GURU KASHI UNIVERSITY

Post Graduate Diploma in Computer Application
Session: 2023-2024

Department of Computer Applications

GRADUATE OUTCOME OF THE PROGRAMME

This program focuses on the design and implementation of programming, database management, software development, networking, security, and web development. It also emphasizes the ability to adapt to new technologies and emerging trends in the field.

PROGRAM LEARNING OUTCOMES After completing the programme, the learner will be able to:

- Apply mathematical foundation, computing knowledge for the conceptualization of computing models from defined problems.
- Identify, critically analyze and formulate complex computing problems using fundamentals of computer science and application domains.
- Use the modern programming languages, tools, techniques, and skills necessary for designing, developing, and deploying software-based applications.
- Apply ethical principles and commit to professional ethics, responsibilities, and norms of the computer practice.
- Adopt a research culture and implement policies to address pressing local and global concerns.

Program Structure

Semester I						
Course Code	**Course Title**	**Type of course**	**L**	**T**	**P**	**Credits**
GCA102	Fundamentals of Computers & Information Technologies	Core	4	0	0	4
GCA114	Programming Using C++	Core	4	0	0	4
GCA103	Database Management Systems	Core	4	0	0	4
GCA106	Fundamentals of Computers & Information Technologies Lab	Technical Skill	0	0	2	1
GCA115	Programming using C++ Lab	Technical Skill	0	0	4	2
GCA121	Database Management Systems Lab	Technical Skill	0	0	2	1
Disciplinary Elective I (Any one of the following)						
GCA111	Internet Concepts and Web Designing	Disciplinary Elective I	3	0	0	3
GCA116	Data Warehousing and Data Mining					
GCA117	IoT and Its Applications					
Disciplinary Elective II (Any one of the following)						
GCA118	Management Information Systems (MIS)	Disciplinary Elective II	3	0	0	3
GCA119	Data Network & Security					
GCA120	Software Project Management					
Total			**18**	**0**	**8**	**22**

Semester II						
Course Code	**Course Title**	**Type of course**				
			L	**T**	**P**	**Credits**
GCA201	Data Structures	Core	4	0	0	4
GCA209	Artificial Intelligence	Core	4	0	0	4
GCA212	Python Programming	Core	4	0	0	4
GCA213	Data Structure & Algorithms Lab	Technical Skill	0	0	4	2
GCA214	Programming using Python Lab	Technical Skill	0	0	4	2
Disciplinary Elective III (Any one of the following)						
GCA202	Digital Electronics	Disciplinary Elective III	3	0	0	3
GCA210	Machine Learning					
GCA211	Parallel Processing					
Disciplinary Elective IV (Any one of the following)						
GCA215	Computer System Architecture	Disciplinary Elective IV	3	0	0	3
GCA216	Software Engineering & Testing					
GCA217	Essentials of Digital Marketing					
Value added Course (For other Department also)						
GCA218	Communication Skills	VAC	2	0	0	2
Total			**20**	**0**	**8**	**24**

Evaluation Criteria for Theory Courses

A. Continuous Assessment: [25 Marks]
   CA1- Surprise Test (Two best out of (three)-10 Marks)
   CA2- Assignment(s) (10 Marks)
   CA3-Term Paper/Quiz/Presentations (05 Marks)

B. Attendance (5 Marks)
C. Mid Semester Test: [30 Marks]
D. End-Semester Exam: [40 Marks]

Semester-I

Course Title: Fundamentals of Computers & Information Technologies.

L	T	P	Credits
4	0	0	4

Course Code: GCA102

Total Hours: 60

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Develop and utilize vocabulary of key terms related to the computer and software program.
2. Understand the concept of input and output devices.
3. Apply commands of window and menu.
4. Acquire the knowledge of MS Office.

Course Content

UNIT-I **14 hours**

Information concepts and processing: Evolution of information processing, data, information language and communication.

Elements of computer processing system: Hardware-CPU, storage devices and media. Input-output devices, data communication equipment, Software-system software, application software.

UNIT-II **16 hours**

Programming Language: classification, machine code, assembly language, higher level languages, and fourth generation languages.

Introduction to Operating System: its need and Operating System services; Operating System classification- single user, multi-user, simple batch processing, Multiprogramming, Multitasking, Parallel system, Distributed system, Real time system. Typical commands of DOS, GUI - Windows.

UNIT-III **15 hours**

Computers and Communication: Single user, multi-user, work station, client server systems, Computer networks, network protocols, LAN, MAN, WAN.

Introducing the Internet: Description of the Internet–Working, Surfing, Internet Domain Names and Addresses

UNIT-IV **15 hours**

Connecting LAN to Internet: Protocols, IP Address, and Web Server.

Internet Applications : Email , Working of email , Advantages of email, Understanding of Internet Email, Net news ,Search Engines, Introducing Usenet ,organization of Usenet articles, reading, saving ,mailing, writing

and posting of an article.

WWW- World Wide Web,Working of WWW, Hypertext and Hypermedia, URL, Searching the WWW, Web access using web browser, locating information on the Web.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Sinha P. K., & SinhaP. (2010). Computer fundamentals. BPB publications.*
- *RajaramanV.(2010)Fundamentals of Computers**.**Prentice Hall.*

Web Sources

- *https://www.tutorialspoint.com/computer_fundamentals/computer_applications.htm*
- *https://www.tutorialspoint.com/computer_fundamentals/computer_output_devices.htm*
- *https://computerhindinotes.com/fundamentals-of-computer-information-technology-pgdca-notes-in-hindi-new-2018/*
- *https://www.academia.edu/34854470/Computer_Fundamentals_and_Information_Technology_Series_1_With_Simple_Visual_Basic_2008_Jumpstart*
- *https://testbook.com/computer-awareness/computer-fundamentals*
- *https://www.javatpoint.com/computer-fundamentals-tutorial*

Course Title: Programming using C++
Course Code: GCA114

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Understand all the basic concepts of C++ and its features such as composition of objects, Operator overloading.
2. Implement the various access modifiers in C++ programs.
3. Analyze the concept of inheritance with the understanding of early binding and late binding.
4. Classify various object oriented concepts to solve different problems.

Course Content

UNIT I **17 Hours**

Programming Basics: Introduction to Programming, Programming Paradigms, Programming Languages and Types. Introduction to C - Basic Program Structure, Execution flow of C Program, Directives, Basic Input /Output Introduction to Object Oriented Programming- OOP concepts, Advantages, Applications, Comparison of C and C++-Data Types, Control Structures, Operators and Expressions.

Introduction to C++: Structure of a C++ program, Execution flow, Classes and Objects, Access modifiers, Data Members, Member Functions, Inline Functions, Passing parameters to a Function (pass by Value, Pass by Address, Pass by Reference), Function with default arguments, Function Overloading, Object as a Parameter, Returning Object Static data members and functions, Constant Data members and functions

Constructors- Default, Parameterized, Copy, Constructor Overloading, Destructors Arrays, Array as a Class Member, Array of Objects, Strings C style strings and String Class.

UNIT II **14 Hours**

Operator Overloading and Pointers: Operator Functions-Member and Non Member Functions, Friend Functions Overloading Unary operators Overloading binary operators(Arithmetic, Relational, Arithmetic Assignment, equality), Overloading Subscript operator Type Conversion Operators- primitive to Object, Object to primitive, Object to Object Disadvantages of operator Overloading, Explicit and Mutable Pointers, Pointer and Address of Operator, Pointer to an Array and Array of Pointers, Pointer arithmetic, Pointer to a Constant and Constant Pointer, Pointer Initialization, Types of Pointers(void, null and dangling), Dynamic Memory Allocation, Advantages and Applications of pointers .

UNIT III **13 Hours**

Inheritance and Polymorphism: Inheritance Concept, protected modifier, Derivation of Inheritance- Public, Private and Protected,

Types of Inheritance-Simple, Multilevel, Hierarchical, Multiple, Hybrid, Constructors and Inheritance, Function Overriding and Member hiding Multiple Inheritance, Multipath inheritance – Ambiguities and solutions Polymorphism, Static and Dynamic Binding, Virtual Functions, Pure Virtual Functions, Virtual destructors, Abstract Classes, Interfaces.

UNIT IV **16 Hours**

Streams and Exceptions: Files, Text and Binary Files, Stream Classes, File IO using Stream classes, File pointers, Error Streams, Random File Access, Manipulators, Overloading Insertion and extraction operators Error handling, Exceptions, Throwing and catching exceptions, Custom Exceptions, Built in exceptions

Advanced C++: Casting- Static casts, Const Casts, Dynamic Casts, and Reinterpret Casts. Creating Libraries and header files. Namespaces Generic Programming, Templates, Class Templates, Function Templates, Template arguments.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Kamthane, A. (2012). Programming in C++, 2/e. Pearson Education India.*
- *Salaria, R. S. (2016). Mastering Object-Oriented Programming with C++. KHANNA PUBLISHING HOUSE.*
- *Balagurusamy, E. (2001). Object-Oriented Programming with C++, 7e. McGraw-Hill Education.*

Web Sources

- *https://www.tutorialspoint.com/basic-concepts-of-object-oriented-programming-using-cplusplus*
- *https://www.geeksforgeeks.org/operator-overloading-cpp/*
- *https://www.simplilearn.com/tutorials/cpp-tutorial/types-of-inheritance-in-cpp*

Course Title: Database Management Systems
Course Code: GCA103

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Develops an Entity-Relationship model based on user requirements.
2. Implements the role of the database administrator and his responsibilities.
3. Apply Normalization techniques on database software.
4. Declares and enforces integrity constraints on database

Course Content

UNIT I **14 hours**

Traditional file processing system: Characteristics, limitations, Database: Definition, composition.

Database Management System: Definition, Characteristics, advantages over traditional file processing system, User of database, DBA and its responsibilities, Database schema, instance.

UNIT II **16 hours**

DBMS architecture, data independence, mapping between different levels.

Database languages: DDL, DML, DCL.

Database utilities, Data Models, Keys: Super, candidate, primary, foreign.

UNIT III **15 hours**

Entity relationship model: concepts, mapping cardinalities, entity relationship diagram, weak entity sets, strong entity set, aggregation, generalization, Overview of Network and Hierarchical model.

Relational Data Model: concepts, constraints. Relational algebra: Basic operations, additional operations.

UNIT IV **15 hours**

Database Design: Functional dependency, decomposition, problems arising out of bad database design, Normalization- Normal forms based on primary keys (1 NF, 2 NF, 3 NF, & BCNF), multi-valued dependency, Database design process, database protection, database integrity.

Database concurrency: Definition and problems arising out of concurrency.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Ramakrishnan, R., Gehrke, J., &Gehrke, J. (2003). Database management systems (Vol. 3). New York: McGraw-Hill.KorthF. Henry. Database System Concepts, McGraw Hill.*
- *Dittrich, K. R., Gatziu, S., & Geppert, A. (1995, September). The active*

database management system manifesto: A rulebase of ADBMS features. In International Workshop on Rules in Database Systems (pp. 1-17). Springer, Berlin, Heidelberg.

Web Sources

- *https://www.tutorialspoint.com/dbms/dbms_architecture.htm*
- *https://www.geeksforgeeks.org/introduction-of-er-model/*
- *https://www.javatpoint.com/dbms-tutorial*
- *https://www.w3schools.in/dbms*
- *https://www.youtube.com/watch?v=T7AxM7Vqvaw*
- *https://www.youtube.com/watch?v=c5HAwKX-suM*
- *https://www.youtube.com/watch?v=DxoRUmW44JE*

Course Title: Fundamentals of Computers & Information Technologies Lab
Course Code: GCA106

L	T	P	Credits
0	0	2	1

Total Hours: 30

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Understand the concept Compose, format and edit a word document.
2. Apply all features of email.
3. Discover , Navigate and search through the internet.
4. Apply the MS PowerPoint tool to make presentation.

Course Content

1. [MS-WORD] Creating, opening, closing, saving and editing a word Document.
2. [MS-WORD] Insert header and footer in the document.
3. [MS-WORD] Create a link between two files using Hyperlink.
4. [MS-WORD] Create a mail-merge and add data of 5 recipients.
5. [MS-WORD] Protect a document.
6. [MS-WORD] Implement macro.
7. [MS-POWERPOINT] Create duplicate slides in PowerPoint. Give an example.
8. [MS-POWERPOINT] Make a master slide.
9. [MS-POWERPOINT] Design a chart of population.
10. [MS-POWERPOINT] Insert Animation.
11. [MS-POWERPOINT] Insert a background in PowerPoint.
12. [MS-EXCEL] How you can filter your data.
13. [MS-EXCEL] Sort data in ascending and descending order.
14. [MS-EXCEL] To show the use of goal seek
15. [MS-EXCEL] To show the use of scenarios.
16. [MS-EXCEL] Perform any 5 Date and Time functions.
17. [MS-EXCEL] Perform any 5 Math & Trig functions.

Course Title: Programming using C++ Lab
Course Code: GCA115

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Design an algorithmic solution for a given problem.
2. Apply algorithm concept in C programme.
3. Identify solutions to a problem and apply control structures and use defined functions for solving the problem.
4. Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.

Course Content

1. Write a Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array.
2. Write a Program to swap two Characters of different data types using function overloading.
3. Write a program to demonstrate the use of inline, friend functions and this keyword.
4. Write a program to implement static data members and member functions.
5. Write a Program to implement Constructor and Destructor.
6. Write a Program to demonstrate Constructor Overloading.
7. Write a Program to calculate factorial using Copy Constructor.
8. Write a Program to allocate & deallocate memory using new [ ] and delete [ ].
9. Write a Program to demonstrate the use of function overloading.
10. Write a Program to overload comparison operator operator== and operator!= .
11. Write a Program to create an array of pointers.
12. Create a base class containing the data member roll number and name. Also create a member function to read and display the data using the concept of single level inheritance. Create a derived class that contains marks of two subjects and total marks as the data members.
13. Write a Program to create multilevel inheritance. (Hint: Classes A1, A2, A3)
14. Write a program to demonstrate the concept of function overriding.
15. Write a Program to demonstrate the use of virtual functions and polymorphism.
16. Write a Program to demonstrate the use of pure virtual functions.
17. Write a Program to demonstrate the concepts of abstract class.
18. Write a Program to perform exception handling.

19. Write a Program to copy the contents of one file to another file.
20. Write a Program to create Generic Functions using Template.

Course Title: Database Management Systems Lab
Course Code: GCA106

L	T	P	Credits
0	0	2	1

Total Hours: 30

Learning Outcomes

After completion of this course, the learner will be able to:

1. Apply queries on database using SQL DML/DDL commands.
2. Apply SQL queries to create database tables and make structural modifications.
3. Understand the concept of inbuilt functions.
4. Implement the concept of join, views and indexes.

Course Content

1. Data Definition, Table Creation, Constraints,
2. Insert, Select Commands, Update and Delete Commands.
3. Nested Queries and Join Queries
4. Views
5. High level programming language extensions (Control structures, Procedures and Functions).
6. Front end Tools
7. Forms
8. Triggers
9. Menu Design
10. Reports
11. Database Design and implementation (Mini Project).

Course Title: Internet Concepts and Web Designing
Course Code: GCA111

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Recognize the basic HTML Tags, List, Types of lists, Adding graphics to HTML documents.
2. Apply knowledge to create tables, linking documents and frames.
3. Develop a web site with the help of HTML tags and CSS.
4. Understand the concept of fundamentals of PHP for designing a dynamic website.

Course Content

UNIT I **10 hours**

Introduction The World Wide Web (WWW) , History, Hypertext and Hypertext Markup Language, Microsoft Front Page, HTML Documents, various Tags.

Elements of an HTML Document: Text Elements, Tag Elements, Special Character elements Structural elements of HTML documents: Header tags, Body tags, Paragraphs, Titles, Numbered list, Non-Numbered lists, and Definition lists.

Formatting HTML Documents: Logical styles (source code, text enhancements, variables), Physical Styles (Bold, Italic, underlined, crossed).

UNIT II **10 hours**

Managing images in Html: Image format (quality, size, type), Importing images (scanners), Tags used to insert images, Frames.

Tables in HTML documents Hypertext and Link in HTML Documents, URL/FTP/HTTP

Types of links: Internal Links, External Links, Link Tags, Links with images and buttons, Links that send email messages

UNIT III **12 hours**

Special effects in HTML documents: Text fonts, Sensitive Images, Tip tables, Page background (Variable, Fixed), Rotating messages (Marquee)

Managing forms: Interactive forms, creating data entry forms

Cascading Style Sheets: ways of inserting a style sheet: External style sheet, Internal style sheet, Inline style.

CSS Id and Class, Inheritance in CSS

UNIT IV **13 hours**

Scripting and websites: Java scripting

PHP: This course is an introduction to the PHP programming language. Topics include installation and configuration with the Apache http server,

variables and data types, language syntax, control structures, functions, strategies and tools for handling input and generating output, error handling, sending email, manipulating dates and times, string manipulation and regular expressions, SQL and MySQL database access, object oriented programming (OOP),.Though primarily focused on PHP 5.0. We will emphasize security and sound coding practices throughout.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Duckett, J. (2014). Web design with HTML, CSS, JavaScript and jQuery set (Vol. 1). IN: Wiley.*
- *Raggett, D., Lam, J., Alexander, I., & Kmiec, M. (1998). Raggett on HTML 4. Addison-Wesley Longman Publishing Co., Inc*

Web Sources

- *https://www.tutorialspoint.com/internet_technologies/website_designing.htm*
- *https://tutorial.techaltum.com/webdesigning.html*
- *https://www.w3schools.com/css/css_intro.asp*
- *https://www.w3schools.com/js/js_operators.asp*
  https://www.codecademy.com/catalog/subject/web-design
- *https://www.entheosweb.com/website_design/responsive_web_design.asp*

Course Title: Data warehousing and Data Mining
Course Code: GCA116

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Understand the functionality of various Data mining techniques.
2. Learn about the Association rules of Data Mining.
3. Identify the Classifications & Prediction Data Mining Techniques
4. Compare the classification Techniques of Data Mining.

Course Content

UNIT I **10 hours**

Data Warehousing: Definition, Characteristics of a Data Warehouse, Data warehouse Usage, DBMS vs. Data warehouse.

Developing Data Warehouse: Data warehousing components, Steps and Crucial decisions for the design and construction of Data Warehouses, Three-tier Data warehouse architecture, Data Warehouse Implementation, Design, performance and technological considerations, Metadata.

UNIT II **10 hours**

Developing Data Mart based Data warehouse: Types of data marts, Metadata for a data mart, Data model for a data mart, Maintenance of a data mart, Software components for a data mart, Performance issues, Security in data mart.

OLAP Systems: Types of OLAP, Relational vs. Multidimensional OLAP, Data modeling: Star schema, Snowflake schema, OLAP tools.

UNIT III **12 hours**

Data Mining: Introduction to data mining, Data mining process, Major issues and Application of Data mining, Data preprocessing: Data cleaning, Data integration and transformation and Data reduction; Tools for data mining.

Data Mining Techniques: Association rules: Introduction, Market basket analysis, Frequent Pattern Mining algorithms: Apriori algorithm, Partition algorithm.

UNIT IV **13 hours**

Classification and Prediction: Definition, Issues regarding Classification and Prediction, Classification by Decision Tree Induction, Support Vector Machines, k-Nearest-Neighbour, Prediction: Linear and Non-Linear Regression.

Clustering: Definition, Types of data in cluster analysis, Clustering paradigms: K-Means and K-Medoids, Mining Sequence patterns: Generalized Sequential Patterns(GSP) mining algorithm, Hidden Markov Model, Social Network Analysis.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Inmon, W. H., 2002: Building the Data Warehouse, John Wiley.*
- *Prabhu, C.S.R., 2010 : Data Warehousing, PHI.*
- *Jiawei Han, Micheline Kamber, 2000: Data Mining: Concepts and Techniques, Morgan Koffman Elsvier.*
- *Pujari, Arun K, 2013 : Data Mining Techniques, Universities Press*

Web Sources

- *https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing*
- *https://www.ibm.com/topics/data-warehouse*
- *https://www.geeksforgeeks.org/difference-between-data-warehousing-and-data-mining/*
- *https://www.investopedia.com/terms/d/data-warehousing.asp*

Course Title: IOT & Its Applications
Course Code: GCA117

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Understand the application areas of IOT
2. Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
3. Understand building blocks of Internet of Things and characteristics
4. Acquire the basics knowledge of IoT Data Analytics and supporting services.

Course Content

UNIT I **10 hours**

FUNDAMENTALS OF IoT- Evolution of Internet of Things, Enabling Technologies, M2M Communication, IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II **10 hours**

IoT PROTOCOLS- IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks,6LoWPAN, Application Transport Methods: SCADA, Application Layer Protocols: CoAP and MQTT

UNIT III **12 hours**

DESIGN AND DEVELOPMENT- Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details

UNIT IV **13 hours**

Data Analytics: Introduction, Structured Versus Unstructured Data, Data in Motion versus Data at Rest, IoT Data Analytics Challenges, Data Acquiring, Organizing in IoT/M2M

Supporting Services: Computing Using a Cloud Platform for IoT/M2M Applications/Services, Everything as a service and Cloud Service Models.

CASE STUDIES/INDUSTRIAL APPLICATIONS: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipment, Industry 4.0 concepts.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry,Cisco(2017) ,IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Press.*
- *Arshdeep Bahga, Vijay Madisetti (2015) ,Internet of Things – A hands-on approach, Universities Press.*
- *Rajkamal, Internet of Things: Architecture, Design Principles and Applications, McGraw Hill Higher Education.*

Web Sources

- *https://www.javatpoint.com/iot-internet-of-things*
- *https://www.simplilearn.com/tutorials/data-analytics-tutorial/what-is-data-analytics*
- *https://www.tutorialspoint.com/iot-network-protocols*

Course Title: Management Information Systems
Course Code: GCA118

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Relate the basic concepts and technologies used in the field of management information systems;
2. Compare the processes of developing and implementing information systems.
3. Outline the role of the ethical, social, and security issues of information systems.
4. Understand to know various information systems like ERP work together to accomplish the information objectives of an organization.

Course Content

UNIT I **10 hours**

MIS Definition - Characteristics - Evolution of MIS: Concepts; framework for understanding and designing MIS in an organization; MIS and other related disciplines: MIS and Management Accounting, MIS and Computer Science, MIS and OR, MIS and Organizational Behavior, MIS and Management. Concept of information : definition, features, types, process of generation and communication; quality of information; information overload; techniques for managing overload; summarizing; filtering; inferences and message routing. System concepts : definition, types and characteristics of system-control in systems: feedback: positive and negative; negative feedback control system, input, process and output control; law of requisite variety.

UNIT II **12 hours**

Structure of MIS: Basic structural concepts: formal and informal information systems; public and private information systems; multiple approaches to the structure of MIS: Operational elements (physical components, process, outputs for users), activity subsystems, functional subsystems and decision support – synthesis of multiple approaches into a conceptual structure for MIS.

UNIT III **10 hours**

Information systems: Transaction Processing Systems, Office Automation Systems, Information Reporting Systems, Decision Support Systems, Executive Support Systems, Expert systems.

UNIT IV **13 hours**

Systems Development and Implementation: System development methodologies; SDLC approach; prototyping approach and user development approach - Systems Analysis; Systems Design; Concepts of database and database design; system implementation; management of

information system projects; system documentation – information system audit. Security of information resources; threats to information resources; security systems for risk management. Enterprise Resource Planning Systems –Features-ERP Modules - implementation of ERP.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *O'Brien, James A: Management Information Systems, Tata McGraw Hill, New Delhi.*
- *George M. Scott: Management Information Systems, McGraw Hill Book Company, New Delhi.*
- *Schultheis, Robert and Summer, Mary: Management Information Systems, Tata McGraw Hill, New Delhi.*
- *Gordon B Davis, et. El: Management Information Systems, Prentice Hall of India, New Delhi.*

Web Sources

- *https://www.techtarget.com/searchitoperations/definition/MIS-management-information-systems*
- *https://www.tutorialspoint.com/management_information_system/management_information_system.htm*
- *https://www.javatpoint.com/mis-management-information-systems*

Course Title: Data Network & Security
Course Code: GCA119

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Understand the fundamental concepts of data networks
2. Explain the different types network security threats and vulnerabilities
3. Evaluate network security measures and technologies
4. Use network security tools proxy server and firewall

Course Content

UNIT I **12 hours**

Introduction to Computer networks and applications: Network Structure and Architecture, Network Hardware and Software (protocol hierarchies, design issues for layers, interfaces and services: connection oriented and connection less), Network structure and architecture-point to point, multicast, broadcast, Classification of networks on the basis of Geographical Span (PAN, LAN, MAN and WAN) , LAN topologies (Bus, Ring, Star, Mesh, Tree and Hybrid). Network Connecting Devices: Repeaters, Hubs, Bridges, Routers, Gateways and Switches, Network Reference models: OSI model, TCP / IP model. Comparison between OSI and TCP/IP.

UNIT II **10 hours**

Introduction: Attacks, Services and Mechanisms, Security Attacks, Security Services, Integrity check, digital Signature, authentication, has algorithms. Secret Key Cryptography: Block Encryption, DES rounds, S-Boxes IDEA: Overview, comparison with DES, Key expansion, IDEA rounds, Uses of Secret key Cryptography; ECB, CBC, OFB, CFB, Multiple encryptions DES.

UNIT III **13 hours**

Hash Functions and Message Digests: Length of hash, uses, algorithms (MD2, MD4, MD5, SHS) MD2: Algorithm (Padding, checksum, passes.) MD4 and 5: algorithm (padding, stages, digest computation.) SHS: Overview, padding, stages.

Public key Cryptography: Algorithms, examples, Modular arithmetic (addition, multiplication, inverse, and exponentiation) RSA: generating keys, encryption and decryption. Other Algorithms: PKCS, Diffie-Hellman, El-Gamal signatures, DSS, Zero-knowledge signatures.

UNIT IV **10 hours**

Authentication: Password Based, Address Based, Cryptographic Authentication. Passwords in distributed systems, on-line vs offline guessing, storing. Cryptographic Authentication: passwords as keys, protocols, KDC's Certification Revocation, Inter domain, groups, delegation. Authentication of People: Verification techniques, passwords, length of passwords, password distribution, smart cards, biometrics.

Security Policies and Security Handshake Pitfalls: What is security policy, high and low level policy, user issues? Protocol problems, assumptions, Shared secret protocols, public key protocols, mutual authentication, reflection attacks, use of timestamps, nonce and sequence numbers, session keys, one-and two-way public key based authentication.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Tanenbaum, A. S. (2002). Computer networks. Pearson Education India.*
- *Peterson, L. L., & Davie, B. S. (2007). Computer networks: a systems approach. Elsevier.*
- *Kiesler, S. (1986). The hidden messages in computer networks (pp. 46-47). Harvard Business Review Case Services.*
- *Atul Kahate .Cryptography and Network Security ,TMH.*
- *Behourz A Forouzan,Data Communications and Networking*

Web Sources

- *https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/*
- *https://www.studytonight.com/computer-networks/reference-models-in-computer-networks*
- *https://www.bing.com/ck/a?!&&p=2b949258678ed6ceJmltdHM9MTY4MzUwNDAwMCZpZ3VpZD0yYzYwNzgyMS05YmI2LTY0ZDItMDJmNi02OGJmOWEyZDY1NjkmaW5zaWQ9NTIxMQ&ptn=3&hsh=3&fclid=2c607821-9bb6-64d2-02f6-68bf9a2d6569&psq=cOMPUTER+nETWORKS&u=a1aHR0cHM6Ly93d3cuamF2YXRwb2ludC5jb20vY29tcHV0ZXItbmV0d29yay10dXRvcmlhbA&ntb=1*

Course Title: Software Project Management
Course Code: GCA120

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

On completion of this course, the students will able to

1. Identify the different project contexts and suggest an appropriate project management strategy.
2. Examine the role of project planning, risks associated in successful software development.
3. Identify and describe the key phases of project monitoring and contracts in management.
4. Understand the concept of project management and planning on organizing a team and people's behavior.

Course Content

UNIT I **10 Hours**

Introduction to Software Project Management: Project Definition, Contract Management, Activities Covered by Software Project Management, Overview Of Project Planning, plan methods, methodology.

Project Evaluation: Strategic Assessment, Technical Assessment, Cost Benefit Analysis, Cash Flow Forecasting, Cost Benefit Evaluation Techniques, Risk Evaluation, selection of project approach: discussion on models, choice of process models.

UNIT II **12 Hours**

Activity Planning : Objectives, Project Schedule, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass, Backward Pass, Activity Float, Shortening Project Duration, Activity on Arrow Networks,

Risk Management: Nature Of Risk, Types Of Risk, Managing Risk, Hazard Identification, Hazard Analysis, Risk Planning And Control.

UNIT III **11 Hours**

Monitoring and Control: Creating Framework, Collecting the Data, Visualizing Progress, Cost Monitoring, Earned Value analysis, Prioritizing Monitoring, Getting Project Back to Target, and Change Control.

Managing Contracts: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance.

Resource allocation: introduction and nature of resources, identification of resource requirements, scheduling, creating critical path, cost schedule, counting cost.

UNIT IV **12 Hours**

Effort estimation: basics of software estimation, techniques, COCOMO-II, cost, staffing pattern.

Managing People and Organizing Teams: Introduction, Understanding Behavior, Organizational Behavior: Background, Selecting The Right Person For The Job, Instruction In The Best Methods, Motivation , The Oldman, Hackman Job Characteristics Model, Working In Groups, Becoming A Team, Decision Making, Leadership, Organizational Structures, Stress, Health And Safety

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- *Bob Hughes, Mike Cotterell, Software Project Management, Tata McGraw Hill Publishing*
- *Ramesh, Gopalaswamy, Managing Global Projects, Tata McGraw Hill Publishing*
- *Royce, Software Project Management, Pearson Education Publishing*
- *Jalote, Software Project Management in Practice, Pearson Education Publishing*

Web Sources

- *https://www.javatpoint.com/software-project-management*
- *https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/*
- *https://www.wrike.com/project-management-guide/faq/what-is-software-project-management/*
- *https://www.tutorialspoint.com/software_engineering/software_project_management.htm*

Semester-II

Course Title: Data Structures
Course Code: GCA201

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Analyze algorithms and algorithm complexity.
2. Learn & implement searching and sorting techniques.
3. Attain knowledge of tree and graph concepts.
4. Apply the different linear data structures like stack and queue to various computing problems.

Course Content

UNIT I **15 hours**

Basic concept and notations: data structures and data structures operations, mathematical notation and functions, algorithmic complexity, Big 'O' notations and time space trade off.

Arrays: Linear array, representation of linear array in memory, Traversing linear array, insertion and deletion in an array, multi-dimensional array: row-major, column major order, sparse array.

UNIT II **16 hours**

Stacks: Push and Pop in stack. Representation of stack in memory (linked and sequential) applications of Stack: conversion from infix notation to postfix notations, evolution of postfix notation, matching of Parentheses, recursion, Tower of Hanoi.

UNIT III **14 hours**

Queue: Queues and Deques, Priority Queues, Operations on queues.

Linked list: Representation of linked list using static and dynamic data structures, Comparison of Linear and non-linear data structures, Insertion and deletion of a node from a linear linked list, Introduction to doubly and circular linked lists, Application of linked lists.

UNIT IV **15 hours**

Searching and Sorting: Linear and binary search, Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Radix Sort and Quicksort comparison of various searching and sorting algorithms.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Samet, H. (1990). The design and analysis of spatial data structures (Vol. 85, p. 87). Reading, MA: Addison-wesley.*
- *Wirth, N. (1985). Algorithms & data structures. Prentice-Hall, Inc..*
- *Samet, H. (1990). Applications of spatial data structures: computer graphics, image processing, and GIS. Addison-Wesley Longman Publishing Co., Inc.*

Web Sources

- *https://www.javatpoint.com/data-structure-introduction*
- *https://www.javatpoint.com/ds-linked-list*
- *https://www.geeksforgeeks.org/array-data-structure/*
- *https://www.programiz.com/dsa/bubble-sort*
- *https://www.geeksforgeeks.org/binary-search-tree-data-structure/*
- *https://www.programiz.com/dsa/bubble-sort*

Course Title: Artificial Intelligence
Course Code: GCA209

L	T	P	Credits
4	0	0	4

Learning Outcomes: **Total Hours: 60**

After completion of this course, the learner will be able to:

1. Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
2. Understand the basic principles of Artificial Intelligence in various applications.
3. Analysis data searching problem using different search technique.
4. Understand the concept knowledge representation, mapping and approaches to knowledge representation.

Course Content

UNIT I **15 hours**

AI History and Applications: Defining AI: Acting Humanly (Turing Test Approach), Thinking Humanly (Cognitive Modelling Approach), Thinking Rationally (laws of thought approach), Acting Rationally (Rational Agent Approach); Foundations of Artificial Intelligence; History of AI, AI techniques, Expert Systems.

UNIT II **14 hours**

Problem Solving by Search: Defining the problem as a State Space Search Strategies: Breadth first Search, Depth- first search, Depth limited search, Iterative Deepening depth first search. Heuristic Search Techniques: Hill Climbing, Simulated Annealing, Best First Search: OR Graphs, Heuristic Functions, A* Algorithm, AND –OR graphs, AO* Algorithms.

UNIT III **16 hours**

Knowledge Representation: Representations and mappings, Approaches to knowledge Representation, Procedural versus Declarative knowledge; Predictive Logic: Representing Simple facts, Instance and Isa relationships in Logic, Proposition versus Predicate Logic, Computable Functions and Predicates- not, Rules of Inferences and Resolution-not, Forward versus Backward Reasoning, Logic Programming and Horn Clauses. Weak slot and Filler Structure: Semantic Nets Frames. Strong slot Filler Structures: Conceptual Dependency, scripts.

UNIT IV **15 hours**

AI Programming Languages (PROLOG): Introduction, How Prolog works, Backtracking, CUT and FAIL operators, Built –in Goals, Lists, Search in Prolog. Foundations for Connectionist Networks, Biological Inspiration; Different Architectures and output functions: Feed forward, Feedback, Recurrent Networks, step, Sigmoid and different functions.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Dean, T., Allen, J., & Aloimonos, Y. (1995). Artificial intelligence: theory and practice. Benjamin-Cummings Publishing Co., Inc..*
- *Winston, P. H. (1992). Artificial intelligence. Addison-Wesley Longman Publishing Co., Inc..*

Web Sources

- *https://www.tutorialspoint.com/artificial_intelligence/index.htm*
- *https://www.javatpoint.com/artificial-intelligence-ai*
- *https://intellipaat.com/blog/tutorial/artificial-intelligence-tutorial/*
- *https://www.w3schools.com/ai/default.asp*
- *https://www.guru99.com/ai-tutorial.html*
- *https://youtu.be/BaFz5q9Ffkg*
- *https://youtu.be/JMUxmLyrhSk*
- *https://www.mygreatlearning.com/blog/artificial-intelligence-tutorial/*

Course Title: Python Programming
Course Code: GCA212

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Understand computer architecture and data representations (variables, representation of numbers and character strings).
2. Apply conditional and looping Structure in function.
3. Learn basic algorithmic problem-solving techniques (decision structures, loops, functions).
4. Identify and remove the various types errors in a program.

Course Content

UNIT I **15 hours**

Introduction to Python Getting Started: Introduction to Python- an interpreted high-level language, interactive mode and script mode.

Variables, Expressions and Statements: Values, Variables and keywords; Operators and Operands in Python: (Arithmetic, relational and logical operators), operator precedence, Expressions and Statements (Assignment statement); Taking input (using raw_input() and input()) and displaying output(print statement);Putting Comments

Conditional constructs and looping: if else statement While, For (range function), break, continue, else, pass, Nested loops, use of compound expression in conditional constructs and looping

UNIT II **15 hours**

Functions: Importing Modules (entire module or selected objects), invoking built in functions, functions from math module, using random() and randint() functions of random module to generate random numbers, composition.

Defining functions, invoking functions, passing parameters, scope of variables, void functions and functions returning values, flow of execution

UNIT III **16 hours**

Strings: Creating, initializing and accessing the elements; String operators: +, *, in, not in, range slice [n:m]; Comparing strings using relational operators; String functions & methods: len, capitalize, find, isalnum, isalpha, isdigit, lower, islower, isupper, upper, lstrip, rstrip, isspace, istitile, partition, replace, join, split, count, decode, encode, swapcase, Pattern Matching

Lists: Concept of mutable lists, creating, initializing and accessing the elements, traversing, appending, updating and deleting elements; List

operations (joining, list slices); List functions & methods: len, insert, append, extend, sort, remove, reverse, pop

UNIT IV **14 hours**

Dictionaries: Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, traversing, appending, updating and deleting elements. Dictionary functions & Methods: cmp, len, clear(), get(), has_key(), items(), keys(), update(), values()

Tuples: Immutable concept, creating, initializing and accessing the elements in a tuple; Tuple functions: cmp(), len(), max(), min(), tuple()

Input and Output: Output Formatting, Reading and Writing Files

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Predefined Clean-up Actions

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- Dawson Michael.*Programming with python*, A users Book Cengage Learning
- Beazley Davi. *Python Essential Reference*, Third Edition

Web Sources

- https://www.w3schools.com/python/python_syntax.asp
- https://www.pythontutorial.net/python-basics/
- https://www.geeksforgeeks.org/python-programming-language/
- https://www.programiz.com/python-programming
- https://www.tutorialspoint.com/python/index.htm
- https://www.javatpoint.com/python-functions
- https://www.guru99.com/python-tutorials.html
- https://www.learnpython.org/

Course Title: Data Structure & Algorithms Lab
Course Code: GCA213

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Understand different types of data structures and its applications.
2. Solve the algorithmic problems like insertion and deletion of data.
3. Interpret the programming code to implement the Link List Structure.
4. Analyze Singly, Doubly, Circular Singly linked lists and its operations.

Course Content

1. Program to input 1-D Array
2. Program to perform insertion in Arrays
3. Program to perform deletion in Arrays
4. Program to input 2-D arrays (Matrices)
5. Program to find transpose of a matrix. Multiply 2 matrices.
6. Program to implement sparse matrices.
7. Program to perform linear search
8. Program to perform Binary search
9. Program to reverse array without using another variables.
10. Program to perform Bubble sort.
11. Program to perform sorting using Selection Sort.
12. Program to perform sorting using Insertion Sort.
13. Program to input and traverse N-nodes in a one way linked list.
14. Program to reverse a one way linked list.
15. Program to perform insertion/deletion in linked lists.
16. Program to input and traverse doubly linked list.
17. Program to implement stack operations.
18. Program to implement Queues.
19. Program to find factorial using recursion.
20. Program to print Fibonacci series using recursion.
21. Program to input a BST.
22. Program to perform insertion in a BST.
23. Program to perform deletion in a BST.
24. Program to implement min-heaps.
25. Program to implement max-heaps.
26. Program to implement AVL trees.
27. Program to perform rotations in AVL trees.
28. Program to perform rotations in AVL trees.
29. Program to input a graph.
30. Program to print adjacency list of a graph.
31. Program to perform traversal in graphs using DFS.
32. Program to perform traversal in graphs using BFS.
33. Program to implement shortest path methods.
34. Programs to perform Dynamic memory allocation.

35. Programs to perform sorting on data stored in a file.
36. Programs to delete duplicates in arrays and linked lists.

Course Title: Programming using Python Lab
Course Code: GCA214

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Develop solutions for a range of problems using a functional/object oriented approach.
2. Implement the basic conditional and looping constructs.
3. Write the code to implement Data Structure Lists.
4. Develop solutions to real time problems using data structure.

Course Content

1. Write a Program to Install Python.
2. Write a Program to print Hello Your Name in Python.
3. Write a Program to Add numbers and Concatenate strings
4. Write a Program to take Input from user
5. Write a Program to making a sum of first 10 natural number through Loops in python
6. Write a Program to making a Student Result through nested IF-Else Conditional Statements
7. Write a Program to make Calculator through Functions
8. Write a Program to show working of Math library
9. Write a Program to implement the String Operations
10. Write a Program to Illustrate the Exceptional Handling
11. Write a Program to Random Numbers/String Generation in Python
12. Write a Program to show working of List
13. Write a Program to show working of Dictionary
14. Write a Program to show working of Tuple
15. Write a Program to show working of file Handling
16. Write a Program to delete the file from the system through File Handling

Course Title: Digital Electronics
Course Code: GCA202

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Apply the conversions of various number systems.
2. Learn the basics of Logic Gates.
3. Analyze and Design various combinational and sequential circuits.
4. Understand the basic digital circuits and to verify their operations.

Course Content

UNIT I **12 hours**

Information Representation: Number systems, Integer and floating point representation, character codes (ASCII, EBCDIC).

Digital IC's: Logic gates, flip-flops, clocks and timers, shift registers, counters.

UNIT II **12 hours**

Boolean Algebra & Circuit Design: Basic laws of Boolean algebra, circuit design using standard (NAND) gates, Adder, coder / De-multiplexer, encoder / multiplexer design.

UNIT III **11 hours**

MOS & LSI Digital Systems: Semiconductor memory, static and dynamic devices, read only & random access memory chips, PROMS and EPROMS. Address selection logic. Read and write control timing diagrams for memory ICs.

UNIT IV **10 hours**

Logical Families: TTL, STTL, CMOS logic families.

Digital Peripherals: Keyboard, multiplexed seven segment display, CRT display schemes, Printers, Control interfaces (parallel and serial) for the peripheral units.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Maini, A. K. (2007). Digital electronics: principles, devices and applications. John Wiley & Sons.*
- *Cook, N. P. (2001). Digital electronics with PLD integration.*
- *Rosenberg, P. (2005). Audel Basic Electronics (Vol. 29). John Wiley & Sons*

Web Sources

- *https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/*
- *https://www.tutorialspoint.com/digital_circuits/index.htm*
- *https://youtu.be/DBTna2ydmC0*
- *https://youtu.be/XrSgsJ-28Do*
- *https://codescracker.com/digital-electronics/*
- *https://www.tutorialandexample.com/digital-electronics-tutorial*

Course Title: Machine Learning
Course Code: GCA210

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Recognize the basic concepts of Bayesian Decision Theory.
2. Apply structured thinking to unstructured problems.
3. Understand the concept of Class conditional probability distributions.
4. Learn both technique Multi-Layer Perceptions and Back Propagation learning.

Course Content

UNIT I **10 hours**

Overview and Introduction to Bayes Decision Theory: Machine intelligence and applications, pattern recognition concepts classification, regression, feature selection, supervised learning class conditional probability distributions, Examples of classifiers bayes optimal classifier and error, learning classification approaches.

UNIT II **12 hours**

Linear machines: General and linear discriminates, decision regions, single layer neural network, linear reparability, general gradient descent, perception learning algorithm, mean square criterion and widrow-Hoff learning algorithm; multi-Layer perceptions: two-layers universal approximates, back propagation learning, on-line, off-line error surface, important parameters.

UNIT III **11 hours**

Learning decision trees: Inference model, general domains, symbolic decision trees, consistency, learning trees from training examples entropy, mutual information, ID3 algorithm criterion, C4.5 algorithm continuous test nodes, confidence, pruning, learning with incomplete data

Instance-based Learning: Nearest neighbor classification, k-nearest neighbor, nearest neighbor error probability

UNIT IV **12 hours**

Machine learning concepts and limitations: Learning theory, formal model of the learnable, sample complexity, learning in zero-bayes and realizable case, VC-dimension, fundamental algorithm independent concepts, hypothesis class, target class, inductive bias, occam's razor, empirical risk, limitations of inference machines, approximation and estimation errors, Trade off.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Zhang, C., & Ma, Y. (Eds.). (2012). Ensemble machine learning: methods and applications. Springer Science & Business Media.*
- *Marsland, S. (2011). Machine learning: an algorithmic perspective. Chapman and Hall/CRC..*
- *C. M. Bishop.Pattern Recognition and Machine Learning, Springer, (2006).*

Web Sources

- *https://www.geeksforgeeks.org/machine-learning/*
- *https://www.javatpoint.com/machine-learning*
- *https://www.w3schools.com/python/python_ml_getting_started.asp*
- *https://www.simplilearn.com/tutorials/machine-learning-tutorial*
- *https://www.tutorialspoint.com/machine_learning/index.htm*
- *https://www.kaggle.com/learn/intro-to-machine-learning*

Course Title: Parallel Processing
Course Code: GCA211

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Learn fundamental concepts of concurrency and parallelism.
2. Attain the major concepts and ideas in parallel computing and its applications.
3. Identify the basic "bottlenecks" encountered in parallel computing, e.g., I/O bottlenecks.
4. Compare the various models of parallelism (e.g., shared versus distributed memory models) and their strengths and limitations.

Course Content

UNIT I **10 hours**

Introduction: Paradigms of parallel computing: Synchronous - vector/array, SIMD, Systolic; Asynchronous -MIMD,
Hardware taxonomy: Flynn's classifications, Handler's classifications.
Software taxonomy: Kung's taxonomy.

UNIT II **12 hours**

Abstract parallel computational models: Combinational circuits, Sorting network, PRAM models, Interconnection RAMs. Parallelism approaches - data parallelism, control parallelism
Performance Metrics: Laws governing performance measurements. Matrices - speedups, efficiency, communication overheads, single/multiple program performances.

UNIT III **12 hours**

Parallel Processors: Taxonomy and topology - shared memory multiprocessors, distributed memory networks, Processor organization - Static and dynamic interconnections, Embeddings and simulations.

UNIT IV **11 hours**

Parallel Programming: Shared memory programming, distributed memory programming, object oriented programming, data parallel programming, functional programming.
Scheduling and Parallelization: Scheduling parallel programs, Loop scheduling, Parallelization of sequential programs, Parallel programming support environments.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Krishnamurthy, E. V. (1990). Parallel processing: principles and practice. Addison-Wesley Longman Publishing Co., Inc..*
- *LewisT.G. Parallel Programming: A Machine-Independent Approach, IEEE Computer Society Press, Los Alamitos, (1994).*

Web Sources

- *https://www.techtarget.com/searchdatacenter/definition/parallel-processing#:~:text=Parallel%20processing%20is%20a%20method,time%20to%20run%20a%20program.*
- *https://www.javatpoint.com/parallel-processing*
- *https://www.spiceworks.com/tech/iot/articles/what-is-parallel-processing/*
- *https://www.geeksforgeeks.org/what-is-parallel-processing/*
- *https://www.techopedia.com/definition/4598/parallel-processing*
- *https://www.tutorialspoint.com/what-is-parallel-processing*

Course Title: Computer System Architecture
Course Code: GCA215

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Determine the designing process of combinational and sequential circuits.
2. Learn the concept ALU, I/O Mapping, flip flops.
3. Understand of instruction pipelining and RISC architecture.
4. Design basic Gates, Sequential & Combinational circuits.

Course Content

UNIT I **10 hours**

Boolean Algebra: Boolean operations, Truth Tables, Boolean Laws, K-maps (2,3 and 4 variable maps, don't care about conditions).

Basic Gates, Combinational logic design: half-adder, full adder, parallel adder.

UNIT II **12 hours**

Sequential circuits: concept, flip-flops (D, RS, JK, T), counters (Ripple, Asynchronous, Synchronous).Instruction codes, Instruction formats, Instruction cycle, addressing modes.

UNIT III **10 hours**

Register Transfer Language, Arithmetic, Logic and Shift micro-operations, Arithmetic Logic Shift unit

Control Memory: Design of control unit, Microprogrammed and hardwired control unit (overview only), Features of RISC and CISC

UNIT IV **13 hours**

Memory Organization: memory hierarchy, Memory types: cache, associative and other types. I/O organization: I/O interface, Modes of data transfer: Programmed I/O, Interrupt initiated I/O, DMA, Block diagram depicting architecture of 8085 machine.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *M.M. Mano**.**Computer System Architecture**. Third Edition, Prentice-Hall of India, 2002.*

- *A.S.Tanenbaum. (1999).Structured Computer Organisation. Prentice-Hall of India,*
- *William Stallings.(2002)Computer Organisation and Architecture. 6th Edition, Pearson Education.*

Web Sources

- *https://www.javatpoint.com/computer-organization-and-architecture-tutorial*
- *https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/*
- *https://www.learncomputerscienceonline.com/computer-organization-and-architecture/*
- *https://www.gatevidyalay.com/computer-organization-architecture/*

Course Title: Software Engineering & Testing
Course Code: GCA216

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Analyze, model customer's requirements, and model its software design.
2. Understand the various model technique for software process.
3. Examine estimate cost and efforts required in building software.
4. Design and build test cases, and to perform software testing.

Course Content

UNIT I **12 hours**

Introduction: Software Engineering – A Layered Approach; Software Process – Process Framework, Umbrella Activities; Process Models – Waterfall Model, Incremental Model, and Evolutionary process Model (Prototyping, Spiral Model); Introduction to Agile – Agility Principles, Agile Model – Scrum. Software Requirements Analysis and Specifications: Use Case Approach, Software Requirement Specification Document, Flow oriented Modeling, Data Flow Modeling, Sequence Diagrams.

UNIT II **11 hours**

Design Modeling: Translating the Requirements model into the Design Model, The Design Process, Design Concepts – Abstraction, Modularity and Functional Independence; Architectural Mapping using Data Flow.

Software Metrics and Project Estimations: Function based Metrics, Software Measurement, Metrics for Software Quality; Software Project Estimation (FP based estimations, COCOMO II Model); Project Scheduling (Timeline charts, tracking the schedule).

UNIT III **12 hours**

Quality Control and Risk Management: Quality Control and Quality Assurance, Software Process Assessment and Improvement Capability Maturity Model Integration (CMMI); Software Risks, Risk Identification, Risk Projection and Risk Refinement, Risk Mitigation, Monitoring and Management.

UNIT IV **10 hours**

Testing and maintenance: Software Testing Techniques, Software testing fundamentals: objectives principles,testability;test case design, Unit testing: white box testing, basis path testing: Control structure testing: Black box testing, testing for specialized environments, Software Reliability and Quality Assurance: Quality concepts, Software quality assurance: SQA activities; Software reviews; cost impact of software defects, defect amplification and removal; formal technical reviews: The review meeting, review reporting record keeping, review guidelines; Formal approaches to SQA;

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Pressman Roger S, Software Engineering - A Practitioner's Approach, MGH, New Delhi, New Delhi. Publications, New Delhi.*
- *Ian Sommerville, Software Engineering, Pearson Education, 5th Edition, New Delhi*
- *Jalote Pankaj, An Integrated Approach to Software Engineering, Narosa Publications,New Delhi.*
- *Mall Rajib, Fundamentals of Software Engineering, PHI, New Delhi.*
- *Ali Bethforooz, Frederick J. Software Engineering Fundamentals, Hudson Oxford University.*

Web Sources

- *https://www.tutorialspoint.com/software_engineering/index.htm*
- *https://www.javatpoint.com/software-engineering*
- *https://www.geeksforgeeks.org/software-engineering/*
- *https://www.tutorialsduniya.com/notes/software-engineering-notes/*
- *https://ecomputernotes.com/software-engineering/levels-of-software-testing*

Course Title: Essentials of Digital Marketing
Course Code:GCA217

L	T	P	Credits
3	0	0	3

Total Hours:45

Learning Outcomes:

After completion of this course, the learner will be able to:

1. Develop strategies for online marketing.
2. Create effective email and social media campaigns.
3. Implement PPC advertising and affiliate marketing.
4. Analyze data and manage online reputation.

Course Contents

UNIT I **12 Hours**

Introduction to Marketing, Importance and Scope of Marketing, Elements of Marketing - Needs, Wants, Demands, Consumer, Markets and Marketers; Marketing vs Sales. Introduction to Digital Marketing, Benefits & Opportunity of Digital Marketing, Inbound and Outbound Marketing, Content Marketing, Understanding Traffic, Understanding Leads, Digital Marketing use in 'Business to Business' (B2B), 'Business to Consumer' (B2C) and 'Not-for Profit' marketing

UNIT II **13 Hours**

Search Marketing (SEO): Introduction to Search Engine, Search Engine Optimization (SEO), importance of SEO for business websites, Search Results & Positioning, Benefits of Search Positioning, Role of Keywords in SEO, Meta Tags and Meta Description, On-page & Off-page optimization, Back Link, Internal & External Links, Ranking, SEO Site Map, Steps for B2B SEO and B2C SEO, Advantages & Disadvantages of SEO.
Email Marketing: Introduction to Email Marketing, Elements of Email, Email List Generation, Email Structure, Email Delivery, Online Data Capture, OffLine data Capture, Creating an Email campaign, Campaign Measurement, Concept of A/B testing & its use in email marketing.

UNIT III **10 Hours**

Digital Display Advertising: Concepts, Benefits, Challenges, Ad Formats, Ad Features, Ad Display Frequency. Overview of Google AdWords.
Social Media Marketing: Key Concepts, Different Social Media Channels – Facebook, YouTube, Twitter, Instagram, Business Page- Setup and Profile, Social Media Content, Impact of Social Media on SEO, Basic concepts – CPC, PPC, CPM, CTR, CR. Importance of Landing Page. How to create & test landing Pages. User Generated Content (Wikipedia etc.), Multimedia - Video (Video Streaming, YouTube etc), Multimedia - Audio & Podcasting (iTunes etc), Multimedia - Photos/Images (Flickr etc).

UNIT IV **10 Hours**

Introduction to Mobile Marketing, Overview of the B2B and B2C Mobile Marketing, Use of Mobile Sites, Apps (Applications) and Widgets, Overview of Blogging Web Analytics: Introduction to Web Analytics, Web Analytics – Types & Levels, Introduction of Analytics Tools and its use case (Google Analytics and others), Analytics Reporting, Traffic and Behaviour Report, Evaluate Conversion.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Charles Worth, A. (2014). Digital marketing: A practical approach. Routledge*
- *Stokes, R. (2011). EMarketing: The essential guide to digital marketing (Vol. 563). Quirk eMarketing.*
- *Chaffey, D., & Smith, P. R. (2017). Digital marketing excellence: planning, optimizing and integrating online marketing. Routledge.*

Web Sources

- *https://www.investopedia.com/terms/d/digital-marketing.asp*
- *https://study.com/learn/lesson/web-presence-overview-importance.html*

Course Title: Communication Skills
Course Code: GCA218

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes:

On completion of this course the students will be able to:

1. Understand the basic grammar, sentence construction and vocabulary.
2. Improve vocabulary sought through mind and word games.
3. Develop a consulting dictionary for usage of words, correct spellings and pronunciation.
4. Enhance confidence in public speaking

Course Contents

UNIT I **8 Hours**

Communication: Concepts and definition - Importance - Process-communication - Model - Types - Mode of communication - Objectives - Inter, Intra personal Communication - Barriers - Commandments of communication.

Developing Communication Skills: a) Reading: Preparation - Reading Styles -Linear reading - Faster Reading - Reading Techniques b) Writing: Effective writing – Report writing - Speech Writing - Minutes - Communication aids - Agenda Writing - Letters – Article writing - Improving English language Writing - When to write and when not to write.

Listening and Speaking: a) Listening: Listening - Importance - Art of Listening -Advantages - Mode of expression - Listening tests b) Speaking: Art of conversation – Using telephone - Methods of asking questions - Brainstorming - Presenting reports –Improving speech delivery - Expressing Techniques

UNIT II **7 Hours**

Interview Techniques: What and Why? - Types of Interviews – Understanding the intricacies - Planning for interviews - Answering skills – Effective Communication during interviews - TIPS - Mock Interview.

Group Discussion: Group Discussion - Purpose - Process of Group Discussion -Preparation - Getting Started - Art of guiding and controlling discussion - Personality test through group discussion - Lateral thinking - Participation techniques - mock G.D.

UNIT III **7 Hours**

Body Language: Origin and development of body language - Tool for personality identification - Analysis of body language - Types - Desirable body language - Attitude and body language - Body language as a powerful communication.

Negotiation Techniques: Meaning - Importance - Fundamentals - Preparation -Techniques of Negotiation - Managing process of negotiation.

UNIT IV **8 Hours**

Presentation: Meaning and types of presentation - Understanding the audience -Planning - Designing - Written and oral - Making use of notes and outlines _ Techniques for delivering presentation - personal style - A postscript - model presentation.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Simon Sweeney, "English for Communication", 2nd Edition, CUP, 2003.*
- *Leo Jones and Richard Alexander, "New International Business English", CUP, 2000.*
- *Essentials of Business Communication, Rajendra Pal. JS Korlahalli.*

Web Sources

- *https://haiilo.com/blog/top-5-communication-skills-and-how-to-improve-them/*
  https://corporatefinanceinstitute.com/resources/management/communication/
- *https://www.thebalancemoney.com/communication-skills-list-2063779*
- *https://www.skillsyouneed.com/ips/communication-skills.html*