CO301U 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 Objectives:

The objectives of offering this course are to:

1. learn general principles of network design and different network protocols.
2. learn various addresses and formats.
3. understand various techniques of namespace, resolution, remote logging and electronics mail.
4. learn the concept of cryptography and firewalls.

Course Outcomes:

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

1. design wired and wireless networks.
2. design secure communication over the network.
3. provide in-depth knowledge of data link layer, network layer, transport layer, application layer technologies.
4. describe network security.

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		2		3	1	3	-	2		3	1
2		-	-	2	2	-	-	-	1		-	
3	1	-	1	1	-	-		2	1		2	1
4		2	-			-	3	-	-		3	

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

Course contents:

Wireless LANs and WANs:IEEE 802.11- architecture, addressing mechanism, wired LANs-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: physical and data link layers, network layer, transport layer, application layer addressing: physical addresses, logical addresses, port addresses, specific addresses.

Network Layer: 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 ICMP- types of messages, message format, error reporting, query, debugging

Transport Layer: 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: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: Introduction to cryptography, symmetric-key and asymmetric key Cryptography, RSA cryptography,Firewall.

Text Book:

1. A. S. Tanenbaum, “Computer Networks”, 4th Edition, Pearson Education, 2005, ISBN-8177581651.

Reference Books:

1. B. A. Forouzan, “Data Communications and Networking”, 4th Edition, TMH, 2009, ISBN-13- 9780070634145.

CO302U DATABASE MANAGEMENT SYSTEM

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 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 Objectives:
The objectives of offering this course are to:

1. learn and understand various Database Architectures andApplications
2. implement an entity relationship diagram (ERD) to express requirements and demonstrate skills to model data requirements and create data models into normalized designs.
3. use structured query language (SQL) and its syntax, transactions, database recovery and techniques for query optimization.
4. learn indexing methods.

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

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

Course contents:

Introduction to Conceptual Modelling: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 dbms.

Relational Model:Basic concepts, Attributes and domains, Concept of integrity and referential constraints,Schema diagram. Relational query languages, Relational Algebra and Relational Calculus: Tuple relational and domain relational calculus.

Structured Query Language-: 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., XML database.

Functional Dependencies and Normalization: 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.

Storage and File Systems: Secondary storage, File organization, Indices, Static and dynamic,hashing.

Query Processing and Transaction Management: Measures of query cost, Selection operation, 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 and Remote backup system.

Introduction to: Cloud computing, data management, mobile databases, hadoop, sqlite database and sql- mongodb.

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: 978-0072322064.

CO303U FORMAL LANGUAGE AND AUTOMATA THEORY

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 the knowledge of finite automata, regular grammar, context free grammar, pushdown automata and Turing machine concept and demonstrates how these concepts can be applied to solve nontrivial real life problems.

Desirable awareness/skills:
Discrete Structure and Graph Theory

Course Objectives:
The objectives of offering this course are to:

1. computing machines by describing, classifying and comparing different types of computatiostudy nal models
2. encourage students to study & develop fundamentals for Computational Theory

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

1. develop analytical thinking and intuition for problem solving situations in related areas of theory of computation
2. understand and design Regular Grammar, Finite Automata, Context Free Grammar, Pushdown Automata and Turing Machines.
3. simplify Context Free Grammar and then convert to CNF and GNF.
4. understand Pumping Lemma, Properties of Regular Languages and Context Free Languages.

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	2	1	3	-	-	-	1	-	-	-	2	1
2	-				3	-	1	1	2	-		1
3	1	2	-	-	2	1	-		2	-		1
4	-	2	-	2		-	1	3	-	2	-	

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

Course Content:
Finite Automata: Alphabet, set, language, operations, finite state machine, definitions, finite automation model, acceptance of strings and languages. Non deterministic finite automaton,

deterministic finite automaton, equivalence between NFA and DFA, conversion of NFA into DFA, minimization of FSM, Moore and Mealy machines.

Regular Expressions: Formal definition of regular expressions, equivalence between RE and FA, Arden's Theorem, closure properties of regular sets, pumping lemma.

Context Free Grammars and Languages: Context free grammars, Derivation parse trees, ambiguity in grammars and languages, Simplification of CFG, Chomsky normal form, greibach normal form, closure properties of context free languages

Regular Grammars: Right linear and left linear grammars, equivalence of right linear and left linear grammar, equivalence of regular grammar and FA.

Push Down Automata: Definition of the pushdown automaton, FA and PDA, the languages of a PDA, equivalence of PDA‟s and CFG‟s, , deterministic push down automata , Non deterministic PDA**.**

Turing Machine: Definition, model, design of TM, composite and iterated turing machine, universal TM, The halting problem church‟s turing hypothesis, , linear bounded automata and context sensitive language. Introduction of DCFL and DPDA, decidability of problems.

Text Books:

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.
3. C. LIU, “Elements of Discrete Mathematics”, 2nd Edition, Tata McGraw-Hill, 2002, ISBN 0-07-043476 X.

Reference Books:

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 Papadimition C.H., “Elements of Theory of Computation”, 2nd Edition, Prentice Hall Publication, 1997, ISBN:0132624788

CO304UA ANDROID PROGRAMMING

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 the students the platform to learn and understand Android technology and encourage them to design, develop and deploy Android applications. This course enables students to successfully apply core Java programming languages features & software patterns needed to develop maintainable mobile apps comprised of core Android components

Desirable awareness/skills:

Basic knowledge of object oriented concepts.

Course Objectives:

The objectives of offering this course are to :

1. gain knowledge of installing an Android studio and cross platform integrated development environment.
2. learn designing of user interface and layouts for an Android application.
3. learn how to use intents to broadcast data within and between applications.
4. study advanced Android development with Android Platform.

Course Outcomes:

At the end of this course, students shall be able to ;

1. design and implement user interfaces and layouts of Android Applications.
2. design and implement an Android database application and content provider.
3. design and implement Android applications based on bluetooth and multimedia service.
4. design an Android application for a particular purpose or service.

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	1		-	-	-	1	-	3	2
2	-	1				-	-	-	-	-	2	
3	1				1	-	-	-	-	-		
4	1		-	1	1	-	1	-	1	-		1

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

Course Contents:

Introduction to Android: Background, an open platform for mobile development, native android Applications, android SDK features, introducing the open handset alliance, introduction of the development framework

Getting Started Developing for Android: General machine structure, machine language, assembly language, creating your first android activity, types of android applications, android development tools, introducing the application manifest, using the manifest editor,

The Android Application Life Cycle: Understanding application priority and process states, externalizing resources, externalizing resources, a closer look at android activities, creating an activity, the activity life cycle, android activity classes, introducing views, introducing layouts, creating new views, creating and using menus,

Data Storage, Retrieval, and Sharing and Peer-to-Peer Communication : Android techniques for saving data, saving simple application data, saving and loading files, databases in android, introducing content providers, introducing SMS, using SMS in your application, sending SMS messages, listening for SMS messages, emergency responder SMS example, automating the emergency responder

Accessing Android Hardware: Introducing the bluetooth service, controlling the local bluetooth device, discovering and bonding with bluetooth devices, managing bluetooth connections, managing network and Wi-Fi connections, monitoring and managing your internet connectivity, managing active connections, managing your Wi-Fi.

Advanced Android Development : Paranoid android, linux kernel security, introducing permissions, declaring and enforcing permissions, enforcing permissions with broadcasting intents, using AIDL to support IPC for services, building rich user interfaces, working with animations, using themes to skin your applications, advanced canvas drawing, introducing surface view, creating interactive controls.

Text Books:

1. Reto Meier, "Professional Android™ Application Development", Wrox Publication
2. Lauren Dercy and Shande Conder, "Sams teach yourself Android application development , Sams publishing

Reference Books:

1. Hello Android, "Introducing Google's Mobile Development Platform", Ed Burnette,
2. Pragmatic Programmers, ISBN: 978-1-93435-617-3
3. Mitchell Schuler, "Android Programming: Mastering Course for Beginners Quick Start to Develop Your Own App", ISBN-10: 1540334139;ISBN-13: 978-1540334138

CO304UB MACHINE LEARNING

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 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 Objectives:
The objectives of offering this course are to:
1. understand a range of machine learning algorithms along with their strengths and weaknesses.
2. understand the basic theory underlying machine learning.
3. able to apply machine learning algorithms to solve problems of moderate complexity.
4. able to read current research papers and understand the issues raised by current research.

Course Outcomes:
On the successful completion of this course students shall be able to ;
1. characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.
2. understand the concept behind neural networks for learning non-linear functions.
3. understand and apply unsupervised algorithms for clustering
4. understand algorithms for learning Bayesian networks.
5. understand reinforcement learning algorithms.

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	2	-	1	-	-	-	-	-	3	
2			2	-		-	-	-	-	1		
3				-		-	-	-	-	-		1
4	2	-		-		-	-	-	-			1
5	2	2		-	1	-	-	-	-	-	3	2

6	**3**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2**

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

Course Contents:

Introduction - Well-posed learning problems, Designing a learning system, Perspectives and issues in machine 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, Remarks on version spaces and candidate elimination, Inductive bias.

Decision Tree learning – Introduction, 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 – Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition Advanced topics in artificial neural networks

Evaluation Hypotheses – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms

Bayesian learning – 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, Gibs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm

Computational learning theory – Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The mistake bound model of learning - Instance-Based Learning- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Genetic Algorithms – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

Learning Sets of Rules – Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution

Analytical Learning - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge

Combining Inductive and Analytical Learning – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators,

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. Tom M. Mitchell, “Machine Learning”, - MGH
2. 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

CO304UC SOFTWARE ENGINEERING

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 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 Objectives:
The objectives of offering this course are to:

1. understand the nature of software complexity in various application domains, disciplined way of software development and software lifecycle models.
2. introduce principles of agile software development, SCRUM process and agile practices.
3. know methods of capturing, specifying, visualizing and analyzing software requirements.
4. understand concepts and principles of software design and architecture.
5. understand the user-centered approach and principles of designing effective user interfaces.
6. present formal methods, automation and recent trends in software engineering.

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

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

Course Contents:

Software Engineering Process- Nature of software, unique nature of webApps, software engineering, the software process**,** software engineering practice–the essence of practice and general principles, myths Process models – Generic process model, process assessment and improvement, prescriptive models, specialized models, unified process, product and process.

Requirement Engineering- Requirements engineering (-inception, elicitation, elaboration, specification, validation, negotiation), eliciting requirements, developing use cases, building requirements model, negotiating requirements, validating requirements.

Requirements Analysis – Basics, scenario based modeling, UML models, data modeling, data and control flow model, behavioral modeling.

Software Design – Design within the context of software engineering, the design process, Design concepts, design model, Software architecture, architectural styles, architectural design, assessing alternative architectural designs.

User Interface Design – Golden rules– place the user in control, reduce user's memory load, make the interface consistent. User interface analysis and design models and process, Interface design steps – applying design steps, user interface design pattern, Interface design issues. Interface Design principles and guidelines.

Formal Modeling, SCM and Trends in Software Engineering- Cleanroom strategy, Functional Specification- black-box specifications, state-box specifications, clear-box specifications, cleanroom design, cleanroom testing. Software configuration management – SCM basics, SCM repository, SCM process. Emerging software engineering trends – technology evolution, process trends, collaborative development, model-driven development, test-driven development.

Agile Development Process – 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.

CO305UA PROFESSIONAL ETHICS AND CYBER SECURITY

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 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 Objectives:

The objectives of offering this course are to :

1. implement Cybersecurity Best Practices and Risk Management
2. identify and Implement Legal Effects,Communicate in a Written and Professional Manner to Strategize.
3. integrate Network Monitoring and Present Real-Time Solutions
4. understand Software Design and Secure Practices.
5. impact Cybersecurity Risk in an Ethical, Social, and Professional Manner

Course Outcomes:

On the successful completion of this course students shall be;

1. apply professional ethics to solve ethical dilemma & identify their professional responsibilities
2. examine intellectual property rights in cyber space and summarize cyber forensics and its role in cyber laws
3. evaluate cyber crimes and its severity, and measures for incident detection and response.
4. learn the underlying principles and techniques associated with the cybersecurity practice known as penetration testing or ethical hacking.

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		3		2				3		1	3	2
2	2				1	3	2	2	1	-		1
3	1		3		1	-	1		-	-		1

4	**1**		**2**	**2**		**-**	**2**			**1**	**3**	**2**
5	**1**		**2**		**3**	**-**		**2**	**1**			**1**

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

Course contents:

Engineering Ethics: 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: 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: 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.

Introduction to Cyber Crime Investigation: Firewalls and Packet Filters, password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks

Systems Vulnerability Scanning: 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

Network Defense tools: Firewalls and Packet Filters: 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

Web Application Tools Scanning for web vulnerabilities tools: Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, L0htcrack, Pwdump, HTC-Hydra

Text Book:

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.
2. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Publication Wiley.

CO305UB SOFTWARE ENGINEERING

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 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 Objectives:
The objectives of offering this course are to:

7. understand the nature of software complexity in various application domains, disciplined way of software development and software lifecycle models.
8. introduce principles of agile software development, SCRUM process and agile practices.
9. know methods of capturing, specifying, visualizing and analyzing software requirements.
10. understand concepts and principles of software design and architecture.
11. understand the user-centered approach and principles of designing effective user interfaces.
12. present formal methods, automation and recent trends in software engineering.

Course Outcomes:
On the successful completion of this course students shall be able to ;

5. identify unique features of various software application domains and classify software applications.
6. apply an appropriate lifecycle model of software development.
7. identify user needs and formulate software specifications.
8. analyze software requirements by applying various modeling techniques.

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	3	1		-	1	-	-	-	-	-		
2		1		-	1	-	-	-	-	1		1
3			2	-	1	-	-	-	-	-		1
4	2	-	1	-	1	-	-	-	-		3	1

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

Course Contents:

Software Engineering Process- Nature of software, unique nature of webApps, software engineering, the software process**,** software engineering practice–the essence of practice and general principles, myths Process models – Generic process model, process assessment and improvement, prescriptive models, specialized models, unified process, product and process.

Requirement Engineering- Requirements engineering (-inception, elicitation, elaboration, specification, validation, negotiation), eliciting requirements, developing use cases, building requirements model, negotiating requirements, validating requirements.

Requirements Analysis – Basics, scenario based modeling, UML models, data modeling, data and control flow model, behavioral modeling.

Software Design – Design within the context of software engineering, the design process, Design concepts, design model, Software architecture, architectural styles, architectural design, assessing alternative architectural designs.

User Interface Design – Golden rules– place the user in control, reduce user's memory load, make the interface consistent. User interface analysis and design models and process, Interface design steps – applying design steps, user interface design pattern, Interface design issues. Interface Design principles and guidelines.

Formal Modeling, SCM and Trends in Software Engineering- Cleanroom strategy, Functional Specification- black-box specifications, state-box specifications, clear-box specifications, cleanroom design, cleanroom testing. Software configuration management – SCM basics, SCM repository, SCM process. Emerging software engineering trends – technology evolution, process trends, collaborative development, model-driven development, test-driven development.

Agile Development Process – 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:

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

Reference Books :

4. Schwaber, K. and Beedle, M., Agile Software Development with SCRUM, 1st Edition, New Jersey : Pearson, 2001, ISBN- 9780130676344.
5. Jalote P, An Integrated Approach to Software Engineering, 3rd Edition, Narosa Publishing House, 2011, ISBN- 9788173197024.
6. Pragmatic, Agile Web Development with Rails by Ruby, ISBN- 9789350234303.

CO451U DISTRIBUTED SYSTEMS

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:
The course introduces the main principles underlying distributed systems, processes,communication, naming, synchronization, consistency, fault tolerance, and security.

Desirable awareness/skills:
Students shall have the basic knowledge of operating systems and networks.

Course Objectives:
1. To study the concepts of Distributed Operating System
2. To study Methods of understanding clock synchronization protocols.
3. To introduce the concepts of file system implementation in DOS.

Course Outcomes:
At the end of this course, students shall be able to:
1. Identify the core concepts of distributed systems: the way in which several machines orchestrate to correctly solve problems in an efficient, reliable and scalable way.
2. Understand the middleware technologies that support distributed applications such as RPC, RMI and object based middleware.
3. Apply and use the techniques, skills, and modern engineering tools necessary for engineering practices learned in the distributed system
4. Develop/design distributed systems/applications.

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	2	3	-	-	-	-	-	1	-	3	1
2	1	-	3	-	2	-	-	-	2	1	3	1
3	1	-	3	-	-	-	-	-	2	-	3	1

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

Course Contents:
Fundamentals: What is a distributed computing system, Evolution of distributed computing systems, distributed computing system models, Why are distributed computing systems gaining popularity, What is a distributed operating system?, Issues in designing a distributed operating system, Introduction to distributed computing environment(DCE).

Message Passing: Introduction, Desirable features of a good message-passing system, Issues in IPC by message passing, Synchronization, Buffering, Multidatagram messages, Encoding and decoding of message data, Process addressing, Failure handling, Group communication, Case study:4.3BSD UNIX IPC mechanism.

Remote Procedure Calls: Introduction, The RPC model, Transparency of RPC, Implementing RPC mechanism, Stub generation, RPC messages, Marshaling arguments and results, Server management, Parameter-passing semantics, Call semantics , Communication protocols for RPCs, Complicated RPCs, Client- server binding, Exception handling, Security, Some special types of RPCs,RPC in heterogeneous environments, lightweight RPC, optimizations for better performance, Case studies: Sun RPC, DCE, RPC.

Distributed Shared Memory: Introduction, General architecture of DSM systems, Design and implementation issues of DSM, Granularity, Structure of shared memory space, Consistency models, Replacement strategy, Thrashing, Other approaches to DSM, Heterogeneous DSM, Advantages of DSM.

Synchronization: Introduction, Clock synchronization, Event ordering, Mutual exclusion, Deadlock, Election algorithms.

Resource Management: Introduction, Desirable features of a good global scheduling algorithm, Task assignment approach, Load-balancing approach, Load-sharing approach.

Process Management: Introduction, Process migration, Threads.

Distributed File System: Introduction, Desirable features of a good distributed file system, File models, file- accessing models, File-sharing semantics, File-caching schemes, File replication, Fault tolerance, Atomic transactions, Design principles, Case study:DCE Distributed file service.

Text Book:

1. Pradeep K.Sinha, Distributed Operating Systems Concepts and Design, PHI.

Reference Books:

1. S.Ghosh, Chapman and Hall/CRC, Distributed Systems, Taylor & Francis Group, 2010.
2. M Singhal, N G Shivarathri, Advanced Concepts in Operating Systems, Tata McGraw-Hill Edition.
3. A.S.Tanenbaum, Distributed Operating Systems, Pearson Education

CO306U COMPUTER NETWORKS LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 50 ICA + 00 ESE **Total Marks:** 50

Minimum 10 experiments (six from group A and six from group B) shall be performed to cover the entire curriculum of course CO301U. 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. 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. Implementation of Telnet / FTP.
5. Implement Client-server application for chat.
6. Develop a Client that contacts a given DNS Server to resolve a given host name.

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 the who is client..
6. Implement a chat server using TCP/IP protocol
7. To implement an RSA algorithm.

Text Book:.

1. B. A. Forouzan, Data Communications and Networking, 4th Edition, TMH, 2009, ISBN-13-9780070634145.
2. Larry L, Computer Networks: A Systems Approach, Peterson, 5th Edition, Morgan Kaufmann Publishers, 2011, ISBN- 9789380501932.

Reference Books:

1. W.R. Stevens,, Unix Network Programming, 3rd Edition, Vol.1, Pearson Education, 2004, ISBN-13: 978-0131411555.
2. S. Keshav, An Engineering Approach to Computer Networking, Addison Wesley, 1997, ISBN:8131711455.3. Internetworking with TCP/IP by Comer, Vol.1, 4th Edition, Pearson Education, 2001, ISBN:8178084449.

NOTE:

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CO307U DATABASE MANAGEMENT SYSTEM LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01

Evaluation Scheme: 25ICA + 25ESE **Total Marks:** 50

Minimum 10 experiments (Six from Group A and six from Group B) shall be performed to cover the entire curriculum CO302U. The list given below is just a guideline. All assignments are to be implemented using open source technology only. Every assignment should include use of syntax, commands/sql statements/ clauses used for Querying database and printout of queries with proper comment and output. The concerned faculty member must engage first six practical turns to cover syllabus. Use of Open source tools/ technology is recommended for laboratory assignments.

Group A:

1. Map the ER/EER diagrams to a relational schema. Be sure to underline all primary keys, include all necessary foreign keys and indicate referential integrity constraints. Create a database of the same schema using Data Definition Language(DDL). Use all DDL statements(Create, Alter, Drop) with all possible options and constraints(Primary key, Foreign Key, unique, Not Null, Default, Check etc.).
2. Design at least 10 SQL queries for suitable database application using SQL DML statements to retrieve, insert, delete and update data and queries which involves DML Features like Set Operation,Set Comparisons, Aggregation, group by, having, order by,queries to demonstrate Transaction control language(TCL): commit, savepoint, Rollback and Data Control Language (DCL): GrantRevoke.
3. SQL queries to demonstrate View,Triggers andIndexing.
4. SQL queries to:
    a. create and use sequences.
    b. demonstrate Stored Procedure and stored functions.
5. Perform DML and DLL usingPL/SQL.
6. Write SQL for implementing Nested Queries.
7. Program to Perform DML and DDL using all possible SQL commands and with the help any one host languages like C, C++ etc (i.e. embeddedSQL).

Group B

1. Install MongoDB, run MongoDB on your OS and set up a python environment with MongoDB.
2. Connect to MongoDB with python, get a Database Handle . Create a collection and insert a document
3. Perform following operations on a collection:
    a. Retrieve all documents in a collection which matches certain property.
    b. Perform queries that uses MongoDB query operators (minimum six)
4. Perform Queries that read, count and sort documents in a collection.
5. Perform following operations on a collection:
    a. Update the document in a collection(use MongoDB update modifiers).
    b. Delete documents from a collection
6. Demonstrate following MongoDB and python patterns.
    a. Embedding
    b. Fast Accounting pattern
7. Design a simple web application using MongoDB as a backend.
8. Mini- Project which includes all RDBMSconcepts.

Text Book:

1. by Dr. P. S. Deshpande, SQL and PL/SQL for Oracle 11g Black Book, DreamTech, 2011, ISBN-9788177229400.
2. Niall O, MongoDB ,"Higgins, SPD O"ReillyPublications.

Reference Books:

1. Kevin Loney, George Koch, Oracle 9i/10g The Complete Reference, Tata McGrawHill.
2. SQL Server – Black Book by Dalton Patrik, 1st Edition, DreamTech Press, 2007, ISBN-8 817722722X.
3. Ivan Bayross, SQL, PL/SQL: The Programming Language of Oracle, 3rd Revised Edition, BPB Publication ISBN-817656964-X.
4. Reese G., Yarger R., King T, Managing and Using MySQL, Williums H, 2ndEdition, Shroff Publishers and Distributors Pvt. Ltd., ISBN 81 - 7366 - 465 –X.

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ESE–The End Semester Examination (PRESE) 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 institute.

CO308UA ANDROID PROGRAMMING LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 25ICA + 25ESE **Total Marks:** 50

Minimum 10 experiments (five from Group B and five from Group C) shall be performed to cover the entire curriculum of course CO304UA. 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. Introduction to Android App Development, setting up JDK, install Android Studio, Android SDKs, tour of Android Studio.
2. Develop a "Hello World" program. That will display "Hello World" in the middle of the screen in the red color with white background with change in fonts & styles of text.
3. Develop an android program to create a Menus and Dialog box.
4. Develop an android program that uses GUI components, Font and Colors.
5. Develop an android program that makes use of databases for insert, delete and create operation.
6. Develop an android program to play Audio and video files.
7. Develop an android program to work with Google maps.

Group B

1. Develop an android program that takes a picture using native application.
2. Develop an android program with a login module.
3. Develop an android program to send an email.
4. Develop an android program that will send SMS using your android application.
5. Develop an android program using Bluetooth APIs.
6. Develop an android program to show how to use notifications.
7. Mini Project: Develop the android application using advanced android development tools.

Text Books:

1. Reto Meier, "Professional Android™ Application Development", Wrox Publications.
2. Lauren Dercy and Shande Conder, "Sams teach yourself Android application development , Sams publishing

Reference Books:

1. Hello Android, Introducing Google's Mobile Development Platform, Ed Burnette, Pragmatic Programmers, ISBN: 978-1-93435-617-3
2. Mitchell Schuler, Android Programming: Mastering Course for Beginners Quick Start to Develop Your Own App, ISBN-10: 1540334139;ISBN-13: 978-1540334138

NOTE:

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student (journal) based on practice performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE–The End Semester Examination (Oral) 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 institute.

CO308UB MACHINE LEARNING PROGRAMMING LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 25ICA + 25ESE **Total Marks:** 50

Minimum nine experiments (five from Group A and five from Group B) shall be performed to cover the entire curriculum of the course CO304UB. The list given below is just a guideline. All assignments are to be implemented using open source technology (preferably). Group A assignment should include use 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.

Group A:

The programs can be implemented in either JAVA or Python.
For Problems from Group A -1 to 6 and GroupB-4, programs are to be developed without using the built-in classes or APIs of Java/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.

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 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. case study : Real world case study on 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:

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ESE– The End Semester Examination (Oral) for this laboratory course shall be based on oral Examination on syllabus of course CO304U and experiments performed by students in the semester followed 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 institute.

CO308UC SOFTWARE ENGINEERING LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 25ICA + 25ESE **Total Marks:** 50

Minimum ten experiments (three from Group A and seven from Group B) shall be performed to cover the entire curriculum of the course CO304UC. The list given below is just a guideline. All assignments are to be implemented using open source technology (preferably). Group A assignment should include use documentation and group B use of command/function used for coding and printout of code with proper comment and output. Use of Open source tool/ technology is recommended for laboratory assignments.

Group A:

1. To study the models in the development of software:
    i. Waterfall Model
    ii. Prototype Model
    iii. RAD Model
    iv. Incremental Model
    v. Spiral Model
2. To study Data Flow Diagrams.
3. To study Software Requirement Specification.
4. To study licensing and legal information about software.

Group B:

Prepare documentation and draw various use case diagrams for Mini-projects, covering Problem Definition, Analysis & Design using process models discussed in Group A. Every model should be applied on distinct mini projects.

Examples for mini project topics are given below:

1. ATM System
2. Library Management System
3. Inventory Control System
4. Reservation System
5. College Admission System
6. University Result Management System
7. Vehicle Navigation System
8. Hospital Management System
9. Banking System
10. Web based/Online Auction System, etc.

Text Books:

1. Pressman, R, Software Engineering: A Practitioner's Approach, 7th or 8th Edition, Singapore: McGraw Hill, 2010, ISBN- 9780071267823
2. Schwaber, K. and Beedle, Agile Software Development with SCRUM, 1st Edition, New Jersey : Pearson, 2001, ISBN- 9780130676344.
3. Lowdermilk T., User-Centered Design, 1st edition, O'Reilly Media, 2013, ISBN-9781449359836.

Reference Books:

1. Timonthy C. Lethbridge, Object Oriented Software Engineering – A Practical Software Development using UML and JAVA, 2nd Edition, Tata McGraw-Hill, 2005, ISBN: 0-0770109082.
2. Mike O"Docherty, Object-Oriented Analysis and Design – Understanding System Development with UML 2.0, 3rd Edition, Wiley, 2005, ISBN: 978-0-470-09240-8.

NOTE:

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ESE– The End Semester Examination (Oral) for this laboratory course shall be based on oral Examination on syllabus of course CO304U and experiments performed by students in the semester followed 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 institute.

CO309U SOFTWARE LAB - II

Teaching Scheme: 01L+ 02P Total: 03 **Credit:** 02
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks:** 50

Minimum 10 experiments (five from Group B and five from Group C) shall be performed to cover the entire curriculum of course CO359U. 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. The concerned faculty member must conduct group-A contents in theory lectures.

Group A

PHP- Introduction, PHP- Environment Setup, Escaping to PHP, Commenting PHP Code, Variable Types, Local Variable, Function Parameters, Global Variables, Static Variables, Constants, Operator Types

PHP - Decision Making: If...Else Statement, ElseIf Statement, Switch Statement .

PHP - Loop Types: for loop statement, while loop statement, do...while loop statement, foreach loop statement, break statement , continue statement

PHP - Arrays, strings, numeric arrays, associative arrays., multidimensional arrays , Strings

PHP - Functions: creating php function, functions with parameters., passing arguments by reference , functions returning value setting default values for function parameters, dynamic function calls

PHP - Web Concepts: identifying browser & platform, display images randomly, using html forms, browser redirection, displaying "file download" dialog box

GET and POST Methods , The GET Method, The POST Method,The $_REQUEST variable

PHP - File Inclusion: the include() function, the require() function, opening and closing files., reading a file , writing a file

PHP - Functions: creating php function, functions with parameters., passing arguments by reference , functions returning value setting default values for function parameters, dynamic function calls

PHP - Cookies: The Anatomy of a Cookie , Setting Cookies with PHP., Accessing Cookies with PHP , Deleting Cookie with PHP

Sessions: Starting a PHP Session, Destroying a PHP Session , Turning on Auto Session., Sessions without cookies

Group B

1. Write a Program to check and print whether a given number is even or odd.
    a. Write a program to compute net amount from the given quantity purchased and rate per quantity. Discount @10% is allowed if the quantity purchased exceeds 100.
2. Write a program to find the largest among three numbers using ternary operators.
    a. Write a program to print the sum of digits of a given number. (using while loop)
    b. Write a program to print Fibonacci series upto a given number.
3. Write a program to enter numbers till the user wants. At the end it should display the count of positive, negative and zeros entered. (Using do-while loop)

4. Write a function countWords ($str) that takes any string of characters and finds the Number of times each word occurs. You should ignore the distinction between capital and lowercase letters.
5. Create a form with one text field and submit buttons for string length, string reverse and uppercase, lowercase, string replace. Display the result accordingly.
6. Write a Menu-Driven program to implement a calculator which performs only addition, subtraction, multiplication and division. The operation should happen based on the user choice. (use switch case)
7. Write a function to swap two string values using call by value and call by references.

Group C

1. Write a program that will accept an array of integers as input, and output an array where for each item in the source array, the new array will perform the following operations:
    a. For even numbers divide by 2
    b. For odd numbers multiply by 3

2. Create an associative array using the countries as keys, the cities as values and transform it into 2- dimensional array and display the data as a table.
3. Write a program that creates a file and writes contents to it and displays it. Then append some data to it.
4. Create a login form with two text fields called “login” and “password”. When a user enters “Galgotias” as a user name and “university” as a password it should be redirected to a Welcome.HTML page or to Sorry.HTML in case of wrong username/password.
5. Write a PHP program using Java Script to convert the decimal number to its binary equivalent. You must use a form to accept the number from the user.
6. Write a PHP code that defines the class Student with attributes RollNo, Name, Branch, and Year, create 3 instances of it, sets the values of each instance appropriately and print the values of all attributes.

Text books

1. Mario Lurig , Mario Lurig , PHP Reference: Beginner to Intermediate PHP5.
2. Robin Nixon, Learning PHP, MySQL, JavaScript, and CSS, O’Reilly

Reference Books:

1. Matte Doyle, Beginning PHP 5.3, Wrox
2. Luke Welling, Laura Thomson, PHP and MySQL Web Development, Sams Publication

NOTE :

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ESE – The End Semester Examination (PRESE) 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 institute.

CO310U Application programming Lab

Teaching Scheme: 01L+ 02P Total: 03 **Credit:** 02

Evaluation Scheme: 25 ICA + 25 ESE **Total Marks:** 50

Minimum 10 experiments from Group B shall be performed to cover the entire curriculum of Group A of course CO310U. 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. The concerned faculty member must conduct group-A contents in theory lectures.

Group A:

An overview of Java: Object oriented Programming,a first simple program,lexical issues

Data Types: Primitive types,Integers,Floating point types,characters,booleans,variables,type conversions and casting,arrays

Operators**:** 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:class fundamentals,declaring objects,assigning object reference variables,introducing methods,constructors,this pointer,garbage collection,the finalize method,a stack class

Methods and classes:overloading methods,using object as parameters,argument passing,returning objects,recursion

Inheritance:inheritance basics,using super,method overriding, dynamic dispatch method,using abstract classes,using final with inheritance

Packages and inheritance:packages,access protection,importing packages,interfaces

Multithreaded programming: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

Applets:applets basics,skeleton of an applet,applet architecture,the HTML applet tag,passing parameters to an applet,requesting repainting,simple applet display methods

Event handling:the delegation event model,event classes,event listener classes,sources of events,adapter classes and inner classes

Introducing AWT:AWT classes,window fundamentals,working with frame windows,creating a frame window in an applet,displaying information within a window,working with graphics,color,fonts

Using AWT controls, layout managers and menus: control fundamentals. Labels, buttons, checkboxes, checkboxGroup, choice controls, lists, scrollbars, text fields, textarea,layout managers, menu bars and menus, dialogue boxes,fileDialog,handling events with AWT components

Group B

1. Write a program for the following
    a. Write a JAVA program to display default values of all primitive data types of JAVA.

b. Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify for the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

2. Write a program for the following
   a. Write a java program to search for an element in a given list of elements using binary search mechanism
   b. Write a java program to sort for an element in a given list of elements using bubble sort
3. Write a program for the following
   a. Write a java program to implement a class mechanism. – Create a class, methods and invoke them inside the main method.
   b. Write a java program to implement constructor overloading
   c. Write a java program implement method overloading
4. Write a program for the following
   a. Write a java program for abstract class to find areas of different shape
   b. Write a java program to give examples for "super" keywords.
   c. Write a java program to implement Interface.
   d. Write a program for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle
5. Write a program for the following
   a. Write an example that counts the number of times a particular character, such as e, appears in a file. The character can be specified at the command line
   b. Write a Java program that checks whether a given string is a palindrome or not.
6. Write a java program that creates threads by extending the Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)
7. Write a JAVA program for creation of User Defined Exception
8. Write a java program that import and use the defined your package in the previous Problem
9. Write a java program to paint like paint brush in applet
10. Write a program to draw a form using GUI components to accept details from a customer for a bank.
11. Write a program using a graphics method to draw an object ; provide direction buttons and move the object in the direction specified by the user through the button.
12. Write a program Event handling by anonymous class

Text Books:

1. Herbet Schildt, JAVA : The Complete Reference, TMH, India.

Reference Books:

1. Core Java, Sun Publication, India.

Note:

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by a 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 (PRESE) 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 institute.

CO455U Distributed Systems Lab

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks:** 50

Minimum 10 experiments (five from Group A and five from Group B) shall be performed to cover the entire curriculum of course CO451. 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. Design a distributed application using RMI for remote computation where client submits two strings to the server and server returns the concatenation of the given strings
2. Design a distributed application using RPC for remote computation where client submits an integer value to the server and server calculates factorial and returns the result to the client program.
3. Design a Distributed Application using Message passing Interface for remote computation.
4. Write a program to simulate the Distributed Mutual Exclusion.
5. Design distributed application which consists of a server and client using threads.
6. To study the World Wide Web
7. To study MPI
8. To study Enterprise JavaBeans and Fractal.
9. To study Java RMI

Group B:

1. Design and develop a distributed Hotel booking application using Java RMI.
A distributed hotel booking system consists of the hotel server and the client machines. The server manages hotel rooms booking information. A customer can invoke the following operations at his machine
i) Book the room for the specific guest
ii) Cancel the booking of a guest
2. Implement distributed system using lock server
3. Design and develop a distributed application to find the coolest/hottest year from the available weather data. Use weather data from the Internet and process it using MapReduce.
4. Write a program to implement a Distributed chat server using TCP sockets.
5. Implement RPC mechanism for a file transfer across a network.
6. Write a code to implement sliding window protocol.
7. To study Squirrel
8. To study Coda
9. To study BitTorrent and End System Multicast.
10. To study Kerberos

Text Books:

1. Pradeep K.Sinha, Distributed Operating Systems Concepts and Design, PHI.

Reference Books:

1. M Singhal, N G Shivarathri, Advanced Concepts in Operating Systems, Tata McGraw-Hill Edition.
2. G Coulouris, J Dollimore and T Kindberg, Distributed Systems Concepts and Design, Fourth Edition, Pearson Education.

Note:

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by a 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 (Oral) 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 institute.

CO351U SOFTWARE PROJECT MANAGEMENT

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:
The objective of this course is to introduce students from other engineering streams to get the knowledge of project management, project life cycle, strategic planning, project quality management and tools and techniques for quality control.

Desirable awareness/skills:
Software engineering and Business management.

Course Objectives:
The objectives of offering this course are :

1. to outline the need for software project management.
2. to outline the need for project quality management and techniques for quality control.

Course Outcomes:
On the successful completion of this course student shall be;

1. able to practice project development principles while developing software.
2. able to understand project management in terms of the software development process.
3. able to do strategic project planning.
4. able to perform project quality management using tools and techniques for quality control.

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	2	-			3	1	1		1	3	
2	-	-	1			-	1	-	-	-	-	-
3	1			1	1	-		-	-	-	-	1
4	1			1	1	-	1	-	-	-	-	-

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

Course Content:
Introduction to Project Management: Project, examples of information technology projects, project attributes, the triple constraint, project management? project stakeholders, project management knowledge areas, project management tools and techniques, project success, the role of the project

manager: project manager job description , suggested skills for project managers, importance of people and leadership skills, careers for information technology project managers

The Project Management and Information Technology Context: A systems view of project management, understanding organizations, the four Frames of organizations, stakeholder management, the importance of top management commitment, the need for organizational commitment to information technology, the need for organizational standards, project phases and the project life cycle, product life cycles, the importance of project phases and management reviews

Project Integration Management: What is project integration management? strategic planning and project selection, developing a project charter, developing a project management plan, project scope management: project scope management? collecting requirements, defining scope, creating the work breakdown structure, verifying scope, controlling scope.

Project Time Management and Cost Management: The importance of project schedules, defining activities, sequencing activities, estimating activity resources, estimating activity durations, developing the schedule, the importance of project cost management, basic principles of cost management, estimating costs, determining the budget, controlling cost.

Project Quality Management and Risk Management: The importance of project quality management project quality management? planning quality, performing quality assurance, performing quality control, tools and techniques for quality control, the importance of project risk management, planning risk management, common sources of risk on information technology projects, identifying risks, performing qualitative risk analysis, performing quantitative risk analysis.

Text Books:

1. : Kathy Schwalbe, Information Technology Project Management, Thomson Publication 6th Revised edition

Reference Books:1

1. Joseph Phillips, PMP Project Management Professional Study Guide, Third Edition , McGraw Hill.
2. Samuel Mantel, Jack Meredith, Scott Shafer, Margaret M. Sutton, With M.R. Gopalan,"Project Management Core TextBook", Wiley India Edition.
3. K.K. Chitkara, UddeshKohli, "Project Management Handbook", Tata McGrawHill Education Pvt. Ltd., 2006

CO352U FINANCE MANAGEMENT AND INFORMATION SYSTEM

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:

The main objective of this course is to provide students with an overall understanding of the main concepts of Finance management, information systems, and to highlight the importance of information systems in modern organizations and societies. To know how information system makes businesses more competitive and efficient. It covers a range of topics including: Finance Management, Management Theory, Basics of Management Information system, E-Business, Enterprise and global management Enterprise management system, Laws and case studies of law.

Desirable awareness/skills:

General proficiency, Humanities and Social Science

Course Objective:

The objectives of offering this course are:

1. to learn why information systems are so important today for business and management.
2. to evaluate the role of the major types of information system in the business environment.
3. assess the impact of the Internet and Information technology on business, electronics, commerce and Electronics business.
4. to provide students with basic concepts in the information system and the benefits with these systems in modern society.
5. to differentiate between data, information, and knowledge.
6. to understand systems definition, systems requirements, and information needed for decision makers.
7. to identify several methods to enhance and develop information systems and to manage the information system resources.

Course Outcomes:

On the successful completion of this course student able to;

1. demonstrate effective MIS and DSS reports.
2. demonstrate effective analytical and critical thinking skills to make an appropriate business related decisions
3. distinguish and analyze ethical problems that occur in business and society
4. apply leadership skills and competencies in business situations
5. apply current technologies and decision-support tools for business operations

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
1	1	2	-	2	3	3	1	1	1	1	3
2	-	-	1	3		-		-	-	-	-
3	1			1		-	1	-	-	-	-
4	1	2		1	1	-		-	-	-	-

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

Course Content:

Basic of Management Theory and Practice: Evolution of management thoughts, system approach to management process, functions of manager, social responsibilities of manager. International management and multinational corporation, cultural differences in international management. Quality perspective, HR management and selection, performance appraisal and career strategies **Finance:**Overview of financial management: goal of financial management, fundamental principle of finance, risk return trade off, forms of business organization .Financial statements taxes and cash flow: balance sheet, profit and loss account, finance topics, taxes, free cash flow. Time value of money: time lines and notations, present and future value of single amount. Mergers & acquisition: Mergers, acquisition, takeover, privatization, Divestitures. Corporate Security: Share, debentures & International Security

Basics of MIS: Decision making- Concepts, process and organizational decision making, role of MIS in decision making. Development process of MIS: MIS plan, development & implementation of MIS. Strategies design of MIS, business process reengineering, relevance of IT, DSS concepts, philosophy and application, knowledge management and system.

E-business: E-business enterprise- Organization of business in digital form, e-business, ecommerce, e-communication, e-collaboration and real time enterprise. Modern business technology: security and businesses, web enabled business management, CMS, ECM, enterprise portal.

Enterprise and Global Management Enterprise Management System: EMS, ERP, SCM, CRM. Information security challenges, Global management: outsourcing and offshoring, cultural, political and economical challenges, global business IT strategies and applications, global IT platform, global data access issues.

Laws and Case Studies Law: cyber law, IT act, right to information act, IPR law, IT impact on society. Case studies.

Text books:

1. W.S. Jawadekar, "Management information system, text and cases: A digital firm perspective", 3 rd Edition, Tata Mcgraw Hill, 2008, ISBN- 9780070616349.
2. J.A.O"Brien,"Management information system", 9th edition, Tata Mcgraw hill, 2009.
3. H. Koontz, "Essentials of management: An international perspective", 5th edition, Tata Mcgraw Hill, 1998, ISBN- 007463227-2.

4. P. Chandra, ”Financial management theory and practice”, 6th edition, Tata Mcgraw Hill, 2007, ISBN- 0074630687.
5. Ellen Monk and Bret Wagner, “Concepts in Enterprise resource planning”, 4th Edition, Course Technology cengage learning, 2013, ISBN:13:978-1-111-82039-8.

References Books:

1. P.K.Goel, “Business law for managers”, Wiley India, 2009, ISBN:9788177225358.
2. V. Sharan, “Fundamentals of financial management”, 2nd Edition, Pearson Education 2012, ISBN:13: 97881317614273.
3. E.Turban, “Information technology for management”, 8th edition, Wiley Edition, 2011, ISBN : 978-1-118-09225-5.
4. R. Mclead, “Management information system”10th Edition, Pearson Education, 2006, ISBN13: 978-0131889187.
5. M. Azam, V. Nicole, “Management Information System”, TMH, 2012, ISBN9788182093171.

CO353U DESIGN AND ANALYSIS OF ALGORITHMS

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 knowledge of divide and Conquer method, Greedy Method, Dynamic programming, backtracking, basic traversal. This course also provides knowledge of different search techniques like DFS, BFS.

Desirable awareness/skills:

Programming Language, Discrete Mathematical Structure and Data Structures

Course Objectives:

The objectives of offering the course are:

1. demonstrate knowledge of how to measure the complexity of an algorithm and understand best-case, worst-case, and average complexities.
2. know the basic algorithmic design strategies, including recursion, divide-and conquer, greedy method,learn dynamic programming and backtracking.
3. use data structure in providing efficient algorithms solutions.

Course Outcomes:

On successful completion of this course student able to;

1. apply mathematical principles to solve various problems also to analyze the complexities of various algorithms and select the best.
2. able to design some algorithms and analyze their performance with respect to selected evaluation parameters
3. apply different strategies that are known to be useful in finding efficient algorithms to solve problems.
4. use appropriate data structure and algorithms to solve a particular problem

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	2	3	1	2	-	-	1	1	-	-	2	1
2			2	-	2	-	1	1	2	-	2	
3	3	2	-	1		-	-	1	-	-	-	
4	3		-	2	3	-	-	-	-	-	-	1

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

Course Content:

Introduction to Algorithms: What is an algorithm, performance analysis- space complexity, time complexity, asymptotic notation .

Divide and Conquer: introduction, binary search-iterative and recursive, finding the maximum and minimum, merge sort, quick sort, heap sort.

Greedy Method: Introduction, 0/1 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: Multistage graphs, all pairs shortest path, single source shortest path, optimal binary search tree, floyd-warshall algorithm.

Backtracking: Introduction, the 8 queens problem, sum of subset, graph coloring, hamiltonian cycles, branch and bound, , 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:

1. Horowitz, Sahani, Rajasekaran, “Fundamentals of Computer Algorithm”, 2nd Edition, Galgotia Publication universities of press. 2008, ISBN: 9788173716126.
2. Coreman, Leiserson, Rivest, Stein, “Introduction to Algorithms”, 2nd Edition, PHI,2001, ISBN- 9788120321410.

Reference Books:

1. Aho Ulman, Hopecroft, “Design and Analysis of Algorithms”,Pearson Edition, Addison Wesley, 2009, ISBN- 9788131702055.
2. Anay Levitin, “Introduction to design and Analysis of algorithms”, 2ns Edition, Pearson Education, 2008, ISBN- 978813118377.
3. 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.

CO354UA PROFESSIONAL ETHICS AND CYBER SECURITY

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 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 Objectives:

The objectives of offering this course are to :

1. implement Cybersecurity Best Practices and Risk Management
2. identify and Implement Legal Effects,Communicate in a Written and Professional Manner to Strategize.
3. integrate Network Monitoring and Present Real-Time Solutions
4. understand Software Design and Secure Practices.

Course Outcomes:

On successful completion of this course student able to;

1. apply professional ethics to solve ethical dilemma & identify their professional responsibilities
2. examine intellectual property rights in cyber space and summarize cyber forensics and its role in cyber laws
3. evaluate cyber crimes and its severity, and measures for incident detection and response.
4. learn the underlying principles and techniques associated with the cybersecurity practice known as penetration testing or ethical hacking.

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				2	3	2		3	3	1	3	1
2					1	3			1	-	1	
3	1	2	3			-			-	-		
4	1					-			1	1		
5	1			2		-	2	2	1	1	3	1

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

Course contents:

Engineering Ethics: 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: 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: 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.

Introduction to Cyber Crime Investigation: Firewalls and Packet Filters, password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks

Systems Vulnerability Scanning: 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

Network Defense tools: Firewalls and Packet Filters: 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

Web Application Tools Scanning for web vulnerabilities tools: Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, HTC-Hydra

Text Book:

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.
2. Nina Godbole and Sunit Belpure, “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Publication Wiley.

CO354UB 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 introduces the student IoT and Architecture of IoT and Understanding of Sensors.

Desirable awareness/skills:
Teamwork, Business Intelligence, Information Security, IP Networking , Automation

Course Objectives:
The objectives of offering this course are to:

1. understanding the definition and significance of the internet of things.
2. discuss the architecture , operation and business benefits of an iot system
3. examine the potential business opportunities that iot can uncover
4. explore the relationship between iot, cloud computing and big data.

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

1. understand the application area of IOT.
2. understand the revolution of the internet in mobile devices, cloud and sensor networks.
3. understand building blocks of the internet of things and characteristics.

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	2	3	-	-	-	-	-	1	-	3	-
2	1	-		-	2	-	-	-	2	1	3	-
3	1	-		-	-	-	-	-	2	-	3	1

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

Course Contents:
Introduction to IoT : Defining IoT, Characteristics of IoT, Physical Design of IoT, Logical design of IoT, Functional Blocks of IoT
IoT and M2M : Machine to Machine, Diff between IoT and M2M, Software Define Network
Network and Communication Aspects: Wireless medium access issues, MAC protocol Survey, Survey Routing Protocol.
Challenges in IoT: Design Challenge, Development Challenge, Security Challenge and other Challenges.
Resource Management in the IoT: Clustering, Software Agents, design guidelines and software agents for object representation, Data synchronization

Developing IoT's:Introduction to Python, Introduction to Different IoT tools, Implementing IoT concept with Python.

Business model for the IoT: Business model and Business Model Innovation, value creation in the IoT, Business model scenarios for the IoT, IoT's Applications: Smart Metering Infrastructure, e-Health Body Area Networks, City Automation, 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. Hakima Chaouchi, " The Internet of Things Connecting Objects to the Web" ISBN : 978-1-84821-140-7, Willy Publications
2. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, ISBN: 978-1-119-99435-0, 2 nd Edition, Willy Publications
3. Daniel Kellmereit, Daniel Obodovski, "The Silent Intelligence: The Internet of Things",. Publisher: Lightning Source Inc; 1 edition (15 April 2014). ISBN-10: 0989973700, ISBN-13: 978- 0989973700.
4. Fang Zhaho, Leonidas Guibas, "Wireless Sensor Network: An information processing approach", Elsevier, ISBN: 978-81-8147-642-5.

CO354UC EMBEDDED SYSTEMS

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 focuses on detailed introduction of embedded systems along with its hardware and software designing. Students will get an insight of ARM.It also gives a sight of real time operating systems and assembly language programming.

Desirable Awareness / Skills :
Knowledge of microcontroller architecture and assembly language, microcontroller peripherals, digital design, and the assembly programming language.

Course Objectives:
The objectives of offering this course are to:

1. introduce the basics of embedded system structure.
2. give knowledge about microcontroller ARM system architecture and study of on-chip peripherals.
3. impart knowledge of real time operating systems and ROTS programming.
4. introduce assembly language programming.

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

1. analyze the complete embedded life cycle in designing of embedded systems (hardware and software)
2. understand the structure and working of rots based on embedded systems.
3. understand the interfacing to microcontroller with various peripherals and control from software
4. write a program for rots.

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

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

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

Course contents:

Introduction of an Embedded System-Definition, Examples, Embedded vs General computing system,Classification, application and purpose of ES, Characteristics and Quality Attributes of Embedded Systems, Current Technologies, Embedded system design process.

Elements of an Embedded System: Core of an Embedded System-Microprocessor,Microcontroller,Digital signal processor,ASIC,PLD's,stepper motor, Memory, Sensors, Actuators, Communication Interface, Reset circuits, RTC, WDT.

Embedded Hardware: The Embedded Board and the von Neumann Model, Powering the Hardware,Basic Hardware Materials: Conductors, Insulators, and Semiconductors,Common Passive Components on Boards and in Chips: Resistors, Capacitors, and Inductors,Semiconductors and the Active Building Blocks of Processors and Memory,Putting It All Together: The Integrated Circuit (IC)

Embedded Processors – ISA architectureModels, Internal processor design, processor performance, Board Memory – ROM, RAM, Auxiliary Memory, Memory Management of External Memory.Embedded board Input / output – Serial versus Parallel I/O, interfacing the I/O components and performance, Board buses – Bus arbitration and timing, integrating the Bus with other board components, Bus performance.

Embedded Software: Device drivers, Device Drivers for interrupt-Handling, Memory device drivers,On-board bus device drivers, Board I/O drivers, Explanation about above drivers with suitable examples.

Hardware Software Co-Design: embedded firmware design approaches, computational models, embedded firmware development languages, Integration and testing of Embedded Hardware and firmware, Components in embedded system development environment (IDE), Files generated during Compilation, simulators, emulators and debugging.

RTOS Based Embedded System Design: Operating System basics, Tasks, Process, Synchronization between processes,Threads, Multitasking and process Management, message passing, Interprocess communication, Scheduling, semaphores, mailboxes, pipes.

OS standards example – POSIX, OS performance guidelines, Board support packages, Middleware and Application Software,Middleware Examples,Application Layer Software Examples.

Microcontroller: 8051 Microcontroller: features and application of 8051, basic I/O port instructions, general assembly language instructions and programming, 8051 addressing modes,8051 interfacing with LCD, LED, Stepper motor.

ARM Microcontroller: features of ARM, categories and examples of ARM microcontroller, Thumb-2 technology and applications of ARM, Architecture of ARM Cortex M3, General Purpose Registers, exceptions, interrupts, stack operation, reset sequence, useful Instruction list and description, Cortex-M3 programming using assembly language.

Text Book:

1. K. V. Shibu, "Introduction to embedded systems", TMH education Pvt. Ltd. 200"https://mrcet.com/downloads/digital_notes/ECE/IV%20Year/5.Embedded%20Systems%20Design.pdf"
2. Frank Vahid, Tony D. Givargis, "Embedded System Design: A Unified Hardware/Software Introduction", John Wily & Sons Inc.2002.
3. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M3", 2nd edition, Newnes,

(Elsevier), 2010.

Reference Books:

1. The 8051 microcontroller. A Systems Approach. Muhammad Ali Mazidi. Janice Gillispie Mazidi. Rolin D. McKinlay. PEARSON
2. Rajkamal, “Embedded Systems: Architecture, Programming and Design”, TMH Publications, Second Edition, 2008.
3. James K. Peckol, "Embedded systems- A contemporary design tool", John Wiley, 2008.
4. Peter Marwedel, “Embedded System Design”, Science Publishers, 2007.

CO355UA INTERNET AND COMMUNICATION TECHNOLOGY

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 basic communication techniques and concepts of data communication. Provide knowledge of networking and different topologies of networks. It also provides encoding techniques for data. Introduce the layered model of the internet and its components.

Desirable awareness/skills:

Basics of computer networks.

Course Objectives:

The objectives of offering this course are;

1. to learn and understand basic communication techniques.
2. to introduce students to the evolution of computer networks and the concepts of data communication.
3. to introduce students the general principles of network design and compare the different network topologies.
4. to introduce students to the digital and analogue representations and channels.
5. to describe the mechanism and techniques of encoding.
6. to introduce students to the general principles of circuit and packet switching.
7. to provide students with in-depth knowledge of data link layer fundamentals such as error detection, correction and flow control techniques; multiple access control techniques.

Course Outcomes:

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

1. introduce the concepts of data communication.
2. learn Data Communication Methods and Algorithms.
3. introduce the layered model of the internet and its components.
4. provide in-depth knowledge of physical layer and data link layer technologies.

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	2	2	3	-	-	-	-	-	-	-	-
2	1	2	2	3	-	-	-	-	-	-	-	-
3	1	2	2	3	1	-	-	-	-	-	-	-
4	1	2	3	3	1		-	-	-	-	-	-

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

Course Contents:

Introduction: Data communication, networks, internet, protocols and standards, network models: OSI, TCP/IP, analog and digital data, periodic analog signal, digital signal, transmission impairments, data rate limits, performance. signal conversion: digital-to-digital, analog-to digital, analog-to-analog, digital-to-analog conversion.

Bandwidth Utilization and Transmission Media: Multiplexing spread spectrum, guided media and unguided media.

Switching: Circuit switched networks, datagram networks, virtual circuit networks, structure of switch.

Error Detection and Correction: Types of errors, redundancy, detection vs correction, fec vs retransmission, coding, modular arithmetic, block coding, linear block codes, cyclic codes, checksum, hamming code.

Data Link Control: Framing, flow control and error control protocols, protocols: stop-and-wait, go-back-n, selective-repeat, piggybacking, HDLC,PPP.

Medium Access, Ethernet and LAN: Random access: ALOHA, CSMA, CSMA/CD, CSMA/CA, controlled access, channelization, IEEE standards, different Ethernets, connecting devices, backbone networks, VLAN.

Multi-user digital: Modulation techniques such as frequency division multiple access (FDMA); time division multiple access (TDMA); code division multiple access (CDMA);

Text Books:

1. B. A. Forouzan, "Data Communications and Networking", 4th Edition, TMH, 2009, ISBN-13-9780070634145.
2. A. S. Tanenbaum, "Computer Networks", 4th Edition, Pearson Education, 2005, ISBN-8177581651.
3. Larry L. Peterson, "Computer Networks: A Systems Approach", 5th Edition, Morgan Kaufmann Publishers, 2011, ISBN- 9789380501932.

Reference Books:

1. Matthew S. Gast, 802.11 Wireless Networks: The Definitive Guide", 2nd Edition, O'Reilly, 2005, ISBN-13: 978-0596100520
2. Alberto, Leon Garcia, "Communication networks- Fundamental concepts and key architectures", 2nd edition, TMH, 2004, ISBN- 9780070595019.

CO355UB HUMAN COMPUTER INTERACTION

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 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. Students will work on both individual and team projects to design, implement and evaluate computer interfaces. The course is open to students from all disciplines, providing them with experience working in interdisciplinary design teams.

Desirable awareness/skills:
Internet basics

Course Objectives:
The objectives of offering this course are to:

1. design, implement and evaluate effective and usable graphical computer interfaces.
2. describe and apply core theories, models and methodologies from the field of HCI.
3. describe and discuss current research in the field of HCI.
4. implement simple graphical user interfaces using the Java Swing toolkit
5. describe special considerations in designing user interfaces for older adults.

Course Outcomes:
On the successful completion of this course,students are able to;

1. design, implement and evaluate effective and usable graphical computer interfaces.
2. describe and apply core theories, models and methodologies from the field of HCI.
3. describe and discuss current research in the field of HCI.

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	2	3	-	-	-	-	-	1	-	3	1
2	1	-	3	-	2	-	-	-	2	1	3	1
3	1	-	3	-	-	-	-	-	2	-	3	1

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

Course Contents:

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

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

User Centric: 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: classical models- Introduction, the GOMS models, models of specific user behavior, the models and the computational framework.

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

Computational Models of users: 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: Introduction, Research Questions, Identification of Variables, Experiment Design, Data Analysis, Use of Empirical Data for Models Building

Formal Models in User- Centric Computing: 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: Introduction, Evaluation with Experts, Evaluation with users, Model-Based Evaluation, A Framework for Usability Evaluation and Design

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

Text Book:

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

CO454UA PATTERN RECOGNITION

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 introduces the student pattern recognition and some classification algorithms.

Desirable awareness/skills:
It is assumed that the student shall have knowledge of probability theory and linear algebra. It is also assumed that the students have some experience of programming in a scientific computing environment.

Course Objectives:
The objectives of offering this course are to:

1. To introduce the fundamental algorithms for pattern recognition
2. To investigate the various classification and clustering techniques

Course Outcomes:
The students will be able to
1. design and construct a pattern recognition system
2. know the major approaches in statistical and syntactic pattern recognition.
3. become aware of the theoretical issues involved in pattern recognition system design such as the curse of dimensionality.
4. implement pattern recognition techniques

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	2		-	-	-	-	-	1	-		1
2	1	-	3	-	2	-	-	-		1	3	1
3	1	-		-	-	-	-	-	2	-	3	1

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

Course Contents:
Introduction: Basics of pattern recognition system, various applications, Machine Perception, classification of pattern recognition systems, Design of Pattern recognition system, Pattern recognition Life Cycle.

Statistical Pattern Recognition: Review of probability theory, Gaussian distribution, Bayes decision theory and Classifiers, Optimal solutions for minimum error and minimum risk criteria, Normal density and discriminant functions, Decision surfaces

Parameter estimation methods: Maximum-Likelihood estimation, Expectation-maximization method, Bayesian parameter estimation, Concept of feature extraction and dimensionality, Curse of dimensionality, Dimension reduction methods - Fisher discriminant analysis, Principal component analysis Hidden Markov Models (HMM) basic concepts, Gaussian mixture models.

Non-Parameter methods: Non-parametric techniques for density estimation - Parzen-window method, K-Nearest Neighbour method.

Non-metric methods for pattern classification: Non-numeric data or nominal data Decision trees: Concept of construction, splitting of nodes, choosing of attributes, overfitting, pruning.

Linear Discriminant based algorithm: Perceptron, Support Vector Machines.

Unsupervised learning: Clustering - Criterion functions for clustering, Algorithms for clustering: K-means and Hierarchical methods, Cluster validation

Text Book:

1. C M Bishop, Pattern Recognition and Machine Learning, Springer
2. R O Duda, P.E. Hart and D.G. Stork, Pattern Classification and scene analysis, John Wiley

Reference Books:

1. Morton Nadier and Eric Smith P., "Pattern Recognition Engineering", John Wiley & Sons, New York, 1993.
2. Robert J. Schalkoff, "Pattern Recognition : Statistical, Structural and Neural Approaches", John Wiley & Sons Inc., New York, 2007.
3. S.Theodoridis and K. Koutroumbas, "Pattern Recognition", 4/e, Academic Press, 2009.

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CO454UB BIG DATA ANALYTICS

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 introduces the student about big data and big data analysis. also the tools required to manage and analyze big data like Hadoop, NoSql Map-Reduce

Desirable awareness/skills:
Data mining and data analysis, R/python/java

Course Objectives:
The objectives of offering this course are to:

1. understand big data for business intelligence.
2. learn business case studies for big data analytics.
3. understand nosql big data management.
4. perform map-reduce analytics using Hadoop and related tool

Course Outcomes:
On the successful completion of this course,students are able to;

1. describe big data and use cases from selected business domains
2. explain NoSQL big data management
3. install, configure, and run Hadoop and HDFS
4. perform map-reduce analytics using Hadoop
5. Use Hadoop related tools such as HBase, Cassandra, Pig for big data analytics

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		2		-	-	-	-	-		-		1
2		-		-	2	-	-	-	2	1	3	1
3	1	-	3	-	-	-	-	-		-		
4	1	2	3	-	-	-	-	-	1	-	3	

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

Course Contents:
Introduction to Big Data: Introduction to big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and

big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations

Introduction to Hadoop: Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structure

MapReduce: MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output format. Algorithms Using MapReduce: Matrix-Vector Multiplication by MapReduce , Relational-Algebra Operations, Computing Selections by MapReduce, Computing Projections by MapReduce, Union, Intersection, and Difference by MapReduce, Computing Natural Join by MapReduce, Grouping and Aggregation by MapReduce, Matrix Multiplication, Matrix Multiplication with One MapReduce Step

Hbase: data model and implementations, Hbase clients, Hbase examples, praxis.Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration

Introduction to Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries.

Text Book:

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

Reference Books:

1. Michael Minelli, Michele Chambers, Ambiga Dhiraj, “Big Data Big Analytics: Emerging Business Intelligence And Analytic Trends For Today's Businesses”, Wiley India
2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, “Big Data for Dummies”, Wiley India
3. Paul Zikopoulos, Chris Eaton, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data’, McGraw Hill Education.

CO454UC INFORMATION STORAGE AND MANAGEMENT

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 introduces the student recent trends of information storage and management on cloud.

Desirable awareness/skills:
Basics of storage management and networking.

Course Objectives:
The objectives of offering this course are to:

1. To understand data creation, the amount of data being created, the value of data to a business, challenges in data storage and data management,
2. To understand solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities

Course Outcomes:
On the successful completion of this course,students are able to;

1. understand the concept of data storage in a distributed environment in a data centre,
2. understand challenges in data storage and management technologies.
3. understand solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities

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		2		-	-	-	-	-	1	-		1
2	1	-		-	2	-	-	-		1	3	
3		-	3	-	-	-	-	-	2	-		

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

Course Contents:
Introduction to Information Storage and Management:
Information Storage-Data, Types of Data, Information, Storage.
Evolution of Storage Technology and Architecture.
Data Center Infrastructure- Core Elements, Key Requirements for Data Center Elements, Managing Storage Infrastructure.
Key Challenges in Managing Information. Information Lifecycle- Information Lifecycle Management, ILM Implementation, ILM Benefits.

Data Protection:
Implementation of RAID- Software RAID, Hardware RAID.
RAID Array Components.
RAID Levels - Striping, Mirroring, Parity, RAID 0, RAID 1, Nested RAID, RAID 3, RAID 4, RAID 5, RAID 6.
RAID Comparison.

Direct-Attached Storage and Introduction to SCSI:
Types of DAS- Internal DAS, External DAS. DAS Benefits and Limitations. Disk Drive Interfaces- IDE/ATA, SATA, Parallel SCSI.
Introduction to Parallel SCSI- Evolution of SCSI, SCSI Interfaces, SCSI-3 Architecture, Parallel SCSI Addressing.
SCSI Command Model- CDB Structure, Operation Code, Control Field, Status

Storage Area Networks:
Fibre Channel: Overview.
The SAN and Its Evolution.
Components of SAN- Node Ports, Cabling, Interconnect Devices, Storage Arrays, SAN Management Software.
FC Connectivity- Point-to-Point, Fibre Channel Arbitrated Loop, Fibre Channel Switched Fabric.
Fibre Channel Ports.
Fibre Channel Architecture- Fibre Channel Protocol Stack, Fibre Channel Addressing, FC Frame, Structure and Organization of FC Data, Flow Control, Classes of Service, Zoning, Fibre Channel Login Types.
FC Topologies- Core-Edge Fabric, Mesh Topology.

Network-Attached Storage:
General-Purpose Servers vs. NAS Devices, Benefits of NAS.
NAS File I/O- File Systems and Remote File Sharing, Accessing a File System, File Sharing.
Components of NAS.
NAS Implementations- Integrated NAS, Gateway NAS, Integrated NAS Connectivity, Gateway NAS Connectivity.
NAS File-Sharing Protocols- NFS, CIFS.
NAS I/O Operations- Hosting and Accessing Files on NAS, Factors Affecting NAS Performance and Availability.

IP SAN:
iSCSI - Components of iSCSI, iSCSI Host Connectivity, Topologies for iSCSI Connectivity, iSCSI Protocol Stack, iSCSI Discovery, iSCSI Names, iSCSI Session, iSCSI PDU, Ordering and Numbering, iSCSI Error Handling and Security.
FCIP - FCIP Topology, FCIP Performance and Security.

Content-Addressed Storage(CAS):
Fixed Content and Archives, Types of Archives, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS.

CAS Examples- Health Care Solution: Storing Patient Studies, Finance Solution: Storing Financial Records.

Introduction to Business Continuity:
Information Availability- Causes of Information Unavailability, Measuring Information Availability, Consequences of Downtime.
BC Terminology, BC Planning Lifecycle.
Failure Analysis- Single Point of Failure, Fault Tolerance.
Multipathing Software, Business Impact Analysis, BC Technology Solutions.

Text Book:

1. John Wiley & Sons, Information Storage and Management, EMC Education Services. Wiley Publishing. Inc 2010

Reference Books:

1. Somasundaram G, Alok Shrivastava, "ISM – Storing, Managing and Protecting Digital Information", EMC Education Services, Wiley India, New Delhi, 2012.
2. Gerald J Kowalski, Mark T Maybury, "Information Storage and Retrieval Systems: Theory and Implementation", BS Publications, New Delhi, 2009.
3. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, New Delhi, 2006

CO356U DESIGN AND ANALYSIS OF ALGORITHMS LAB

Teaching Scheme: 00L + 02T, Total: 02 **Credit:** 01
Evaluation Scheme: 25 ICA+ 25ESE **Total Marks: 50**
Duration of ESE: 03 Hrs

Minimum 10 experiments (five from Group A and five from Group B) shall be performed to cover the entire curriculum of course CO353U. 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. Recursive and non-recursive algorithms for a specific problem and their complexity measures
2. Implement any two algorithms using divide and conquer approach (finding Min-Max problem, merge sort, quick sort)
3. Write a program using greedy method:
   a. for minimal spanning tree using Prim‟s algorithm
   b. Write a program for minimal spanning tree using Kruskal‟s algorithm
4. Write a program to solve
   a. knapsack ,0/1 knapsack problem using greedy method.
   b. 0/1 knapsack problem using dynamic programming using memory function.
5. Write a program using dynamic programming to
   a. find single source shortest path for multistage graph problem.
   b. find all pairs shortest path for multistage graph problem.
6. Write a program to solve
   a. Huffman code problem.
   b. Optimal Binary Search tree. using dynamic programming.
7. Write a program to solve
   a. Traveling Salesman problem.
   b. Flow shop Scheduling. using dynamic programming.

Group B

1. Apply Heap sort technique on a given set of elements.
2. Develop a simulator for a given set of elements using Merge sort technique / selection sort technique/ Quick sort technique.
3. A disorganized carpenter has a mixed pile of bolts and nuts and would like to find the corresponding pairs of bolts and nuts. Each nut matches exactly one bolt (and vice versa). By trying to match a bolt and a nut the carpenter can see which one is bigger, but she cannot compare two bolts or two nuts directly. Can you help the carpenter match the nuts and bolts quickly?
4. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra‟s algorithm.
5. Implement a programme using Depth first Search technique to Check whether a graph is connected.
6. Implement a minimum cost spanning tree for a given undirected graph using Prim‟s algorithm or Kruskal‟s algorithm.

7. Print all the nodes reachable from a given starting node in a digraph using Breadth first search technique.
8. Develop a simulator for all pair shortest paths problem using Floyd‟s algorithm
9. Design a simulator for n-Queens problem using backtracking technique.

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, Hopecroft, “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 for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skills acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

ESE – The End Semester Examination (PRESE) 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 the institute

CO357UA PROFESSIONAL ETHICS AND CYBER SECURITY LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01

Evaluation Scheme: 25 ICA + 00 ESE **Total Marks:** 25

Minimum 10 experiments (Five from group A and Five from group B) shall be performed to cover the entire curriculum of course CO354UA. 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. Practical Ethical decision making model as per the assessment criteria.
2. Practical on "How to make strong passwords" and "passwords cracking techniques" for mobile/computer systems.
3. Practical on 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. Practical on 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. 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. 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.

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).

CO357UB INTERNET OF THINGS LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 25 ICA + 00 ESE **Total Marks:** 25

Minimum 10 experiments(five from group A and five from group B) shall be performed to cover the entire curriculum of course CO354U-B. 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 tool/ technology is recommended for laboratory assignments. The concerned faculty member must conduct group-A contents in theory lectures.

Group A

1. IOT intro and overview • Intro to Arduino board • Interfacing Leds • Serial Communication • Interfacing with Sensors 1. PIR 2. Ultrasonic 3. LDR 4. Temperature sensor
2. Arduino IDE Installation
3. Understanding Arduino Libraries
4. Working with Analog I/O's
5. Working with Digital I/O's
6. Software Serial Library in Arduino

Group B

1. Introduction to Bluetooth Technology
2. Home automation using Voice Commands & Bluetooth
3. TCP /IP/HTTP Protocol
4. Client and Server Communication
5. Introduction to MIT App Inventor
6. Working with PWM outputs

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. Hakima Chaouchi, “ The Internet of Things Connecting Objects to the Web” ISBN : 978-1-84821-140-7, Willy Publications
2. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, ISBN: 978-1-119-99435-0, 2 nd Edition, Willy Publications
3. Daniel Kellmereit, Daniel Obodovski, “The Silent Intelligence: The Internet of Things”,. Publisher: Lightning Source Inc; 1 edition (15 April 2014). ISBN-10: 0989973700, ISBN-13: 978- 0989973700.
4. Fang Zhaho, Leonidas Guibas, “Wireless Sensor Network: An information processing approach”, Elsevier, ISBN: 978-81-8147-642-5.

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).

CO357U-C EMBEDDED SYSTEM LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 25 ICA + 00 ESE **Total Marks:** 25

Minimum 10 experiments (Five from group A and Five from group B) shall be performed to cover the entire curriculum of course CO354U-C. 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. Study of the Basics of UNIX commands with its description and functions.
2. Implementation of CPU scheduling: a) Round Robin b) SJF
3. Implement Banker's algorithm for Deadlock Avoidance
4. Write a shell script program to display “HELLO WORLD” for the unix operating system
5. Write a shell script program to check variable attributes of file and processes for the unix operating system.
6. Write a program to create a child process and allow the parent to display “parent” and the child to display “child” on the screen for the unix operating system..
1. Implement Paging Technique for memory management.
2. Implement Threading & Synchronization Applications for operating systems.

Group B

Assembly language programming for 8051 microcontroller interfacing.

1. Program for interfacing LEDs.
2. To demonstrate interfacing of seven-segment LED display
3. Program for keyboard interfacing.
4. Program for Interface stepper motor with 8051 and write a program to move the motor through a given angle in a clockwise or anticlockwise direction.
5. Generate traffic signals.
6. Text LCD Module
7. To study of ARM processor (LPC2148) system and describe the features of architecture.
8. Study of Architecture of ARM Cortex M3 using useful Instruction list and description.

Text Book:

1. Mazidi and Mazidi, “The 8051 Microcontroller and Embedded System”, 2nd edition, Pearson/PHI publication, 2008, ISBN- 9788131710265.
2. Kenneth Ayala, “The 8051 Microcontroller”, 3rd edition. Thomson Cengage Learning India,ISBN -9781401861582

Reference Books:

1. A. K. Roy and K. M. Bhurchandi, “Advance Microprocessor and Peripherals (Architecture, Programming and Interfacing)”, 3rd edition, TMH, 2014, ISBN- 978-125900613-5.
2. M. A.Mazidi, R. D. Mckinlay, “The 8051 Microcontroller and Embedded Systems Using Assembly and C”, 2nd edition, Pearson/ Prentice Hall, 2008, ISBN9788131710265.

3. ARM microcontroller
   ”https://parushuece.webs.com/ARM_MANUAL_VER3.2%28modyfideraj%29.pdf”

NOTE:

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CO358U 'R' PROGRAMMING LAB

Teaching Scheme: 01L+ 02PR+ 00T **Total:** 03 **Credits:** 02
Evaluation Scheme: 25 ICA+25 ESE **Total Marks:** 50
ESE Duration: 3Hrs.

Minimum 10 experiments (five from Group B and five from Group C) shall be performed to cover the entire curriculum of course CO358U. 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. The concerned faculty member must conduct group-A contents in theory lectures.

Group A:

Introduction to R: Introduction, Installation of R,Objects,functions, Simple manipulations-Numbers and Vectors, Matrices and Arrays, Factors,Lists,Data Frames.

Programming Using R: Function Creation,Scripts,Logical Operators,Conditional Statements,Loops in R,Switch statements.

Lists and Frames: Creating a List,Common List Operations,Recursive List, Creating a Data Frame,Common Data Frame Operations,Using lapply() and sapply() functions,

Import and Export : Saving and Loading R Data, Import and Export to CSV file,Importing Data from SAS, Import and Export vis ODBC.

Mathematical and Statistical Concepts: Maximum and Minimum, Frequency Distribution, Frequency Distribution Types, Measure of Central Tendency, Correlation.

Group B:

1. Write a R program that swaps any two numbers without using any third number.
2. Write a R program script using *for*, *while* and *repeat* loop that prints the value of i from 1 to 10.
3. Write a R program script to find the factorial of any given number using a recursive Function.
4. Write a R program that reads the csv file. Find the maximum and minimum values among all three.
5. Using the various uin built functions plot pie chart, scatter plot, histogram and line charts
6. Consider the annual rainfall details at a place starting from January 2012. Create an R time series object for a period of 12 months and plot it. Also plot multiple time series in one chart by combining both the series into a matrix.

Group C:

1. For Iris dataset visualize data using plot() also perform filter(), select(),mutate(), arrange() functions
2. Write a R program that will identify and remove the missing values from datasets using frequency mean, median or mode options.
3. Write a R program that will identify outliers and remove outliers from dataset
4. Write a R script for performing feature selection using boruta algorithm
5. Using lm() function, perform linear regression on the dataset.
6. Write a R script to predict classification of values using decision trees

Text Books:

1. by Sandip Rakshit, **"**R for beginners", McGraw Hill Education, ISBN-13 : 978-93-5260-455-5.
2. by Rodrigo Ribeiro" R Language: for Absolute Beginners".
3. by Mike McGrath" R for Data Analysis".

Reference Books:

1. PaulTeetor, "R Cookbook", Oreilly.
2. Rob Kabacoff, "R in Action",Manning.

NOTE :

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ESE – The End Semester Examination (PRESE) 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 institute.

CO359U WEB PROGRAMMING LAB

Teaching Scheme: 01L+ 02PR+ 00T **Total:** 03 **Credits:** 02
Evaluation Scheme: 25 ICA+25 ESE **Total Marks:** 50
ESE Duration: 3Hrs.

Minimum 10 experiments from Group B shall be performed to cover the entire curriculum of Group A of course CO359U. 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. The concerned faculty member must conduct group-A contents in theory lectures and in the first few practical turns.

Group-A:

Django-

Introduction to Django,Getting started,The Basics of the dynamic web Pages,The Django Template system,Interacting with a database:models, The Django Administration sites,form Processing,Advanced Views and URLconfs.

Group-B:

1. Installation of Django framework.
2. Create a simple “Hello World” page using django framework.
3. Design a django project for “email sender”
4. Design a django project for “text-to-HTML converter”
5. Design a django project for “chat Application”
6. Design a django project for “Dictionary Application”
7. Design a django project for “Notes Applications”
8. Design a django project for “Django Blog”
9. Design a django project for “Ecommerce Store”
10. Design a django project for “Video Calling App”
11. Design a django project for “Social Networking App”

Group-C:

1. Design a django project for “Django CMS”
2. Design a django project for “News App”
3. Design a django project for “Login System”
4. Design a django project for “Weather App”
5. Design a django project for “Calorie Counter App”
6. Design a django project for “Online School System”
7. Design a django project for “Library Management System”
8. Design a django project for “Railway Enquiry System”
9. Design a django project for “Quiz App”

Text Books:

1. Adrian Holovaty and Jocab Kaplan-Moss, “The Definitive Guide to Django: Web Development Done Right” Apress Publication,2008

Note:

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by a student (journal/online submission) 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 (PRESE) 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 institute.

CO457UA PATTERN RECOGNITION LAB

Teaching Scheme: 02PR **Total:** 01 **Credits:** 01
Evaluation Scheme: 25 ICA+25 ESE **Total Marks:** 50

Minimum 05 experiments shall be performed to cover the entire curriculum of course CO454UAU. 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. The concerned faculty member must conduct group-A contents in theory lectures.

Group A

1. Implement a function for extracting the color histogram of an image.
2. Read all the images from the training set. For each image compute the color histogram with general bin size m and save it as a row in the feature matrix X. Save the corresponding class label in the label vector y.
3. Implement the k-NN classifier for an unknown image and for a general K value.
4. Evaluate the classifier on the test set by calculating the confusion matrix and the overall accuracy.
5. Try out different values for the number of bins for the histogram and the parameter K to see which feature attains the best performance.
6. Convert the input image into Luv or HSV color-space before histogram calculation.
7. Optionally, try out more complex features (such as histograms on image regions) or other distance metrics (Manhattan distance, weighted Euclidean).

Text Book:

3. C M Bishop, Pattern Recognition and Machine Learning, Springer
4. R O Duda, P.E. Hart and D.G. Stork, Pattern Classification and scene analysis, John Wiley

Reference Books:

4. Morton Nadier and Eric Smith P., Pattern Recognition Engineering, John Wiley & Sons, New York, 1993.
5. Robert J. Schalkoff, Pattern Recognition : Statistical, Structural and Neural Approaches, John Wiley & Sons Inc., New York, 2007.
6. S.Theodoridis and K. Koutroumbas, Pattern Recognition, 4/e, Academic Press, 2009.
7. Tom Mitchell, Machine Learning, McGraw-Hill
8. Tou and Gonzales, Pattern Recognition Principles, Wesley Publication Company, London, 1974.

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 record submitted by a 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 (Oral) 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 institute.

CO457UB BIG DATA ANALYTICS LAB

Teaching Scheme: 02PR **Total:** 01 **Credits:** 01
Evaluation Scheme: 25 ICA+25 ESE **Total Marks:** 50

Minimum 8 experiments (four from Group A and four from Group B) shall be performed to cover the entire curriculum of course CO454UB. 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. The concerned faculty member must conduct group-A contents in theory lectures.

Group A

1. Install Hadoop system
2. Implement the following file management tasks in Hadoop: i. Adding files and directories ii. Retrieving files iii. Deleting files
3. Write a Map Reduce program that mines weather data. Hint: Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record oriented
4. Run a basic word count Map Reduce program to understand Map Reduce Paradigm.
5. Implement matrix multiplication with Hadoop Map Reduce.

Group B

1. Installation of PIG.
2. Study of Pig latin script
3. Write Pig Latin scripts sort, group, join, project, and filter your data.
4. Run the Pig Latin Scripts to find Word Count.
5. Run the Pig Latin Scripts to find a max temp for each and every year.
6. Mini Project(Compulsory): One real life large data application to be implemented (Use standard Datasets available on the web)
   a) Twitter data analysis b) Fraud Detection c) Text Mining etc.

Text books

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

Reference Books:

1. Michael Minelli, Michele Chambers, Ambiga Dhiraj, “Big Data Big Analytics: Emerging Business Intelligence And Analytic Trends For Today's Businesses”, Wiley India
2. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, “Big Data for Dummies”, Wiley India
3. Paul Zikopoulos, Chris Eaton, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data’, McGraw Hill Education.

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 record submitted by a 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 (Oral) 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 institute.

CO457UC INFORMATION STORAGE AND MANAGEMENT LAB

Teaching Scheme: 02PR **Total:** 01 **Credits:** 01
Evaluation Scheme: 25 ICA+25 ESE **Total Marks:** 50

Minimum 04 experiments shall be performed to cover the entire curriculum of course CO454UC. 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. DATA CENTER ENVIRONMENT (Review and understand the components and systems in a data center.)
    a) Installation of VNXE Simulator
    b) Discover the Infrastructure
2. INTELLIGENT STORAGE SYSTEM (To explore the management interface and general tasks to be performed within an intelligent storage system.)
    a) Navigate the Storage System
    b) Create a Block Device
    c) Create a File Device
3. FC SAN (To explore the management interface and general tasks to be performed within a Fibre Channel SAN.)
    a) FC SAN Configuration
    b) FC SAN Trace
4. IP SAN (To configure the interface and provision storage within an iSCSI SAN.)
    a) IPSAN Configuration
    b) iSCSI SAN Trace
5. MANAGING PROTECTION SERVICES (To review the use of local protection systems to provide highly available resources within a storage network.)
    a) Array Based Protection
    b) Configuring LUN Configuration
6. Managing Storage Infrastructure (Review reports and data collections in order to determine operational status and health of the infrastructure)
    a) Monitoring and Reporting

Text Book:

2. John Wiley & Sons, “Information Storage and Management”, EMC Education Services. Wiley Publishing. Inc 2010

Reference Books:

4. Somasundaram G, Alok Shrivastava, “ISM – Storing, Managing and Protecting Digital Information”, EMC Education Services, Wiley India, New Delhi, 2012.
5. Gerald J Kowalski, Mark T Maybury, “Information Storage and Retrieval Systems: Theory and Implementation”, BS Publications, New Delhi, 2009.

6. Robert Spalding, “Storage Networks: The Complete Reference”, Tata McGraw Hill, New Delhi, 2006

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 record submitted by a 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 (Oral) 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 institute.

CO360U MINI-PROJECT

Teaching Scheme: 00L+ 02PR+ 00T **Total:** 02 **Credits:** 02
Evaluation Scheme: 25 ICA+25 ESE **Total Marks:** 50
ESE Duration: 3Hrs.

The mini project is one of the most important single piece of work in the degree programme. It is introduced in the curriculum to put into practice some of the techniques that have been taught to students in earlier years. It also provides the opportunity to students to demonstrate independence and originality, to plan and organise a large project over a long period. The mini-project topic should be selected to ensure the satisfaction of the need to establish a direct link between the techniques they learnt and productivity. Thus it should reduce the gap between the world of work and the world of study.

Desirable awareness/skills:
Knowledge of concepts, principles and techniques studied in all earlier courses.

Course Objectives:
The objectives of offering this course are to:

1. design or investigation of a technical problem.
2. explores the knowledge of design, experiment and analysis of data.
3. develop ability to synthesize knowledge and skills previously gained and to put some of them into practice
4. make students capable to select from different methodologies, methods and forms of analysis studied to produce a suitable system or subsystem.
5. plan and organise a large project over a long period.
6. inculcate ability to present the findings of their technical solution in a written report.

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

1. Work in a team.
2. Improve leadership quality among students.
3. Apply techniques and engineering skills.

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	2	-		3	3	1	1	1	1	3	
2	-	-	1		1	-		-	-	-	-	
3		3		1	1	-		-	-	-	-	1
4	1		3	1		-	1	-	-	-	-	1

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
			05M	**05M**	**05M**	**10M**	**25**

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.

CO361U SEMINAR

Teaching Scheme: 00L+ 02PR+ 00T **Total:** 02 **Credits:** 02
Evaluation Scheme: 25 ICA+00 ESE **Total Marks:** 50

Course Description: The course develops the ability to work on multidisciplinary teams, identify, formulate, and solve engineering problems in view of economic, environmental and societal context. The course explores the knowledge of presentation and effective communication.

Course Objectives:

The objectives of offering this course are to :

1. survey selected topics addressing issues of science in society today.
2. assimilate, synthesize and integrate information related to a topic.
3. familiarize with scientific literature.
4. organize, discuss and present the information into an analysis.
5. present the work in prescribed formats.

Course Outcomes:

After completing this course, students will able to:

1. collect, organize & analyze information about emerging technologies /market demands/current trends.
2. exhibit effective communication skills, stage courage, and confidence.
3. demonstrate intrapersonal skills,
4. prepare a well organized report employing elements of technical writing and critical thinking.

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
1	1	2	-	2		3		1	1	1	3
2	-	-	1	3	1	-		-	-	-	-
3	1				1	-		-	-	-	-
4		2			1	-	1	-	-	-	-

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

Guidelines for presenting a seminar:

1. Each Student shall select a topic for seminar which is not covered in the curriculum. Seminar topic should not be repeated and registration of the same shall be done on a first come first serve basis.
2. Topic of Seminar shall be registered within three weeks from commencement of VII Semester and shall be approved by the committee.
3. The three-member committee appointed by the Head of the department shall be constituted for finalizing the topics of Seminar.

4. Students should prepare a report based on outcomes of literature studies, field visits, observation schedules, group meetings etc related to a problem in a relevant technology area.
5. Each student should deliver a seminar in a scheduled period (Specified in time table or time framed by department) and submit the seminar report (paper bound copy/Thermal bound) in the suggested format.

ASSESSMENT OF SEMINAR

Guidelines for ICA: ICA shall be based on topic selection, presentation and Seminar report submitted by the student in the form of thermal bound. Assessment of the seminar for award of ICA marks shall be done jointly by the guide and a departmental committee based on presentation of seminar topic, as per the guidelines given below:

Name of Guide: _____

Sr No	**Name of Student**	**Seminar Topic**	**Literature Survey**	**Report Writing**	**Depth of understanding**	**Presentation**	**Total**
			5M	5M	5M	10M	25M