end to back-end via REST APIs, JSON data exchange, Authentication and Authorization using Spring Security, JWT (JSON Web Token) implementation, Cross-Origin Resource Sharing (CORS).

DevOps and Deployment:

[10 Hrs]

Version control using Git and GitHub, Build tools: Maven or Gradle basics, Testing: JUnit, Mockito for unit and integration testing, Introduction to containerization: Docker, Basics of CI/CD pipelines, Deploying full-stack applications to local servers or cloud (Heroku, AWS, or similar).

TEXT BOOKS:

1. Java Programming Java: The Complete Reference — Herbert Schildt Covers Core and Advanced Java topics comprehensively ISBN: 978-1260440232
2. Spring Framework & Spring Boot, Spring in Action — Craig Walls ISBN: 978-1617294945
3. Front-End Framework, If Angular:ng-book: The Complete Guide to Angular — Nathan Murray et al. ISBN: 978-0991344628

REFERENCE BOOKS:

1. Pro Git — Scott Chacon and Ben Straub, ISBN: 978-1484200779
2. Learning Docker — Pethuru Raj, Jeeva S. Chelladhurai, Vinod Singh, ISBN: 978-1784397937

MDM VI
AIM354N Data Visualisation

Teaching Scheme: 02L + 00T, Total: 02

Credit:02

Evaluation Scheme: 30 MSE +10 ISA + 60ESE

Total Marks: 100

Duration of ESE: 03 Hrs

COURSE DESCRIPTION:

This course introduces data literacy required as a key twenty-first century skill. You will learn the nature of data across different domains and the concepts and skills of data visualization by understanding, questioning, and problematizing how data are generated, analyzed, and used. You will be able to apply its concepts and skills to visualize your own data, interpret the findings, and identify the impacts of data-driven decisions.

Desirable awareness/skills:

Data Analysis with SQL is a prerequisite for this course.

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Explain the understanding of Data Visualization and key Terms
2. Design Effective Data Visualization for visual Mapping and Design
3. Identify different defence mechanisms and identify different ways to protect against threats.
4. Create different types of Representation

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	-	-	-	-	-	-	-	-	-	-	-	2	1	-
2	2	1	3	-	-	-	-	-	-	-	-	1	1	2	-
3	1	1	-	1	2	-	-	-	-	-	-	1	1	-	-

4	2	-	2	-	2	-	-	-	-	-	-	1	2	2	-
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1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated Course

COURSE CONTENTS:

Introduction of visual perception: [5 Hrs]
 visual representation of data, Gestalt principles, information overloads.

Creating visual representations: [10 Hrs]
 Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

Classification of visualization systems: [10 Hrs]
 visualization systems and classification, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

Visualization: Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

Visualization of volumetric data: [10 Hrs]
 vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations.

TEXT BOOKS:

1. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick: A K Peters, Ltd, 1st Edition, 2010.
2. Kieran Healy, Data Visualization: A Practical Introduction, 1st Edition, 2018.
3. Andy Krik, Data Visualization: a successful design process 1st Edition, 2012.
4. Corey Lanum, Visualizing Graph Data 1st Edition, 2016.

REFERENCE BOOKS:

1. E. Tufte, The Visual Display of Quantitative Information, Graphics Press.2nd Edition, 2001.
2. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick: A K Peters, Ltd. 1st Edition, 2014.
3. Kieran Healy, Data Visualization: A Practical Introduction, sew Edition, 2013 2016.
4. Andy Krik, Data Visualization: a successful design process 1st Edition.

AIM364N Natural Language Processing

Teaching Scheme: 02L + 00T, Total: 02

Credit:02

Evaluation Scheme: 30 MSE +10 ISA + 60ESE

Total Marks: 100

Duration of ESE: 03 Hrs

COURSE DESCRIPTION:

This course introduces the fundamentals of Natural Language Processing (NLP), where computers interact with and understand human language. Students will learn core NLP tasks such as tokenization, part-of-speech tagging, parsing, and language modeling. The course explores both traditional approaches (like N-grams and Hidden Markov Models) and modern deep learning techniques including RNNs, LSTMs, and Transformers. Emphasis is placed on practical applications such as sentiment analysis, text classification, and question answering. Students will gain hands-on experience using tools like NLTK, spaCy, and Hugging Face Transformers. By the end, students will have a strong foundation to build or apply NLP systems and pursue further study in AI or machine learning.

Desirable awareness/skills: Python, Basic of statistics, Programming

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Understand and explain fundamental concepts in Natural Language Processing
2. Apply text processing and machine learning techniques to solve NLP problems
3. Analyze and compare the performance of traditional and neural network-based NLP models
4. Design and develop a functional NLP application using modern tools and techniques

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	2	-	-	-	-	-	-	-	-	-	2	1	-
CO 2	2	2	2	-	-	-	-	-	-	-	-	2	1	1	-

C O 3	2	2	1	1	2	-	-	-	-	-	-	2	1	1	-
C O 4	2	2	2	1	1	1	-	-	-	-	-	1	2	2	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENTS:

Introduction to NLP & Text Processing:

What is NLP? Applications & challenges, Text preprocessing: tokenization, stemming, lemmatization, stopword removal, Regular expressions for text

Language models:

unigram, bigram, n-gram, smoothing, perplexity, Evaluation metrics: Precision, Recall, F1, Accuracy, BLEU

Syntax and Parsing:

Part-of-speech (POS) tagging: Rule-based, HMM, CRF, Syntax: Phrase structure grammar, Dependency grammar, Parsing: Constituency and dependency parsers, Chunking and Named Entity Recognition (NER)

Dealing with Semantics:

Word meanings: synonyms, polysemy, ambiguity, Vector space models (VSM): Bag of Words, TF-IDF, word co-occurrence matrices Word embeddings: Word2Vec, GloVe, FastText, Semantic similarity and word analogies, Contextual embeddings: basics of BERT

Statistical Machine Learning for NLP:

Text classification (Naive Bayes, SVM, Logistic Regression), Sentiment analysis, spam detection, Sequence labeling (NER, POS tagging, chunking)

Neural networks for NLP:

RNN, LSTM, GRU (intro), Intro to Transformer models (self-attention, encoder-decoder)

NLP Applications:

Machine Translation (MT), Text summarization (extractive vs abstractive), Question Answering (QA)

TEXT BOOKS:

1. Steven Bird et al. – Natural Language Processing with Python ISBN-10: 0596516495
2. Denis Rothman – Transformers for Natural Language Processing ISBN-10: 1800565798

REFERENCE BOOKS:

1. Jurafsky, D., & Martin, J. H. (2024). Speech and Language Processing
2. Manning, C. D., & Schütze, H. (1999). Foundations of Statistical Natural Language Processing.

CPM354N Database Management System

Teaching Scheme: 02L + 00T, Total: 02

Credit:02

Evaluation Scheme: 30 MSE +10 ISA + 60ESE

Total Marks: 100

Duration of ESE: 03 Hrs

COURSE DESCRIPTION:

This course introduces the student Database Management System (DBMS), different data models, relational algebra concept, sql queries, Relational Database design theory and Transaction management and query optimization in DBMS. This course also introduces the Object Oriented databases and Database architecture. This course equips students with fundamental knowledge and basic technical competence in the field of DBMS.

Desirable Awareness/skills :

knowledge of Data Structure, Discrete Mathematics

COURSE OUTCOMES:

On the successful completion of this course student shall be able to;

1. Create a good database design.
2. Handle relational databases.
3. Use and explain the E-R model and apply normalization for a given specification of the requirement.
4. Illustrate understanding of indexing methods.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		2		2	3		3	1		1	1	1	1		3

C O 2					2		2				2		1	2
C O 3	3		1	2			2	1	2		2		2	1
C O 4	1	2		2					1		1		2	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated Course

CONTENTS:

Introduction to Conceptual Modelling: [7 Hrs]

Basic concepts, Advantages of DBMS over file-processing systems, Data abstraction, Data models and data independence, Components of DBMS and overall structure of DBMS, Data modeling, Entity, Attributes, Relationships, Constraints, Keys E-R diagrams, Components of E-R Model, centralized and client/server architectures for database management systems.

Relational Model: [7 Hrs]

Basic concepts, Attributes and domains, Concept of integrity and referential constraints, Schema diagram. Relational query languages, Relational Algebra

Structured Query Language-: [6 Hrs]

Introduction, Characteristics and advantages, Data types and literals, DDL Tables: creating, modifying, deleting, Views: creating, dropping, Updation using views, DML, Operators, SQL DML queries, SELECT query and clauses.,

Functional Dependencies and Normalization: [8 Hrs]

ACID Properties, Informal design guidelines for relational schemas, functional dependencies (FDs), Normal form based on primary keys, 2NF, 3NF, Boyce- Codd NF, properties of relational decomposition, algorithms for relational database schema design, multivalued dependencies and 4NF, join dependencies and 5NF, inclusion dependencies, other dependencies and NF.

Query Processing and Transaction Management: [8 Hrs]

Sorting and join operation, Transaction concept, Components of transaction management, Concurrency and recovery system, Different concurrency control protocols such as timestamps and locking, Validation, Multiple granularity, Deadlock handling, Different crash recovery methods such as log-based recovery, Shadow-paging, Buffer management .

Text Books:

1. Ramez Elmasri, Shamkant B Navathe, "Fundamentals of Database Systems", 5th Edition, Pearson, 2008, ISBN- 9788131250.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 5th Edition, McGraw-Hill, 2006, ISBN- 007-124476-X.

REFERENCE BOOKS:

1. R. Ramakrishnan, J. Gehrke, "Database Management Systems", 2nd Edition, McGraw-Hill, 2000, .ISBN-13: 978-00723

CPM364N- Web Development

Teaching Scheme: 02L + 00T, Total: 042
 Evaluation Scheme: 30 MSE +10 ISA + 60ESE
 Duration of ESE: 03 Hrs

Credit:02
 Total Marks: 50

COURSE DESCRIPTION:

This Web Development course provides students with a solid foundation in both front-end and back-end development, equipping them with the essential skills to build dynamic, interactive, and fully functional websites. The course covers a wide range of web technologies, from basic HTML, CSS, and JavaScript to advanced techniques such as responsive design, server-side programming, and databases.

Desirable awareness/skills: Familiarity with computers, file systems, and basic software (like text editors or IDEs) is essential to start coding and working on web projects.

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Discuss and critically analyze basic protocols used in the World Wide Web.
2. Write client side programming using Javascript, JQuery, Ajax, HTML, CSS
3. Write server side programming using PHP or any server side language.
4. Implement a three tier application using web technologies.
5. Create, publish and test RESTful web service

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO 2	1	1	3	1	2	1	1	2	2	1	3	1	2	3	3
CO 3	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3
CO 4	2	1	3	1	3	2	1	2	2	2	3	1	2	3	3

1-

Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENTS:

WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0 :

[7 Hrs]

Web Essentials: Clients, Servers and Communication ,The Internet World wide web , HTTP Request Message, HTTP Response Message Web Clients ,Web Servers , HTML5 ,Tables ,Lists ,Image HTML5

control elements ,Drag and Drop Audio ,Video controls - CSS3 – Inline, embedded and external style sheets ,Rule cascading Inheritance,Backgrounds ,Border Images ,Colors ,Shadows,Text, Transformations,Transitions Animations. Bootstrap Framework

CLIENT SIDE PROGRAMMING using Javascript: [7 Hrs]

Declaring variables: var, let, const, Data types: Strings, Numbers, Booleans, Arrays, Objects, Type coercion and typeof operator **Operators and Control Flow:** Arithmetic, comparison, logical operators, Conditionals: if, else, switch, Loops: for, while, do-while

Arrays, Objects, and Asynchronous JavaScript: Advanced Arrays and Objects: [7 Hrs]

Array methods: map, filter, reduce, forEach, Object properties, methods, and destructuring, JSON and parsing, **Asynchronous JavaScript:** What is asynchronous programming? Event loop basics, Callbacks and callback hell, Promises: then, catch, chaining, **Async/Await and Fetch API:** Using async and await for cleaner code, Fetching data from a public API (e.g., JSONPlaceholder), Error handling with try/catch

Functions and DOM Manipulation: Functions: [7 Hrs]

Defining functions: Declaration, expression, arrow functions, Parameters, return statements, scope, Higher-order functions and callbacks ,Introduction to the DOM What is the DOM? Accessing elements with querySelector, getElementById, Modifying elements: innerHTML, textContent, style, Creating and appending elements Event Handling, Adding event listeners: click, input, submit, Event object and preventing default behavior, Event delegation basics

SERVER SIDE PROGRAMMING: [7 Hrs]

PHP: Introduction to PHP: What is PHP, installation (XAMPP/WAMP), and setup., PHP Syntax: Variables, data types, operators, and echo/print., Control Structures: if-else, switch, loops (for, while, foreach)., Functions: Defining functions, parameters, return values, and scope, Arrays: Indexed, associative, and multidimensional arrays., Handling Forms: GET, POST, and basic form processing.

Database handling with PHP: [7 Hrs]

Introduction to MySQL: Setting up a database, creating tables.PHP and MySQL: Connecting to a database using MySQLi or PDO., CRUD Operations: Create, Read, Update, Delete data using PHP,Prepared Statements: Preventing SQL injection, Handling Query Results: Fetching and displaying data in HTML, Basic Error Handling: Try-catch with PDO.

TEXT BOOKS:

1. Powell, Thomas. HTML & XHTML: the complete reference. McGraw-Hill, Inc., 2003.
2. Godbole, Achyut, and Atul Kahate. "Web Technologies." McGraw Hill Education (India) Private Limited, 2013.
3. Deitel and Deitel and Nieto, Internet and World Wide Web - How to Program, Prentice Hall, 5th Edition, 2011.
4. Jeffrey C and Jackson, Web Technologies A Computer Science Perspective, Pearson Education, 2011.

5. Stephen Wynkoop and John Burke “Running a Perfect Website”, QUE, 2nd Edition,1999.
2. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.

REFERENCE BOOKS:

1. McGrath, Mike. HTML, CSS & JavaScript in easy steps. In Easy Steps Limited, 2020.
2. Casabona, Joe. HTML and CSS: Visual QuickStart Guide. Peachpit Press, 2020.
3. Beard, Jason, Alex Walker, and James George. The principles of beautiful web design. SitePoint Pty Ltd, 2020.

DCM354N Cryptography and Application

Teaching Scheme: 02L + 00T, Total: 02
 Evaluation Scheme: 10 ISA + 30MSE + 60ESE
 Duration of ESE: 03 Hrs

Credit:02
 Total Marks:100

COURSE DESCRIPTION:

This course will emphasise on principles and practice of cryptography and network security: classical systems, symmetric block ciphers (DES, AES, other contemporary symmetric ciphers), linear and differential cryptanalysis, perfect secrecy, public-key cryptography algorithms for factoring and discrete logarithms, cryptographic protocols, hash functions, authentication, key management, key exchange, signature schemes, email and web security, viruses, firewalls, digital right management, and other topics. In this course students will learn aspects of network security and cryptography.

DESIRABLE AWARENESS/SKILLS:

Computer network, Essential need of security

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Explain concepts of finite mathematics and number theory.
2. Identify the common network vulnerabilities and attacks, defence mechanisms against network attacks, and cryptographic protection mechanisms.
3. Analyze different defence mechanisms and different ways to protect against these threats.
4. Analyze the concepts related to applied cryptography, including plaintext, ciphertext, symmetric cryptography, asymmetric cryptography, and digital signatures

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO 2	1	1	3	1	2	1	1	2	2	1	3	1	2	3	3
CO 3	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3
CO 4	2	1	3	1	3	2	1	2	2	2	3	1	2	3	3

1-

Weakly correlated

2 – Moderately correlated

3 – Strongly correl

COURSE CONTENTS:

Introduction:

[5 Hrs]

Security trends, The OSI Security Architecture, Security Attacks, Security Services and Security Mechanisms, A model for Network security.

Classical Encryption Techniques: [5 Hrs]

Symmetric Cipher Modes, Substitute Techniques, Transposition Techniques, Rotor Machines, Stenography

Block Cipher And Data Encryption Standards: [7 Hrs]

Block Cipher Principles, Data Encryption Standards, the Strength of DES, Differential and Linear CryptAnalysis, Block Cipher Design Principles.

Advanced Encryption Standards: [5 Hrs]

Evaluation Criteria for AES, the AES Cipher. More On Symmetric Ciphers: Multiple Encryption, Triple DES, Block Cipher Modes of Operation, Stream Cipher and RC4.

Introduction To Number Theory: [10 Hrs]

Prime Numbers, Fermat's and Euler's Theorem, Testing for Primality, The Chinese Remainder Theorem, Discrete logarithms. Public Key Cryptography And RSA: Principles Public key cryptoSystems, Diffie Hellman Key Exchange, the RSA algorithm, Key Management, , Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

Message Authentication And Hash Functions: [9 Hrs]

Authentication Requirement, Authentication Function, Message Authentication Code, Hash Function, Security of Hash Function and MACs. Hash And Mac Algorithm: Secure Hash Algorithm, Whirlpool, HMAC, CMAC. Digital Signature: Digital Signature, Authentication Protocol, Digital Signature Standard.

Authentication Application: [3 Hrs]

Kerberos, X.509 Authentication Service, Public Key Infrastructure.

Email Security: [9 Hrs]

Pretty Good Privacy (PGP) and S/MIME. Ip Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management. Web Security: Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET), Intruders, Viruses and related threats. Firewall: Firewall Design principles, Trusted Systems.

TEXT BOOKS:

1. William Stallings (2006), Cryptography and Network Security: Principles and Practice, 4th edition, Pearson Education, India.
2. William Stallings (2000), Network Security Essentials (Applications and Standards), Pearson Education, India.

REFERENCE BOOKS:

1. Charlie Kaufman (2002), Network Security: Private Communication in a Public World, 2nd edition, Prentice Hall of India, New Delhi.
2. Atul Kahate (2008), Cryptography and Network Security, 2nd edition, Tata Mcgraw Hill, India.
3. Robert Bragg, Mark Rhodes (2004), Network Security: The complete reference, Tata Mcgraw Hill, India.

DCM364N Information Security

Teaching Scheme: 02L + 00T, Total: 02

Credit:02

Evaluation Scheme: 10 ISA + 30 MSE + 60 ESE

Total Marks:100

Duration of ESE: 03 Hrs

COURSE DESCRIPTION:

Information Security is a critical field focused on the protection of digital data, information systems, and networks from unauthorized access, cyber threats, and potential damage. This course provides an in-depth understanding of core principles, methodologies, and technologies employed to ensure the confidentiality, integrity, and availability (CIA) of information in various environments.

Desirable awareness/skills:

Cyber Ethics & Cyberlaw

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Identify and prioritize information assets.
2. Analyzing information security strategy and architecture.
3. Apply cryptography techniques in information security.
4. Analyze security models for secure information systems.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO 2	1	1	3	1	2	1	1	2	2	1	3	1	2	3	3
CO 3	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3
CO 4	2	1	3	1	3	2	1	2	2	2	3	1	2	2	3

1-

Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENTS:

Introduction:

[7 Hrs]

Definition of security, Assessing security, Security terminology, Historical developments, Structure of security, Introduction to Information Security, The Need for Security, Legal, Ethical, and Professional Issues in Information Security.

Risk Management and Special requirements

[5 Hrs]

such as Emanation Security/TEMPEST Standards, Planning for Security, Rainbow Series Reports for DOD; FIPS for all Federal Govt; DHS and CNSS guidance: Firewalls & VPNs

Cryptography:**[10 Hrs]**

Applications of cryptography, Terminology, Evolution of cryptography, Caesar ciphers, one-time pads, Operation of DES, AES, Public-key cryptosystems, Topics in Information Systems Security, Minimum privilege, Compartmentalization, Dual controls, Security perimeters, Trustworthy software, proof of design correctness, Single-points-of-failure, Covert channels, Inference

Technology:**[7 Hrs]**

IDS and Access Control Cryptography, Physical Security including Emanations Security, (EMSEC)/TEMPEST/CFR 32 Marking, Handling, labeling and destruction of Sensitive information) Implementing Security, Security and Personnel, InfoSec Maintenance.

Security models:**[7 Hrs]**

Requirements ;Types, State-machine models, Mandatory/Discretionary controls, Information-flow models, Informal models, Kerberos Authentication, Authentication in centralized systems, Distributed Authentication

Denial of Service attacks, Security vs. ATM:**[8 Hrs]**

IP, wireless mobile networks, QoS, Traffic modeling, Network topology, Security Protocols, Zero-knowledge proofs, Subliminal channels, Oblivious transfer, Digital signature schemes, Bit commitment, Digital cash, Secure contract signing, Secure voting, Digital certified mail, Anonymous message broadcast TEMPEST and related topics

Secure programming languages-**[3 Hrs]**

concepts structured multiprogramming, shared classes, cooperating sequential processes, structure of the multiprogramming system RC-4000 software.

TEXT BOOKS:

1. M. Whitman and H. Mattord. Principles of Information Security, 2nd Edition (Course Technology, 2005).
2. Bruce Schneier, "Secrets and Lies: Digital Security in a Networked World," Wiley, ISBN 0- 471-25311-1
3. Applied Cryptography: Protocols, Algorithms, and Source Code in C, Wiley, ISBN 0- 471-11709-9.

DTM354N GIS and REMOTE SENSING

Teaching Scheme: 2L Total: 2Hr

Credit: 2

Evaluation Scheme: 30MSE + 10ISA + 60ESE

Total Marks: 100

Duration of ESE: 3 Hrs

COURSE DESCRIPTION

This course provides an introduction to Remote Sensing (RS), a powerful technology for capturing, storing, analyzing, and managing spatial and geographic data.

COURSE OUTCOMES

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

1. Understand digital data and their formats
2. Understand remote sensing procedures
3. Know the Digital Image Analysis of RS data.

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2	1	3	2	2		1	1	1	1	3		3
2	3	3			2	2	2		1	1		1	3		
3	2	1	3	2	3	2	2		2	3	2	2	2		2

1-Weakly correlated

2 – Moderately correlated

3– Strongly correlated

COURSE CONTENT

Introduction:

[3 Hrs]

GIS definition, development, application areas

Map Concept:

[7 Hrs]

Map-Definition, Elements of Maps, Types of maps, Advantages and disadvantages of analog/digital maps, Coordinate Systems- Geometric models of earth, Global/Local coordinate system, Projection Systems- Classification, Cylindrical projection, Conical projection, Selection of a particular projection

Fundamental concepts of GIS:

[6 Hrs]

Modeling Real World Features- Raster data model, vector data model, Data Formats- Spatial and Non-Spatial data Database preparation and editing: Data collection and Input, Data conversion, Hardware & software Requirements, Topology – Editing and Error Rectification, Types of topology, Topological Relationships.

Definition & Scope of Remote Sensing**[6 Hrs]**

Electromagnetic energy and spectrum, Atmospheric windows. Remote Sensing systems, sensors and scanners, resolution of sensors, Multispectral, thermal, Radar and LIDAR data. Radiometers, spectral signatures.

Elements of Remote Sensing Systems**[5 Hrs]**

Terrestrial, airborne and spaceborne platforms, sun synchronous & Geosynchronous satellites. Various earth resources satellites, Indian Remote Sensing Programs.

Remote sensing Data Products & their types**[5 Hrs]**

Analogue & Digital data formats, errors in Raster data. Interpretation Techniques: Elements & Methods of Interpretation, Relief displacement and vertical exaggeration, Digital Elevation Model. Sensing and applications of Drone Technology.

Digital Image Processing**[7 Hrs]**

Projection systems and Datums, Image pre-processing and Georeferencing, image enhancements, image classification; supervised & unsupervised, accuracy assessments. Potential applications of Remote Sensing in diverse areas and decision making, Integrated use of remote sensing and GIS, case studies.

TEXT BOOKS:

1. Concepts and Techniques of Geographic Information Systems, C.P. Lo, Albert K. W. Yeung, Prentice Hall India Pvt. Ltd, New Delhi, 2009
2. Introduction to Geographic Information Systems, Kang-Tsung Chang, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2015

REFERENCE BOOKS:

1. M. Anji Reddy BS Publications Remote Sensing and Geographical Information Systems Third Edition.
2. John R Jensen Remote Sensing of the Environment: An Earth Resource Perspective, Pearson Education 2006.
3. Bhatta Remote Sensing and GIS Oxford University press First Edition.
4. T. M. Lillesand and R. W. Kiefer, Remote Sensing and Image Interpretation, 5th Ed., John Willey, New York, 2024
5. J. B. Campbell, Introduction to Remote Sensing, Taylor & Francis, London, 1996.

COR311N Fundamentals of Research and Ethics

Teaching Scheme: 03L + 00T, Total: 03

Credit:03

Evaluation Scheme: 10 ISA + 30 MSE + 60 ESE

Total Marks:100

Duration of ESE: 03 Hrs

COURSE DESCRIPTION:

This course introduces students to the fundamental principles and practices of research, including the development of research questions, design, methodology, data collection and analysis, as well as the responsible conduct of research. Emphasis is placed on ethical considerations, integrity, and compliance with regulatory standards.

Desirable awareness/skills: Understand the basic concepts and processes of scientific and scholarly research.

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Explain the fundamental concepts, types, and significance of research in their discipline.
2. Identify and formulate clear research problems, objectives, and hypotheses.
3. Develop appropriate research designs and select suitable methods for data collection and analysis.
4. Critically review and synthesize existing literature relevant to their research topic.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3
CO 2	1	1		1	2	1	1	2	2	1	3	1		3	3
CO 3	2	1	3		3		1	2		2	3	1	2	2	3
CO 4	2	1	3	1	3	2	1		2	2	3	1	2		3

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

COURSE CONTENTS:

PHILOSOPHY AND ETHICS

[5 Hrs]

Introduction to philosophy: definition, nature and scope, concept, branches - Ethics: definition, moral philosophy, nature of moral judgements and reactions.

SCIENTIFIC CONDUCT

[5 Hrs]

Ethics with respect to science and research - Intellectual honesty and research integrity - Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP) – Redundant Publications: duplicate and overlapping publications, salami slicing - Selective reporting and misrepresentation of data.

PUBLICATION ETHICS

[7 Hrs]

Publication ethics: definition, introduction and importance - Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. - Conflicts of interest - Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types - Violation of publication ethics, authorship and contributor ship - Identification of publication misconduct, complaints and appeals - Predatory publisher and journals.

OPEN ACCESS PUBLISHING

[6 Hrs]

Open access publications and initiatives - SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies - Software tool to identify predatory publications developed by SPPU - Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer, Journal Suggester, etc.

PUBLICATION MISCONDUCT

[4 Hrs]

Group Discussion (2 Hrs.) : a) Subject specific ethical issues, FFP, authorship b) Conflicts of interest c) Complaints and appeals: examples and fraud from India and abroad Software tools (2 Hrs.) : Use of plagiarism software like Turnitin, Urkund and other open source software tools.

DATABASES AND RESEARCH METRICS

[7 Hrs]

Databases (4 Hrs): Indexing databases, Citation databases: Web of Science, Scopus, etc. Research Metrics (3 Hrs.): Impact Factor of journal as per Journal Citations Report, SNIP, SJR, IPP, Cite Score - Metrics: h-index, g index, i10 Index, altmetrics.

REFERENCES

1. Nicholas H. Steneck. Introduction to the Responsible Conduct of Research. Office of Research Integrity. 2007. Available at: <https://ori.hhs.gov/sites/default/files/rcrintro.pdf>
2. The Student's Guide to Research Ethics By Paul Oliver Open University Press, 2003
3. Responsible Conduct of Research By Adil E. Shamoo; David B. Resnik Oxford University Press, 2003
4. Ethics in Science Education, Research and Governance Edited by Kambadur Muralidhar, Amit Ghosh Ashok Kumar Singhvi. Indian National Science Academy, 2019. ISBN : 978-81-939482-1-7.

COR312N Fundamentals of Research and Ethics Lab

Teaching Scheme: 02P + 00T, Total: 02

Credit:01

Evaluation Scheme: 30ICA + 20 ESE

Total Marks: 50

Duration of ESE: 02 Hrs

This laboratory course provides practical training in essential research skills, use of research tools, ethical compliance procedures, data handling, and academic integrity practices. Students will gain hands-on experience in literature search, proposal writing, referencing, data analysis, plagiarism detection, and preparation of research reports and presentations.

Course Outcome:-

CO1: Utilize online research databases and institutional resources to access scholarly literature.

CO2: Perform effective literature searches and critically review research articles.

CO3: Identify research problems and formulate clear objectives and testable hypotheses.

CO4: Draft structured research proposals with defined aims, methods, timelines, and references.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	3	1	2	1	1	1	2	2	3	1	2	2	3.
CO2	1	1		1	2	1	1	2	2	1	3	1		3	3
CO3	2	1	3		3		1	2		2	3	1	2	2	3
CO4	2	1	3	1	3	2	1		2	2	3	1	2		3

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlated

Lab No.	Title	Description
1	Introduction to Research Tools	Orientation to online resources (Google Scholar, PubMed, Scopus) and institutional library access.
2	Literature Search	Hands-on practice in searching, selecting, and reviewing scholarly articles.
3	Problem Identification and Hypothesis Formulation	Group activity to frame research problems and draft objectives/hypotheses.
4	Research Proposal Writing	Draft a short research proposal including aims, methods, timeline, and references.

5	Referencing and Citation	Practice using citation styles (APA, MLA, Vancouver) manually and with reference managers (Zotero, Mendeley).
6	Plagiarism Detection	Use plagiarism detection tools (e.g., Turnitin, Grammarly) and understand similarity reports.
7	Ethics Committee Forms	Fill sample Institutional Review Board (IRB) application forms for hypothetical projects.
8	Data Collection and Entry	Simulate a small survey or experiment; enter and organize data in spreadsheets.
9	Data Analysis Basics	Introduction to basic statistical tools using Excel/SPSS/R (mean, median, standard deviation, simple charts).
10	Research Presentation	Prepare and deliver a short oral or poster presentation summarizing a mini research idea or proposal.

TEXT BOOKS:

1. C. R. Kothari & Gaurav Garg – Research Methodology: Methods and Techniques
2. Ranjit Kumar – Research Methodology: A Step-by-Step Guide for Beginners
3. John W. Creswell & J. David Creswell – Research Design: Qualitative, Quantitative, and Mixed Methods Approaches

REFERENCE BOOKS:

1. Dheepak Cawla & Neena Sodhi – Research Methodology: Concepts and Cases
2. S K Kakani & K C Vashistha – Research Methodology and Ethics

NOTE:

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skills acquired and recorded by a student (journal) based on practical performance by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S10)

DTM306N Drone Programming and Automations

Teaching Scheme: 04L + 00T, Total: 04

Credit:04

Evaluation Scheme: 10 ISA + 30 MSE + 60 ESE

Total Marks:100

Duration of ESE: 03 Hrs

COURSE DESCRIPTION:

This course provides a comprehensive introduction to drone technology, flight principles, embedded programming, sensor integration, and automation techniques. Students will learn to program drones for autonomous operations using modern development platforms, apply computer vision for navigation, and explore real-world applications and safety protocols.

Desirable awareness/skills: C/C++ for Embedded Systems, Python Scripting, ROS (Robot Operating System)

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Explain the fundamental principles of drone aerodynamics, components, and flight control systems.
2. Describe the hardware and software architecture of drones, including microcontrollers, sensors, and communication protocols.
3. Develop and implement basic drone control scripts using programming environments and open-source platforms.
4. Integrate and configure various onboard sensors for navigation, stabilization, and data collection.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1		1	2	1	1	1	2	2	3	1	2	2	3.
CO2	1	1	2	1	2	1	1	2	2	1	3	1	1	3	3
CO3	2	1	3	3	3	2	1	2		2	3	1	2	2	3
CO4	2	1	3	1	3	2	1		2	2	3	1	2		3

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlate

COURSE CONTENTS:

Introduction to Drones:

[5 Hrs]

History and evolution of UAVs, Types and classifications of drones, Drone components: frame, motors, ESCs, flight controllers, batteries, propellers, Principles of flight: lift, thrust, drag, stability, and control

Drone Hardware and Software Architecture:**[5 Hrs]**

Drone electronics: microcontrollers, IMU, GPS, compasses, and telemetry modules, Flight control systems: ArduPilot, PX4, DJI SDKs, Communication protocols: RC, telemetry radio, Wi-Fi, LTE,

Drone Programming Basics:**[7 Hrs]**

Introduction to drone programming environments (e.g., Python, ROS, MAVLink), Writing basic scripts for drone control, Ground control stations (e.g., QGroundControl, Mission Planner), Simulators for testing (e.g., Gazebo, AirSim)

Sensors and Navigation:**[10 Hrs]**

Types of drone sensors: accelerometers, gyroscopes, magnetometers, barometers, GPS, lidar, cameras, Sensor data acquisition and processing, Basics of SLAM (Simultaneous Localization and Mapping), Path planning algorithms

Drone Automation Techniques:**[7 Hrs]**

Autonomous takeoff and landing, Waypoint navigation, Obstacle detection and avoidance, Swarming and multi-drone coordination basics, Computer vision for drones: object detection, tracking, follow-me mode

Safety, Regulations, and Applications:**[6 Hrs]**

UAV safety guidelines, Airspace regulations and legal considerations, Risk assessment and fail-safes, Industrial and societal applications: aerial photography, mapping, delivery, inspection, surveillance, agriculture,

TEXT BOOKS:-

1. Learning ROS for Robotics Programming By Aaron Martinez, Enrique Fernández
2. Programming AR.Drone: Augmented Reality Drone By Stephen Chin, Johan Vos, Weiqi Gao, James Weaver
3. Drone Programming with Python: Develop real-world skills to build and operate autonomous drones using Raspberry Pi, Python, and ArduPilot By Cameron Coward

DTM364N THERMAL IMAGING AND AERODYNAMICS

Teaching Scheme: 02L + 00T, Total: 02

Credit:02

Evaluation Scheme: 10 ISA + 30 MSE + 60 ESE

Total Marks:100

Duration of ESE: 03 Hrs

COURSE DESCRIPTION:

This course includes principles and applications of thermal imaging and aerodynamics. In this course, students will explore the fundamentals of infrared (IR) thermography, including heat transfer mechanisms, radiative properties of surfaces, and thermal camera technologies. Simultaneously, the course delves into aerodynamic concepts such as flow behavior, boundary layers, drag, lift, and flow visualization techniques.

Desirable awareness/skills: Basics of Heat Transfer, Fluid Mechanics, and Image Processing

COURSE OUTCOMES:

On the successful completion of this course, students shall be able to:

1. Explain the fundamental concepts and principles of thermal imaging and aerodynamics.
2. Analyze how thermal imaging and aerodynamics intersect in applications such as aviation, automotive, and environmental monitoring.
3. Identify computational and experimental approaches to study thermal patterns and aerodynamic behaviors.

Course Outcomes (COs) and Program Outcomes (POs) mapping with strength of correlation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1		1	2	1	1	1	2	2	3	1	2	2	3.
CO2	1	1	2	1	2	1	1	2	2	1	3	1	1	3	3
CO3	2	1	3	3	3	2	1	2		2	3	1	2	2	3

1-Weakly correlated

2 – Moderately correlated

3 – Strongly correlate

COURSE CONTENTS:

Basics of Aerodynamics & Thermal Imaging :

[9 Hrs]

Introduction to Thermal Imaging, Principles of heat transfer (conduction, convection, radiation), Infrared radiation and its properties, Fundamentals of thermal imaging cameras Aerodynamic forces and Moments, Derivation of Lift, Drag and moment Coefficients with pressure distribution, Variation of pressure distribution with respect to angle of attack, Governing equations of flow- Continuity, momentum and Energy equations in differential form. Flow regimes based on Mach number.

Thermal Imaging Technology:

[10 Hrs]

Components of a thermal imaging system, Working of infrared sensors and detectors, Types of thermal imaging cameras, Thermal image processing techniques, Applications of Thermal Imaging, Industrial applications (predictive maintenance, quality control), Medical applications (fever screening, diagnostics), Environmental applications (wildlife monitoring, climate studies), Military and security applications (night vision, surveillance)

Aerodynamic Forces & Motion:

[7 Hrs]

Lift and drag forces, Airfoil design and characteristics, Flow patterns: laminar vs turbulent, Aircraft Aerodynamics, Wing configurations and their effects, Stability and control in flight, Supersonic and hypersonic aerodynamics, Fluid Dynamics: Basic concepts, governing equations, and flow regimes.

Computational Methods and Simulation:

[6 Hrs]

Introduction to MATLAB, Simulink, and CFD Software, Thermal and Aerodynamic Simulation Techniques, Integration of Thermal Imaging Data with Aerodynamic Models, Case Study: CFD Analysis of Heat Distribution in Aerodynamic Structures

Applications in Engineering:

[6 Hrs]

Thermal Imaging in Aerospace & Aviation Safety, Aerodynamics in Automotive Design & Drone Technology, Environmental Monitoring: Forest Fires, Building Energy Efficiency, and Agriculture, Future Trends: AI-based Thermal Image Processing & Smart Aerodynamics

TEXT BOOKS:

1. Basic and Applied Thermodynamics by P. K. Nag, TMH
2. Engineering Thermodynamics by Rogers & Mayhew, Pearson
3. Thermodynamics by Holman, Mc Graw Hill.

REFERENCE BOOKS:

1. Thermal Engineering by Rathore, TMH
2. Applied Thermodynamics by R.K. Rajput, Laxmi Publications
3. Thermal Engineering by Soman, PHI
4. Engineering Thermodynamics by P. L. Dhar, Elsevier