

**ST. XAVIER'S COLLEGE (AUTONOMOUS)**

**PALAYAMKOTTAI - 627 002**

(Recognized as "College with Potential for Excellence" by UGC)  
(Accredited by NAAC at "A<sup>++</sup>" Grade with a CGPA of 3.66 in IV Cycle)  
(Star College Programme by DBT, Govt. of India.)  
(Affiliated to Manonmaniam Sundaranar University Tirunelveli)

**SYLLABUS**



*Preserve this copy of the syllabus until you complete the course, as it is  
an important document of your present course of study.*

Name \_\_\_\_\_

**MASTER OF COMPUTER APPLICATIONS**

*Choice Based Credit System (CBCS)*

*(w.e.f. June 2023 - 2024)*

**Programme Name : MCA**

**Programme Code : PCA**

## MASTER OF COMPUTER APPLICATIONS (MCA) – PROGRAMME STRUCTURE

Sem.	Part	Status	Course Code	Title of the Course	Hours	Credits
I	A	Core-T1	23PCAC11	Mathematical Foundations of Computer Science	4	4
		Core-T2	23PCAC12	Linux and Shell Programming	4	4
		Core-T3	23PCAC13	Python Programming With MySQL	4	4
		Core-P1	23PCAC14	<b>Practical:</b> Linux and Shell Programming Lab	4	3
		Core-P2	23PCAC15	<b>Practical:</b> Python Programming	4	3
	B	Elective-T1	23PCAE11	Data Engineering and Management / Dot Net Technologies	4	3
		Elective-P1	23PCAE12	<b>Practical:</b> Data Engineering and Management / Dot Net Technologies	3	2
		Elective-T2	23PCAE13	Organizational Structure and Human Resource Management / Soft Computing	3	2
				<b>Sub-Total</b>	<b>30</b>	<b>25</b>
II	A	Core-T4	23PCAC21	Advanced Java Programming	4	4
		Core-T5	23PCAC22	Database Systems	4	4
		Core-P3	23PCAC23	<b>Practical:</b> Advanced Java Programming	5	4
		Core-P4	23PCAC24	<b>Practical:</b> Oracle	5	4
	B	Elective-T3	23PCAE21	Data Science with Cloud Computing / Machine Learning	4	3
		Elective-T4	23PCAE22	Operating Systems / Internet of Things	4	3
		SEC-1	23PCAS21	Optimization Techniques	4	3
				<b>Sub-Total</b>	<b>30</b>	<b>25</b>

Sem.	Part	Status	Course Code	Title of the Course	Hours	Credits
III	A	Core-T6	23PCAC31	Data Structures and Algorithms	4	4
		Core-T7	23PCAC32	Mobile Application Development	4	4
		Core-T8	23PCAC33	Web Technologies	4	4
		Core-P5	23PCAC34	<b>Practical:</b> Data Structures and Algorithms	4	3
		Core-P6	23PCAC35	<b>Practical:</b> Android Programming	4	3
		Core-P7	23PCAC36	<b>Practical:</b> Web Technologies	4	2
	B	Elective-T5	23PCAE31	Data Communication and Computer Networks / Artificial Intelligence	3	2
		SEC-2	23PCAS31	Software Engineering	3	2
		Internship	23PCAI35	Carried out in Summer vacation at the end of Sem II	-	2
				<b>Sub-Total</b>	<b>30</b>	<b>26</b>
IV			Project Work and Viva Voce	Real Time Project	<b>14</b>	
			<b>STAND</b>		<b>1</b>	
<b>Additional Compulsory Courses</b>						
I PG	Value Added (Any one)	23PCAVA1/ 23PCAVA2/ 23PCAVA3	Edge Computing / Privacy and Security in Online Social Media / Introduction to Industry 4.0 and Industrial Internet of Things		<b>3</b>	
II PG	Extra Credit Courses (Any one)	23PCAEC1	Aptitude and Reasoning Skills		<b>3</b>	
		23PCAEC2	Communication and Presentation Skills			
		23PCAEC3	Scripting Languages			
		23PCAEC4	Digital Forensics			
<b>GRAND TOTAL</b>					<b>90</b>	<b>97</b>

**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**  
(Course Code: 23PCAC11)

<b>SEMESTER - I</b>	<b>CORE-T1</b>	<b>HOURS - 4</b>	<b>CREDITS - 4</b>	<b>TOTAL HOURS: 60</b>
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**COURSE OUTCOMES:**

On successful completion of the course, the learners will be able to

**CO1:** Define the notion of Tautologies and Predicate Calculus. **(K1)**

**CO2:** Interpret the concepts of Set Theory, Relations, Ordering and Functions. **(K2)**

**CO3:** Demonstrate the basic concepts of Groups. **(K3)**

**CO4:** Outline the properties of Graphs and related Discrete Structures, and be able to relate these to practical examples. **(K4)**

**CO5:** Compare the operations of graphs. **(K5)**

**CO6:** Develop Finite-State Machines to model computer operations. **(K6)**

**UNIT I MATHEMATICAL LOGIC (12 HOURS)**

**Statement and Notations** – Connectives – Negation – Conjunction – Disjunction – Conditional and Bi-conditional statement – Statement formulae and truth tables – Well Formed Formulae – Tautologies – Equivalences of Formula – Duality Law.

**Predicate Calculus:** Predicates – Statements functions – Variables – Quantifiers – Predicate formulae – Free and Bound variables.

**UNIT II SET THEORY (12 HOURS)**

**Basic concepts of set theory:** Notation – Inclusion of equality of sets – Power set – Operation on sets – Venn diagrams

**Relations and ordering:** Cartesian products - Relations – Properties of Binary Relation in a set – Relation matrix and graph – Equivalence relations – Composition of Binary Relations.

**Functions:** Definition and Introduction – Composition of functions – Inverse function.

**UNIT III GROUPS (12 HOURS)**

**Definition and Examples** – Subgroups – Homomorphism – Cosets – Normal subgroups.

**UNIT IV GRAPH THEORY (12 HOURS)**

**Basic terminology:** Different types of graphs – Directed and Undirected – Simple – Pseudo – Complete – Regular – Bipartite – Incidence and Degree – Pendant and Isolated Vertex – Null Graph – Isomorphism – Sub Graphs – Walk – Path and Circuit – Connected and Disconnected Graphs and Components – Operations on Graphs – Matrix representation of Graphs – Incidence and Adjacency Matrices.

**UNIT V LANGUAGES, GRAMMARS, MACHINES (12 HOURS)**

**Introduction** – Alphabets, Words, Languages – Regular Expressions, Regular Languages – Finite State Automata – Finite State Machines – Godel numbers – Grammars.

**TEXT BOOKS**

1. J.P Trembley, R. Manohar, “Discrete Mathematical structures with applications to Computer Science”, Tata McGrawHill publications, 2017. **(Units I - IV)**
2. Seymour Lipschutz, Marc Lipson, “Discrete Mathematics”, Revised Third Edition, Schaum’s Outline Series, Tata McGraw Hill Publications, 2002.  
**(Unit V) Note: Excluding algorithms and theorems.**

**REFERENCE BOOK**

S. Santha, “Discrete Mathematics with Combinatory and Graph Theory”, Third Edition, Cengage Publications, 2015.

**WEB RESOURCES**

- ❖ <https://www.tutorialspoint.com/mathematical-foundation>
- ❖ <https://www.geeksforgeeks.org/discrete-mathematics-tutorial>

**LINUX AND SHELL PROGRAMMING**  
(Course Code: 23PCAC12)

<b>SEMESTER - I</b>	<b>CORE-T2</b>	<b>HOURS - 4</b>	<b>CREDITS - 3</b>	<b>TOTAL HOURS: 45</b>
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**COURSE OUTCOMES:**

On successful completion of the course, the learners will be able to

**CO1:** Describe the basic bash shell commands and structured commands. (K1)

**CO2:** Interpret the passing and tracking of parameters in user input. (K2)

**CO3:** Demonstrate the creation of functions and use of sed and gawk editor. (K3)

**CO4:** Analyze the creation of sed utilities and using structured commands in gawk. (K4)

**CO5:** Evaluate the database shell scripts using internet and e-mailing report from scripts. (K5)

**CO6:** Design applications using Python as a Bash Scripting Alternative.(K6)

**UNIT I INTRODUCTION (12 HOURS)**

**Basic bash Shell Commands:** Interacting with the shell - Traversing the file system - Listing files and directories - Managing files and directories - Viewing file contents. **Basic Script Building:** Using multiple commands - Creating a script file-Displaying messages - Using variables - Redirecting input and output – Pipes - Performing math-Exiting the script. **Using Structured Commands:** Working with the if-then statement - Nesting ifs - Understanding the test command - Testing compound conditions-Using double brackets and parentheses - Looking at case.

(Book-1, Chapters: 3, 11, and 12)

**UNIT-II STRUCTURED COMMANDS (12 HOURS)**

**More Structured Commands:** Looping with for statement - Iterating with the until statement - Using the while statement-Combining loops-Redirecting loop output. **Handling User Input:** Passing parameters - Tracking parameters-Being shifty - Working with options - Standardizing options - Getting user input. **Script Control:** Handling signals - Running scripts in the background - Forbidding hang-ups - Controlling a Job - Modifying script priority - Automating script execution. (Book-1, Chapters: 13, 14, and 16)

**UNIT III FUNCTIONS (12 HOURS)**

**Creating Functions:** Basic script functions - Returning a value-Using variables in functions - Array and variable functions-Function recursion - Creating a library - Using functions on the command line. **Writing Scripts for Graphical Desktops:** Creating text menus - Building text window widgets - Adding X Window graphics. **Introducing sed and gawk:** Learning about the sed Editor - Getting introduced to the gawk Editor - Exploring sed Editor basics.

(Book-1, Chapters: 17, 18, and 19)

**UNIT IV REGULAR EXPRESSIONS (12 HOURS)**

**Regular Expressions:** Defining regular expressions - Looking at the basics - Extending our patterns - Creating expressions. **Advanced sed:** Using multiline commands - Understanding the hold space - Negating a command-Changing the flow-Replacing via a pattern - Using sed in scripts - Creating sed utilities. **Advanced gawk:** Reexamining gawk - Using variables in gawk-Using structured commands - Formatting the printing-Working with functions.

(Book-1, Chapters: 20, 21, and 22)

## UNIT-V SCRIPTS

(12 HOURS)

**Working with Alternative Shells:** Understanding the dash shell - Programming in the dash shell - Introducing the zsh shell - Writing scripts for zsh. **Writing Simple Script Utilities:** Automating backups - Managing user accounts-Watching disk space. **Producing Scripts for Database, Web, and E-Mail:** Writing database shell scripts-Using the Internet from your scripts - Emailing reports from scripts

### TEXT BOOKS

1. Richard Blum, Christine Bresnahan, "Linux Command Line and Shell Scripting BIBLE", Wiley Publishing, Third Edition, 2015. **Chapters:** 3, 11 to 14, 16 to 25.
2. MokhtarEbrahim, Andrew Mallett, "Mastering Linux Shell Scripting", Packt Publishing, Second Edition, 2018. **Chapter:** 14.

### REFERENCE BOOKS

1. Clif Flynt, Sarath Lakshman, Shantanu Tushar, "Linux Shell Scripting Cookbook ", Packt Publishing, Third Edition, 2017.
2. Stephen G.Kochan, Patrick Wood, "Shell Programming in Unix, Linux, and OS X", Addison Wesley Professional, Fourth Edition, 2016.
3. Robert Love, "Linux System Programming", O'Reilly Media, Inc, 2013.
4. W.R. Stevens, "Advanced Programming in the UNIX environment", Second Edition, Pearson Education, 2013.
5. Graham Glass, King Ables, " UNIX for Programmers and Users", Third Edition, Pearson Education, 2003.

### WEB RESOURCES

- ❖ <https://www.geeksforgeeks.org/introduction-linux-shell-shell-scripting/>
- ❖ [https://www.tutorialspoint.com/unix/shell\\_scripting.htm](https://www.tutorialspoint.com/unix/shell_scripting.htm)

**PYTHON PROGRAMMING WITH MYSQL**  
(Course Code: 23PCAC13)

<b>SEMESTER: I</b>	<b>CORE-T3</b>	<b>HOURS: 4</b>	<b>CREDITS: 3</b>	<b>TOTAL HOURS: 60</b>
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**COURSE OUTCOMES**

On successful completion of the course, the learners will be able to

- CO1:** Describe the types of Operators, Input/output and Control Statements. **(K1)**
- CO2:** Interpret Arrays, Lists and Tuples. **(K2)**
- CO3:** Demonstrate the various operations on Strings. **(K3)**
- CO4:** Evaluate Dictionaries and Object Oriented Programming concepts in Python. **(K4)**
- CO5:** Integrate various GUI tools. **(K5)**
- CO6:** Design web applications using Django. **(K6)**

**UNIT I INTRODUCTION (12 HOURS)**

**Introduction to Python:** Features of Python – Writing the First Python Program – Executing a Python Program – Data types in Python – Literals – Operators – Input and Output. **Control Statements:** if statement, else Statement, elif Statement, while loop, for loop, break Statement, continue Statement, pass Statement, assert Statement, return Statement.

**UNIT II ARRAYS, STRINGS, LISTS AND TUPLES (12 HOURS)**

**Array:** Creating an Array – Indexing and Slicing on Arrays – Types of Arrays – Working with arrays using numpy - Slicing and Indexing in numpy Arrays – Working with Multi-dimensional Arrays – Indexing the Multi-dimensional Arrays – **Strings:** Creating Strings – Indexing, Slicing and Comparing Strings – Finding and Counting Substrings – Splitting and Joining Strings – **Lists:** Creating and Updating the Elements of a List – Methods to Process Lists – **Tuples:** Creating Tuples – Functions to process Tuples – Inserting, Modifying and Deleting Elements from a Tuple.

**UNIT III DICTIONARIES, FUNCTIONS AND INTRODUCTION TO OOPS (12 HOURS)**

**Dictionaries:** Operations on Dictionaries – Dictionary Methods – **Functions:** Defining and Calling a Function – Pass by Object Reference – Anonymous Functions or Lambdas- **Classes and objects:** Creating a Class – Types of Variables – Types of Methods – Constructors in Inheritance – Types of Inheritance – Operator Overloading – Method Overloading - Method Overriding – Interfaces in Python.

**UNIT IV GRAPHICAL USER INTERFACE (12 HOURS)**

**Graphical User Interface:** The Root Window – Working with Containers – Canvas – Frame – Widgets – Button Widget – Label Widget – Message Widget – Text Widget – Scrollbar Widget – Checkbutton Widget – Radiobutton Widget – Entry Widget – Listbox Widget – Menu Widget – Creating Tables – Sending a Simple Mail.

**UNIT V DATABASE (12 HOURS)**

**Database Connectivity:** Advantages of DBMS over files - Types of Databases used with Python – Using MySQL from Python – Retrieving all rows from a Table – Inserting, Deleting and Updating rows in a Table – Creating Database Tables using Python.

**TEXT BOOK**

Dr. R. NageswaraRao, “Core Python Programming”, Second Edition, Dreamtech Press, 2019.

**REFERENCE BOOKS**

1. Martin C. Brown, “The Complete Reference Python”, Indian Edition, McGraw Hill Education, 2018.
2. Yashavant Kanetkar, Aditya Kanetkar, “Let us Python”, Second Edition, BPB Publications, 2019.

**WEB RESOURCES**

- ❖ <https://www.geeksforgeeks.org/python-programming-language>
- ❖ <https://www.tutorialspoint.com/python>

**PRACTICAL: LINUX AND SHELL PROGRAMMING**  
**(Course Code: 23PCAC14)**

<b>SEMESTER - I</b>	<b>CORE-P1</b>	<b>HOURS - 4</b>	<b>CREDITS -2</b>	<b>TOTAL HOURS: 60</b>
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**LIST OF PROGRAMS**

1. Write a Shell Script program to calculate the number of days between two dates.
2. Write a Shell Script program to check systems on local network using control structures with user input.
3. Write a Shell Script program to check systems on local network using control structures with file input.
4. Write a Shell Script program to demonstrate the script control commands.
5. Write a Shell Script program to demonstrate the Shell script function.
6. Write a Shell Script program to demonstrate the Regular Expressions.
7. Write a Shell Script program to demonstrate the sed and awk Commands.
8. Write a Shell Script program to demonstrate the File Backup process through creating a daily archive location.
9. Write a Shell Script program to create a following GUI tools.
  - a) Creating text menus
  - b) Building text window widgets
10. Write a Shell Script program to demonstrate to connect a PostgreSQL database and performing CRUD operations.



## **PRACTICAL: PYTHON PROGRAMMING**

**(Course Code : 23PCAC15)**

<b>SEMESTER - I</b>	<b>CORE-P2</b>	<b>HOURS - 4</b>	<b>CREDITS -2</b>	<b>TOTAL HOURS: 60</b>
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### **LIST OF PROGRAMS**

1. Program using Control Structures.
2. Program using Arrays.
3. Program using Strings.
4. Program using Lists.
5. Program using Tuples.
6. Program using Dictionaries.
7. Program using class and object.
8. Program using Inheritance.
9. Working with Widgets.
10. Program to perform Insert, Delete and Update operations using Database.

## DATA ENGINEERING AND MANAGEMENT

(Course Code: 23PCAE11)

SEMESTER - I	ELECTIVE-T1	HOURS – 3	CREDITS – 2	TOTAL HOURS: 45
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### COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

**CO1:** Describe the Data Management concepts and the relationship with the enterprise.(K1)

**CO2:** Interpret Corporate Data Modelling. (K2)

**CO3:** Apply business modeling techniques. (K3)

**CO4:** Analyze Data Modeling concepts and assess its quality.(K4)

**CO5:** Evaluate the use of Artificial Intelligence and Machine Learning in CRM.(K5)

**CO6:** Develop CRM applications in cloud. (K6)

### UNIT I DATABASE DEVELOPMENT AND MANAGEMENT (9 HOURS)

**Database development:** Database architecture of an information system – Overview of the database development process–Conceptual data modeling – Relational data analysis – Roles of a data model–Physical database design. **Data management:** Problems encountered without data management – Data management responsibilities – Data management activities – Roles within data management – Benefits of data management–Relationship between data management and enterprise.

### UNIT II DATA DEFINITION, QUALITY AND ACCESSIBILITY (9 HOURS)

**Corporate data modelling:** Need for a corporate data model – Nature of a corporate data model – Develop a corporate data model – Corporate data model principles. **Data definition and naming:** Elements of a data definition – Data naming conventions. **Data quality:** Issues associated with poor data quality – Causes of poor data quality – Dimensions of data quality – Data model quality – Improving data quality. **Data accessibility:** Data security – Data integrity – Data recovery.

### UNIT III DISTRIBUTED DATA AND DATA BASES (9 HOURS)

**Use of packaged application software:** Application software packages – Impact on data management. **Distributed data and databases:** Rationale for distributing data – Perfect distributed database system – Top down fragmentation and partitioning. Bottom up integration – The management of replication. **Business intelligence:** Data warehousing – Multidimensional model of data – Standard reporting tools – Online analytical processing OLAP – Relational schema for a data warehouse.

### UNIT IV CRM (9 HOURS)

**Crm:** Three main pillars of CRM. Getting to know your customer: 360-degree client view. Utilizing Artificial Intelligence and Machine learning in your CRM Strategy.: Evolution of AI – Current state of AI – Teaming up AI with people – Applying AI to your CRM solution – Ethical aspects of AI – An example of AI in CRM processes.

## UNIT V ERROR HANDLING AND DATABASE

(9 HOURS)

**Cloud versus on premise versus hybrid:** Factors influencing vendor selection – Hybrid deployment – What are your options. **Crm differentiators:** It's not about the feature list – It's about the ecosystem – Fourth industrial revolution and CRM –AI and smart cloud – To cloud or not to cloud – Leveraging smart cloud into CRM – Big data – Social selling and advertising – Implementation tools – Sustainable CRM platform.

### TEXT BOOKS

1. Keith Gordon, “Principles of Data Management Facilitating Information Sharing”, BCS Learning, 2013. (Chapters:1-5, 7,8,12,13,14)
2. Max Fatouretchi, “The Art of CRM”, Packt Publishing, 2019. (Chapters: 1,2,5,8,9)

### REFERENCE BOOKS

1. Peter Ghavami, “Big Data Management\_ Data Governance Principles for Big Data Analytics”, De Gruyter, 2020.
2. Francis Buttle, Stan Maklan, Customer Relationship Management Concepts and Technologies, Routledge, 2019.

### WEB RESOURCES

- ❖ <https://www.geeksforgeeks.org/how-to-become-a-data-engineer/>
- ❖ <https://www.simplilearn.com/tutorials/big-data-tutorial/what-is-data-engineering>



## **PRACTICAL: DATA ENGINEERING AND MANAGEMENT LAB**

**(Course Code: 23PCAE12)**

<b>SEMESTER - I</b>	<b>ELECTIVE-P1</b>	<b>HOURS – 2</b>	<b>CREDITS – 1</b>	<b>TOTAL HOURS: 30</b>
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### **LIST OF PROGRAMS**

1. Write a script to create a MongoDB database and perform insert operation.
2. Write a MongoDB script to perform query operations.
3. Write a MongoDB Script to perform update operations.
4. Write a MongoDB Script to update documents with aggregation pipeline.
5. Write a MongoDB script to delete single and multiple documents.
6. Write a MongoDB script to perform string aggregation operations.
7. Design a Data Model for MongoDB using DbVisualizer.
8. Perform CRUD operations using DbVisualizer.
9. Create a Zoho CRM account and organize your Tasks, Meetings and Deals.
10. Create and maintain a project using Zoho CRM features.

**PRACTICAL: DOT NET TECHNOLOGIES LAB**  
**(Course Code: 23PCAE12)**

<b>SEMESTER - I</b>	<b>ELECTIVE-P1</b>	<b>HOURS - 2</b>	<b>CREDITS - 1</b>	<b>TOTAL HOURS: 30</b>
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**LIST OF PROGRAMS**

1. Demonstrate method overloading and method overriding
2. Class and Objects
3. Multilevel Inheritance
4. Interfaces
5. Demonstrate multiple type of Exceptions
6. Design and Develop .Net application with Database.
7. Student management system using ASP.NET
8. Designing Web- based Applications.

**ORGANIZATIONAL STRUCTURE AND HUMAN RESOURCE MANAGEMENT**  
(Course Code: 23PCAE13)

<b>SEMESTER - I</b>	<b>ELECTIVE-T2</b>	<b>HOURS - 3</b>	<b>CREDITS - 2</b>	<b>TOTAL HOURS: 45</b>
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**COURSE OUTCOMES:**

On successful completion of the course, the learners will be able to

**CO1:** Describe the principles and dynamics of Organizational Structure. **(K1)**

**CO2:** Interpret the Group Dynamics and Leadership. **(K2)**

**CO3:** Predict the challenges of Human Resources Management. **(K3)**

**CO4:** Analyze the Performance Evaluation of the Human Resources. **(K4)**

**CO5:** Evaluate Human Resource Planning and Communication. **(K5)**

**CO6:** Create Human Resource Motivation. **(K6)**

**UNIT I ORGANIZATIONAL STRUCTURE (9 HOURS)**

Organization: Meaning – Function –Types – Formal and Informal Structures of Organization – Principles of an Organization – Tall and flat Organization – Organizational Authority – Life and Staff Organization –Departmentation: Meaning – Importance – Types.

**UNIT II INDIVIDUAL DIFFERENCES – GROUP DYNAMICS (9 HOURS)**

Personality – Types – Traits – Individual Differences – Factors influencing – Individual’s behavior and differences -Definition and Importance of Group Dynamics – Types of groups – Group Formation – Group Cohesiveness – Group Development – Decision making in groups – Conflict Management – Principle – Central approach to team development – Leadership: Meaning – Styles and Theories – Quality of an effective leader.

**UNIT III HUMAN RESOURCES MANAGEMENT (9 HOURS)**

Concepts – Evolution – Objectives and Functions of HR Management – HR Management as a profession – Challenges for the HR Executives of today – HR Management in India.

**UNIT IV HUMAN RESOURCES PLANNING (9 HOURS)**

Human Resources Planning – Job analysis – Selection – Orientation and Placement – Training and Development – Communication : Definition – Characteristic – Process and barriers.

**UNIT V HUMAN RESOURCES MOTIVATION (9 HOURS)**

Motivation: Meaning – Process and theories need hierarchy – XY and two factor theories – Performance Evaluation: Meaning – Objective and Methods.

**TEXT BOOKS**

1. L.M. Prasad, “Principles of Management”, Sultan Chand & Sons, 2007. **(Unit-I)**
2. J. Jayasankar, “Organisational Behaviour”, Margham Publication, 2012.**(Unit-II)**
3. C.B. Momoria, “Human Resource Management”, Margham Publication, 2017.  
**(Units: III - V)**

**REFERENCE BOOKS**

1. Koontz and O’Donol, ”Principles of Management”.
2. Dr. K. Aswathappa, “Organizational Behaviour”, Himalaya Publishing Hall, 2019.
3. Dessler, Varkkey, “Human Resource Management”, Eleventh Edition, Pearson Education India, 2015.

**WEB RESOURCES**

- ❖ [https://www.tutorialspoint.com/human\\_resource\\_management/](https://www.tutorialspoint.com/human_resource_management/)
- ❖ <https://www.geeksforgeeks.org/human-resource-management-hrm/>





## **UNIT V GENETIC ALGORITHM**

**(9 HOURS)**

**Genetic algorithm:** Introduction - Biological Background - Traditional Optimization and Search Techniques -Gradient Based Local Optimization Method-Random Search-Stochastic Hill Climbing-Simulated Annealing-Symbolic Artificial Intelligence

### **TEXT BOOKS**

1. Principles of Soft Computing, S.N. Sivanandam, S.N.Deepa, Wiley, Third Edition, 2019.

**UNIT I:** Chapter 1: 2.1,2.3,2.4,2.5,2.6,2.7

**UNIT II:** Chapter 2: 3.2,3.3,3.5,3.6

**UNIT III:** Chapter 3: 4.3,,4.7,5.3

**UNIT IV:** Chapter 4: 7.2,7.3,8.4,9.3,9.4,10,10.2,10.3,10.4

**UNIT V:** Chapter 5: 15,15.2,15.3

### **REFERENCE BOOKS**

1. Das, A. (2018). Artificial Intelligence and Soft Computing for Beginners.
2. Amit, K. (2018). Artificial intelligence and soft computing: behavioral and cognitive modeling of the human brain. CRC press.
3. Rajasekaran, S., &Pai, G. V. (2011). Neural networks, fuzzy logic and genetic algorithm: synthesis and applications (with cd). PHI Learning Pvt. Ltd.

### **WEB RESOURCES**

- ❖ <https://www.javatpoint.com/what-is-soft-computing>
- ❖ <https://www.includehelp.com/soft-computing/>

**ADVANCED JAVA PROGRAMMING**  
**(Course Code: 23PCAC21)**

<b>SEMESTER - II</b>	<b>CORE-T4</b>	<b>HOURS - 4</b>	<b>CREDITS - 4</b>	<b>TOTAL HOURS: 60</b>
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**COURSE OUTCOMES:**

On successful completion of the course, the learners will be able to

- CO1:** Describe the History and Fundamentals of Java. **(K1)**
- CO2:** Explain about Inheritance, Package and Exception Handling. **(K2)**
- CO3:** Demonstrate the Multithreaded Programming. **(K3)**
- CO4:** Design the Applet using various Events and AWT controls. **(K6)**
- CO5:** Create Database Related Applications using JDBC. **(K6)**
- CO6:** Develop Servlet programs and JSP applications. **(K6)**

**UNIT I INTRODUCTION TO JAVA (12 HOURS)**

The History and Evolution of Java – Java buzz words – An overview of Java – Data types – Variables and Arrays – Operators – Control Statements – Introducing Classes – A Closer Look at Methods and Classes.

**UNIT II INHERITANCE, PACKAGE, EXCEPTION HANDLING (12 HOURS)**

Inheritance – Overriding methods – Abstract classes – Packages and Interfaces – Exception Handling.

**UNIT III MULTITHREADING, APPLET (12 HOURS)**

Multithreaded Programming – Java Thread Model – Runnable Interface – Inter-thread Communication – Applet basics – Architecture – Applet Skeleton – Using status window – HTML Applet tags – Passing parameters to Applets – Methods available in Applets –

**UNIT IV EVENT HANDLING, AWT (12 HOURS)**

Event handling: Event classes – Event Listener interfaces – Using the Delegation Event Model – Introducing the AWT: Working with Windows, Graphics, and Text – Using AWT Controls, Layout Managers, and Menus.

**UNIT V JDBC, SERVLETS, JSP (12 HOURS)**

JDBC: Types of drivers – Steps to establish connectivity – Example of connectivity. Java Servlets: Benefits of using a Servlet – A simple Java Servlet. Reading Data from a client – Sending Data to a client – Working with Cookies – Tracking Sessions. JSP: JSP Tags – Variable and Objects – Methods – Control Statements – Loops – Session Objects.

**TEXT BOOKS**

1. Herbert Schildt, “Java The Complete Reference”, Eleventh Edition, Tata McGraw Hill, 2019.
2. Dr. K. Somasundaram, “Programming in Java2”, Jaico Publishing House, 2005. **(JDBC)**
3. Jim Keogh, “The Complete Reference J2EE”, First Edition, Tata McGraw Hill, 2017. **(Unit V)**

**REFERENCE BOOKS**

1. E.Balaguruswamy, “Programming with JAVA”, Sixth Edition, McGraw Hill Education, 2019.
2. Rashmi Kanta Das, “J2EE Made Easy”, First Edition, Vikas Publishing House, 2014.

**WEB RESOURCES**

1. <https://www.javatpoint.com/java-tutorial/>
2. <https://www.geeksforgeeks.org/java/>

**DATABASE SYSTEMS**  
**(Course Code: 23PCAC22)**

<b>SEMESTER - II</b>	<b>CORE-T5</b>	<b>HOURS - 4</b>	<b>CREDITS - 4</b>	<b>TOTAL HOURS: 60</b>
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**COURSE OUTCOMES:**

On successful completion of the course, the learners will be able to

**CO1:** Describe the concepts of the Database and Data Models. **(K1)**

**CO2:** Interpret SQL. **(K2)**

**CO3:** Model database applications using normalization. **(K3)**

**CO4:** Analyze different special purpose databases and to critique how they differ from traditional database systems. **(K4)**

**CO5:** Evaluate query and monitor the performance of the DBMS. **(K5)**

**CO6:** Design database using ER diagrams and map ER into Relations and normalize the relations. **(K6)**

**UNIT I INTRODUCTION (12 HOURS)**

Database System Applications – Purpose of Database Systems – View of Data – Database Languages – Relational Databases – Database Design – Database and Application Architecture – Database Users and Administrators – History of Database Systems – Introduction to the Relational Model – Structure of Relational Databases – Database Schema – Keys – Schema Diagrams – Relational Query Languages – Relational Operations.

**UNIT II SQL (12 HOURS)**

Introduction to SQL – Overview of the SQL Query Language – SQL Data Definition – Basic Structure of SQL Queries – Additional Basic Operations – Set Operations – Null Values – Aggregate Functions – Intermediate SQL – Join Expressions – Views – Transactions – Integrity Constraints – SQL Data Types and Schemas – Index Definition in SQL – Authorization.

**UNIT III ER MODEL AND RELATIONAL DATABASE DESIGN (12 HOURS)**

Overview of the Design Process – The Entity Relationship Model – Complex Attributes – Mapping Cardinalities – Primary Key – Removing Redundant Attributes in Entity Sets – Reducing E-R Diagrams to Relational Schemas Entity-Relationship Diagrams – Relational Database Design – Features of Good Relational Designs – Decomposition Using Functional Dependencies – Normal Forms – Decomposition using Multivalued Dependencies – More Normal Forms.

**UNIT IV STORAGE MANAGEMENT & INDEXING (12 HOURS)**

Overview of Physical Storage Media – Storage Interfaces – Magnetic Disks – Flash Memory – RAID – Disk Block Access – Database Storage Architecture – File Organization – Organization of Records in Files – Data-Dictionary Storage – Database Buffer – Column-Oriented Storage – Indexing – Basic Concepts – Ordered Indices – B+-Tree Index Files – B+-Tree Extensions – Hash Indices – Multiple Key Access – Creation of Indices - Bitmap Indices.

**UNIT V TRANSACTIONS & RECOVERY SYSTEM (12 HOURS)**

Transaction Concept – A simple Transaction Model – Transaction Atomicity and Durability – Transaction Isolation – Serializability – Concurrency Control – Lock-Based Protocols

– Deadlock Handling – Multiple Granularity – Timestamp-Based – Protocols – Validation-Based Protocols – Multiversion Schemes – Recovery System – Failure Classification – Storage – Recovery and Atomicity – Recovery Algorithm – Buffer Management – Failure with Loss of Non-volatile Storage.

### **TEXT BOOK**

Abraham Silberschatz, Henry F. Korth and S. Sudharsan, “Database System Concepts”, Seventh Edition, Tata McGraw Hill, 2019.

### **REFERENCE BOOKS**

1. Elmasri Ramez and Navathe Shamkant, “Fundamentals of Database System”, Seventh Edition, Pearson Education, 2017.
2. G. K. Gupta, “Database Management Systems”, First Edition, McGraw Hill Education, 2018.
3. Thomas Connolly, Carolyn Begg, “Database Systems”, Sixth Edition, Pearson Education, 2019.

### **WEB RESOURCES**

- ❖ <https://www.javatpoint.com/dbms-tutorial>
- ❖ <https://www.tutorialspoint.com/dbms/>

## **PRACTICAL : ADVANCED JAVA PROGRAMMING**

**(Course Code: 23PCAC23)**

<b>SEMESTER - II</b>	<b>CORE-P3</b>	<b>HOURS - 5</b>	<b>CREDITS - 4</b>	<b>TOTAL HOURS: 75</b>
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### **LIST OF PROGRAMS**

1. Program using simple Java Classes.
2. Program using Constructor.
3. Program using Method Overloading.
4. Program using Inheritance. (Single, Multilevel)
5. Program using Interface.
6. Program using Exception Handling.
7. Program using Package.
8. Program using Multithreading.
9. Design a Simple Calculator using Applet.
10. Program using AWT Controls (Text, Button, Checkbox, Radio Button).
11. Program using JDBC (Insert, Update and Delete Records in the Database).
12. Servlet Life Cycle Program.
13. Implementing Cookies using Servlet.
14. Implementing Session Tracking using JSP
15. Accessing Database with JSP using JDBC.

## **PRACTICAL: ORACLE**

**(Course Code: 23PCAC24)**

<b>SEMESTER - II</b>	<b>CORE-P4</b>	<b>HOURS - 5</b>	<b>CREDITS - 4</b>	<b>TOTAL HOURS: 75</b>
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### **LIST OF PROGRAMS**

1. Working with DDL and DML commands.
2. Queries Using Relational, Logical and Special Operators.
3. Queries using Character, Number and Date functions.
4. Queries using Group Functions.
5. Queries using Order By and Group BY Clause.
6. Queries using Joins and Sub Queries.
7. Queries using Sub Queries.
8. PL/SQL program using Control Structures.
9. PL/SQL program using Cursors.
10. PL/SQL program using Exception Handling.
11. PL/SQL program using Stored Procedures.
12. PL/SQL program using Stored Packages.

## DATA SCIENCE WITH CLOUD COMPUTING

(Course Code: 23PCAE21)

<b>SEMESTER - II</b>	<b>ELECTIVE-T3</b>	<b>HOURS - 4</b>	<b>CREDITS - 3</b>	<b>TOTAL HOURS: 60</b>
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### COURSE OUTCOMES

On successful completion of this course, students will be able to

**CO1:** Describe Data Pre-processing methods and Data Warehouse. **(K1)**

**CO2:** Discuss Cloud Security and Standards. **(K2)**

**CO3:** Demonstrate Cloud Infrastructure and Cloud Accessing. **(K3)**

**CO4:** Analyze the Frequent Itemset Mining Methods and Association Rules. **(K4)**

**CO5:** Assess Cloud-Based Services. **(K5)**

**CO6:** Develop Cloud-Based Applications. **(K6)**

### UNIT I INTRODUCTION AND DATA PRE-PROCESSING (12 HOURS)

Data Mining: Introduction – Data Mining: On what kind of data – Data Mining Functionalities– What kind of patterns to be mined – Classification of Data Mining Systems – Data Mining task primitives – Integration of a Data Mining Systems with a Database or Data Warehouse Systems –Major issues in Data Mining.

Data Pre-processing: Descriptive Data Summarization – Data Cleaning –Data Integration and Transformation – Data Reduction –Data Discretization and Concept Hierarchy Generation.

### UNIT II DATA WAREHOUSE AND ASSOCIATION RULES (12 HOURS)

Data Warehouse and OLAP technology: What is Data Warehouse? – A Multidimensional Data Model – Data Warehouse Architecture – Data Warehouse implementation –Development of Data Cube Technology – Multi dimensional Data Analysis in Cube Space.

Basic concepts – Efficient and Scalable Frequent Itemset Mining Methods – Mining Various Kinds of Association Rules - From Association Mining to Correlation Analysis – Constraint-Based Association Mining.

### UNIT III CLOUD COMPUTING – IAAS, PAAS, SAAS (12 HOURS)

The Evolution of Cloud Computing – Hardware Evolution – Internet Software Evolution – Server Virtualization – Communication as a Service – Infrastructure as a Service – Monitoring as a Service – Platform as a Service – Software as a Service.

Building Cloud Networks – Evolution from MSP to cloud – The Cloud Data Center – Service Oriented Architectures – Basic Approach to Data Centered SOA.

### UNIT IV SECURITY AND COMMON STANDARDS (12 HOURS)

Security in the Cloud – Challenges – Security Governance – Risk Management – Security Awareness – Security Monitoring and Incident Response – Security Architecture Design – Data Privacy – Governance – Security.

Common Standards in Cloud Computing – Standards for Application Developers – Standards for Messaging.

## **UNIT V CLOUD BASED SERVICES AND APPLICATIONS**

**(12 HOURS)**

Cloud Based Services and Applications – Cloud Services and Platforms – Compute Services – Storage Services – Database Services – Application Services – Content Delivery Services – Analytic & Deployment Services.

Hadoop & MapReduce – Job Execution – Schedulers – Cluster Setup – Cloud Application Development using Python.

### **TEXT BOOKS**

1. Jiawei Han, MichelineKamberJian Pei, “Data Mining: Concepts and Techniques”, Third Edition, Morgan Kauffman Publishers, 2012. **(Unit : I& II)**
2. John W. Rittinghouse, James F. Ransome “Cloud Computing – Implementation, Management and Security, Second Edition, CRC Press, 2017. **(Unit : III & IV)**
3. ArshdeepBahga, Vijay Madiseti, “Cloud Computing – A Hands-on Approach”, Universities Press, 2018. **(Unit : V)**

### **REFERENCE BOOKS**

1. Mohammed J.Zaki, Wagner Meira JR, “Data Mining and Analysis”, First Edition, Cambridge University Press, 2014.
2. Charu C. Aggarwal, “Data Mining”, First Edition, Springer, 2015
3. Anthony . T. Velte, Toby J. Velte, Robert Elsen Peter, “ Cloud Computing A Practical Approach”, McGraw Hill, 2014.
4. Michael Miller, “Cloud Computing: Web Based Applications that change the way you work and collaborate online”, Eighth Impression, Pearson Education, 2013.
5. Thomas Erl, Ricardo Puttini, Zaigham Mahmood, “Cloud Computing: Concepts, Technology & Architecture”, Prentice Hall, 2013.

### **WEB RESOURCES**

- ❖ <https://www.geeksforgeeks.org/cloud-computing-tutorial/>
- ❖ <https://www.geeksforgeeks.org/data-mining/>



**MACHINE LEARNING**  
**(Course Code: 23PCAE21)**

<b>SEMESTER - II    ELECTIVE-T3    HOURS - 4    CREDITS - 3    TOTAL HOURS: 60</b>
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**COURSE OUTCOMES:**

On successful completion of the course, the learners will be able to

- CO1:** Describe the types of Machine Learning and its applications. **(K1)**
- CO2:** Discuss about Feature Engineering and Bayesian Concept Learning. **(K2)**
- CO3:** Illustrate the Supervised Learning and Model Representation. **(K3)**
- CO4:** Classify the Decision Tree Algorithms and Clustering Techniques. **(K4)**
- CO5:** Evaluate the Support Vector Machine and Unsupervised Learning Algorithms. **(K5)**
- CO6:** Design a Basic Artificial Neural Network using Deep Learning Techniques. **(K6)**

**UNIT I INTRODUCTION TO MACHINE LEARNING (12 HOURS)**

Need for Machine Learning – Types of Machine Learning: Supervised Learning – Unsupervised Learning – Reinforcement Learning – Applications of Machine Learning – Type of Data in Machine Learning – Data Quality and Data Pre-Processing – Tools in Machine Learning.

**UNIT II MODELING, EVALUATION, FEATURE ENGINEERING AND BAYESIAN CONCEPT LEARNING (12 HOURS)**

Selecting Model – Training Model – Model Representation and Interpretability –Evaluating performance of a model – Improving performance of model – Define Feature Engineering – Feature transformation – Feature subset selection – Bayesian theorem and concept learning.

**UNIT III SUPERVISED LEARNING: CLASSIFICATION AND REGRESSION (12 HOURS)**

Introduction to Supervised Learning – Its examples – Classification model – Classification learning steps – Classification algorithms: K-nearest Neighbor (KNN) – Decision Tree – Random forest – Support Vector Machine (SVM) – Introduction to Regression and its examples – Regression algorithms: Simple Linear Regression – Multiple Linear Regression – Problems in Regression Analysis – Logistic Regression.

**UNIT IV UNSUPERVISED LEARNING: CLUSTERING AND FINDING PATTERNS (12 HOURS)**

Introduction to Unsupervised Learning – Supervised Learning vs. Unsupervised Learning – Application of Unsupervised Learning – Clustering: Types of clustering techniques – Partitioning methods – K-Medoid – Hierarchical clustering – Density based methods – DBSCAN – Finding patterns using Association Rules – Apriori Algorithm.

**UNIT V BASICS OF NEURAL NETWORK (12 HOURS)**

Introduction – Artificial neuron – Types of activation functions – Implementation of ANN – Architectures of Neural Network – Learning process in ANN – Active Learning – Memory based Learning – Bootstrap aggregation (bagging) – Boosting – Gradient Boosting Machines (GBM) – Introduction to Deep Learning and its need and applications.

**TEXT BOOK**

Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, “Machine Learning”, First Edition, Pearson, 2018.

**REFERENCE BOOKS**

1. Vincy Joseph, Anuradha Srinivasaraghavan, “Machine Learning”, First Edition, Wiley Publication, 2019.
2. Rajiv Chopra, “Machine Learning”, Second Edition, Khanna Publishing Ltd., 2018.

**WEB RESOURCES**

- ❖ <https://www.geeksforgeeks.org/machine-learning/>
- ❖ [https://www.tutorialspoint.com/machine\\_learning/](https://www.tutorialspoint.com/machine_learning/)

**OPERATING SYSTEMS**  
**(Course Code: 23PCAE22)**

<b>SEMESTER - II    ELECTIVE-T4    HOURS - 4    CREDITS - 3    TOTAL HOURS: 60</b>
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**COURSE OUTCOMES**

- CO1:** Describe the Operating System Operations, Structures and Processes. **(K1)**
- CO2:** Interpret the various types of threads and CPU scheduling algorithms. **(K2)**
- CO3:** Demonstrate Critical Section Problem, Semaphores and Monitors. **(K3)**
- CO4:** Analyze Main Memory and Virtual Memory. **(K4)**
- CO5:** Classify Disk Scheduling, RAID structure, Distributed Systems and Network-Based Operating Systems. **(K4)**
- CO6:** Summarize the methods for handling deadlock. **(K5)**

**UNIT I INTRODUCTION AND PROCESSES (12 HOURS)**

Introduction to Operating system – Computer System Organization – Computer System Architecture – Operating System Operations – Process Management – Memory Management – Storage Management – Protection and Security – Open Source Operating Systems. Operating System Structures: Operating System Services – User and Operating System Interface – Operating System Structure.

Processes: Process Concept – Process Scheduling – Operations on Processes – Interprocess Communication – Communication in Client-Server Systems.

**UNIT II THREADS, SCHEDULING AND DEADLOCKS (12 HOURS)**

Threads : Overview – Multithreading Models – Threading Issues – CPU Scheduling : Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Deadlocks : Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock.

**UNIT III SYNCHRONIZATION (12 HOURS)**

Process Synchronization : Background – The Critical Section Problem – Peterson’s Solution – Synchronization Hardware – Semaphores – Classical Problems of Synchronization – Monitors – Alternative Approaches.

**UNIT IV MEMORY MANAGEMENT (12 HOURS)**

Main Memory : Background – Swapping – Contiguous Memory Allocation – Segmentation – Paging – Structure of the Page Table – Virtual Memory: Background – Demand Paging – Copy-on-Write – Page Replacement – Allocation of Frames – Thrashing.

**UNIT V STORAGE MANAGEMENT AND DISTRIBUTED SYSTEMS (12 HOURS)**

Mass-Storage Structure : Overview – Disk Structure — Disk Scheduling – RAID Structure – File-System Implementation : File-System Structure – Allocation Methods – Distributed Systems : Advantages of Distributed Systems – Types of Network-based Operating Systems – Network Structure – Communication structure.

**TEXT BOOK**

Silberschatz, Galvin and Gagne, “Operating System Concepts”, Ninth Edition, John Wiley and Sons Inc. Publications, 2013.

**REFERENCE BOOKS**

1. Archer Harris. J, “Operating Systems - Schaum’s Outlines”, First Edition, McGraw Hill Education, 2020.
2. Mukesh Singhal, Niranjana Shivaratri, “Advanced Concepts in Operating Systems”, First Edition, Mc Graw Hill Education, 2017.
3. Andrew S. Tanenbaum, Herbert Bos, “Modern Operating Systems”, Fourth Edition, Pearson Education India, 2016.

**WEB RESOURCES**

- ❖ <https://www.geeksforgeeks.org/operating-systems/>
- ❖ [https://www.tutorialspoint.com/operating\\_system/](https://www.tutorialspoint.com/operating_system/)

**INTERNET OF THINGS**  
**(Course Code: 23PCAE22)**

<b>SEMESTER - II    ELECTIVE-T4    HOURS - 4    CREDITS - 3    TOTAL HOURS: 60</b>
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**COURSE OUTCOMES:**

On successful completion of the course, the learners will be able to

**CO1:** Describe the characteristics, physical and logical design of IoT. **(K1)**

**CO2:** Differentiate IoT and M2M. **(K2)**

**CO3:** Examine various Amazon web services for IoT. **(K3)**

**CO4:** Illustrate IoT using various case studies. **(K4)**

**CO5:** Develop applications using Raspberry Pi with Python. **(K6)**

**CO6:** Perform data analysis using Mapreduce Programming Model. **(K6)**

**UNIT I    INTRODUCTION AND DOMAIN SPECIFIC IOTS    (12 HOURS)**

Introduction – Definition and Characteristics of IoT – Physical design of IoT – Logical Design of IoT – IoT enabling technologies – Domain Specific IOTs: Home Automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry – Health and Lifestyle.

**UNIT II IOT SYSTEM MANAGEMENT AND DESIGN METHODOLOGY    (12 HOURS)**

IoT and M2M: Introduction – M2M – Difference between IoT and M2M – SDN and NFV for IoT – Software Defined Networking – Need for IoT System Management SNMP – Network operator requirements – NETCONF – YANG – IoT System Management with NETCONF-YANG – IoT Design methodology.

**UNIT III IoT SYSTEMS LOGICAL DESIGN AND PHYSICAL DEVICES    (12 HOURS)**

IoT Systems – Logical Design using Python – Python data types and data structures – Control flow – Functions – Modules – Packages – File Handling – Date/Time operations – Classes – Python packages for IoT – IoT Physical devices and endpoints: Basic building blocks of IoT devices – Exemplary device: Raspberry Pi – Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming Raspberry Pi with Python.

**UNIT IV    IOT PHYSICAL SERVERS, WEB SERVICES AND CASE STUDIES    (12 HOURS)**

Introduction to Cloud storage models and Communication APIs – WAMP – Python Web Application Framework - DJANGO – Amazon Web Services for IoT – Amazon EC2 – Amazon Autoscaling – Amazon S3 – AmazonRDS – Case studies illustrating IoT – Smart Lighting – Home Intrusion System – Forest Fire Detection – Smart Irrigation – IoT printer.

**UNIT V    DATA ANALYTICS AND TOOLS FOR IOT    (12 HOURS)**

Introduction – Apache Hadoop – Mapreduce Programming Model – Hadoop Mapreduce Job Execution – Mapreduce Job Execution Workflow – Hadoop Cluster Setup – Tools for IoT – Chef – Setting up Chef – Chef Case studies – Puppet – Puppet case study.

**TEXT BOOK**

Arshdeep Bahga, Vijay Madiseti, “Internet of Things: A Hands-on Approach”, First Edition, Universities Press, 2016.

**REFERENCE BOOKS**

1. Anand Tamboli, “Build your own IoT Platform”, First Edition, APress, 2019.
2. Yashavant Kanetkar, Shrirang Korde, “21 IOT Experiments”, BPB Publications, 2018.
3. Raj Kamal, “Internet of Things Architecture and Design Principles”, First Edition, Mc Graw Hill Education, 2017.

**WEB RESOURCES**

- ❖ <https://www.javatpoint.com/iot-internet-of-things>
- ❖ [https://www.tutorialspoint.com/internet\\_of\\_things](https://www.tutorialspoint.com/internet_of_things)

## OPTIMIZATION TECHNIQUES

(Course Code: 23PCAS21)

<b>SEMESTER - II</b>	<b>SEC-1</b>	<b>HOURS - 4</b>	<b>CREDITS – 3</b>	<b>TOTAL HOURS: 60</b>
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### COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

**CO1:** Identify the formulation and solving techniques of Linear Programming Problem. **(K1)**

**CO2:** Interpret the Two Phase method effectively. **(K2)**

**CO3:** Solve Integer Programming Problem. **(K3)**

**CO4:** Analyze the Assignment and Transportation Problems. **(K4)**

**CO5:** Evaluate the Sequencing Problems and Queueing Models. **(K5)**

**CO6:** Design the optimal solution using PERT and CPM techniques. **(K6)**

### UNIT I INTRODUCTION, LINEAR PROGRAMMING PROBLEM (12 HOURS)

**The Nature and Meaning of OR** – Management – Applications of OR – Modeling in OR – General methods for solving OR models – Scope of OR .

**Linear Programming Problem:** Formulation of LP problems – Graphical solution of LP problems – General formulation of LPP – Slack and Surplus variables – Standard form of LPP – Some important forms of LPP – Simplex Method and its special cases.

### UNIT II ARIFICIAL VARIABLE TECHNIQUES AND IPP (12 HOURS)

**Artificial Variable Techniques:** Two Phase method and special cases.

**Integer Programming Problem:** Importance – Definitions – Gomory's Pure Integer Programming Problem – Mixed Integer Programming Problem.

### UNIT III ASSIGNMENT AND TRANSPORTATION PROBLEMS (12 HOURS)

**Assignment Problem:** Mathematical formulation – Hungarian method – Unbalanced assignment problem – Various types.

**Transportation Model:** Mathematical formulation – Matrix form – Methods for finding Initial Basic Feasible solution and Optimal solution – Degeneracy in Transportation Problems – Unbalanced Transportation Problem.

### UNIT IV SEQUENCING PROBLEMS AND QUEUING MODELS (12 HOURS)

**Sequencing Problems:** Assumptions – Solutions to Sequencing Problems: Processing n jobs through 2 machines – Processing n jobs through 3 machines – Processing n jobs on m machines.

**Queueing Models:** Queueing System – Transient and Steady States – Kendal's Notation for representing Queueing Models – Various Models in Queueing System – Birth and Death Model.

### UNIT V PERT AND CPM TECHNIQUES (12 HOURS)

**PERT and CPM Techniques:** Basic Steps – Network Diagram representation – Rules for drawing Network Diagram – Labeling Fulkerson's I-J Rule – Time Estimates and Critical Path in Network Analysis – Examples on optimum duration and minimum duration cost – PERT.

### TEXT BOOK

S.D. Sharma, "Operations Research", Tenth Edition, Pearson, 2017.

### REFERENCE BOOKS

1. Hamdy Taha, "Operations Research", Ninth Edition, 2016.
2. V. Sundaresan, K.S. Ganapathy Subramanian, K. Ganesan, "Resource Management Techniques", Ninth Edition, A.R. Publications, 2015.

### WEB RESOURCES

1. [https://deeplearning.neuromatch.io/tutorials/W1D5\\_Optimization/student/W1D5\\_Tutorial1](https://deeplearning.neuromatch.io/tutorials/W1D5_Optimization/student/W1D5_Tutorial1)
2. <https://www.geeksforgeeks.org/optimization-techniques-set-1-modulus/>

**DATA STRUCTURES AND ALGORITHMS**  
(Course Code : 23PCAC31)

<b>SEMESTER – III</b>	<b>CORE – T6</b>	<b>HOURS – 4</b>	<b>CREDITS – 4</b>	<b>TOTAL HOURS: 60</b>
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**COURSE OUTCOMES**

On successful completion of the course, the learners will be able to

- CO1:** Get the basic knowledge about Data Structures. **(K1)**
- CO2:** Acquire an exposure in the development of Algorithms. **(K2)**
- CO3:** Gain knowledge about Stacks and Queues. **(K3)**
- CO4:** Understand the concepts about Trees and Graphs. **(K4)**
- CO5:** Acquire basic knowledge about Dynamic Programming. **(K5)**
- CO6:** Assess various algorithmic techniques. **(K6)**

**UNIT I ANALYSIS OF ALGORITHMS AND ARRAYS (12 HOURS)**

**Introduction:** Definitions – Structure and Properties of Algorithms – Development of an algorithm – Data Structures and Algorithms – Data Structure Definition and Classification.  
**Analysis of Algorithms:** Efficiency of Algorithms – Apriori Analysis – Asymptotic Notations – Time complexity of an Algorithm using O notation – Average, Best and Worst Case complexities.  
**Arrays:** Introduction – Array Operations – Number of elements in an array – Representation of arrays in memory – Applications.

**UNIT II STACKS, QUEUES AND LINKED LISTS (12 HOURS)**

**Stacks:** Introduction – Stack operations: push and pop operations – Applications of Stack: Recursive programming - Evaluation of expressions. **Queues:** Introduction – Operations on Queues: insert and delete operations – Circular Queues – Operations on Circular Queues: insert and delete operations – Application of Linear Queue. **Linked Lists:** Introduction – Singly linked list - Insertion and deletion in a singly linked list – Circularly linked list – Operations on Circularly linked lists - Doubly linked list – Operations on doubly linked lists – Applications: Addition of polynomials - Representation of a sparse matrix.

**UNIT III TREES, BINARY TREES AND GRAPHS (12 HOURS)**

**Trees and Binary Trees:** Introduction – **Trees:** Definition and basic terminology – Representation of Trees – **Binary Trees:** Basic Terminology - types of Binary Trees – Representation of Binary Trees – Binary Tree Traversal: Inorder Traversal - Preorder Traversal - Postorder Traversal. **Graphs:** Introduction – Definition and Basic Terminology: Graph – Multigraph – Directed and Undirected graph – Complete graph – subgraph – Connected graph. Representation of Graphs – Graph Traversals: Breadth first traversal - Depth first traversal – Applications: Determination of Single Source Shortest path - Extraction of minimum cost spanning trees.

**UNIT IV SEARCHING AND GREEDY METHOD (12 HOURS)**

**Searching:** Introduction – Linear Search: Ordered linear search - Unordered linear search. Transpose Sequential Search – Binary Search: Decision tree for binary search. Fibonacci Search:

Decision tree for binary search. **Greedy Method:** General Method – Knapsack Problem – Spanning Tree – Minimum Cost Spanning Trees.

**UNIT V      SORTING AND DYNAMIC PROGRAMMING      (12 HOURS)**

**Internal Sorting:** Introduction – Bubble sort – Insertion sort – Selection sort – Merge sort – Quick sort. **Dynamic Programming:** General Method –Single Source Shortest Path Problem–Travelling Sales Man Problem.

**TEXT BOOK**

G.A.Vijayalakshmi Pai, “Data Structures and Algorithms Concepts, Techniques and Applications” , Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

**REFERENCE BOOKS**

1. Ellis Horowitz and Sartaj Sahani, “Fundamentals of Data Structures”, Computer Science Press Inc, Galgotia Book Sources Publishers, New Delhi., 2010.
2. Ellis Horowitz and Sartaj Sahani, “ Fundamentals of Computer Algorithms”, Computer Science Press Inc, Galgotia Book Sources Publishers, New Delhi., 2016

**WEB RESOURCES**

- ❖ <https://www.javatpoint.com/data-structure-tutorial>
- ❖ [https://www.tutorialspoint.com/data\\_structures\\_algorithms](https://www.tutorialspoint.com/data_structures_algorithms)



Permission for Internet Access - Using Databases: Using the SQLiteOpenHelper Class - Building an SQLite Project - Fetching the Desired Rows from Tables -Using Cursors - Displaying Table Rows Via ListView

### **TEXTBOOKS**

1. J.F. DiMarzio, “Beginning Android Programming with Android Studio”, Fourth Edition, John Wiley & Sons Inc., 2017.
2. B.M..Harwani, “Android Programming Unleashed”, Pearson Education, Inc., I edition 2013

### **REFERENCE BOOKS**

1. Wei-Meng Lee, “Beginning Android 4 Application Development”, Wiley India Pvt. Ltd., 2011.
2. James C. Sheusi, “Android Application Development for Java Programmers”, Cengage Learning India Private Limited, New Delhi, 2013.
3. Ed Burnette, “Hello Android: Introducing Google’s Mobile Development Platform”, Fourth Edition, The Pragmatic Programmers, New Delhi, 2015
4. Dawn Griffiths and David Griffiths, “Head First Android Development”, Second Edition, Shroff/O’Reilly, 2018.
5. John Horton, “Android Programming for Beginners”, Second Edition, Packt Publishing Limited, 2018.
6. M. M. Sharma, Rashmi Aggarwal, “Android Programming for Beginners”, First Edition, BPB Publications, 2018.
7. Ian F. Darwin, Android Cookbook: Problems and Solutions for Android Developers, Second Edition, O’Reilly Media, Inc., 2017.

### **WEB RESOURCES**

- ❖ <https://www.javatpoint.com/android-tutorial>
- ❖ <https://www.tutorialspoint.com/android/index.htm>
- ❖ <https://www.geeksforgeeks.org/android-tutorial/>
- ❖ <https://www.tutlane.com/tutorial/android>





User defined objects - Defining Methods for an Object – Number object – Boolean object – String object – Array object: Array Properties - Array Methods.

### **TEXT BOOKS**

1. C. Xavier, “World Wide Web design with HTML”, Fifth Edition, McGraw Hill Publication, 2017.
2. Matt Lambert, "Learning Bootstrap 4", Packt Publishing, Second Edition, 2016.
3. Kevin Tatroe, Peter MacIntyre, and Rasmus Lerdorf, "Programming PHP", Third Edition, O’Reilly Publications, 2013.

### **REFERENCE BOOKS**

1. Jon Duckett, “Beginning Web Programming with HTML, XHTML, and CSS”, Second Edition, Wiley Publishing Inc.
2. Yehuda Shiran and Tomer Shirar, “Learn Advanced Java Script Programming”, BPB Publications, New Delhi.

### **WEB RESOURCES**

- ❖ <https://www.tutorialspoint.com/javascript/index.htm>
- ❖ <https://www.w3schools.com/js/>
- ❖ <https://www.javatpoint.com/javascript-objects>

**PRACTICAL : DATA STRUCTURES AND ALGORITHMS**  
**(Course Code: 23PCAC34)**

<b>SEMESTER : III    CORE-P5    HOURS : 4    CREDITS : 3    TOTAL HOURS :60</b>
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**LIST OF PROGRAMS**

1. Program to perform matrix operations.
2. Program to implement Stack Operations.
3. Program to implement Queue Operations.
4. Program to implement Tree traversals.
5. Program to implement Singly Linked List.
6. Program to implement Linear Search
7. Program to implement Binary Search
8. Program to implement Merge sort.
9. Program to implement Quick sort.

## **PRACTICAL : ANDROID PROGRAMMING**

**(Course Code : 23PCAC35)**

<b>SEMESTER – III</b>	<b>CORE – P6</b>	<b>HOURS – 4</b>	<b>CREDITS – 3</b>	<b>TOTAL HOURS: 60</b>
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### **LIST OF PROGRAMS**

1. Program to implement Activity Life Cycle
2. Program to use Multiple Layouts
3. Program to display alert messages
4. Program to display Text using Styles
5. Program using Check Boxes and Radio Buttons
6. Program using Spinner.
7. Program using DatePicker
8. Program for Menu Creation
9. Program to display an image in ImageView
10. Program to load a Web Page in a WebView
11. Program using Android Resources.
12. Program to move to the Second Activity
13. Program using SQLite database

## **PRACTICALS - WEB TECHNOLOGIES**

**(Course Code: 23PCAC36)**

<b>SEMESTER : III</b>	<b>CORE-P7</b>	<b>HOURS : 4</b>	<b>CREDITS : 2</b>	<b>TOTAL HOURS : 60</b>
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### **LIST OF PROGRAMS**

1. Design a web page in HTML using tables.
2. Design a web page in HTML using List.
3. Design a web page in HTML using frames with External CSS.
4. Design a web page in HTML using forms with Internal CSS.
5. Design a web page in XML using CSS.
6. Design a web site in PHP using string functions.
7. Design a web site in PHP using Numericfunctions.
8. Design a web site in PHP using Array.
9. Design a web site in PHP using forms.
10. Design a web site in PHP using cookies.
11. Design a web site in PHP using session.
12. Design a web site in PHP using database.
13. Design a web page usingJavaScript Functions
14. Design a web site using JavaScript Form Object Methods









**INTERNSHIP**  
**23PCAI35**

**SEMESTER – III**

**CREDITS – 2**

- All PG students will undergo internship during the summer holidays of the first year after completing II semester.
- Two credits will be given for internship.
- Minimum Days: 30
- Minimum working time per day: 3 Hrs. & Maximum working Time: 5 Hrs.
- The places of internship can be government offices, Panchayats, MP, MLA offices, private institutions, companies, production units etc.
- The HoD of the departments will give a letter of introduction to each student.
- The students will identify the company / institution for internship.
- The students will be divided equally based on the number of professors available in the departments. Each professor will serve as a guide to the assigned students.
- The students will finalize the institutions / companies for the internship in consultation with the guides.
- The students shall maintain a work diary which will be countersigned by the managers / authorities of the company in which the students do the internship on daily basis.
- The work diary, Work completion certificate obtained from the company and a comprehensive report on the learning outcomes will be submitted to the guides at the end of the internship.
- Viva will be conducted based on the experience of the internship in the month of August. The guide will be the internal examiner and another faculty from the same department will serve as the external examiner.

**VALUE ADDED COURSES**  
**EDGE COMPUTING**  
**(Course Code :23PCAVA1)**

<b>SEMESTER - I</b>	<b>HOURS - 2</b>	<b>CREDITS- 3</b>	<b>TOTAL HOURS: 30</b>
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**COURSE OUTCOMES:**

On successful completion of the course, the learners will be able to

- CO1:** Describe the basic concepts of Edge Computing. **(K1)**
- CO2:** Interpret the architectures of Edge Computing. **(K2)**
- CO3:** Analyze the concepts of distributed systems in Edge Computing. **(K3)**
- CO4:** Examine the lightweight edge clouds and its services. **(K4)**
- CO5:** Evaluate the Edge analytics topologies for M2M and WSN network. **(K5)**
- CO6:** Assess the use cases of machine learning and deep learning with Edge Computing. **(K5)**

**UNIT I INTRODUCTION (6 HOURS)**

Introduction to Cloud and its limitations to support low latency and RTT – From Cloud to Edge computing: Waves of innovation – Introduction to Edge Computing Architectures.

**UNIT II DISTRIBUTED SYSTEMS IN EDGE COMPUTING (6 HOURS)**

Edge Computing to support User Applications (5G-Slicing, self-driving cars and more) – Concepts of distributed systems in edge computing such as time ordering and clock synchronization, distributed snapshot, etc.

**UNIT III EDGE CLOUD SERVICES (6 HOURS)**

Introduction to Edge Data Center– Lightweight Edge Clouds and its services provided by different service providers – Introduction to docker container – Kubernetes in edge computing – Design of edge storage systems like key-value stores.

**UNIT IV MQTT AND KAFKA (6 HOURS)**

Introduction to MQTT and Kafka for end-to-end edge pipeline – Edge analytics topologies for M2M and WSN network (MQTT).

**UNIT V EDGE SENSOR DATA IN MACHINE LEARNING (6 HOURS)**

Use cases of machine learning for edge sensor data in predictive maintenance, image classifier and self-driving cars – Deep Learning On-Device inference at the edge to support latency-based application.

**TEXT BOOK**

Rajkumar Buyya, Satish Narayana Srirama, “Fog and Edge Computing: Principles and Paradigms”, First Edition, Wiley, 2019.

**REFERENCE BOOKS**

1. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, “Cloud Computing: Principles and Paradigms”, First Edition, Wiley, 2011.
2. Rajiv Misra, Yashwant Patel, “Cloud and Distributed Computing: Algorithms and Systems”, First Edition, Wiley, 2020.

**WEB RESOURCES**

- ❖ [https://onlinecourses.nptel.ac.in/noc24\\_cs66/preview](https://onlinecourses.nptel.ac.in/noc24_cs66/preview)  
(NPTEL Online Course videos by Dr. Rajiv Misra, IIT, Patna)
- ❖ <https://www.frontiersin.org/articles/10.3389/fenrg.2022.850252/full>

## PRIVACY AND SECURITY IN ONLINE SOCIAL MEDIA

(Course Code : 23PCAVA2)

<b>SEMESTER - II</b>	<b>HOURS - 2</b>	<b>CREDITS- 3</b>	<b>TOTAL HOURS: 30</b>
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### COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

**CO1:** Describe the challenges, opportunities and pitfalls in online social networks. **(K1)**

**CO2:** Interpret the credibility in social systems. **(K2)**

**CO3:** Analyze Policing in Online Social Media. **(K3)**

**CO4:** Classify the revelation and its effects in OSM. **(K4)**

**CO5:** Examine the phishing process in Online Social Media. **(K5)**

**CO6:** Summarize the ideas observed in various research papers. **(K5)**

### UNIT I INTRODUCTION (6 HOURS)

What is Online Social Networks – Data collection from social networks – Challenges – Opportunities and pitfalls in online social networks – APIs.

### UNIT II TRUST, CREDIBILITY AND REPUTATIONS (6 HOURS)

Trust in social systems – Credibility in social systems – Reputations in social systems.

### UNIT III POLICING AND REVELATION IN OSM (6 HOURS)

Online Social Media and Policing – Information privacy disclosure – Revelation and its effects in OSM – Online social networks.

### UNIT IV PHISHING (6 HOURS)

Phishing in Online Social Media – Identifying fraudulent entities in online social networks.

### UNIT V RESEARCH WORK DISCUSSION (6 HOURS)

Refresher for all topics – Research paper discussion.

### TEXT BOOK

B. K. Tripathy, Kiran Baktha, “Security, Privacy, and Anonymization in Social Networks: Emerging Research and Opportunities”, First Edition, IGI Global Publications, 2018.

### REFERENCE BOOKS

1. Nick Vandome, “100 Top Tips - Stay Safe Online and Protect Your Privacy”, In Easy Steps Limited, 2019.
2. Matt Reyes, “Cyber Security: How to Protect Your Digital Life, Avoid Identity Theft, Prevent Extortion, and Secure Your Social Privacy in 2020 and beyond”, Personal Development Publishing, 2019.

### WEB RESOURCES

1. [https://onlinecourses.nptel.ac.in/noc24\\_cs04/preview](https://onlinecourses.nptel.ac.in/noc24_cs04/preview)  
(SWAYAM/NPTEL Online Course videos by Prof. Ponnurangam Kumaraguru, IIIT, Hyderabad)
2. <https://research.vit.ac.in/publication/on-privacy-and-security-in-social-media>

**INTRODUCTION TO INDUSTRY 4.0 AND INDUSTRIAL INTERNET OF THINGS**  
(Course Code : 23PCAVA3)

<b>SEMESTER - II</b>	<b>HOURS - 2</b>	<b>CREDITS- 3</b>	<b>TOTAL HOURS: 30</b>
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**COURSE OUTCOMES:** On successful completion of the course, the learners will be able to

- CO1:** Describe the basic ideas of Industry 4.0. **(K1)**
- CO2:** Discuss the IIoT Business Models and Reference Architectures. **(K2)**
- CO3:** Examine the IIoT Layers and IIoT Analytics. **(K3)**
- CO4:** Analyze the Real Case Studies in IIoT. **(K4)**
- CO5:** Classify the various Application Domains. **(K4)**
- CO6:** Evaluate Security and Fog Computing in IIoT. **(K5)**

**UNIT I INTRODUCTION TO INDUSTRY 4.0 (6 HOURS)**

Introduction: Sensing & actuation – Communication– Networking– Industry 4.0: Globalization and Emerging Issues – The Fourth Revolution – LEAN Production Systems – Smart and Connected Business Perspective – Smart Factories– Industry 4.0: Cyber Physical Systems and Next Generation Sensors – Collaborative Platform and Product Lifecycle Management – Augmented Reality and Virtual Reality – Artificial Intelligence – Big Data and Advanced Analysis.

**UNIT II INTRODUCTION TO INDUSTRIAL IIoT (6 HOURS)**

Cyber security in Industry 4.0 – Basics of Industrial IIoT: Industrial Processes– Industrial Sensing & Actuation – Industrial Internet Systems – IIoT-Introduction – Industrial IIoT: Business Model and Reference Architecture: IIoT-Business Models– IIoT Reference Architecture– Industrial IIoT-Layers: IIoT Sensing– IIoT Processing – IIoT Communication.

**UNIT III IIoT LAYERS AND IIoT ANALYTICS (6 HOURS)**

Industrial IIoT-Layers: IIoT Communication– IIoT Networking – Big Data Analytics and Software Defined Networks: IIoT Analytics – Introduction – Machine Learning and Data Science– R and Julia Programming – Data Management with Hadoop.

**UNIT IV INDUSTRIAL IIoT-APPLICATION DOMAINS (6 HOURS)**

SDN in IIoT– Data Center Networks – Industrial IIoT: Security and Fog Computing: Cloud Computing in IIoT – Fog Computing in IIoT – Security in IIoT– Industrial IIoTApplication Domains: Factories and Assembly Line –Food Industry.

**UNIT V REAL CASE STUDIES OF IIoT (6 HOURS)**

Industrial IIoT Application Domains: Healthcare – Power Plants – Inventory Management & Quality Control – Plant Safety and Security (Including AR and VR safety applications) – Facility Management – Oil, Chemical and Pharmaceutical Industry –Applications of UAVs in Industries – Real case studies :Milk Processing and Packaging Industries– Manufacturing Industries–Student Projects – Virtual Reality Lab–Steel Technology Lab.

**TEXT BOOK**

S. Misra, C. Roy, and A. Mukherjee, “Introduction to Industrial Internet of Things and Industry 4.0”, First Edition, CRC Press. 2020.

Availability:

[https://www.amazon.in/dp/1032146753/ref=sr\\_1\\_3?dchild=1&keywords=sudip+misra&qid=1627359971&sr=8-3](https://www.amazon.in/dp/1032146753/ref=sr_1_3?dchild=1&keywords=sudip+misra&qid=1627359971&sr=8-3)

**REFERENCE BOOKS**

1. Fulong Chen, Yonglong Luo, “Industrial IIoT Technologies and Applications”, First Kindle Edition, Springer, 2017.
2. A.Suresh, Malarvizhi Nandagopal, Pethuru Raj, E.A. Neeba, Jenn-Wei Lin, “Industrial IIoT Application Architectures and Use Cases”, First Kindle Edition, CRC Press, 2020.

**WEB RESOURCES**

1. [https://onlinecourses.nptel.ac.in/noc24\\_cs34/preview](https://onlinecourses.nptel.ac.in/noc24_cs34/preview)  
(SWAYAM/NPTEL Online Course Videos by Prof. Sudip Misra, IIT, Kharagpur)
2. <https://www.geeksforgeeks.org/difference-between-iiot-and-iiot/>

**EXTRA CREDIT COURSES  
APTITUDE AND REASONING SKILLS  
(COURSE CODE: 23PCAEC1)**

<b>SEMESTER – I</b>	<b>ECC</b>	<b>CREDITS- 3</b>
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**COURSE OUTCOMES:**

On successful completion of the course, the learners will be able to

- CO1:** Identify basic skills in Analogy. **(K1)**
- CO2:** Interpret Analytical Reasoning and Verbal Reasoning. Problems. **(K2)**
- CO3:** Solve the problems with Simplifications and Average. **(K3)**
- CO4:** Analyze problems on Percentage and Partnership. **(K4)**
- CO5:** Assess Time and Work related problems. **(K5)**
- CO6:** Derive solution for the problems with Trains, Boats and Simple Interest. **(K6)**

**UNIT I ANALOGY, SERIES, CODING**

**Analogy:** Verbal Analogy – Alphabet Analogy – Number Analogy **Series:** Letter Series – Number Series **Coding:** Letter Coding – Number Coding Verbal Classification (Odd Man Out) – Dissimilarity.

**UNIT II ANALYTICAL REASONING**

**Analytical Reasoning:** Direction – Family – Relation – Symmetric Relation – Ordering – Logical Diagram. **Verbal Reasoning:** Analogies – Series – Classification

**UNIT III PROBLEMS**

Problems on Numbers – Simplification – Average.

**UNIT IV PROBLEMS**

Percentage – Ratio and Proportion – Partnership – Profit and Loss – Time and Distance – Time and Work – Problems on Ages.

**UNIT V PROBLEMS**

Problems on Trains – Boats and Streams – Simple Interest – Compound Interest.

**REFERENCE BOOKS**

1. Dr. R.S. Agarwal, “Reasoning”, S.Chand & Co. Ltd. Publications.
2. Dr. R.S. Agarwal, “Quantitative Aptitude”, S. Chand & Co. Ltd. Publications.
3. Deepak Agarwal, D.P. Gupta, “Quantitative Aptitude for Competitive Exams”, Disha Experts.

**WEB RESOURCES**

1. [https://www.tutorialspoint.com/quantitative\\_apptitude/index.htm](https://www.tutorialspoint.com/quantitative_apptitude/index.htm)
2. <https://www.javatpoint.com/apptitude/quantitative>

## COMMUNICATION AND PRESENTATION SKILLS

(Course Code: 23PCAEC2)

SEMESTER – II

ECC

CREDITS- 3

### COURSE OUTCOMES:

On successful completion of the course, the learners will be able to know the

**C01:** Basics of English grammar(**K1**)

**C02:** Methods to speak English fluently(**K2**)

**C03:** Presentation and communication theories(**K3**)

**C04:** Principles of effective communication(**K4**)

**C05:** Various styles in public speaking(**K5**)

### UNIT I BASICS OF COMMUNICATION

Understanding English Grammar – How to write and speak correctly – Speaking and writing with style – Word Choice.

### UNIT II ENGLISH FLUENCY

Methods for speaking English fluently – English pronunciation – Common mistakes speakers repeat – Use of slang – Body language – Developing the skills.

### UNIT III COMMUNICATION & PRESENTATION THEORIES

Verbal, Non-verbal communication – Making presentations – Listening skills – How to be a good communicator.

### UNIT IV THE ART OF EFFECTIVE COMMUNICATION

Significance of communication – Roadmap to effective communication – Principles for effective communication – The art and skill of good communication.

### UNIT V PUBLIC SPEAKING AND PRESENTATION

What is Public Speaking? – The art of public speaking – Language and Proficiency in Public Speaking – Group discussions and seminars.

### REFERENCE BOOKS

1. S. K. Mandal, “Effective communication & Public Speaking”, Jaico Publishing House, 2016.
2. Reena Gupta, “How to write and speak correct English”, Lotus Press and Publishers, 2012.
3. Namrata Palta, “The art of effective communication”, Lotus Press and Publishers, 2015.
4. Prem P. Bhalla, “7 steps to effective communication”, Goodwill publishing house, 2014.

### WEB RESOURCES

1. <https://www.coursera.org/articles/presentation-skills>
2. <https://www.cleverism.com/skills-and-tools/presentation-skills/>

**SCRIPTING LANGUAGES**  
**(Course Code : 23PCAEC3)**

**SEMESTER : III**

**ECC**

**CREDITS-**

**COURSE OUTCOMES**

On successful completion of the course, the learners will be able to

- CO1:** Describe the basics concepts of VB Script. **(K1)**
- CO2:** Demonstrate the arrays and VB Script Operators. **(K2)**
- CO3:** Describe the Linked Scripts and Java Script Entities. **(K3)**
- CO4:** Examine the features of Java Script. **(K4)**
- CO5:** Implement Ajax in the applications. **(K5)**

**UNIT I VB SCRIPT**

VB Script's Popularity – VBScript Defined – Platform or Host Dependence – Scripting Languages – Basics Embedding VBScript in HTML – VB Script to Display Information – Hiding VBScript from Older Browsers – Code Documentation and Formatting.

**UNIT II VB SCRIPT ARRAYS AND OPERATORS**

Variables – Subtypes – Constants – Variables Deformed – Declaring Variables – Naming Variables Variants and Subtype – Data Subtypes Conversion – Numeric and Literal Constants – Arrays Groups of Similar Variables – One Dimensional Arrays – Multi Dimensional Arrays – VBScript Operators Logic Operators – Arithmetic Operator Precedence – Comparison Operators Logic Operators – String Concatenation.

**UNIT III JAVA SCRIPT**

**Introduction to JavaScript:** Adding JavaScript to HTML Documents – Event Handlers – Linked Scripts – JavaScript Pseudo-URL – JavaScript Entities – JavaScript Applications – History of JavaScript.

**UNIT IV JAVASCRIPT CORE FEATURES**

**Overview:** Basic Definitions – Language Characteristics – Variables – Basic Data Types – Composite Types – Flow Control Statements – Loops – Functions – Input and Output in JavaScript – Regular Expressions – Comments Line.

**UNIT V AJAX**

Introduction to Ajax –AJAX – Technologies - XMLHttpRequest Object – Sending Request – Types of Request – Handling Responses – Submitting Forms – Form Data Object.

**REFERENCE BOOKS**

1. Jusaner Clark and Team, “VB Script Programmer Reference”,Shroff Publications and Distributors Pvt.Ltd.,2000.
2. Adrian Kingsley-Hughes, Kathie Kingsley-Hughes, Daniel Read, "VBScript Programmer's Reference", Third Edition, Wiley Publishing.
3. Thomas Powell and Fritz Schneider, "JavaScript 2.0 The Complete Reference", Second Edition, McGraw-Hill.
4. Yehuda Shiran and Tomer Shirar, “Learn Advanced Java Script Programming”, BPB Publications, New Delhi
5. Thomas Powell, "Ajax: The Complete Reference", McGraw-Hill.
6. Ronald Huereca, "WordPress and Ajax- An in-depth guide on using Ajax with WordPress", Second Edition.

**WEB RESOURCES**

- ❖ <https://www.tutorialspoint.com/vbscript/index.htm>
- ❖ <https://www.w3schools.com/js/>
- ❖ <https://www.javatpoint.com/ajax-tutorial>

**DIGITAL FORENSICS**  
**(Course Code : 23PCAEC4)**

<b>SEMESTER - IV</b>	<b>ECC</b>	<b>CREDITS- 2</b>
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**COURSE OUTCOMES:**

On successful completion of the course, the learners will be able to

- CO1** : Describe the rules and characteristics of Digital Evidences.(**K1**)
- CO2** : Interpret the Computer Forensic Tools.(**K2**)
- CO3** : Examine the types of Intrusion Detection Systems.(**K3**)
- CO4** : Analyze the Live Data Collection Techniques.(**K4**)
- CO5** : Evaluate Digital Evidence using Forensic Tools.(**K5**)
- CO6** : Formulate Ethical Hacking.(**K6**)

**UNIT I INTRODUCTION**

Definition of Hacker, Crackers and Phreakers – Ethical Hacking – Difference between Hacking and Ethical Hacking – Steps of Ethical Hacking – Exploring some tools for Ethical Hacking – Introduction to Digital Forensic–Types of Digital Forensics – Ethical Issues – Digital Forensic Investigations – Introduction to Digital Evidences – Rules – Characteristics – Types of Evidences – Challenges in Evidence Handling.

**UNIT II INCIDENT RESPONSE PROCESS AND LIVE DATA COLLECTION**

People involve in Incident Response Process – Incident Response Process – Incident Response Methodology – Activities in Initial Response – Phases after Detection of an Incident – Live Data Collection: People involved in Data Collection Techniques – Live Data Collection from Windows System – Live Data Collection from UNIX System.

**UNIT III FORENSIC DUPLICATION**

**Forensic Duplication:** Rules – Necessity – Important terms – Forensic Image Formats – Traditional Duplication – Live System Duplication – Forensic Duplication Tool Requirements – Creating a Forensic Duplicate of a Hard Drive – Disk and File System Analysis.

**UNIT IV DATA ANALYSIS AND NETWORK FORENSIC**

**Data Analysis:** Preparation Steps for Forensic Analysis – Investigating Windows Systems – Investigating UNIX Systems and Applications – Malware Handling – **Network Forensic:** Understanding Password Cracking – Understanding Technical Exploits – Types of Intrusion Detection System.

**UNIT V COMPUTERFORENSIC TOOLS**

**Network Forensic:** Understanding Network Intrusions and Attacks – Collecting Network-Based Evidence – Investigating Routers – Handling Router Table Manipulation Incidents – Using Routers as Response Tools – Report Writing – Layout and Guidelines for writing a report – Sample for writing a report – Computer Forensic Tools.

**TEXT BOOK**

Dr. Nilakshi Jain, Dr. Dhananjay R. Kalbande, “Digital Forensic”, First Edition, Wiley India Pvt. Ltd., 2019.

**REFERENCE BOOKS**

1. Joakim Kavrecstad, “Fundamentals of Digital Forensics Theory, Methods and Real-Life Applications”, Springer, 2020.
2. Dr. Sangita Chaudhari, Dr. Madhumita Chatterjee, “Digital Forensics”, First Edition, Star EduSolutions India Pvt. Ltd., 2019.

**WEB RESOURCES**

- ❖ [https://www.tutorialspoint.com/python\\_digital\\_forensics/](https://www.tutorialspoint.com/python_digital_forensics/)
- ❖ [https://www.tutorialspoint.com/python\\_digital\\_forensics/index.htm](https://www.tutorialspoint.com/python_digital_forensics/index.htm)