M.D University

Scheme of Studies and Examination

B.TECH (Artificial Intelligence & Data Science)-5th semester w.e.f. 2022-23

Sr.No.	Course Code	Course Title	Teaching Schedule			Credit	Examination Schedule (Marks)				Duration of Exam (Hours)	No of hours/ week
			L	T	P		Marks of Class works	Theory	Practical	Total		
1	PCC-CSE-309G	Programming in Java *(Common with CSE)*	3	0	-	3	25	75	-	100	3	3
2	PCC-CSE-303G	Computer Network *(Common with CSE)*	3	0	-	3	25	75	-	100	3	3
3	PCC-CSE-305G	Formal Languages & Automata *(Common with CSE)*	3	0	-	3	25	75	-	100	3	3
4	PCC-CSE-307G	Design & Analysis of Algorithms *(Common with CSE)*	3	0	-	3	25	75	-	100	3	3
5	PCC-ADS-301G	Information Retrieval	3	0	-	3	25	75	-	100	3	3
6	PCC-ADS-303G	Introduction to R Programming	3	0	-	3	25	75	-	100	3	3
7	LC-CSE-327G	Programming in Java Lab *(Common with CSE)*	-	-	3	1.5	25		25	50	-	2
8	LC-CSE-323G	Computer Network Lab *(Common with CSE)*	-	-	3	1.5	25		25	50	-	3
9	LC-CSE-325G	Design & Analysis of Algorithms Lab *(Common with CSE)*	-	-	3	1.5	25		25	50	-	3
10	LC-ADS-303G	R Programming Lab	-	-	2	1	25		25	50	-	3
11	PT-CSE-329G	Practical Training I *(Common with CSE)*		-	-	-	-	-	-	-	-	*Refer note 1
		TOTAL				**23.5**				**800**		

Note 1:

Assessment of Practical Training-I, undergone at the end of IV semester, will be based on seminar, viva-voce, report and certificate of practical training obtained by the student from the industry. According to performance letter grades A, B, C, F are to be awarded. A student who is awarded „F“ grade is required to repeat Practical Training.

M.D University

Scheme of Studies and Examination

B.TECH (Artificial Intelligence & Data Science)-6th semester w.e.f. 2022-23

Sr.No.	Course Code	Course Title	Teaching Schedule			Credit	Examination Schedule (Marks)				Duration of Exam (Hours)	No of hours/ week
			L	T	P		Marks of Class works	Theory	Practical	Total		
1	PCC-CSE-302G	Compiler Design *(Common with CSE)*	3	0	-	3	25	75	-	100	3	3
2	PCC-ADS-302G	Theory of Deep Learning	3	0	-	3	25	75	-	100	3	3
3	PCC-ADS-304G	Data Science Essentials	3	0	-	3	25	75	-	100	3	3
4	PCC-ADS-306G	Network Security	3	0	-	3	25	75	-	100	3	3
5	PCC-ADS-308G	Distributed System	3	0	-	3	25	75	-	100	3	3
6	PCC-ADS-310G	Mobile Application Develpoment	3	0	-	3	25	75	-	100	3	3
7	LC-ADS-304G	Data Science Lab	-	0	3	1.5	25		25	50	-	3
8	LC-ADS-302G	Deep Learning Lab	-	0	2	1	25		25	50		2
9	LC-ADS-306G	Mobile Application Develpoment Lab	-	0	3	1.5	25		25	50		3
10	PROJ-CSE-322G	Project-I *(Common with CSE)*	-	0	4	2	25		25	50		4
11	*MC-317G	Constitution of India *(Common with CSE)*	2	0	-	-						
		TOTAL				**24**				**800**		

NOTE: Examiner will set nine questions in total. Question One will be compulsory and will comprise of all sections and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit

Programming in Java

Course code	PCC-CSE-309-G				
Category	Professional Core Course				
Course title	Programming in Java				
Scheme and Credits	L	T	P	Credits	Semester 5th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note:

Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Course Objectives:

- Programming in the Java programming language.
- Knowledge of object-oriented paradigm in the Java programming language.
- The use of Java in a variety of technologies and on different platforms.

UNIT I

Introduction to Java: Evolution of Java, Object Oriented Programming Structure, Overview and characteristics of Java, Java program Compilation and Execution Process, Organization of the Java Virtual Machine, Client side Programming, Platform Independency & Portability, Security, Relation b/w JVM, JRE and JDK, Introduction to JAR format, Naming Conventions, Data types & Type casting, operators, Security Promises of the JVM, Security Architecture and Security Policy, security aspects, sandbox model

UNIT II

OOPS Implementation: Classes, Objects, attributes, methods, data encapsulation, reference variables, Constructors, Anonymous block, Method Overloading, Static Data members, Block & methods; Memory Structure: Stack, Heap, Class & Method area Class loading & Execution flow: Static vs Dynamic Class loading, implicit vs explicit class loading, class loading operations; Argument Passing Mechanism: Passing primitive arguments, passing objects, Wrapper Classes;

This keyword: Referencing instance members, Intra class constructor chaining, Method chaining; Inheritance & code reusability: Extending classes for code reusability, Usage of super keyword, Method Overriding, Object class

Inheritance & Runtime Polymorphism: Static & Dynamic binding, Inheritance and Is-A relation, Runtime Polymorphism and Generalization, Abstract classes & methods, Final Keyword;

Interfaces and Role based Inheritance: Feature & Role based Inheritance, Static & Dynamic classing Environment, classes & interfaces, interface applications in real scenarios; Has-A relation: Aggregation & Composition, Nested classes, Inner classes, Anonymous Inner classes, String Buffer Class, tokenizer, applets, Life cycle of applet and Security concerns

UNIT III

Threads: Creating Threads, Thread Priority, Blocked States, Extending Thread Class, Runnable Interface, Starting Threads, Thread Synchronization, Synchronize Threads, Sync Code Block, Overriding Synced Methods, Thread Communication, wait, notify and notify all.
Swing & AWT: Swing class hierarchy, containers, user interface components, graphics context, AWT Components, Component Class, Container Class, Layout Manager Interface Default Layouts, Insets and Dimensions, Border Layout, Flow Layout, Grid Layout, Card Layout Grid Bag Layout AWT Events, Event Models, Listeners, Class Listener, Adapters, Action Event Methods Focus Event Key Event, Mouse Events, Window Event
Package & Scopes: Need of Packages, associating classes to Packages, Class path environment variable, Import Keyword and Feature of static import, Public, protected, private & default scope, Private Inheritance;
Exception Handling: exception and error, Exception Handling & Robustness, Common Exceptions and Errors, Try and catch block, Exception handlers, throw keyword, Checked and Unchecked Exceptions, Role of finally, User defined Exceptions;

UNIT IV

Collection Framework: Role and Importance of Collection Framework, List & Set based collection, Iterator & List Iterator, Maps, Searching elements in List, Hash and Tree based collections, Role of equals and hash Code() methods, Comparable and Comparator Interfaces, Thread Safety and Vector, Difference b/w Enumeration and Iterator, Type safety and Generics, Common algorithms and Collections class, Using Properties class for managing properties files;
Database Connectivity Using JDBC: Overview of native and ODBC Drives, Introduction to JDBC, Type of JDBC drivers, Usage of drivers, Defining properties-based Connection Factory; Basic database operations: Insert, Delete, Update, and Select;
Prepared Statement: Statement, Prepared Statement, Setting Query parameters, Executing Queries; Callable Statement: Creating PL/SQL Stored procedures and functions, Creating Callable statements, Executing procedures & functions, Batch Updation, Transacting Queries, Programmatic initialization of database, Result Set Meta Data, Database Meta Data;
Input/Output Stream, Stream Filters, Buffered Streams, Data input and Output Stream, Print Stream Random Access File,
Reflection: reflection API, newInstance()method, javap tool, creating javap tool, creating applet viewer, call private method, java 9 features;

Text Books:

1. Patrick Naughton and HerbertzSchidt, “Java-2 the complete Reference”,TMH
2. Sierra & bates, “Head First Java”, O’Reilly.

Reference Books:

1. E. Balaguruswamy, “Programming with Java”, TMH
2. Horstmann, “Computing Concepts with Java 2 Essentials”, John Wiley.

3. Decker &Hirshfield, “Programming.Java”, Vikas Publication.

Course Outcomes:

- Knowledge of the structure and model of the Java programming language, (knowledge)
- Use the Java programming language for various programming technologies (understanding)
- Develop software in the Java programming language

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Computer Network

Course code	PCC-CSE-303-G				
Category	Professional Core Course				
Course title	Computer Network				
Scheme and Credits	L	T	P	Credits	Semester 5th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Course Objectives:

- To develop an understanding of modern network architectures from a design and
- Performance perspective.
- To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
- To provide an opportunity to do Network programming
- To provide a WLAN measurement idea.

UNIT-I

Introduction: Data communication, Components, Computer networks and its historical development, distributed processing, Internet.

Network Models: OSI model and TCP/IP Model, Physical Layer – physical layer functions, Data Representation, Simplex, Half Duplex and Full Duplex Transmission, Modulation and Multiplexing, Packet and circuit switching,Transmission media, Topologies, connectionless and connection-oriented services.

Data Link Layer: Data link layer functions and services, MAC Addressing, Framing, Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window Protocol.

UNIT-II

Medium Access Control: MAC layer functions, Random access, Controlled Access and channelization protocols.

Network Layer: Network layer functions and services, Logical addressing, IPv4 classful and classless addressing, subnetting, NAT, IPv4, ICMPv4, ARP, RARP and BOOTP, IPv6, IPv6 addressing, DHCP.

Network Devices: Repeater, hub, switch, router and gateway.

UNIT-III

Routing Algorithms: introduction to routing, Shortest Path Algorithm, Flooding, Hierarchical Routing, Link State and Distance Vector Routing

Transport Layer: Transport layer functions and services, Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), TCP connection management

Application Layer: Application layer functions and services, Domain Name Space (DNS), EMAIL, File Transfer Protocol (FTP), HTTP, SNMP

UNIT-IV

Congestion Control, Quality of Service, QoS Improving techniques.

LAN: Ethernet, Token Bus, Token Ring, MAN Architecture- DQDB, WAN Architectures- Frame Relay, ATM, SONET/SDH

Network Security: Firewalls, security goals, types of attack, Introduction to cryptography, Types of ciphers: symmetric and asymmetric key ciphers.

Suggested books:

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.

Suggested reference books:

1. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
2. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
3. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

Course Outcomes:

- Explain the functions of the different layer of the OSI Protocol.
- Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) and describe the function of each.
- Identify and connect various connecting components of a computer network.
- Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

Formal Language & Automata

Course code	PCC-CSE-305-G				
Category	Professional Core Course				
Course title	Formal Language & Automata				
Scheme and Credits	L	T	P	Credits	Semester 5th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Course Objectives:

- To understand basic concepts of formal languages and automata theory.
- To study the types of Automata i.e. NFA, DFA, NFA with ϵ-transition and their interconversion methods and importance.
- To Study formal languages of different kinds, such as regular and context-free languages. Understand the concept of grammar and its types. Removal of ambiguity and reduced form and Normal forms of grammar.
- To develop the concepts and design of higher-level automata to accept the language not accepted by finite automata such as PDA &Turing machine.
- To study the various properties of turing machine and their designing.

UNIT 1

Finite Automata: Introduction: Set, Power Set, Super Set, Alphabet, languages and grammars, productions and derivation, Deterministic finite automata (DFA), Non-Deterministic finite automata (NDFA), Equivalence of DFA and NDFA, Conversion of NFA to DFA , minimization of finite automata, Finite automata with ϵ- moves, Acceptability of a string by a finite Automata.

Introduction to Machines: Properties and limitations of Finite Automata, Mealy and Moore Machines, Equivalence of Mealy and Moore machines.

UNIT-II

Regular Expression: State and prove Arden's Method, Regular Expressions, Recursive definition of regular expression, Regular expression conversion to Finite Automata and vice versa.

Properties of regular languages: Regular language, pumping lemma for regular sets/languages, Application of regular languages.

UNIT-III

Grammars: Chomsky hierarchy of languages, Relation between different types of grammars, Context-free grammar, Derivation tree / Parse tree, Ambiguity in regular grammar and their

removal, Reduced Forms: Removal of useless symbols, null and unit productions, Normal Form: Chomsky Normal form(CNF) and Greibach Normal Form(GNF)

Push Down Automata: Introduction to PDA, Deterministic and Non-Deterministic PDA, Design of PDA: Transition table, Transition diagram and acceptability of strings by designed PDA, Pushdown automata (PDA) and equivalence with CFG.

UNIT-IV

Turing machines: The basic model for Turing machines (TM), Deterministic and Non-Deterministic Turing machines and their equivalence, Design of Turing Machines: Transition table, Transition diagram and acceptability of strings by designed turing machine. Variants of Turing machines, Halting problem of Turing machine, PCP Problem of Turing Machine, Linear Bounded Automata, TMs as enumerators.

Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

Suggested books:

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.

Suggested reference books

1. K. L. P Mishra, N. Chandrashekaran (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.
2. Raymond Greenlaw, H. James Hoover, Fundamentals of the Theory of Computation, Principles and Practice, Morgan Kaufmann, 1998.
3. John C. Martin: Introduction to Languages and Automata Theory, 3rd edition, Tata Mcgraw-Hill, 2007

Course Outcomes:

- To use basic concepts of formal languages of finite automata techniques.
- To Design Finite Automata's for different Regular Expressions and Languages.
- To Construct context free grammar for various languages.
- To solve various problems of applying normal form techniques, push down automata and Turing Machines.

Design and Analysis of Algorithms

Course code	PCC-CSE-307-G				
Category	Professional Core Course				
Course title	Design & Analysis of Algorithms				
Scheme and Credits	L	T	P	Credits	Semester 5th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note:
Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Course Objectives:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

UNIT-I

Introduction to Algorithms: Algorithm, Performance Analysis (Time and Space complexity), Asymptotic Notation (Big OH, Omega and Theta)-best, average and worst-case behaviour. Elementary Data Structures (Basic terminology of Stacks and Queues, Tree, Graph), Sets and Disjoint Set Union.

Divide and Conquer: General method, Binary Search, Merge Sort, Quick Sort, and other sorting algorithms with divide and conquer strategy, Strassen's Matrix Multiplication algorithms and analysis of these problems.

UNIT-II

Greedy Method: General method, Fractional Knapsack problem, Job Sequencing with Deadlines, Minimum Cost Spanning Trees, Single source shortest paths.

Dynamic Programming: General method, Optimal Binary Search Trees, 0/1 knapsack, The Traveling Salesperson problem.

UNIT-III

Back Tracking: General method, The 8-Queen's problem, Sum of subsets, Graph Colouring,Hamiltonian Cycles.

Branch and Bound: The method, 0/1 knapsack problem, Traveling Salesperson problem, Efficiency considerations.

UNIT-IV

NP Hard and NP Complete Problems: Basic concepts, Cook's theorem, NP hard graph problems, NP hard scheduling problems, NP hard code generation problems, and Some simplified NP hard problems.

Suggested Text Books:

1. Fundamental of Computer algorithms, Ellis Horowitz and Sartaj Sahni, 1978, Galgotia Publication

2. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson and Ronald L Rivest: 1990, TMH

Suggested Reference Books:

1. The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., 1974, Addison Wesley.

2. Algorithms-The Construction, Proof and Analysis of Programs, Berlion, P.Bizard, P., 1986. Johan Wiley & Sons,

3. Writing Efficient Programs, Bentley, J.L., PHI

4. Introduction to Design and Analysis of Algorithm, Goodman, S.E. &Hedetnieni, 1997, MGH.

5. Introduction to Computers Science- An algorithms approach, Jean Paul Trembley, Richard B.Bunt, 2002, T.M.H.

6. Fundamentals of Algorithms: The Art of Computer Programming Vol Knuth, D.E.: 1985, Naresh Publication.

Course Outcomes:

- To identify and justify correctness of algorithms and to analyse running time of algorithms based on asymptotic analysis.
- To understand when an algorithmic design situation calls for the divide-and-conquer paradigm. Synthesize divide-and-conquer algorithms.
- Describe the greedy paradigm and dynamic-programming paradigm. Explain when an algorithmic design situation calls for it.
- Developing greedy algorithms/dynamic programming algorithms, and analyze it to determine its computational complexity.
- To write the algorithm using Backtracking and Branch and Bound strategy to solve the problems for any given model engineering problem.

Information Retrival

Course code	PCC-ADS-301-G				
Category	Professional Core Course				
Course title	Information Retrival				
Scheme and Credits	L	T	P	Credits	Semester 5th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note:
Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Course Outcomes:

1. Understand how statistical models of text can be used to solve problems in IR, with a focus on how the vector-space model and language models are implemented and applied to document retrieval problems
2. Understand how statistical models of text can be used for other IR applications, for example clustering and news aggregation
3. To have experience of building a document retrieval system, through the practical sessions.

UNIT-I

Introduction to Information Retrieval (IR) systems: Goals and history of IR; the impact of the web on IR; Related areas to IR.
Basic IR Models: Boolean and vector-space retrieval models; ranked retrieval; text-similarity metrics.
Basic IR Models: text-similarity metrics; TF-IDF (term frequency/inverse document frequency) weighting; cosine similarity.

UNIT-II

Basic Searching and Indexing: Simple tokenizing, stop-word removal, and stemming, inverted indices and files; efficient processing with sparse vectors

UNIT-III

Experimental Evaluation of IR: Performance metrics: recall, precision, and F-measure; Evaluations on benchmark text collections.

Query Operations and Languages: Relevance feedback and query expansion; Query Languages.
Text representation and properties: Word statistics; Zipf's law; Porter stemmer; morphology; index term selection; using thesauri; Metadata and markup languages (SGML, HTML, XML, DTD) and schema Web linking technologies.

UNIT-IV

Hypermedia: Introduction; Hypermedia architectures and models: closed hypermedia (HyperWave), open hypermedia (DLS, Microcosm), the Dexter model, AHM, HAM
Using Hypermedia: browsing, navigation and orientation, paths, trails; Hypermedia design: modeling methodologies (OOHDM, RMM), link consistency, link patterns, rhetoric and context, Usability and evaluation.
Web Search and Link Analysis: Introduction and web history; spidering; metacrawlers; directed spidering.Web Interface.
Information Extraction and Integration: Extracting data from text; XML; ontologies, thesauri, semantic web; collecting and integrating specialized information on the web.

Reference Books:

1. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze, An Introduction to Information Retrieval, Cambridge University Press, Cambridge, England, 2007
2. R.K. Belew, Finding out about—A cognitive perspective on search engine technology and the
www, Cambridge University Press, 2001

Introduction to R Programming

Course code	PCC-ADS-303-G				
Category	Professional Core Course				
Course title	Introduction to R Programming				
Scheme and Credits	L	T	P	Credits	Semester 5th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note:
Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Course Outcomes:

1. Develop an R script and execute it
2. Install, load and deploy the required packages, and build new packages for sharing and reusability
3. Extract data from different sources using API and use it for data analysis
4. Visualize and summarize the data
5. Design application with database connectivity for data analysis

UNIT-I

Introduction: R interpreter, Introduction to major R data structures like vectors, matrices, arrays, list and data frames, Control Structures, vectorized if and multiple selection, functions.

UNIT II

Installing, loading and using packages: Read/write data from/in files, extracting data from web-sites, Clean data, Transform data by sorting, adding/removing new/existing columns, centring, scaling and normalizing the data values, converting types of values, using string in-built functions, Statistical analysis of data for summarizing and understanding data, Visualizing data using scatter plot, line plot, bar chart, histogram and box plot

UNIT III

Designing GUI: Building interactive application and connecting it with database.

UNIT IV

Building Packages.

Suggested readings:

1. “Cryptography & Network Security”, PHI William Stalling
2. “Cryptography & Network Security”, Mc Graw Hill Atul Kahate
3. “Cryptography & Network Security”, PHI Forouzan
4. "Modern Cryptography, Theory & Practice", Pearson Education. Wenbo Mao
5. "An Introduction to Mathematical Cryptography", Springer. Hoffstein, Pipher, Silvermman.
6. "The Design of Rijndael", Springer. J. Daemen, V. Rijmen.
7. "Algorithmic Cryptanalysis", CRC Press. A. Joux
8. "Number Theory", Tata Mc Graw Hill. S. G. Telang
9. "Protocols for Authentication and Key Establishment", Springer. C. Boyd, A. Mathuria.
10. "Computer Security", Pearson Education. Matt Bishop
11. “Understanding Cryptography”, Springer-Verlag Berlin Heidelberg Christof Paar, Jan Pelzl

Programming in Java Lab

Course code	LC-CSE-327-G				
Category	Professional Core Corse				
Course title	Programming in Java Lab				
Scheme and Credits	L	T	P	Credits	Semester 5th
	0	0	3	1.5	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	3 Hours				

List of Experiments:

1. Create a java program to implement stack and queue concept.
2. Write a java package to show dynamic polymorphism and interfaces.
3. Write a java program to show multithreaded producer and consumer application.
4. Create a customized exception and also make use of all the 5 exception keywords.
5. Convert the content of a given file into the uppercase content of the same file.
6. Develop an analog clock using applet.
7. Develop a scientific calculator using swings.
8. Create an editor like MS-word using swings.
9. Create a servlet that uses Cookies to store the number of times a user has visited your servlet.
10. Create a simple java bean having bound and constrained properties.

Note: 1. At least Ten experiments are to be performed in the semester.

2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or as designed and set by the current institution as per the scope of the syllabus.

Computer Network Lab

Course code	LC-CSE-323-G				
Category	Professional Core Course				
Course title	Computer Network Lab				
Scheme and Credits	L	T	P	Credits	Semester 5th
	0	0	3	1.5	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	3 Hours				

1. Introduction to basic Linux networking commands. (Commands like ipconfig, getmac, tracert, pathping, arp, ping, netstat, finger etc.)
2. Implement bit stuffing and de-stuffing
3. Write a program for hamming code generation for error detection and correction.
4. Implement cyclic redundancy check (CRC).
5. Write a program for congestion control using the leaky bucket algorithm.
6. Implement Dijkstra's algorithm to compute a shortest path through graph.
7. Take a 64-bit plain text and encrypt the same using DES algorithm.
8. Using RSA algorithm encrypts a text data and decrypts the same.
9. Implementation of the link state routing protocols.
10. Implementation of LZW compression and decompression algorithms.
11. Introduction to basic Linux networking commands. (Commands like ipconfig, getmac, tracert, pathping, arp, ping, netstat, finger etc.)

Note: 1. At least Ten experiments are to be performed in the semester.

2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or as designed and set by the current institution as per the scope of the syllabus.

DESIGN & ANALYSIS OF ALGORITHMS USING C++

Course code	LC-CSE-325-G				
Category	Professional Core Course				
Course title	DESIGN & ANALYSIS OF ALGORITHMS USING C++				
Scheme and Credits	L	T	P	Credits	Semester 5th
	0	0	3	1.5	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	3 Hours				

Course Objectives:

1. Implementation of various algorithms and to analyze the performance of algorithms.
2. Demonstrate a familiarity with major algorithms and data structures.
3. Apply important algorithmic design paradigms and methods of analysis.
4. Synthesize efficient algorithms in common engineering design situations.

List of Experiments:

1. Write a Program for iterative and recursive Binary Search.
2. Write a Program to sort a given set of elements using the Quick Sort/Merge Sort/Selection Sort method and determine the time required to sort the elements.
3. Write a Program for implementation of Fractional Knapsack problem using Greedy Method and 0/1 Knapsack problem using Dynamic Programming.
4. Write a Program to find the shortest path from a given vertex to other vertices in a weighted connected graph using Dijkstra's algorithm.
5. Write a Program to find the minimum cost spanning tree (MST) of a given undirected graph using Kruskal's algorithm/Prim's Algorithms.
6. Write a Program to implement N-Queens problem using back tracking.
7. Write a Program to check whether a given graph is connected or not using DFS method.
8. Write a program to implement the Travelling Salesman Problem (TSP).

Course Outcomes: The course will help in improving the programming skills of the students. The design of algorithms for any problem will inculcate structured thinking• process in the students and improve the analytical power.

Note: 1. At least Ten experiments are to be performed in the semester.
2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or as designed and set by the current institution as per the scope of the syllabus.

R Programming Lab

Course code	LC-ADS-303-G				
Category	Professional Core Course				
Course title	R Programming Lab				
Scheme and Credits	L	T	P	Credits	Semester 5th
	0	0	2	1	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	3 Hours				

List of Experiments:

Q1. Write an R script to do the following:
a) Simulate a sample of 100 random data points from a normal distribution with mean 100 and standard deviation 5 and store the result in a vector.
b) Visualize the vector created above using different plots.
c) Test the hypothesis that the mean equals .
d) Use wilcox test to test the hypothesis that mean equals .

Q2. Using the Algae data set from package DMwR to complete the following tasks.
a) create a graph that you find adequate to show the distribution of the values of algae a6.
b) show the distribution of the values of size 3.
c) check visually if oPO4 follows a normal distribution.
d) produce a graph that allows you to understand how the values of NO3 are distributed across the sizes of river.
e) using a graph check if the distribution of algae a1 varies with the speed of the river.
f) visualize the relationship between the frequencies of algae a1 and a6. Give the appropriate graph title, x-axis and y-axis title.

Q3. Read the file Coweeta.CSV and write an R script to do the following:
a) count the number of observations per species.
b) take a subset of the data including only those species with at least 10 observations.
c) make a scatter plot of biomass versus height, with the symbol colour varying by species, and use filled squares for the symbols. Also add a title to the plot, in italics.
d) log-transform biomass, and redraw the plot.

Q4. The built-in data set mammals contain data on body weight versus brain weight. Write R commands to:
a) Find the Pearson and Spearman correlation coefficients. Are they similar?
b) Plot the data using the plot command .

c) Plot the logarithm (log) of each variable and see if that makes a difference.

Q5. In the library MASS is a dataset UScereal which contains information about popular breakfast cereals. Attach the data set and use different kinds of plots to investigate the following relationships: a) relationship between manufacturer and shelf
b) relationship between fat and vitamins
c) relationship between fat and shelf
d) relationship between carbohydrates and sugars
e) relationship between fibre and manufacturer
f) relationship between sodium and sugars

Q6. Write R script to:
a) Do two simulations of a binomial number with n = 100 and p = .5. Do you get the same results each time? What is different? What is similar?
b) Do a simulation of the normal two times. Once with n = 10, μ = 10 and σ = 10, the other with n = 10, μ = 100 and σ = 100. How are they different? How are they similar? Are both approximately normal?

Q7. Create a database medicines that contains the details about medicines such as {manufacturer, composition, price}. Create an interactive application using which the user can find an alternative to a given medicine with the same composition.

Q8. Create a database songs that contains the fields {song_name, mood, online_link_play_song}. Create an application where the mood of the user is given as input and the list of songs corresponding to that mood appears as the output. The user can listen to any song form the list via the online link given.

Q9. Create a package in R to perform certain basic statistics functions.

Note: 1. At least Ten experiments are to be performed in the semester.

2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or as designed and set by the current institution as per the scope of the syllabus.

PRACTICAL TRAINING 1

<table>
<tr><td>Course code</td><td colspan="5">PT-CSE-329G</td></tr>
<tr><td>Category</td><td colspan="5">Professional Core Course</td></tr>
<tr><td>Course title</td><td colspan="5">PRACTICAL TRAINING 1</td></tr>
<tr><td rowspan="2">Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Credits</td><td rowspan="2">Semester 5th</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td></td></tr>
<tr><td>Class work</td><td colspan="5">-</td></tr>
<tr><td>Exam</td><td colspan="5">-</td></tr>
<tr><td>Total</td><td colspan="5">-</td></tr>
<tr><td>Duration of Exam</td><td colspan="5">-</td></tr>
</table>

The evaluation of Practical Training-I will be based on seminar, viva-voce, report submitted by the students. According to performance, the students are awarded grades A, B, C, F. A student who is awarded 'F' grade is required to repeat Practical Training.

Excellent: A; Good : B; Satisfactory: C; Not Satisfactory: F.

Compiler Design

Course code	PCC-CSE-302-G				
Category	Professional Core Course				
Course title	Compiler Design				
Scheme and Credits	L	T	P	Credits	Semester 6th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which have to attempt 5 questions out of 9 questions.

Course Objectives :

- To understand and list the different stages in the process of compilation.
- Identify different methods of lexical analysis.
- Design top-down and bottom-up parsers.
- Identify synthesized and inherited attributes.
- Develop syntax directed translation schemes.

UNIT-I

Introduction To Compilers: Compilers and translators, need of translators, structure of compiler : itsdifferent phases, Compiler construction tools.

Lexical Analysis: Role of lexical analyzer, design of lexical analyzer, regular expressions , Specification and recognition of tokens, input buffering, A language specifying lexical analyzer. Finite automata, conversion from regular expression to finite automata, and vice versa, minimizing number of states of DFA, Implementation of lexical analyzer.

UNIT-II

Syntax Analysis: Role of parsers, context free grammars, definition of parsing.

Parsing Technique: Shift- reduce parsing, operator precedence parsing, top down parsing, predictive parsing.

UNIT-III

LR parsers, SLR, LALR and Canonical LR parser, Syntax Directed Translations: Syntax directed definition, construction of syntax trees, syntax directed translation scheme, implementation of syntax directed translation, three address code, quadruples and triples.

UNIT-IV

Symbol Table & Error Detection and Recovery: Symbol tables, its contents and data structure for symbol tables; trees, arrays, linked lists, hash tables. Errors, lexical phase error, syntactic phase error, semantic error.

Code Optimization & Code Generation: Code generation, forms of objects code, machine dependent code, optimization, register allocation for temporary and user defined variables.

Suggested Text Books:

1. Compilers Principle, Techniques & Tools - Alfread V. AHO, Ravi Sethi& J.D. Ullman; 1998 Addison Wesley.

Suggested Reference Books:

1. Theory and practice of compiler writing, Tremblay & Sorenson, 1985, Mc. Graw Hill.
2. System software by Dhamdere, 1986, MGH.
3. Principles of compiler Design, Narosa Publication
4. Elements compiler Design, Dr. M. Joseph, University Science Press

Course Outcomes:

1. To develop the lexical analyser for a given grammar specification.
2. For a given parser specification design top-down and bottom-up parsers.
3. To Develop syntax directed translation schemes.

Theory of Deep Learning

Course code	PCC-ADS-302G				
Category	Professional Core Course				
Course title	Theory of Deep Learning				
Scheme and Credits	L	T	P	Credits	Semester 6th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Course Outcomes:

1. Recognize the characteristics of deep learning models that are useful to solve real-world problems.
2. Understand different methodologies to create application using deep nets.
3. Identify and apply appropriate deep learning algorithms for analyzing the data for variety of problems.
4. Implement different deep learning algorithms
5. Design the test procedures to assess the efficacy of the developed model.
6. Combine several models in to gain better result

UNIT-I

Introduction to theoretical aspects in Deep Learining (DL), Ingredients of DL, Expressivity theorems in DL, Data classes and curse of dimentionality, DL through lens of Matrix Factorization (MF), Review of MF techniques, Supervised and Unsupervised learning via MF

UNIT-II

Deep MF and approximation guarentees, Geometric perspective of expressivity, Input domain partitions and random paths, DL through lense of Random Matrix Theory (RTM) , Evolution for signal variances and covariances in infinite depth DNN , Random DNN - Input/output Jacobian, DNN gaussian vs orthogonal initialization

UNIT-III

DL through lense of Information Theory, Mutal infomation estimation in DNN, Optimization algorithms

UNIT-IV

Advanced optimizers and second-order algorithms, Loss landscape of DNNs, Saliency map Visualization, Spectral Visualization: Generalization error in DNNs

Suggested Readings:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio, Aaron Courville

Data Science Essentials

Course code	PCC-ADS-304G				
Category	Professional Core Course				
Course title	Data Science Essentials				
Scheme and Credits	L	T	P	Credits	Semester 6th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Course Outcomes:

1. Students will be able to perform exploratory analysis of multivariate data and scientific data Visualization.
2. Student will be able to conduct statistical hypothesis testing
3. Student will be able to use regression techniques for predictive data analytics and time series modeling.
4. Students will build capability of real life problem solving and dealing with large data.

UNIT-I

Random variable, distribution, Maximum Likelihood Estimation usingmaxLik, basic multivariate stats - matrix summarisation, Simpson's paradox, variance- covariance, correlation, canonical correlation; Data preprocessing, exploratory data analysis and high quality visualisation. Advanced scientific plots - stacked histograms for multivariate data, bi-variate scatter plots, parallel coordinate plot, table plot, mosaic plot etc**.**

UNIT-II

Goodness of fit - likelihood ratio test, Lagrange multiplier test, Q-Q plot, performing varity of hypothesis testings. Dimension reduction using PCA, SVD, tSNE. Generalised linear models (GLM) with various link functions (eg logit). Specific focus on gamma regression

UNIT-III

Time series modeling using autoregressive errors (AR), moving average (MA), ARIMA - stationary and non-stationary time series data, mean stationarity, trend stationarity, statistical test for stationarity. Survival Analysis using survfit - Kaplan Meier survival density estimation,

Cox proportional hazards model, Gaussian mixture model and Naive Bayes, assessment of model performance

UNIT-IV

Bootstrapping and Monte Carlo methods, randomisation test. Introduction to handling large data - locality sensitive hashing, sizing sketches, corset, Applications - gene expression, EHR data, demand forecasting, price optimisation in retal, probability of default in banking

Reference Books

[1] Han, Jiawei, Jian Pei, and Micheline Kamber. Data mining: concepts and techniques. Elsevier, 2011.
[2] Tan, Pang-Ning. Introduction to data mining. Pearson Education India, 2007.b
[3] Friedman, Jerome, Trevor Hastie, and Robert Tibshirani. The elements of statistical learning. Vol. 1. No. 10. New York, NY, USA:: Springer series in statistics, 2001
[4] Shalev-Shwartz, Shai, and Shai Ben-David. Understanding machine learning: From theory to algorithms. Cambridge university press, 2014.
[5] R for Data Science, by Garrett Grolemund and Hadley Wickham (2016)
[6] Exploratory Data Analysis with R, by Roger D. Peng (2016)
[7] An Introduction to Statistical Learning with Application in R, First Edition, by Gareth James et al. (2013)
[8] Introduction to linear algebra, by Gilbert Strang

Network Security

Course code	PCC-ADS-306G				
Category	Professional Core Course				
Course title	Network Security				
Scheme and Credits	L	T	P	Credits	Semester 6th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 20 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 20 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

Course Outcomes:

1. Develop Concept of Security needed in Communication of data through computers and networks along with Various Possible Attacks
2. Understand Various Encryption mechanisms for secure transmission of data and management of key required for required for encryption
3. Understand authentication requirements and study various authentication mechanisms
4. Understand network security concepts and study different Web security mechanisms.

UNIT-I

Introduction: Need for Security, Security Attacks , Services and Mechanisms, Network Security, Model

Unit II

Ciphers: Symmetric Ciphers, Substitution &Transposition Techniques , Block Cipher, DES, Triple DES, Stream Ciphers, RC4

Unit III

Public Key Cryptography: Need and Principles of Public Key Cryptosystems, RSA Algorithm, Key Distribution and Management, Diffie-Hellman Key Exchange, Digital Signatures

Unit IV

Authentication: Authentication Requirements, Message Authentication Codes, Hashes, MD5 & SHA, User Authentication: Password, Certificate based & Biometric Authentication, Kerberos

Network Security: Firewalls, IP Security, VPN, Intrusion Detection, Web Security, SSL,TLS

Suggested readings:

1. “Cryptography & Network Security”, PHI William Stalling
2. “Cryptography & Network Security”, Mc Graw Hill Atul Kahate
3. “Cryptography & Network Security”, PHI Forouzan
4. "Modern Cryptography, Theory & Practice", Pearson Education. Wenbo Mao
5. "An Introduction to Mathematical Cryptography", Springer. Hoffstein, Pipher, Silvermman.
6. "The Design of Rijndael", Springer. J. Daemen, V. Rijmen.
7. "Algorithmic Cryptanalysis", CRC Press. A. Joux
8. "Number Theory", Tata Mc Graw Hill. S. G. Telang
9. "Protocols for Authentication and Key Establishment", Springer. C. Boyd, A. Mathuria.
10. "Computer Security", Pearson Education. Matt Bishop
11. “Understanding Cryptography”, Springer-Verlag Berlin Heidelberg Christof Paar, Jan Pelzl

Distributed System

Course code	PCC-ADS-308G				
Category	Professional Core Course				
Course title	Distributed System				
Scheme and Credits	L	T	P	Credits	Semester 6th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 20 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV.Examiner will set two questions from each Unit of the syllabus and each question will carry 20 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

Course Outcomes:

1. To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
2. To know about Shared Memory Techniques.
3. Have Sufficient knowledge about file access.
4. Have knowledge of Synchronization and Deadlock.

UNIT-I

Introduction : Introduction to Distributed System, Goals of Distributed system, Hardware and Software concepts , Design issues. Communication in distributed system: Layered protocols, ATM networks, Client – Server model, Remote Procedure Calls and Group Communication. Middleware and Distributed Operating Systems.

UNIT-II

Synchronization in Distributed System: Clock synchronization, Mutual Exclusion, Election algorithm, the Bully algorithm, a Ring algorithm, Atomic Transactions, Deadlock in Distributed Systems, Distributed Deadlock Prevention, Distributed Deadlock Detection .

UNIT-III

Processes and Processors in distributed systems: Threads, System models, Processors Allocation, Scheduling in Distributed System, Real Time Distributed Systems.
Distributed file systems: Distributed file system Design, Distributed file system Implementation, Trends in Distributed file systems.

UNIT-IV

Distributed Shared Memory: What is shared memory, Consistency models, Page based distributed shared memory, shared variables distributed shared memory.

Case study MACH: Introduction to MACH, process management in MACH, communication in MACH, UNIX emulation in MACH.

Text Book:

1 Distributed Operating System – Andrew S. Tanenbaum, PHI.
2 Operating System Concepts , P.S.Gill, Firewall Media

Mobile Application Development

Course code	PCC-CSD-310-G				
Category	Professional Core Course				
Course title	Mobile Application Development				
Scheme and Credits	L	T	P	Credits	Semester 6th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each.

Course Outcomes:

1. Explain the principles and theories of mobile computing technologies.
2. Describe infrastructures and technologies of mobile computing technologies.
3. List applications in different domains that mobile computing offers to the public, employees, and businesses.
4. Describe the possible future of mobile computing technologies and applications.
5. Effectively communicate course work through written and oral presentations

UNIT I

Introduction: Mobile operating system, Operating system structure, Constraints and Restrictions, Hardware configuration with mobile operating system, Features: Multitasking Scheduling, Memory Allocation, File System Interface, Keypad Interface, I/O Interface, Protection and Security, Multimedia features

UNIT II

Introduction to Mobile development IDE's, Introduction to Worklight basics, Optimization, pages and fragments , Writing a basic program- in Worklight Studio, Client technologies, Client side debugging, Creating adapters, Invoking adapters from Worklight Client application, Common Controls, Using Java in adapters, Programming exercise with Skins, Understanding Apache Cordova.

UNIT III

Understanding Apple iOS development, Android development, Shell Development, Creating Java ME application, Exploring the Worklight Server, Working with UI frameworks, Authentication, Push notification, SMS Notifications, Globalization.

UNIT IV

Android: Introduction to Android, Architecture, memory management, communication protocols, application development methods, deployment. iOS: Introduction to iOS, Architecture, memory management, communication protocols, application development methods, deployment

Suggested text books:

1. Anubhav Pradhan, Anil V Deshpande, " Mobile Apps Development" Edition:
2. Jeff McWherter, Scott Gowell "Professional Mobile Application Development", John Wiley & Sons, 2012.
3. Barry Burd, "Android Application Development All in one for Dummies", Edition: I 4. Teach Yourself Android Application Development In 24 Hours, Edition: I, Publication: SAMS

Suggested reference books:

1. Neal Goldstein, Tony Bove, "iPhone Application Development All-In-One For Dummies", John Wiley & Sons
2. Henry Lee, Eugene Chuvyrov, "Beginning Windows Phone App Development", Apress, 2012.
3. Jochen Schiller,"Mobile Communications", Addison-Wesley, 2nd edition, 2004.
4. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN 0471419028.

Data Science Lab

Course code	LC-ADS-304-G				
Category	Professional Core Course				
Course title	Data Science Lab				
Scheme and Credits	L	T	P	Credits	Semester 6th
	0	0	3	1.5	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	3 Hours				

List of Experiments

1. Interactive commands in Python, data operations, simple programs for writing into files and reading from files. Data file manipulations programs.
2. Familiarization with IDE in Python.
3. Writing programs for standard algorithms of sorting and searching in Python.
4. Plotting the data using X-Y graph, Bar- chart, and using other plotting techniques.
5. Write programs to perform exploratory data analysis: variance, standard derivation, summarization, distribution, and statistical inference.
6. Plotting the various distributions for given data sets.
7. Classifying and presentation of data using support vector machine.
8. Write programs for k-means clustering and presentation for given data sets.
9. Write programs on graphs of social networks for community detection
10. Write programs for analysis of graphs to find centrality and page-rank.

Note: 1. At least Ten experiments are to be performed in the semester.

2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or as designed and set by the current institution as per the scope of the syllabus.

Deep Learning Lab

Course code	LC-ADS-302-G				
Category	Professional Core Course				
Course title	Deep Learning Lab				
Scheme and Credits	L	T	P	Credits	Semester 6th
	0	0	2	1	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	3 Hours				

List of Experiments:

1. Implement Simple Programs like vector addition in TensorFlow.
2. Implement a simple problem like regression model in Keras.
3. Implement a perceptron in TensorFlow/Keras Environment.
4. Implement a Feed-Forward Network in TensorFlow/Keras.
5. Implement an Image Classifier using CNN in TensorFlow/Keras.
6. Implement a Transfer Learning concept in Image Classification.
7. Implement an Autoencoder in TensorFlow/Keras.
8. Implement a Simple LSTM using TensorFlow/Keras.
9. Implement an Opinion Mining in Recurrent Neural network.
10. Implement an Object Detection using CNN.

Note: 1. At least Ten experiments are to be performed in the semester.

2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or as designed and set by the current institution as per the scope of the syllabus.

Mobile Application Development Lab

Course code	LC-ADS-306G				
Category	Professional Core Course				
Course title	**Mobile Application Development Lab**				
Scheme and Credits	L	T	P	Credits	Semester 6th
	0	0	3	1.5	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	3 Hours				

List of Experiments:

1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi threading
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock

Note: 1. At least Ten experiments are to be performed in the semester.

2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or as designed and set by the current institution as per the scope of the syllabus.

PROJECT – I

Course code	PROJ-CSE-322G				
Category	Professional Core Course				
Course title	PROJECT – I				
Scheme and Credits	L	T	P	Credits	Semester 6th
	0	0	4	2	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	3 Hours				

Students will be assigned projects individually or in a group of not more than 3 students depending on the efforts required for completion of project.

The project will have 4 stages :

(*Marks for internal evaluation are given in brackets)

- Synopsis submission (5 marks),
- 1stmid term progress evaluation (5 marks)
- 2nd mid term progress evaluation (5 marks)
- Final submission evaluation (10 marks).

The external examiner will evaluate the project on the basis of idea/quality of project, implementation of the project, project report and viva.

Constitution of India

Course code	MC-317G				
Category	Mandatory Course				
Course title	**Constitution of India**				
Scheme and Credits	L	T	P	Credits	Semester 6th
	2	0	0	0	

Course Objectives:

Students will be able to:
1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

B.Tech(Artificial Intelligence & Data Science)
Scheme of Studies/Examination
Semester 7th w.e.f. 2022-23

Sr. No.	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L	T	P			Internal Assessment	Theory	Practical	Total	
1	PCC-ADS-401G	Natural Language Processing & Speech Recognition	3	0	0	3	3	25	75		100	3
2	Refer to Annexure IV	Professional Elective–IV (*Common with CSE)*	3	0	0	3	3	25	75		100	3
3	Refer to Annexure V	Professional Elective–V (*Common with CSE)*	3	0	0	3	3	25	75		100	3
4	Refer to Annexure OEC-I	Open Elective–I (*Common with CSE)*	3	0	0	3	3	25	75		100	3
5	LC-ADS-421G	Natural Language Processing & Speech Recognition Lab	0	0	2	2	1	25	-	25	50	3
6	PROJ-CSE-423G	Project-II (*Common with CSE)*	0	0	6	6	3	50	-	50	100	3
7	PT-CSE-425G	Practical Training-II (*Common with CSE)*	0	0	0	1	-	-	-	-	-	-
		TOTAL					**16**	**175**	**300**	**75**	**550**	

NOTE:

1. Practical Training II: The evaluation of Practical Training-II will be based on seminar, viva-voce, reportsubmitted by the students. According to performance, the students will be awarded grades A, B, C, F. A student who is awarded 'F' grade is required to repeat Practical Training.

2. Choose one subject from each Professional Elective–IV, Professional Elective–V and Open Elective– I. List of elective subjects is attached as annexures.

Annexure IV: Professional Elective -IV

1. PEC-CSE-403G: Software Project Management
2. PEC-CSE-405G: Web Mining
3. PEC-CSE-407G: Predictive Analysis
4. PEC-CSE-409G: Information Hiding Techniques

Annexure V: Professional Elective -V

1. PEC-CSE-411G: Network Security and cryptography
2. PEC-CSE-413G: Software Testing
3. PEC-CSE-415G: Cyber Security Threats
4. PEC-CSE-417G: Advanced Computer Architecture

Annexure OEC-I: Open Elective-I

1. OEC-PHY-101G: Material Science
2. OEC-ECE-451-G: Electronic Principles
3. HSMC-08G: Fundamentals of Management
4. OEC-CE-451-G: Disaster Management
5. HSMC-10G: English for Professionals

B.Tech(Artificial Intelligence & Data Science)
Scheme ofStudies/Examination
Semester 8th w.e.f 2022-23

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Internal Assessment	Theory	Practical	Total	
1	Professional Core Course	PCC-ADS-402G	IoT and Cloud computing	3	0	0	3	3	25	75		100	3
2	Professional Core Course	PCC-CSE-404G	Big Data Analytics (*Common with CSE)*	3	0	0	3	3	25	75		100	3
3	Open Elective Course	Refer to Annexure OEC-III	Open Elective-II (*Common with CSE)*	3	0	0	3	3	25	75		100	3
4	Professional Core Course	LC-CSE-410G	Big Data Analytics Lab (*Common with CSE)*	0	0	0	2	1	25		25	50	3
5	Professional Core Course	LC-ADS-402G	IoT and Cloud computing Lab	0	0	2	2	1	25		25	50	3
6	Project	PROJ-CSE-422G	Project-III (*Common with CSE)*	0	0	8	4	4	50		50	100	3
		TOTAL CREDIT						**15**	**175**	**225**	**100**	**500**	

NOTE:
Choose one subject from open Elective– II. List of elective subjects is attached as annexure.

Annexure OEC-II: Open Elective-II

1.PEC-ME-410G:Quality Engineering

2.OEC-ECE-430G: Wireless Adhoc and Sensor Networks

3.OEC-ECE-452G: Intelligent Instrumentation for Engineers

4. OEC-CE- 448G: Traffic Engineering and Road Safety

5. OEC-EE-08G: Conventional and Renewable Energy Resources

Natural Language Processing & Speech Recognition

Course code	PCC-ADS-401G				
Category	Professional Core Course				
Course title	Natural Language Processing & Speech Recognition				
Scheme and Credits	L	T	P	Credits	Semester 7th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note:

Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

Course Outcomes:

By the end of the course the students will be able to:

1. Understand Natural Language Processing, Probabilistic model of defining language and techniques.
2. Applying Hidden Markov model and Speech Recognition.
3. Application of context free grammar and language parsing.
4. Implement probabilistic and language parsing.

UNIT-I

Introduction to Natural Language Processing: NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The problem of ambiguity.

Regular Expressions: Regular Expressions, Automata, Similarity Computation: Regular Expressions, patterns, FA, Formal Language, NFSA, Regular Language and FSAs, Raw Text Extraction and Tokenization, Extracting Terms from Tokens, Vector Space Representation and Normalization, Similarity Computation in Text.

UNIT - II

Matrix Factorization and Topic Modeling: Introduction, Singular Value Decomposition, Nonnegative Matrix Factorization, Probabilistic Latent Semantic Analysis, Latent Dirichlet Allocation Computational

Phonology and Text-to-Speech: Speech Sounds and Phonetic Transcription, The Phoneme and Phonological Rules, Phonological Rules and Transducers, Advanced Issues in Computational Phonology, Machine Learning of Phonological Rules, Mapping Text to Phones for TTS, Prosody in TTS .

Introduction to Probabilistic Models of Pronunciation and Spelling, N-gram Language Models

UNIT - III

HMMs and Speech Recognition: Speech Recognition Architecture, Overview of Hidden Markov Models, The Viterbi Algorithm Revisited, Advanced Methods for Decoding, Acoustic Processing of Speech, Computing Acoustic Probabilities, Training a Speech Recognizer, Waveform Generation for Speech Synthesis, Human Speech Recognition. Word Classes and Part-of-Speech Tagging: Tagsets for English, Part of Speech Tagging, Rule-based Part-of-speech Tagging, Stochastic Part-of-speech Tagging, Transformation Based Taggin, Context-Free Grammars for English

UNIT - IV

Parsing with Context-Free Grammars and Features and Unification: Parsing as Search, A Basic Top-down Parser, The Earley Algorithm, Finite-State Parsing Methods, Feature Structures, Unification of Feature Structures, Features Structures in the Grammar, Implementing Unification, Parsing with Unification Constraints, Types and Inheritance

Introduction of Lexicalized and Probabilistic Parsing, Representing Meaning and Semantic Analysis, Text Sequence Modeling and Deep Learning:

Reference Books

1. Daniel Jurafsky and James H.Martin: Speech and Language Processing(2nd Edition),Prentice Hall:2 edition,2008.
2. Charu C.Aggarwal: Machine Learning for Text Springer,2018 edition
3. Christopher D.Manning and Hinrich Schuetze: Foundations of Statistical Natural Language Processing MIT press.
4. Steven Bird,Ewan Klein and Edward Loper: Natural Language Processing with Python,O'Reilly Media.
5. Roland R.Hausser: Foundations of Computational Linguistics:HumanComputer Communication in Natural Language,Paperback,MIT press..
6. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time

Natural Language Processing & Speech Recognition Lab

Coursecode	LC-ADS-421G				
Category	Professional Core Course				
Coursetitle	Natural Language Processing & Speech Recognition Lab				
Scheme and Credits	L	T	P	Credits	Semester 7th
	0	0	2	1	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	3 Hours				

List of Experiments

1 Word Analysis
2. Word Generation
3. Morphology
4. N-Grams
5. N-Grams Smoothing
6. POS Tagging: Hidden Markov Model
7. POS Tagging: Viterbi Decoding
8. Building POS Tagger
9. Chunking
10. Building Chunker

Note: 1. At least Ten experiments are to be performed in the semester.

2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or as designed and set by the current institution as per the scope of the syllabus.

PROJECT-II

Coursecode	PROJ-CSE-423G				
Category	Professional Core Course				
Coursetitle	Project-II				
Scheme and Credits	L	T	P	Credits	Semester 7
	0	0	6	3	
Class work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	03 Hrs				

Students will be assigned projects individually or in a group of not more than 3 students depending on the efforts required for completion of project.

The project will have 4 stages:

(*Marks for internal evaluation are given in brackets)

1. Synopsis submission (10 marks),
2. 1st mid-term progress evaluation (10 marks)
3. 2nd mid-term progress evaluation (10 marks)
4. Final submission evaluation (20 marks).

The external examiner will evaluate the project on the basis of idea/quality of project, implementation of the project, project report and viva.

Practical Training-II

Coursecode	PT-CSE-425G				
Category	Professional Core Course				
Coursetitle	Practical Training-II				
Scheme and Credits	L	T	P	Credits	Semester 7
	0	0	1		
Class work					
Exam					
Total					
Duration of Exam					

Practical Training II: The evaluation of Practical Training-II will be based on seminar, viva-voce, report submitted by the students. According to performance, the students are awarded grades A, B, C, F. A student who is awarded 'F' grade is required to repeat Practical Training.

Software Project Management

Coursecode	PEC-CSE-403G				
Category	Professional Elective Course				
Coursetitle	Software Project Management				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

Course Outcomes:

By the end of this course the students will be able to:

1. Identify different stages of Project Management and able to manage scope & objectives defined by project stakeholders at the same time as focussing on project success.
2. Analyse cost benefit evaluation, different risk associated with project, and techniques used to evaluate & mitigate risk.
3. Manage the resources, monitoring the progress of project using different techniques and managing contracts & peoples associated with the project.
4. Understand the importance of software quality and techniques to enhance software quality.

UNIT-1

Introduction to Software Project Management (SPM): Definition of a Software Project (SP), SP Vs. other types of projects activities covered by SPM, categorizing SPs, project as a system, management control, requirement specification, information and control in organization.

Stepwise Project planning: Introduction, selecting a project, identifying project scope and objectives, identifying project infrastructure, analyzing project characteristics, identifying project products and activities, estimate efforts each activity, identifying activity risk, allocate resources, review/ publicize plan.

UNIT-2

Project Evaluation & Estimation: Cost benefit analysis, cash flow forecasting, cost benefit evaluation techniques, risk evaluation. Selection of an appropriate project report; Choosing technologies, choice of process model, structured methods, rapid application development,

waterfall, V-process model, spiral models, Prototyping, delivery. Albrecht function point analysis.

Activity planning & Risk Management: Objectives of activity planning, project schedule, projects and activities, sequencing and scheduling activities, network planning model, representation of lagged activities, adding the time dimension, backward and forward pass, identifying critical path, activity throat, shortening project, precedence networks.

Risk Management: Introduction, the nature of risk, managing risk, risk identification, risk analysis, reducing the risks, evaluating risks to the schedule, calculating the z values.

UNIT-3

Resource allocation & monitoring the control: Introduction, the nature of resources, identifying resource requirements, scheduling resources creating critical paths, counting the cost, being specific, publishing the resource schedule, cost schedules, the scheduling sequence.

Monitoring the control: Introduction, creating the frame work, collecting the data, visualizing progress, cost monitoring, earned value, prioritizing monitoring, getting the project back to target, change control.

Managing contracts and people: Introduction, types of contracts, stages in contract, placement, typical terms of a contract, contract management, acceptance, Managing people and organizing terms: Introduction, understanding behaviour, organizational behaviour: a back ground, selecting the right person for the job, instruction in the best methods, motivation, working in groups, becoming a team, decision making, leadership, organizational structures.

UNIT-4

Software quality: Introduction, the place of software quality in project planning, the importance of software quality, defining software quality, ISO 9126, Practical software quality measures, product versus process quality management, external standards, techniques to help enhance software quality.

Text Book:

1. Software Project Management (2nd Edition), by Bob Hughes and Mike Cotterell, 1999, TMH

Reference Books:

1. Software Engineering – A Practitioner's approach, Roger S. Pressman (5th edi), 2001, MGH

2. Software Project Management, Walker Royce, 1998, Addison Wesley.

3. Project Management 2/c. Maylor

4. Managing Global software Projects, Ramesh, 2001, TMH.

Web Mining

Coursecode	PEC-CSE-405G				
Category	Professional Elective Course				
Coursetitle	Web Mining				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	0		3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

Course Objectives:

1. To understand the architecture of web, mining the data, issues, challenges.
2. To study the methods of extracting knowledge from web data, text and unusual data.
3. To understand and use data mining language like R, Python etc.
4. To understand the optimization of web and its applications.

UNIT: 1

Data Mining Foundations: Basic concepts in data Mining, Web mining versus Data mining, Discovering knowledge from Hypertext data; An overview of web mining : What is Web mining, Web mining taxonomy, Web mining subtasks, issues, challenges

UNIT: 2

Web Search and Information Retrieval : Information Retrieval Models, Web Search and IR, Text Mining, , Latent Semantic Indexing, Web Spamming, Clustering and Classification of Web Pages, Information Extraction , Web Content Mining;

UNIT: 3

Optimization : Introduction to Models and Concept of Computational Intelligence, Social Behavior as Optimization: Discrete and Continuous Optimization Problems, Classification of Optimization Algorithms, Evolutionary Computation Theory and Paradigm, Swarm and Collective intelligence

UNIT: 4

Swarm Intelligence Techniques: Particle Swarm Optimization, Ant Colony Optimization, Artificial Bees and Firefly Algorithm etc., Hybridization and Comparisons of Swarm Techniques, Application of Swarm Techniques in Different Domains and Real World Problems

Course Outcomes:

power of web search engine by classifying the web documents and identifying the web pages

1. Learn how the Web mining helps to improve the power of web search engine by classifying the web documents and identifying the web pages.
2. How to predict user behaviour in the web.
3. For a given data set how the optimization will be performed.

Suggested books:

1. Witton Frank, Data Mining , Morgan Kauffan Publishers.
2. Kennedy, J.and Eberhart, R.C., Swarm Intelligence, Morgan Kaufmann Publishers, 2001
3. Bonabeau, E., Dorigo, M. and Theraulaz, G., Swarm Intelligence: From Natural to Artifical Systems, Oxford University Press, 1999
4. Dorigo, M., Stutzle, T., Ant Colony Optimization, MIT Press, 2004
5. Parsopoulos, K.E., Vrahatis, M.N., Particle Swarm Optimization and Intelligence: Advances and Applications, Information Science Reference, IGI Global, 2010
6. Clerc, M., ParticleSwarm Optimization, ISTE, 2006
7. Nature Inspired Metaheuristic Algorithms, Xin-She Yang, Luniver Press, 2010

Predictive Analytics

Coursecode	PEC-CSE-407G				
Category	Professional Elective Course				
Coursetitle	Predictive Analytics				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	0		3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Objectives:

1. To provide the knowledge of various quantitative and classification predictive models based on various regression and decision tree methods.
2. To provide the knowledge to select the appropriate method for predictive analysis
3. To provide the understanding of how to search, identify, gather and pre-process data for the analysis.
4. To provide the understanding of how to formulate predictive analytics questions.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

UNIT-1

Introduction: The Analytics Life Cycle, Introduction to Predictive Analytics, Matrix Notation, Basic Foundations, Model, Method and Feature Selection

Regression: Covariance, Correlation and ANOVA review; Simple Linear Regression, OLS Model Diagnostics, Dummy Variables, Multivariate Regression, OLS Assumptions ,Weighted Least Squares (WLS), Generalized Linear Models (GLM).

UNIT-2

Classification Models: Introduction, Binomial Logistic Regression, Multinomial Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis.

Decision Trees: Introduction Regression Trees, Regression Tree Issues, Classification Trees, Pruning Trees, Bootstrap Aggregation (Bagging), Random Forest Models.

UNIT-3

Data Pre-Processing: Overview, Variable Types, Introduction to Data Transformations, Data Transformations: Categorical to Dummy Variables, Polynomials, Box-Cox Transformation, Log & Elasticity Models, Logit Transformation, Count Data Models, Centering, Standardization, Rank Transformations, Lagging Data (Causal Models), Data Reduction.

UNIT-4

Variable Selection: Dimensionality Issues, Multi-Collinearity, Variable Selection Methods, Step Methods.

Dimensionality: Regularization (Penalized or Shrinkage Models, Ridge Regression, LASSO, Dimension Reduction Models, Principal Components Regression (PCR), Partial Least Squares (PLS).

Machine Learning: Machine Learning Overview, Bias vs. Variance Trade-off, Error Measures, Cross-Validation.

Course Outcomes:

1. Ability to develop and use various quantitative and classification predictive models based on various regression and decision tree methods.
2. Ability to select the appropriate method for predictive analysis
3. Ability to search, identify, gather and pre-process data for the analysis.
4. Ability to formulate predictive analytics questions.

Suggested books:

1. "An Introduction to Statistical Learning: with Applications in R" by James, Witten, Hastie and Tibshirani, Springer, 1st. Edition, 2013.

Suggested reference books

1. "The Elements of Statistical Learning-Data Mining, Inference, and Prediction " by Trevor Hastie, Robert Tibshirani, Jerome Friedman , Second Edition , Springer Verlag, 2009.
2. Predictive & Advanced Analytics (IBM ICE Publication)

Information Hiding Techniques

Coursecode	PEC-CSE-409G				
Category	Professional Elective Course				
Coursetitle	Information Hiding Techniques				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	0		3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

Course Objectives:

1. To learn about data hiding applications and their techniques.
2. To learn about hacking.
3. To learn security based protocols, attacks and intrusions.
4. To work with advance data hiding techniques.

UNIT 1

Introduction to Information Hiding: Types of Information Hiding, Applications, Importance & Significances. Differences between cryptography and steganography, Wisdom from Cryptography, types of steganography their application and significances. Past present and future of steganography

UNIT 2

Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data, Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text, Steganographic system, Study of Different methods of insertion and retrieval of message using image steganography, Study of histrogram analysis using MATLAB of original image and stegno image

UNIT 3

Basics of watermarking, Watermarking process, Watermarking applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking, Bit plane of an Image, study of noises in stego images and their comparisons, Robustness of watermarking schemes on different attacks like blurring,

cropping , compression of theimage. PSNR calculation of the images.

UNIT 4

Use of image steganography in biometric sciences, Study of security enhancement of biometric template using steganographic Frame proof codes:-Definition, Introduction of frame proof codes, Methods to obtain 2- frame proof codes using mutually orthogonal latin squares. Use of frame proof codes in ownership and software piracy.

Course Outcomes:

After completing the course the student will be able to:

1. Explain information security.
2. Give an overview of access control of relational databases.
3. State the basic concept in information systems security, including security technology and principles, software security and trusted systems and IT security management.
4. Learn advance data hiding techniques.

Suggested Books:

1. Recent Advances in Information Hiding and Applications, Pan, J.-S., Huang, H.-C., Jain, L.C., Zhao, Y., Springer (2013).
2. Information Hiding Techniques for Steganography and Digital Watermarking, Stefan Katzenbeisser, Fabien A. P. Petitcolas, Artech House, 2000.

Network Security And Cryptography

Coursecode	PEC-CSE-411G				
Category	Professional Elective Course				
Coursetitle	Network Security and Cryptography				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	0		3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

Course Objectives:

1. To understand cryptography theories; algorithms & systems.
2. To understand the symmetric and asymmetric key algorithms.
3. To understand necessary approaches & techniques to build protection mechanisms in order to secure Computer Networks.
4. Acquire fundamental knowledge on the concepts of different security layers.

UNIT- I

Introduction: Plain text and cipher text, substitution techniques, transposition techniques, encryption anddecryption, symmetric and asymmetric key cryptography.

UNIT- II

Symmetric Key Algorithms:-Introduction, algorithms types and modes, DES, AES.

Asymmetric Key Algorithms: Introduction, history of asymmetric key cryptography, RSAsymmetric and asymmetric key cryptography together, Digital signature.

UNIT- III

Internet Security Protocols: Basic concepts, Secure Socket Layer (SSL), Transport Layer Security (TLS),Secure Hyper Text Transfer protocol (SHTTP), Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), S SL versus SET, Electronic Money, Email Security.

UNIT- IV

User Authentication And Kerberos:-Introduction, Authentication basics, Passwords, authenticationtokens, certificate based authentication, biometric based authentication, Kerberos, key distribution center(KDC), Security handshake pitfalls, single Sign on(SSO) approach.

TEXT/ REFERENCE BOOKS:

1. Cryptography and Network Security, 2nd Edition by Atul Kahate, TMH
2. Network Management Principles & Practices by Subramanian, Mani (AWL)
3. SNMP, Stalling, Willian (AWL)
4. SNMP: A Guide to Network Management (MGH)
5. Telecom Network Management by H.H. Wang (MGH)
6. Network Management by U. Dlack (MGH)

Course Outcomes:

After completing the course the student will be able to

1. Compare various cryptographic techniques.
2. Work with symmetric & asymmetric key algorithms.
3. Design secure applications.
4. Inject secure coding in the developed applications.

Software Testing

Coursecode	PEC-CSE-413G				
Category	Professional Elective Course				
Coursetitle	Software Testing				
Scheme and Credits	L	T	P	Credits	Semester 7
	3	0		3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Objectives:

1. To study fundamental concepts of software testing including software testing objectives, process, criteria, strategies, and methods.
2. To learn how to plan a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
3. To gain an insight into techniques and skills on how to use modern software testing tools to support software testing projects.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

UNIT1

Introduction: Overview of Software Development Life Cycle (SDLC), Significance of Software Testing in SDLC, Objectives and Limitations of software testing. Difference between an Error, Fault and Failure (Software Bug), Software Testing Life Cycle (STLC) and Seven Principles of Software Testing, Role of Software Testing in Software Quality

UNIT II

Test Case Design: Test Cases and Test Suite, Test Case Planning and Designing, Characteristics of Good Test Case Design, Format of test case.

Testing Activities: Levels of Testing- UNIT, Integration Testing and System Testing. V Model for Software Testing.

UNIT III

Types of Software Testing: Black box testing, White Box and Gray Box Testing.

Reporting and Analyzing bugs: Problem reports, Content and Characteristics of Problem Report, analysis and Tactics for analyzing a reproducible bug. Making a bug reproducible, Problem/Bug Reporting tools

UNIT IV

Test Case Selection: Need ofRegression Testing, Non-feasibility of Exhaustive Testing, Selection, Minimization and Prioritization of test cases in regression testing.

Testing Tools: Manual vs Automated Testing, Types of Testing Tools, Automated Test Case Generation

Course Outcomes:

1. Understand software testing and quality as a fundamental component of software development life cycle
2. Understand and design the test cases for a given problem
3. Understand the process of Reporting of software failures(bugs) using tools like Bugzilla
4. Develop the knowledge of selection of appropriate test cases for execution during regression testing

Suggested books:

1. "Software Testing: Principles and Practices", by Naresh Chauhan. Oxford University Press

Suggested reference books

1. "William Perry, Effective Methods for Software Testing , John Wiley & Sons, New York, 1995.
2. Boris Beizer, Software Testing Techniques , Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990.
3. Louise Tamres, Software Testing , Pearson Education Asia, 2002
4. Roger S. Pressman, Software Engineering – A Practitioner's Approach , Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
5. Boris Beizer, Black-Box Testing – Techniques for Functional Testing of Software and Systems , John Wiley & Sons Inc., New York, 1995.
6. K.K. Aggarwal & Yogesh Singh, Software Engineering , New Age International Publishers, New Delhi, 2003.

Cyber Security Threats

Coursecode	PEC-CSE-415G				
Category	Professional Elective Course				
Coursetitle	Cyber Security Threats				
Scheme and Credits	L	T	P	Credits	
	3	0		3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Objectives:

1. The learner will gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
2. The learner will understand key terms and concepts in cyber law, intellectual property and cybercrimes, trademarks and domain theft.
3. The learner will be able to examine secure software development practices.
4. The learner will understand principles of web security.
5. The learner will be able to incorporate approaches for risk management and best practices.
6. The learner will gain an understanding of cryptography, how it has evolved, and some key encryption techniques used today.
7. The learner will develop an understanding of security policies (such as confidentiality, integrity, and availability), as well as protocols to implement such policies.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

UNIT I

Introduction: Security threats - Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Cyber crimes. Network Threats: Active/ Passive – Interference – Interception –Impersonation – Worms –Virus – Spam's – Ad ware - Spy ware – Trojans and covert channels –Backdoors – Bots – IP, Spoofing - ARP spoofing - Session Hijacking - Sabotage-Internal treats Environmental threats - Threats to Server security.

UNIT II

Security Threat Management: Risk Assessment - Forensic Analysis - Security threat correlation –Threat awareness - Vulnerability sources and assessment- Vulnerability assessment tools –Threat identification - Threat Analysis - Threat Modelling - Model for Information Security Planning.

UNIT III

Security Elements: Authorization and Authentication - types, policies and techniques – Security certification - Security monitoring and Auditing - Security Requirements Specifications – Security Policies and Procedures, Firewalls, IDS, Log Files, Honey Pots

UNIT IV

Access control, Trusted Computing and multilevel security - Security models, Trusted Systems, Software security issues, Physical and infrastructure security, Human factors – Security awareness, training, Email and Internet use policies.

Course Outcomes:

1. Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.
2. Design, develop, test and evaluate secure software.
3. Develop policies and procedures to manage enterprise security risks.
4. Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.
5. Interpret and forensically investigate security incidents.

Reference Books:

1. Swiderski, Frank and Syndex, “Threat Modeling”, Microsoft Press, 2004.
2. William Stallings and Lawrie Brown, “Computer Security: Principles and Practice”, Prentice Hall, 2008.
3. Joseph M Kizza, “Computer Network Security”, Springer Verlag, 2005
4. Thomas Calabres and Tom Calabrese, “Information Security Intelligence: Cryptographic Principles & Application”, Thomson Delmar Learning, 2004.

Advanced Computer Architecture

Coursecode	PCC-CSE-417G				
Category	Professional Elective Course				
Coursetitle	Advanced Computer Architecture				
Scheme and Credits	L	T	P	Credits	
	3	0		3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Objectives:

1. To make students know about the Parallelism concepts in Programming.
2. To give the students an elaborate idea about the different memory systems and buses.
3. To introduce the advanced processor architectures to the students.
4. To make the students know about the importance of multiprocessor and multicomputer.
5. To study about data flow computer architectures.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

UNIT I

Architecture And Machines: Some definition and terms, interpretation and microprogramming. The instruction set, Basic data types, Instructions, Addressing and Memory. Virtual to real mapping. Basic Instruction Timing.

UNIT II

Cache Memory Notion: Basic Notion, Cache Organization, Cache Data, adjusting the data for cache organization, write policies, strategies for line replacement at miss time, Cache Environment, other types of Cache. Split I and D-Caches, on chip caches, Two level Caches, write assembly Cache, Cache references per instruction, technology dependent Cache
considerations, virtual to real translation, overlapping the Tcycle in V-R Translation, studies. Design summary.

UNIT III

Memory System Design: The physical memory, models of simple processor memory interaction, processor memory modeling using queuing theory, open, closed and mixed-queue models, waiting time, performance, and buffer size, review and selection of queuing models, processors with cache.

UNIT IV

Concurrent Processors: Vector Processors, Vector Memory, Multiple Issue Machines, Comparing vector and Multiple Issue processors.

Shared Memory Multiprocessors: Basic issues, partitioning, synchronization and coherency, Type of shared Memory multiprocessors, Memory Coherence in shared Memory Multiprocessors.

Course Outcomes:

1) Understand the Concept of Parallel Processing and its applications.
2) Implement the Hardware for Arithmetic Operations.
3) Analyze the performance of different scalar Computers.
4) Develop the Pipelining Concept for a given set of Instructions.
5) Distinguish the performance of pipelining and non-pipelining environment in a processor.

Text Book:

Advance computer architecture by Hwang & Briggs, 1993, TMH.

Reference Books:

Pipelined and Parallel processor design by Michael J. Fiynn – 1995, Narosa

Material Science

Coursecode	OEC-PHY-101G				
Category	Open Elective Course				
Coursetitle	Material Science				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of exam	03 Hours				

Course objectives:

The course intends to provide the knowledge of

1. Crystal structure and defects in solids.
2. Classification of different solids.
3. Properties of semiconductor, dielectric and magnetic materials.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

UNIT I

Crystal Structure

Space lattice and translation vectors, UNIT cell, Bravais lattice, Closed packed structures, Miller indices, Diffraction of electromagnetic waves by crystals: X-rays, electrons and neutrons, Bragg's law, X-ray diffraction (Laue and Powder method), Point defects in solids - Schottky and Frenkel defects.

UNIT II

Electrical Properties

Classification of solids into conductors, semiconductors and insulators, Semiconductor Materials: intrinsic and extrinsic, Fermi level and electron & hole concentrations at equilibrium, Carrier transport:diffusionanddrift,p-njunction, Zener and Avalanche breakdown.

UNIT III

Magnetic Properties

Atomic magnetic moments and origin of magnetization, Types of magnetic materials, Ferromagnetism: molecular field, Curie temperature, Domain theory, Hysteresis and its applications.

Superconductivity: Properties of superconductors, Meissner effect, London equations, Elements of BCS Theory, Applications of superconductors.

UNIT IV

Dielectric Properties

Molecular theory, Polarization, Electric displacement vector, susceptibility, dielectric constant, permittivity and various relations between these parameters, Gauss's law in the presence of a dielectric, Energy stored in a uniform electric field, Concept of local molecular fields and Claussius - Mossotti relation.

Course outcome:

At the end of the course, the student should at least be able to:

1. Segregate crystals based on their structure and apply effects of defects on manipulating properties of solids.
2. Distinguish between insulator, conductor and semiconductor. They should know the difference between intrinsic and extrinsic semiconductors and about the fermi level position in these semiconductors.
3. Select various dielectric, magnetic materials for specific applications in different fields.

Suggested reference books:

1. Concepts of Modern Physics- Arthur Beiser (TMGH)
2. Solid State Physics- S.O. Pillai (New Age Int. Ltd. Pub.)
3. Modern Physics for Engineers- S.P. Taneja (R. Chand)
4. Engineering Physics- Satya Prakash (Pragati Prakashan)
5. Engineering Physics- Malik & Singh (McGraw Hill)
6. Charles Kittel, Introduction to Solid State Physics, 7thEdition, John Wiley & Sons,2008.
7. S O Pillai, Solid State Physics, 8thedition, New Age international Publishers,2018

Electronic Principles

Course code	OEC-ECE-451-G				
Category	Open Elective Course				
Course title	Electronic Principles				
Scheme and Credits	L	T	P	Credits	Semester 7th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objective:

1. Study the basic principles of electronic systems.
2. Understand working of Digital electronics.
3. Understand the working of Display devices.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

UNIT I

SEMICONDUCTOR DIODE: P-N junction and its V-I Characteristics, P-N junction as a rectifier, Switching characteristics of Diode. Diode as a circuit element, the load-line concept, half -wave and full wave rectifiers, clipping circuits, clamping circuits, filter circuits, peak to peak detector and voltage multiplier circuits.

UNIT II

ELECTRONIC DEVICES: LED, Zener Diode as voltage regulator, BJT, UJT, MOSFET, Thyristor, DIAC, TRIAC.

UNIT III

DISPLAY DEVICES: LED, LCD, Seven Segment, Sixteen Segment.

UNIT IV

DIGITAL ELECTRONICS: Binary, Octal and Hexadecimal number system and conversions, Boolean Algebra, Truth tables of logic gates (AND, OR, NOT) NAND, NOR as universal gates, Difference between combinational circuits and sequential circuits, Introduction to flipflops (S-R & J-K).

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the working of electronic components.
2. Understand the Digital System and various displays.

TEXT BOOK :

1.Integrated Electronics: Millman &Halkias ;McGrawHill

2.Modren Digital Electronics: R.P. Jain; McGraw-Hill

REFERENCE BOOKS:

1. Electronics Principles: Malvino ;McGrawHill
2. Electronics Circuits: Donald L. Schilling & Charles Belove ;McGrawHill
3. Electronics Devices & Circuits: Boylestad&Nashelsky ; Pearson.

FUNDAMENTALS OF MANAGEMENT

Course code	HSMC-08G				
Category	Open Elective Course				
Course title	Fundamentals of Management				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Objectives:
Students will be able to understand:

1. Evolution of Management and contribution of Management thinkers.
2. The importance of staffing and training
3. The concept of material management and inventory control
4. The components of marketing and advertising, various sources of finance and capital structure.

UNIT 1

Meaning of management, Definitions of Management, Characteristics of management, Management vs. Administration. Management-Art, Science and Profession. Importance of Management.
Development of Management thoughts. Principles of Management. The Management Functions, Inter-relationship of Managerial functions. Nature and Significance of staffing, Personnel management, Functions of personnel management, Manpower planning, Process of manpower planning, Recruitment, Selection; Promotion - Seniority Vs. Merit. Training - objectives and types of training.

UNIT 2

Production Management: Definition, Objectives, Functions and Scope, Production Planning and Control; its significance, stages in production planning and control. Brief introduction to the concepts of material management, inventory control; its importance and various methods.

UNIT 3

Marketing Management - Definition of marketing, marketing concept, objectives & Functions of marketing. Marketing Research - Meaning; Definition; objectives; Importance; Limitations; Process. Advertising - meaning of advertising, objectives, functions, criticism.

UNIT 4

Introduction of Financial Management, Objectives of Financial Management, Functions and Importance of Financial Management. Brief Introduction to the concept of capital structure and various sources of finance.

Course outcomes:

Students will be able to understand

1. Evolution of Management and contribution of Management thinkers.
2. Importance of staffing and training
3. The concept of material management and inventory control
4. The components of marketing and advertising
5. Various sources of finance and capital structure

Suggested Books:

1. Principles and Practice of Management - R.S. Gupta, B.D.Sharma, N.S.Bhalla.(Kalyani Publishers)
2. Organisation and Management - R.D. Aggarwal (Tata Mc Graw Hill)

Suggested Reference Books:

1. Principles & Practices of Management – L.M. Prasad (Sultan Chand & Sons)
2. Management – Harold, Koontz and Cyrilo Donell (Mc.Graw Hill).
3. Marketing Management – S.A. Sherlikar (Himalaya Publishing House, Bombay).
4. Financial Management - I.M. Pandey (Vikas Publishing House, New Delhi)
5. Management - James A.F. Stoner &R.Edward Freeman, PHI.

Disaster Management

Course code	OEC-CE-451G				
Category	Open elective courses				
Course title	Disaster Management				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course objectives:

1. To provide basic conceptual understanding of disasters and its relationships with development.
2. Provide an understanding of the social nature of natural hazards and disasters
3. Increase awareness of hazards and disasters around the world and the unequal social consequences stemming from disaster events.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

UNIT I

Introduction: Definition of Disaster, hazard, Global and Indian scenario, role of engineer, importance of study in human life, long term effects of disaster. Geological Mass Movement and land disasters, Atmospheric disasters, Disaster Mitigation

UNIT II

Natural Disaster: Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion

Man-made Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.

UNIT III

Case Studies: Damage profile analysis- Uttarkashi/Bhuj/Latur earthquakes, Kedarnath landslide, Kerala floods, cyclone Fani and Amphan, Bihar floods, Covid 19, Forest Related disasters, Mining disasters, Atmospheric disasters.

UNIT IV

Disaster Management: Importance of public awareness, Preparation and execution of emergency management programme. Scope and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India. Use of Internet and software for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard.

Course Outcomes:

After completing this course, students should be able:

1. To know natural as well as manmade disaster and their extent and possible effects on the economy.
2. To Plan national importance structures based upon the previous history.
3. To acquaint with government policies, acts and various organizational structures associated with an emergency.
4. To know the simple dos and don'ts in such extreme events and act accordingly.

Reference Books

1. Singhal J.P. Disaster Management, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

English for Professionals

Course code	HSMC-10G				
Category	Open Elective Course				
Course title	English for Professionals				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Objectives:

The course aims at developing the desired language (English) skills of students of engineering and technology so that they become proficient in communication to excel in their professional lives. The course aims at developing competence for report writing with a focus on its complex writing techniques and procedures.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

UNIT I

Communication Process Types and Levels, Scopes and significance, Technical and Tools of Effective communication

UNIT II

Speaking files and Personality Development Oral Presentation, Body Language, Voice Modulation, Negotiation, Group Discussion, Interview techniques

UNIT III

Advanced Technical Writing Job Application, CV writing, Business Letters, Memos, Minutes, Notices, Report Writing and structure, Blog writing.

UNIT IV

Communication and Media Recent Developments in Media, Context of Communication

SUGGESTED READING

1. Borowick, Jerome. N. *Technical Communication and its Applications*. New Delhi: PHI, 2000
2. Guffey, Mary Ellen. *Business Communication: Process & Product*. USA: South western College Publishing, 2000.
3. Kumar, Sanjay and Pushp Lata. *Communication Skills*. Delhi: OUP, 2011

IoT and Cloud Computing

Coursecode	PCC-ADS-402G				
Category	Professional Core Course				
Coursetitle	IoT and Cloud computing				
Scheme and Credits	L	T	P	Credits	Semester-8
	3	0		3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

Course Outcomes:

1. Describe the IoT and Cloud architectures
2. Determine the right sensors and communication protocols to use in a particular IoT system.
3. Deploy Cloud Services using different cloud technologies.
4. Implement cloud computing elements such virtual machines, web apps, mobile services, etc.
5. Establish data migration techniques from IoT devices to the cloud.
6. Implement security features to protect data stored in the cloud.
7. Use visualisation techniques to show data generated from the IoT device.

UNIT-I

Trends of Computing, Introduction to IoT

UNIT-II

IoT Architectures, IoT Devices and Sensors, IoT communication and protocols.

UNIT-III

Cloud Computing Fundamentals, Cloud Computing Architectures, Cloud Types and Services, Virtualization and Resource Management

UNIT-IV

IoT and cloud integration, Application development and cloud processing, Security and Privacy for IoT/Cloud Computing.

Reference Books

1. Botta A, De Donato W, Persico V, Pescapé A, “Integration of Cloud computing and Internet of Things: A survey”, 2015.

Big Data Analytics

Coursecode	PCC-CSE-404G				
Category	Professional Core Course				
Coursetitle	Big Data Analytics				
Scheme and Credits	L	T	P	Credits	Semester 8
	3	0		3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Objectives of the course

- To Provide an explanation of the architectural components and programming models used for scalable big data analysis.
- To Identify the frequent data operations required for various types of data and Apply techniques to handle streaming data
- To describe the connections between data management operations and the big data processing patterns needed to utilize them in large-scale analytical applications
- To Identify describe and differentiate between relational and non-relational database and how Data Warehouses, Data Marts, Data Lakes, and Data Pipelines work.
- Explain how the Extract, Transform, and Load process works to make raw data ready for analysis.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

UNIT I

Introduction to Big Data: Big Data: Why and Where, Application and Challenges, Characteristics of Big Data and Dimensions of Scalability, The Six V, Data Science: Getting Value out of Big Data, Steps in the Data science process, Foundations for Big Data Systems and Programming, Distributed file systems

UNIT II

Data Repositories and Big Data Platforms: RDBMS, NoSQL, Data Marts, Data Lakes, ETL, and Data Pipelines, Foundations of Big Data, Big Data Processing Tools, Modern Data Ecosystem, Key Players, Types of Data, Understanding Different Types of File Formats, Sources of Data Using Service Bindings

UNIT III

Introduction to Big Data Modeling and Management: Data Storage, Data Quality, Data Operations, Data Ingestion, Scalability and Security Traditional DBMS and Big Data Management Systems, Real Life Applications, Data Model: Structure, Operations, Constraints, Types of Big Data Model

UNIT IV

Big Data Integration and processing: Big Data Processing, Retrieving: Data Query and retrieval, Information Integration, Big Data Processing pipelines, Analytical operations, Aggregation operation, High level Operation, Tools and Systems: Big Data workflow Management

Course Outcomes

1. For a given query Describe the Big Data landscape including examples of real world big data problems including the three key sources of Big Data: people, organizations, and sensor.
2. For a given specification, Recognize different data elements in your own work and in everyday life problems
3. For a given specification select a data model to suit the characteristics of your data
4. For a given problem one will be able to Retrieve data from example database and big data management systems and identify when a big data problem needs data integration
5. For a given problem one will be able to design an approach to leverage data using the steps in the machine learning process and apply them to explore and prepare data for modelling.

Suggested books:

Seema Acharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015.

Suggested reference books

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.
4. Anand Rajaraman and Jefrey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.
5. Bill Franks, "Taming the Big Data Tidal Wave: Finding OpportUNITies in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
6. Glen J. Myat, "Making Sense of Data", John Wiley & Sons, 2007
7. Pete Warden, "Big Data Glossary", O'Reily, 2011.
8. Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
9. ArvindSathi, "BigDataAnalytics: Disruptive Technologies for Changing the Game", MC Press, 2012
10. Paul Zikopoulos ,DirkDeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corigan , "Harness the Power of Big Data The IBM Big Data Platform ", Tata McGraw Hill Publications, 2012.

Big Data Analytics Lab

Coursecode	LC-CSE-421G				
Category	Big Data Analytics				
Coursetitle	Neural Networks Lab				
Scheme and Credits	L	T	P	Credits	Semester 8
	3	0		3	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

List of Experiments:

1. To Study of Big Data Analytics and Hadoop Architecture.
2. To Understand Overall Programming architecture of Mapreduce API. Implement MapReduce Programming.
3. To Study HDFS Commands.
4. To Study serializes and deserializes data of integer type in Hadoop.
5. To run a basic Word Count MapReduce program to understand MapReduce Paradigm
6. Basic CRUD operations in MongoDB.
7. Store the basic information about students such as roll no and name using various collection types Map.
8. To run a Grep program on Hadoop to understand Mapreduce Paradigm: To count words in a given file, To view the output file, and To calculate execution time.
9. Installation of SPARK framework with or without Hadoop framework.
10. To Study about the Hive commands using HQL (DDL and DML).

Note: 1. At least Ten experiments are to be performed in the semester.

2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or as designed and set by the current institution as per the scope of the syllabus.

IoT and Cloud Computing lab

Coursecode	LC-ADS-402G				
Category	Professional Core Course				
Coursetitle	IoT and cloud computing Lab				
Scheme and Credits	L	T	P	Credits	Semester 8
	3	0		3	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

List of Experiments:

1. Installation of Raspbian OS or Ubuntu ARM OS on a Rasberry Pi Platform
2. Setting the networking parameters for Raspbian OS like Ethernet, WLAN, Bluetooth, etc
3. Enabling Security or SELinux in Raspbian OS or Ubuntu OS
4. Accessing IBM Bluemix from IoT Devices
5. Data dissemination from Sensor nodes (any make)
6. Data visualization using d3.js or any other tool
7. Contiki OS Installation and Simple IoT network configuration usingContiki
8. Border Router using Contiki OS
9. Implementation of CoAP protocol using Contiki OS
10. Energy, power, duty cycle calculation of IoT devices in Contiki OS
11. Simple application deployment in Google Cloud Engine or Juju Framework
12. Simple application deployment with PubNub cloud services.

Note: 1. At least Ten experiments are to be performed in the semester.

2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or as designed and set by the current institution as per the scope of the syllabus.

Project-III

Coursecode	PROJ-CSE-422G				
Category	Professional Core Course				
Coursetitle	Project-III				
Scheme and Credits	L	T	P	Credits	Semester 8
	0	0	8	4	
Class work	50 Marks				
Exam	50 Marks				
Total	50 Marks				
Duration of Exam	03 Hrs				

Students will be assigned projects individually or in a group of not more than 3 students depending on the efforts required for completion of project.

The project will have 4 stages:

(*Marks for internal evaluation are given in brackets)

1. Synopsis submission (10 marks),
2. 1st mid-term progress evaluation (10 marks)
3. 2nd mid-term progress evaluation (10 marks)
4. Final submission evaluation (20 marks).

The external examiner will evaluate the project on the basis of idea/quality of project, implementation of the project, project report and viva.

Quality Engineering

Course code	PEC-ME-410G				
Category	Open Elective Courses				
Course title	QUALITY ENGINEERING				
Scheme and Credits	L	T	P	Credits	Semester-8
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

UNIT I

Basic Concepts of Quality: Definitions of Quality and its importance in industry, Quality function, Quality Characteristics, Quality process, Quality Traits, Applications of Quality Concept, Introduction to quality control, Computer aided quality control, Total quality control(TQC) and its implementation, Elements of TQC, Quality Circle, Objectives of quality circle, Role of management in quality circle, Quality in service organizations, characteristics of a service organization, Important service dimensions, Design of service quality.

UNIT2

Basic Statistical Concepts: The Concept of variation, Distinction between variables and attributes data, The frequency distribution, graphical representation of frequency distribution, Quantitative description of distribution, the normal curve, concept of probability, laws of probability, probability distributions, hyper geometric distribution, binomial distribution, The Poisson distribution.

UNIT3

Quality systems: Quality systems, Need for quality System, Need for standardization, History of ISO:9000 series standards and its features, steps to registration, India and ISO:9000, Automated inspection systems technologies, Different forms of Inspection, Industrial inspection,

UNIT4

Total Quality Management: Introduction o TQM, Concepts, Characteristics of TQM, Relevance of TQM, Approaches to TQM Implementation, TQM philosophies, Taguchi Philosphy, JIT, Kaizen, Six Sigma approach, 5-S approach

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

1. Attain the basic techniques of quality improvement, fundamental knowledge of statistics and probability
2. Use control charts to analyze for improving the process quality.
3. Describe different sampling plans
4. Acquire basic knowledge of total quality management

5. Understand the modern quality management techniques

Text Books:

1. Quality planning and Analysis, Juran and Gryna, TMH, New Delhi
2. Quality Management, Kanishka Bed, Oxford University Press, New Delhi
3. Introduction to SQC, Montgomery DC, 3e, Wiley, New Delhi
4. Fundamentals of quality control and improvement, A Mitra, Mcmillan pub. Company, NY

Reference Books:

1. Fundamentals of Applied Statistics, Gupta and Kapoor, Sultan Chand and Sons, New Delhi.

Wireless Adhoc And Sensor Networks

Coursecode	OEC-ECE-430G				
Category	Open Elective Course				
Coursetitle	Wireless Adhoc and Sensor Networks				
Scheme and Credits	L	T	P	Credits	SEMESTER 8
	3	0		3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Objectives of the course

1. Learn Ad hoc network and Sensor Network fundamentals
2. Understand the different routing protocol
3. Have an in-depth knowledge on sensor network architecture and design issue.
4. Understand the transport layer and security issues possible in Ad hoc and Sensor networks
5. Have an exposure to mote programming platforms and tool.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

UNIT- I

Introduction to Ad Hoc Networks: Characteristics of MANETs, Applications of MANETs and challenges of MANETs - Routing in MANETs: Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms, Position based routing algorithms, Other routing algorithms.

UNIT- II

Data Transmission: Broadcast storm problem, Broadcasting, Multicasting and GeocastingTCPover Ad Hoc: TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT- III

Basics of Wireless, Sensors and Applications: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.

UNIT- IV

Data Retrieval in Sensor Networks: Routing layer, Transport layer, High-level application layer support; Adapting to the inherent; dynamic nature of WSNs; Sensor Networks and mobile robots. Security: Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems.

Sensor Network Platforms and Tools: Sensor Network Hardware, Berkeley motes, Sensor

Network Programming Challenges, Node-Level Software Platforms - Operating System: TinyOS– Imperative Language: nesC, Dataflow style language: TinyGALS, Node-Level Simulators, ns2 and its sensor network extension, TOSSIM.

Course Outcomes:

1. Understand the needs of Wireless Adhoc and Sensor Network in current scenario.
2. Describe current technology trends for the implementation and deployment of wireless Adhoc/sensor networks.
3. Discuss the challenges in designing MAC, routing.
4. Transport protocols for wireless Ad-hoc/sensor networks.
5. Explain the principles and characteristics of wireless sensor networks.

Suggested Books:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications, March 2006, ISBN – 981-256-681-3
2.Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman

Traffic Engineering and Road Safety

Course code	OEC-CE- 448G				
Category	Open Elective Course				
Course title	Traffic Engineering and Road Safety				
Scheme and Credits	L	T	P	Credits	SEMESTER 8
	3	**0**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

COURSE OBJECTIVES:

1. Acquaint the students to basic concepts of Traffic and their significance.
2. To stimulate the students to think systematically and objectively about various traffic problems

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

UNIT I

Traffic Characteristics: Importance of traffic characteristics. Road user characteristics. Vehicular characteristics. Max dimensions and weights of vehicles allowed in India.

Traffic Studies: Traffic volume study, speed study and origin and destination study. Speed and delay study.

UNIT II

Traffic Accidents: Accident surveys. Causes of road accidents and preventive measures.Capacity and Level of Service.

Relationship between speed, volume and density, PCU, Design service volume, Capacity of non-urban roads. IRC recommendations, Brief review of capacity of urban roads.

UNIT III

Traffic Control Devices: Signs, Signals, markings and islands. Types of signs, Types of signals, Design of Signal, Intersections at grade and grade separated intersections. Types of grades separated intersections, Parking surveys: On street parking, off street parking.

UNIT-IV

Road safety audit, RSA team, RSA Report, Elements of RSA, Vehicular air pollution and Situation in India, Motor vehicle act, Vehicular emission norms in India and abroad, Alternate fuels, Factors affecting fuel consumption.

COURSE OUTCOMES:

After completing this course, students should be able:

- To realize the significance of traffic engineering in today life.
- To understand the processes involved in traffic studies.
- To appreciate the role of Traffic regulations.

RECOMMENDED BOOKS:

- Principles of Transportation Engineering by Chakroborty& Das, Prentice Hall, India.
- Highway Engg by S.K.Khanna& C.E.G. Justo, Nem Chand Bros., Roorkee.
- Traffic Engg and Transport Planning by L.R.Kadiyali, Khanna Publishers, Delhi.
- Principles of Transportation and Highway Engineering by G.V.Rao, Tata McGraw-Hill Publishing Co. Ltd. N.Delhi.

Conventional and Renewable Energy Resources

Course code	**OEC-EE- 08G**				
Category	Open Elective Course				
Course title	**Conventional and Renewable Energy Resources**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**SEMESTER 8**
	3	**0**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all UNITs and remaining eight questions of 15 marks each to be set by taking two questions from each UNIT. The students have to attempt five questions in total, first being compulsory and selecting one from each UNIT.

Objective:

1. The course will provide understanding of power generation technology using conventional and non-conventional energy sources which will be useful for understanding the operation and working of power plants.
2. Students will learn basics of Tariff structure for energy production.
3. Students will understand the operation, maintenance and working of substations.

UNIT I

INTRODUCTION: Energy sources, their availability, recent trends in Power Generation, Amount of generation of electric power from Conventional and non-conventional sources of energy in Haryana, India and some developed countries of the world. Interconnected Generation of Power Plants.

UNIT II

POWER GENERATION PLANNING: Load forecasting, load curves, load durationcurve, Base load and Peak load Power Plants, connected Load, maximum demand,demand factor, Group diversity factor, load factor, significance of load factor, plantfactor, capacity factor, selection of UNIT size, No. of UNITs, reserves, cost of powergeneration, Depreciation, tariff.

UNIT III

CONVENTIONAL ENERGY SOURCES: Selection of site, capacity calculations,classification, Schematic diagram and working of Thermal Power Stations(TPS), HydroElectric Plant and Nuclear Power Plant .
NON-CONVENTIONAL ENERGY SOURCES: Selection of site, capacity calculations, Schematic diagram and working of Wind, Solar, fuel cell, Magneto Hydro Dynamic (MHD) system.

UNIT IV

ELECTRIC ENERGY CONSERVATION & MANAGEMENT: Energy management,
Energy Audit, Energy Efficient Motors, Co-generation.

Course Outcomes:

After learning the course the students should be able to:

1. Describe the working of thermal power station using single line diagram and state the functions of the major equipment and auxiliaries of a TPS.
2. Explain hydro energy conversion process with block diagrams and identify the appropriate site for it.
3. Explain the working of Nuclear power station.
4. Describe the working of Solar Power station and wind power plant.
5. Compare various economic aspects of different types of Tariffs.
6. Classify various substations and describe working of its equipments.
7. Compare various generating systems.

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