



Two-Year Postgraduate Programme

Master of Science in Information Technology

Faculty of IT & Computer Science

Parul University

Vadodara, Gujarat, India

Faculty of IT & Computer Science
Master of Science in Information Technology (M.Sc. IT)

1. Vision of the Department

To contribute towards generating resources and means for the betterment of humanity through quality educational services, active participation in community services and establishment of institutions to sensitize all stakeholders towards “Inclusive India, Progressive India.”

2. Mission of the Department

To build diligent, ethical and competitive IT professionals by imparting conceptual knowledge and experimental skills to deliver ICT based solutions to the society.

M1: To Foster Excellence in IT Education

M2: To Nurture Ethical IT Leadership

M3: To Empower Tomorrow's Technological Innovators

3. Program Educational Objectives

The statements below indicate the career and professional achievements that the M.Sc.IT curriculum enables graduates to attain.

PEO 1	To equip future-ready ICT professionals to shape society through innovative technological solutions.
PEO 2	To nurture socially conscious graduates with proven expertise, ready to lead and solve challenges, individually or in teams.
PEO 3	To prepare graduates with life-long learning attitude and strong communication skills in tandem with analytical and conceptual expertise.

4. Program Learning Outcomes

Program Learning outcomes are statements conveying the intent of a program of study.

PLO 1	Thinking with Code	Master the foundations of computing, your chosen specialization, and relevant math, then use this knowledge to turn real-world problems into powerful digital tools.
PLO 2	Cracking the Puzzle	Face complex computing challenges head-on. Use a researcher's toolkit (literature, analysis, logic) to uncover solutions backed by hard evidence.
PLO 3	Building Better	Architect and assess solutions for intricate computing problems. Design systems, components, and processes that work flawlessly, while keeping people, planet, and culture in mind.
PLO 4	Unmasking the Unknown	Use scientific methods like experiments and data analysis to explore complex problems, then weave the findings into valuable conclusions.
PLO 5	Master of Tools	Choose, build, and wield the right tech and resources for complex computing tasks, all while knowing their limits and potential.
PLO 6	Ethical Navigator	Understand and embrace professional ethics and cyber regulations. Be a responsible, rule-abiding member of the computing world.
PLO 7	Perpetual Student	Learn independently, always. Stay sharp, curious, and adaptable throughout your computing career.
PLO 8	Project Maestro	Understand how computing and management work together. Lead or join teams, manage projects, and thrive in multidisciplinary environments.

PLO 9	The Clear Communicator	Speak fluently to both tech wizards and everyday folks. Write impactful reports, craft clear documentation, deliver compelling presentations, and give instructions that hit the mark.
PLO 10	Global Citizen	Grasp the societal, environmental, legal, and cultural issues we face, both locally and globally. Take responsibility for the impact your work has on the world.
PLO 11	Team Player	Work effectively as a solo performer and as a team member or leader in diverse teams and in multidisciplinary environments.
PLO 12	Visionary Venture	Spot a golden opportunity and leverage your innovative spirit to turn it into reality. Create value and wealth that benefits all, from you to the wider world.

5. Program Specific Learning Outcomes

PSO 1	Demand as per recent development	Design the solutions as per the recent industrial demand objective.
PSO 2	Software skill	Test any apparatus and system with appropriate usage of software tools, and gather data for modelling system.

6. Credit Framework

Semester wise Credit distribution of the programme	
Semester-1	26
Semester-2	26
Semester-3	22
Semester-4	18
Total Credits:	92

7. Program Curriculum

Semester-1:

Sr. No	Subject Code	Course Title	Credits
1	05202113	Operating System with Linux	4.00
2	05202109	Advanced Database Management Systems with NoSQL	4.00

3	05202110	Object Oriented Programming using Java	4.00
4	05202114	Fundamental Mathematics & Statistics for Computer Science	5.00
5	05202112	Data Structures & Algorithms	5.00
6	05293202	Communication & Programming Skills	4.00
		Total Credits in Semester-1:	26

Semester-2:

Sr. No	Subject Code	Course Title	Credits
1	05202108	Software Engineering with Agile	4.00
2	05202155	Seminar / Research Activity (change of title)	1.00
3	05202156	Advanced Java Programming	5.00
4	05202157	Computer Networks & Network Security	5.00
5		Specialization – I	5.00
6	05293252	English and Mathematical Aptitude	2.00
7		Elective - 1 (Compulsory Subjects: 1)	4.00
		Total Credits in Semester-2:	26

Semester - 2 Elective – 1

Code	Subject
05202183	Data Science with Python
05202182	Computer Graphics
05202207	Web Application Development using ASP.NET

Semester-3:

Sr. No	Subject Code	Course Title	Credits
1	05202206	Mobile Apps Development using Android	6.00
2	05202__	Advanced Web Development using React-JS	6.00
3	05202208	Minor Project	1.00
4		Specialization - II	5.00
5		Elective - 2 (Compulsory Subjects :1)	4.00
		Total Credits in Semester-3:	22

Elective - II

Code	Subject
05202181	Software Project Management
05202286	Software Testing and Quality Assurance

0520287 IOT

Semester-4:

Sr. No	Subject Code	Course Title	Credits
1	05202256	Major Project	18
		Total Credits in Semester-4:	18
Grant Total of Credits in Four Semesters of MCA Programme:			92

PARUL UNIVERSITY - Faculty of IT & Computer Science
Department of Computer Application

DETAILED SYLLABUS FOR M.Sc. (IT)

Semester 1

(1)

- **Course Name:** Advanced Database Management Systems with NoSQL
- **Course Code:** 05202109
- **Prerequisite:** Knowledge of DBMS
- **Rationale:** This course is intended to give students advanced concepts of Relational Database Management System, security aspects of databases and introduction to other databases. Also concepts and practical aspects of data manipulation using stored procedures and triggers will be given

- **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

- **Course Learning Outcomes:**

CLO 1	Describe Software Development Life Cycle.
CLO 2	Explain software development process in association with its fundamental principles and methodologies.
CLO 3	Analyze & represent end user requirements and model requirement analysis using Unified Modeling Language.
CLO 4	Prepare & represent software design and design software model using Unified Modeling Language.
CLO 5	Define significance of project planning, effort estimation and risk management
CLO 6	Design test cases and identify testing strategies.

- **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

- **Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
1	Introduction to Databases: Basic Concepts: Data, Database, Database systems, DBMS, Purpose and advantages of DBMS. Data Models: Introduction, Three level architecture, Various components of a DBMS. Overview: Parallel database, Distributed database, Object oriented database, Object Relational Database, Comparison of RDBMS, OODBMS and ORDBMS.	10%	5
2	Relational Data Model and Database Design: Relational Structure: Tables, Rows, Columns, Entity sets, Attributes, Types of entities, Relationships and types of relationships, Database modelling using entity and relationships. Keys: Super key, Candidate keys, Primary key, Entity integrity constraints, Referential integrity constraints. Indexing: Types of single level ordered indexes, Primary index, Cluster index, Secondary index, and Multilevel index.	15%	8
3	Query Language and Database operations: Overview of SQL, Basic and Advanced queries in SQL, Aggregation, Views in SQL, Introduction of NoSQL, Relational Algebra and Calculus – basic and advanced operators.	10%	6
4	PL/SQL, Cursor and Trigger: Basic code structure, Variables, Conditional statements, Looping Structures, Cursor Operations, Triggers.	15%	7
5	Stored Procedures: Understanding the main features of stored procedures, stored procedure architecture, Advantages of using procedures. Stored procedures - functions, procedures and packages.	20%	8
6	Database Transactions and Database Security: Overview of Database Transactions, concurrency control, Deadlock Handling. Database security and its issues, Granting and Revoking privileges, Role based access control for multilevel security, Encryption and PKI, Challenges in database security.	20%	7
7	Backup and Recovery in Database: Database Backup and Recovery concepts, Database Backup and Recovery techniques, Current trends of database technologies.	10%	4
	TOTAL	100%	45

- **Text Book and Reference Book:**
- Database System Concepts
- Silberschatz, Korth, Sudarshan; McGraw Hill Publication; 4th Edition
- SQL, PL/SQL – The Programming Language Ivan Bayross; BPB Publications
- Database Management Systems
- Raghu Ramakrishnan, Johannes Gehrke; McGraw Hill Publication
- Fundamentals of Database Systems
- Ramesh Elmasari, Shamkant B. Navathe; Pearson Education

Semester 1

(1)

- **Course Name:** Object Oriented Programming using Java
- **Course Code:** 05202110
- **Prerequisite:** Knowledge of C, C++
- **Rationale:** To acquire the fundamental knowledge of Java programming.
- **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

- **Course Learning Outcomes:**

CLO1	Implement object oriented principles using java
CLO 2	Identify errors and implement exception handling mechanism.
CLO 3	Develop programs using multi-threading concepts.
CLO 4	Manage source code in Java packages.
CLO 5	Design and develop java applications using Applets, Abstract Window Toolkit and Swing API.

- **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

- **Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
	Introduction to Java Data Types, Operators, Statements:		

1	Paradigms of programming languages, Evolution of OO methodology, Basic concepts of OO approach, Comparison of object oriented and procedure oriented approaches. Concepts of OOP - classes and objects, abstraction and encapsulation, inheritance, polymorphism. Features of the Java language, Java environment, Object oriented programming in Java, Java program structure, Java and unicode, Data types, Variables and arrays - data types in Java, literals, characters, variable declaration, symbolic constants. Type casting operations in Java, Arithmetic operators, Basic assignment operators, Relational operators, Boolean logical operators, Ternary operator, Operator precedence. Control statements - Java's selection statements, switch, nested switch, iteration constructs, continue, return.	20%	8
2	Inheritance, Sub Classing, Package: Inheritance Concepts - defining sub classes, method overriding, using super keyword, Variable shadowing, Method and variable binding, Using final keyword, Abstract classes and interfaces. Object class, Packages - Creating package, CLASSPATH environment variable, access specifiers, Access Control / visibility.	20%	8

3	Exception, Collection Frameworks: Exception handling - types of exceptions, Throwable class, Keywords - try, catch, throw, throws and finally, Nested try statements, Java built in exceptions, User defined exceptions. Collection framework - Collections, List, Set, Enumeration, Iterator, ArrayList.	15%	8
4	IO and Multi Threading: java.io- File class, Creating directory, Input/Output basics, Streams (byte and character), Reading from and writing to console, Reading and writing files, PrintWriter Class, the transient modifier, RandomAccessFile, Introduction to multi-threading, Thread class and execution of thread, Runnable interface, ThreadGroup, Daemon threads, Thread states.	15%	8
5	GUI Programming and Applets: Introduction to AWT and Swing, Fundamentals of applets, Applet class, Applet life cycle, A simple banner applet, getDocumentBase(), getCodeBase(), showDocument(), AppletContext and AppletStub interface, Working with frames, windows, graphics, color, fonts. AWT controls - buttons, checkbox, choice, list and textField. Layout Managers - Flow Layout, Grid Layout and Border Layout.	30%	13

	User interface events - event classes and event listener interfaces, Adapter classes.		

- **Text Book and Reference Book:**
- The Complete Reference Java J2SE (TextBook)
- Herbert Schildt; TMH Publishing Company Ltd; 5th Edition
- Core Java Volume 1
- Cay Horstmann and Gary Cornell; Pearson Education; 8th Edition

Semester 1

(1)

- **Course Name: Operating System with Linux**
- **Course Code:** 05202111
- **Prerequisite:** Basic Knowledge of Windows OS
- **Course Learning Objective:**

CLOBJ 1	To Build the Linux operating system and configure it.
CLOBJ 2	To Discover Linux commands for working with Linux Environment.
CLOBJ 3	To Appraise the Process Management algorithms, Process Management system calls, Inter Process Communication and CPU Scheduling algorithms

- **Course Learning Outcomes:**

CLO 1	Build the Linux operating system and configure it.
CLO 2	Discover Linux commands for working with Linux Environment.
CLO 3	Appraise the Process Management algorithms, Process Management system calls, Inter Process Communication and CPU Scheduling algorithms

- **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

- **Course Content:**

Course Content

hours

W - Weightage (%) , T - Teaching

Sr.	Topics	T	W
1	Introduction: Definition and types of operating systems, Batch Systems, multi-programming, time-sharing, parallel, distributed, and real-time systems, operating system structure, Operating system components and services, System calls, system programs, and system boot. Process Management: Process concept, Process scheduling, Cooperating process, Threads, Inter-process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling and Algorithm evaluation.	9	20

- 2 **Process synchronization and Deadlocks:** The Critical-Section problem, synchronization hardware, Semaphores Classical problem of synchronization, Critical regions, Monitors, Deadlock-system model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling. 10 25
- 3 **File system and secondary storage structure:** file concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure, Disk scheduling methods, Disk management, Recovery, Swap-space management, Disk reliability. 8 20
- 4 **Introduction to Linux:** Evolution of Linux, Linux vs. UNIX, Different Distributions of Linux, Installing Linux, Linux Architecture, Linux file system (inode, Super block, Mounting and Unmounting), Essential Linux Commands (Internal and External Commands), Kernel, Process Management in Linux, Signal Handling, System call, System call for Files, Processes and Signals. 8 15
- 5 **Shell Programming:** Shell Programming – Introduction to Shell, Various Shell of Linux, Shell Commands, I/O Redirection and Piping, Vi and Emacs editor, Shell control statements, Variables, if-then-else, case-switch, While, Until, Find, Shell Meta characters, Shell Scripts, Shell keywords, Tips and Traps, Built in Commands, Handling documents, C language programming, Prototyping, Coding, Compiling, Testing and Debugging, Filters, Advanced filters: sed and awk commands. 10 20

Reference Books

1. Das S. : Your UNIX – The Ultimate Guide, Tata McGraw-Hill, 2001
2. Nemeth E., Hein T., Snyder G.: Linux Administration Handbook, 2nd edition, Pearson Education/ PH PTR, 2007
3. Kernighan B. W. and Pike R. : The Unix Programming Environment, Prentice-Hall of India, 1994
4. Sobel M.: A Practical Guide to Linux Commands, Editors, and Shell Programming, Pearson Education, 2006

Semester 1

(1)

- **Course Name: Data Structures & Algorithms**
- **Course Code: 05202112**
- **Prerequisite:** Knowledge of programming language (C/C++).
- **Rationale:** To provide understanding of basics of data structures and their operation for efficient storage and retrieval of data.
- **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

- **Course Learning Outcomes:**

CLO 1	Describe the significance of various linear and non-linear data structures such as arrays, stack, queue, linked list, trees and graph.
CLO 2	Identify the appropriate data structure for a given problem.
CLO 3	Construct most suitable data structure to solve a problem by considering various problem characteristics such as data size and various type of operations.
CLO 4	Design and implement various techniques for searching, sorting and hashing.

• **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	2	5	20	20	20	60	30	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

• **Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
1	Introduction: Primitive and non-primitive data structures, String manipulation and pattern matching, Storage representation of strings, Text handling, Key Word In Context (KWIC) indexing, Arrays, Storage structure for arrays, Special types of arrays – triangular and sparse.	10%	7
2	Stack and Queue: Stack, Stack operations, Applications of stack - recursion, polish notations - prefix, infix, postfix, Algorithms of stack applications, Introduction to queue, Algorithms and implementation of simple queue, Circular queue, Double ended queue, Priority queue.	20%	12
3	Linked List: Linked list, Algorithms and implementation of singly linked list, Doubly linked list, Circular linked list, Operations on linked list, Applications – polynomial representation, addition of two polynomials.	20%	8
4	Trees: Concept and terminologies of tree, General tree, Binary tree and its storage representation, Binary search tree and its operations – create, insert, delete, Traversal of tree - inorder, preorder, postorder, Threaded tree, B tree and B+ tree, Height balanced tree - AVL tree, Rotations in AVL tree, Applications – heap tree, expression tree.	20%	12
5	Graph: Concept and terminologies of graph, Representation of graph - adjacency matrix, adjacency lists, Introduction to graph traversal - Depth First Search (DFS), Breadth First Search (BFS), Introduction to spanning tree.	10%	5

6	Searching, Sorting and Hashing:		
	Linear search, Binary search, Bubble sort, Selection sort, Insertion sort, Shell sort, Quick sort, Heap sort, Merge sort, Radix sort, Hashing, Hashing functions, Collision resolution techniques.	20%	13
	TOTAL	100%	45

• **Text Book and Reference Book:**

- An Introduction to Data Structures with Applications (TextBook)
- Jean-Paul Tremblay, Paul G. Sorenson; Tata McGraw-Hill; 2nd Edition, (2007)
- Introduction to Algorithm
- Cormen, Leiserson, Rivest, Stein; PHI (2003); 2nd Edition
- Data Structures using C and C++ Tanenbaum; PHI
- Expert Data Structures with C
- R. B. Patel
- Theory and Problems of Data Structures
Seymour Lipschutz; Schaum's Outline Series
- Data Structures Through C++ Yashavant Kanetkar; BPB

Semester 1

(1)

Course Name: Fundamental of Mathematics and Statistics for computer science

Course: MScIT

Prerequisite: Knowledge of mathematical logic.

Rationale: To acquire fundamental knowledge and apply it Computer Application discipline.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	2	0	-	5	20	20	-	60	-	100

SEE - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

Course

Content

Teaching hours

W - Weightage (%) , **T** -

Sr. Topics

W T

1 Logics and Proofs

13 6

Introduction, Propositional logic, Propositional equivalences, Predicates and quantifiers, Nested quantifiers, Rules of inference, Introduction to proofs.

2 Basic Structures: Sets, Functions, and Relations

13 6

Sets, Set operations, Functions, Relations and their properties, n - ary relation and their applications, Representing relations, Closures of relations, Equivalence relations, Partial orderings.

3 Algebraic Structure

18 9

Binary operation, Semi groups, Monoids group, Abelian group, Cyclic group, Sub group, Cosets, Normal subgroup, Homomorphism, Isomorphism, Automorphism.

4	Lattices, Boolean Algebra and its Application Partially Ordered Set (POSET), Linearly ordered set, Some special elements of lattice, Lattices, Lattice by hasse diagram, Sub lattices, Bounded lattices, Join-irreducible element, Meet-irreducible element, Atom, Antiatom complemented lattices, Complete lattice, Lattice homomorphism, Lattice isomorphism, Direct product of two lattices. Boolean algebra, Sub-boolean algebra, Homomorphic boolean algebras, Isomorphic boolean algebras, Boolean function, Boolean expression, Equivalent boolean expression, Sum of Product (SOP) form of boolean Algebra, applications of boolean algebra.	27	10
5	Statistical Methods: Definition and scope of Statistics, concepts of statistical population and sample. Data: quantitative and qualitative, attributes, variables, scales of measurement- nominal, ordinal, interval and ratio. Presentation: tabular and graphical, including histogram and ogives, consistency and independence of data with special reference to attributes	15	7
6	Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, absolute moments, factorial moments, skewness and kurtosis, Sheppard's corrections	14	7
TOTAL		100%	45

Reference Books

- Discrete Mathematical & it's Applications with Combinatorics and Graph Theory**
By Kenneth H Rosen | Tata McGraw-Hill
- Discrete Mathematical Structures with Applications to Computer Science**
By J.P.Tremblay and R. Manohar | Tata McGraw-Hill

Semester 1

(1)

- Course Name: Communication & Programming Skills**
- Course Code: 05293202**
- Prerequisite:**
- Rationale:** Cracking aptitude and Programming related questions is the first step towards cracking placements and competitive exams
- Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

- **Course Learning Outcomes:**

CLO 1	Comprehend day to day English.
CLO 2	Respond to familiar issues / topics in English
CLO 3	Speak confidently on stage
CLO 4	Able to solve aptitude questions
CLO 5	Able to crack the technical exam for IT companies

- **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	2	0	4	0	100	0	0	0	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

- **Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
1	Articles, Prepositions and Interrogatives:	5%	3
2	Listening-Skill Building IL16-01W:	2%	1
3	Clocks, Calendars, Direction sense and Cubes:	5%	3
4	Listening-Skill Building IL16-02W:	3%	1
5	Data arrangements and Blood relations:	5%	3
6	Listening-Skill Building IL16-03W:	2%	1
7	Data Interpretation, Data Sufficiency:	3%	3
8	Speaking-Skill Building IS 16-01W:	2%	1
9	C - Programming - Part 1:	3%	2
10	Speaking-Skill Building IS 16-02W:	2%	1
11	C - Programming - Part 2:	3%	2
12	Speaking-Skill Building IS 16-03W:	2%	1
13	C worksheets:	5%	2
14	Paragraph Completion Worksheet:	3%	1
15	C++ Programming - Part 1:	3%	2
16	Paragraph Jumble Worksheet:	2%	1

17	C++ Programming - Part 2:	3%	2
18	Reading Comprehension Worksheet:	2%	1
19	C++ Worksheets:	5%	2
20	Sentence Completion Worksheet:	2%	1
21	Data Structures - Part 1:	3%	2
22	Reading-Skill Building 16-01:	2%	1
23	Data Structures - Part 2:	3%	2
24	Writing-Skill Building IW 16-01W:	2%	1
25	Data Structures Worksheets:	5%	2
26	Writing-Skill Building IW 16-02W:	3%	1
27	Writing-Skill Building IW 16-03W:	2%	1
28	Extra Worksheet 16-03:	5%	1
29	SWOT Analysis:	4%	3

30	Speaking and Writing Skills:Report Writing, Movie Review, Presentation:	4%	4
31	Developing Professional Skills:Vision of Success, Vision of Career, Scope of Contribution, Developinglearning attitude:	5%	8
	TOTAL	100%	60

- **Text Book and Reference Book:**
-
- Word Power Made Easy
Norman Lewis; Goyal
Publishers
- Understanding and Using English Grammar
Betty Azar & Stacy Hagen; Pearson
Education
- Let Us C
- Yeshavant Kanetkar; BPB Publications
- Let Us C++
Yashavant
Kanetkar

Semester 2

- **Course Name: Software Engineering with Agile**
- **Course Code:** 05202108
- **Prerequisite:** Understanding of Object Oriented Design, UML
- **Rationale:** To analyze the requirements of end users, Understands the software development life cycle (SDLC) along with many other process models, gain understanding of test strategies and different types of testing, gain understanding of different agile processes
- **Course Learning Objective:**

CLOBJ 1	Develop a comprehensive understanding of signals, including continuous-time and discrete-time signals, analog and digital signals, and their characteristics such as amplitude, frequency, and phase.
CLOBJ 2	Analyze signals in the time domain by performing operations such as addition, multiplication, differentiation, and integration. Understand the concept of linearity and time-invariance in systems.
CLOBJ 3	Apply Fourier analysis to decompose signals into their frequency components. Perform frequency domain operations like convolution and filtering.
CLOBJ 4	Learn to transform signals from the time domain to the complex frequency domain using Laplace and Z-transforms. Analyze the stability and system behaviour in the transformed domains.
CLOBJ 5	Understand the characteristics of linear, time-invariant (LTI) systems. Compute and interpret the impulse response of systems.
CLOBJ 6	Grasp the fundamentals of sampling and the Nyquist theorem.

- **Course Learning Outcomes:**

CLO 1	Describe Software Development Life Cycle.
CLO 2	Explain software development process in association with its fundamental principles and methodologies.
CLO 3	Analyze & represent end user requirements and model requirement analysis using Unified Modeling Language.
CLO 4	Prepare & represent software design and design software model using Unified Modeling Language.

CLO 5	Define significance of project planning, effort estimation and risk management
CLO 6	Design test cases and identify testing strategies.

- Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

- Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
1	Introduction to System and Software Development: Concept of system, Basic components of system, Information systems categories, Need of information system development. Study of different models, Software characteristics, Components, Applications, Layered technologies, Processes, Methods and tools, Generic view of software engineering, Classical Systems Development Life Cycle (SDLC) method.	15%	6
2	Requirements Analysis & Engineering: Requirement Analysis: Classical Systems Development Life Cycle (SDLC) method, Requirement determination, System Requirement Specification (SRS), Fact finding techniques. Process models - waterfall model, incremental, Evolutionary process models - prototype, spiral and concurrent development model. Requirement Engineering: Problem recognition, Requirement engineering tasks, , Use cases and functional specification, Requirements validation	20%	10
3	Structured System Analysis & Design: System Analysis: Introduction to Structured System Analysis Development Methodology (SSADM), Tools for analysis - decision trees, decision tables, structured english, Data flow diagram, Entity Relationship (ER) diagram, Data dictionary. System Design: Design concepts, Design modeling, Software architecture, Data design, Architectural styles and patterns, Procedural design, Object oriented design.	20%	10
4	Agile Methodology:	20%	7

	Agile process, Extreme Programming (XP), Brief overview of other agile process models - adaptive software development, Scrum.		
5	User Interface Design: Concepts of UI, Interface design model, Internal and external design, Evaluation, Interaction and information display software.	5%	3
6	Planning a Software Project: Management spectrum, People, Product, Process, Project, W5HH Principle, Importance of team management, Scope and feasibility, Effort estimation, Schedule and staffing, Quality planning, Risk management- identification, assessment, control,	15%	6
7	Case Tools and Study: Introduction to CASE, Building blocks of CASE, Integrated CASE environment.	5%	3
	TOTAL	100%	45

- **Text Book and Reference Book:**
- Software Engineering : A Practitioner's Approach (TextBook) Pressman R.S;TMH
- Software Engineering Sommerville
- Software Engineering Rajiv Mall; PHI
- Software Engineering Pankaj jalote;Wiley India
- Software Engineering, An Engineering Approach Peters & Pedrycz; Wile-India
- Software Engineering, Principles and Practice Jawadekar; TMH

(1)

- **Course Name : Advanced Java Programming**
- **Course Code:** 05202156
- **Prerequisite:** Knowledge of Core Java Programming and HTML.
- **Rationale:** To make the students aware of the data driven web applications, web services, MVC architecture and ORM concepts of modern web application development.

- **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

- **Course Learning Outcomes:**

CLO 1	Design and develop data driven web applications using JDBC, servlet and JSP API.
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CLO 2	Develop MVC based web applications using Struts.
CLO 3	Develop and integrate web services and web clients.
CLO 4	Describe significance of Object Relational Mapping (ORM) in Java context.

- Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	4	6	20	20	20	60	30	150

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

- Course Content:**

Sr .	Topic	Weightage	Teaching Hrs.
1	Java Database Connectivity: Introduction to JDBC, JDBC architecture. Common JDBC Components - DriverManager, Driver, Connection, Statement, ResultSet, SQLException. Types of JDBC drivers, Establishing connection with database, Submitting queries and obtaining results, ResultSetMetadata Interface, Precompiled statements, CallableStatement, JDBC transactions.	15%	8
2	Java Servlets: Configuring Java Development Environment, Downloading and configuring Apache Tomcat web server. Introduction to servlets, Servlet life cycle, Exploring servlet API, Basic servlet structure, Handling client requests, Generating response, Working with cookies, Session tracking. Servlet filters - Introduction to filters, creating custom filters, mapping filters to servlets, mapping filters to specific URL pattern.	20%	10
3	Java Server Pages: Introduction to JSP, Need of JSP, Advantages of JSP over servlet, Life cycle of a JSP page, JSP basic tags: declaration tag, scriptlet tag, expression tag. JSP implicit objects - out, request, response, application, session, pageContext, page, exception. Introduction to java beans, Reading and writing properties of JavaBeans in JSP pages.	25%	12

	JSP 2.0 expression language - Use of EL, Invoking Expression Language, Preventing Expression language evaluation, Accessing scoped variables. Custom tag libraries - tag handlers, tag library descriptor. JSP standard tag library (JSTL): Downloading and installing JSTL in Java web application, Core tags (c:out, c:forEach, c:if, c:choose, c:set, c:remove, c:import, c:catch).		
4	Java Web Services: Introduction to web services, Architecture of web services, Types of web services - SOAP web services, REST web services SOAP v/s REST, Introduction to REST, Configuring RESTful web service using Jersey framework in java web application, RESTful architectural principles, HTTP method and URI matching. JAX-RS injection - PathParam, QueryParam, FormParam. Introduction to Server responses and exception handling, JAX-RS client API.	20%	1 2
6	Introduction to Spring and Hibernate: Introduction to Spring MVC Framework, Spring MVC Architecture and Components, Advantages of Spring MVC, Modules Of Spring Framework. Spring Application Introduction to Hibernate, Architecture of hibernate, Hibernate O/R mapping, Configuring hibernate development environment, Implementing hibernate O/R Mapping, Introduction to Hibernate Query Language (HQL)..	20%	12
	TOTAL	100%	54

- **Text Book and Reference Book:**

- Java Server Programming Java EE6 Black Book (TextBook); Dreamtech Press
- RESTful Java with JAX-RS 2.0
Bill Burke; O'Reilly; 2nd Edition
- Core Servlets and Java Server Pages Volume-1
Mary Hall and Larry Brown; Prentice Hall; 2nd Edition
- Core Servlets and Java Server Pages Volume-2
- Marty Hall, Larry Brown and Yaakov Chaikin; Prentice Hall; 2nd Edition

Semester 2

(1)

- **Course Name : Computer Networking**
- **Course Code:** 05202157
- **Prerequisite:** : Basic concept of computer organization and knowledge of programming skills.
- **Rationale:** To provide thorough understanding of networking concepts and knowledge of OSI layer's functionality.
 - **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
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CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

• **Course Learning Outcomes:**

CLO 1	define and explain basics of data communications and computer network architecture.
CLO 2	describe OSI reference model and basic functionalities of DNS, WWW and HTTP.
CLO 3	identify relevant data transmission techniques and media.
CLO 4	implement framing, error handling and congestion control techniques.
CLO 5	describe need for computer network security.

• **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	2	5	20	20	20	60	30	150

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

Course Content		T - Teaching Hours W - Weightage	
Sr.	Topics	T	W
1	Networking Fundamentals: Introduction, Data & Information, Data Communication-Characteristics of Data Communication, Components of Data Communication, Data Representation, Data Flow-Simplex, Half Duplex, Full Duplex, Computer Network- Categories of a network, Protocol- Elements of a Protocol, Networking Standards, Reference Models- OSI Model, TCP/IP Model, Comparison of OSI and TCP/IP Model.	12	20
2	The Data Link Layer Design Issues: Framing, Error Control, Flow Control, Protocols: FDDI, CDDI, Frame Relay, ATM, 802.11, PPP, HDLC. The Medium Access Sub-Layer Multiple Access Protocols: ALOHA, CSMA, Ethernet: Switched Ethernet, Fast Ethernet, Gigabit Ethernet, DLL Switching: Internetworking, Repeaters, Hubs, Bridges, Switches, Routers, Gateways, Virtual LANs	12	25
3	The Network Layer Design Issues, Routing Algorithms: Link State Routing, Distance Vector Routing, Flooding, Routing Protocols: RIP, IGRP, EIGRP, OSPF, Internetworking: Tunneling, Fragmentation, IPV4, IPV6 Basics, BGP.	10	20

	The Transport Layer Protocols: UDP, TCP, Headers.		
4	The Application Layer: DNS: The DNS Name Space, Name Servers-Mail: SMTP, POP3, HTTP, FTP, Telnet, Network Management: SNMP	6	10
5	Network & System Security: Authentication Applications: Kerberos X.509, Directory Authentication Service, Electronic Mail Security, Pretty Good Privacy (PGP), S / Mime, Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Cryptography-Key Management, Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (Set), System Security: Intruders, Viruses, Firewall Design Principles, Trusted Systems	14	25
	TOTAL	54	100 %

Textbooks:

1. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson, 2017.
2. Nader F Mir, Computer and Communication Networks, 2nd Edition, Pearson, 2014.

Reference Books:

1. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition
2. Larry L Peterson and Bruce S Davie, Computer Networks, fifth edition, ELSEVIER
3. Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson
4. Mayank Dave, Computer Networks, Second edition, Cengage Learning

Semester 2

(1)

- **Course Name : Seminar**
- **Course Code: 05202155**
- **Prerequisite:**
- **Rationale:**
- **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

- **Course Learning Outcomes:**

CLO 1	learn about exploring topic on ICT domain.
CLO 2	develop skills for identification and retrieval of relevant information.
CLO 3	effectively communicate and present ICT topic.
CLO 4	summarize on ICT topic.

• **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				T	CE	P	Theory	P	
2	-	2	1	0	20	20		30	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; **MSE**- Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE**- End Semester Examination

• **Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
1	Seminar: Each Student is expected to choose a topic of current relevance of Computer Science/Application field. They have to refer papers / reading material from various resources including latest tools. Student should compile the material in the form of presentation / seminar report and appropriately present the topic.	100%	

Semester 2 (Elective-I)

(1)

- **Course Name :** Web Application Development using ASP.NET
- **Course Code:** 05202207
- **Prerequisite:** Fundamental knowledge of Object oriented programming, DBMS and HTML.
- **Rationale :** To provide basic understanding of .NET framework and knowledge of developing dynamic and rich web application in conjunction with event handling, state management and data access.
- **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

- **Course Learning Outcomes:**

CLO 1	explain .NET framework architecture and its features.
CLO 2	build dynamic web applications to demonstrate event handling, state management and content manipulation using C#.
CLO 3	develop data driven applications using ADO.NET, LINQ and XML.
CLO 4	construct web applications using model-view-controller pattern.

- **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				T	CE	P	Theory	P	
4	0	4	6	20	20	20	60	30	150

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

- **Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
1	Introduction: ASP.NET framework, The origin of .NET technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just - in time compiler, Framework base classes.	10%	6
2	ASP.NET Controls, UI Design & Coding: ASP.NET server controls: Controls - buttons, textboxes, labels, checkboxes, radio buttons, list controls and other web server controls, web.config and global.asax files. Programming ASP.NET web pages: Web page, Data types and variables, Statements, Organizing code, Object oriented basics of C#.	25%	12

3	ASP.NET Validation Controls, State Management & Navigation: Validation Control: Controls, Basic validation controls, Validation techniques, Using advanced validation controls. State Management: Using view state, Using session state, Using application state, Using cookies and URL encoding. Master Pages: Creating master pages, Content pages, nesting master pages, Accessing master page controls from a content page. Navigation: Site navigation, Using site navigation controls.	25%	14
4	Data Access through ADO.NET: Basic features of ADO.NET, Using SQL data sources, Grid view control, Detail view control, Form view control, List view and other controls, Using object data sources.	20%	10
5	Advanced ASP.NET: AJAX extension, LINQ, Stored procedure, Working with XML data. ASP.NET MVC: Overview of Model-View-Controller, Model-View-Controller and ASP.NET, Routes and URLs, Controllers, Views.	20%	12
	TOTAL	100%	54

● **Text Book and Reference Book:**

- Professional ASP.Net
- Bill Evjen, Scott Hanselman, Devin Rader; Wrox Publication
- ASP.NET 4 Unleashed
- Stephen Walther, Kevin Hoffman, Nate Dudek; Sams Publication
- NET 4.0 Programming Black Book
- ; Kogent Learning Solutions Incorporation

Semester 2 (Elective-I)

(1)

- **Course Name : Computer Graphics**
- **Course Code:** 05202182
- **Prerequisite:** Knowledge of linear algebra, calculus and programming skills in C/C++.
- **Rationale :** To provide the fundamental principles and algorithms of underlying computer graphics, including line drawing algorithms, circle/ellipse drawing algorithms, 2D geometrical transformation, 3D geometric transformations, viewing in 3D (orthographic projection and perspective projection) and visible surface detection algorithms.
- **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.

CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.
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- Course Learning Outcomes:**

CLO 1	identify various components of graphics system.
CLO 2	implement algorithms for rendering basic shapes.
CLO 3	describe significance of projection, illumination models, viewing and clipping techniques.
CLO 4	implement various 2D and 3D transformation techniques and clipping algorithms.

- Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				T	CE	P	Theory	P	
3	0	2	4	20	20	20	60	30	150

L- Lectures; T- Tutorial; P- Practical; C- Credit; **MSE**- Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE**- End Semester Examination

- Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
1	Introduction and Basic Drawing Algorithms: Computer graphics and its applications, Raster-scan system, Random-scan system, Graphics primitives. Basic Drawing Algorithms: Line-drawing algorithms - DDA Algorithm, Bresenham's line algorithm. Circle Generating Algorithms: Midpoint circle algorithm, Bresenham's circle algorithm. Ellipse-Generating Algorithm: Midpoint ellipse algorithm.	20%	8
2	Region Filling Algorithms and Two-Dimensional Geometric Transformations: Attributes of output primitives, Line style, Colour and intensity, Area filling algorithm, Scan line and boundary fill algorithm, Flood fill algorithm, Antialiasing technique. Two dimensional transformations: Translation, Scaling, Rotation, Reflection, Shearing, Composite transformation, Transformation commands, Character generation.	20%	12

3	Viewing and Clipping: Viewing coordinates, Window view port, Clipping, Window to view port transformation, Line clipping algorithm - Cohen Sutherland, Polygon clipping - Sutherland Hodgman algorithm, 3D clipping - normalized view volume, View port clipping, Clipping in homogeneous coordinates.	15%	7
4	Illumination Model: Light sources, Diffuse reflection, Colour Models like RGB, YIQ, CMY, HSV. 3D Viewing: 3D concepts, 3D display techniques, 3D representation, 3D transformation - transition, scaling, composite transformation, rotation about arbitrary axis. Projection: Parallel and perspective projection, Hidden surface and line removal, Back face removal, Depth buffer and scan line methods	15%	7
5	2D and 3D Animation Tools – Flash I: What is Multimedia, Animation, Introduction to Flash. Flash Tools : Selction, subselection, Free transform, Gradient transform, Line, lasso, Pen, Text , Oval, Rectangle, Pencil, Brush, Ink bottle, Paint bucket, Eyedropper and Eraser. Flash Toolbars, Stage and Panels. Animation : Frame by frame animation, Tweening :Motion tweening, Shape tweening, Character tweening. Animation, Sound and Action Scripting – Flash II: Animation: Masking and Layers Sound : Adding sound, Stop and Play sound, Importing sound files Flash Scripting: x (current x coordinate), y (current y coordinate) Timeline controls: All Actions Movie clip controls :setProperty(), getProperty(), startDrag(), on(), stopDrag() Browser / Network controls : fscommand – quit , fullscreen, getUrl(), loadMovie(), fullscreen	20%	10
6	Working with MatLab: Overview, features and uses of MatLab. Understanding Matlab Environment. Matlab Basics : Syntax, Variables, Naming conventions. Matlab Commands. Datatypes, Decision statements, Looping structures. Matlab Vectors, Matrix, Array. Matlab Numbers, Strings and Functions. Matlab Image Processing Functions:(imread(), imwrite(), imshow(), rgb2gray(), imhist(), imadjust(), im2bw(), uigetfile(), im2bw(), imcomplement(), edge(filename, method), imrotate(filename, angle), etc. Edge Detection using Canny Method, Rotate image clockwise and anti-clockwise.	10%	3
	TOTAL	100%	48

● **Text Book and Reference Book:**

1. Computer Graphics (TextBook)
Donald Hearn & M. Pauline Baker; PHI,2011; Second Edition
2. Computer Graphics - a Programming approach
S. Harrington; McGraw Hill,2014; 2nd Edition
3. Principles of interactive computer graphics
New Mann & Sprovl; McGraw Hill,2001; 2nd edition
4. Procedural Elements for Computer Graphics David F. Rogers; Tata McGraw Hill,2001
5. Multimedia System Design
Prabhat K. Andleigh & Kiran Thakur; PHI
6. Fundamentals of Multimedia Drew; Pearson.

Semester 2 (Elective – I)

Data Science with Python

Course	Master of Science in Information Technology (M.Sc. (IT))	Semester - 3
Type of Course	-	
Prerequisite	Basic knowledge of AI & ML	
Course Objective	Provide you with the knowledge and expertise to become a proficient data scientist Demonstrate an understanding of statistics and machine learning concepts that are vital for data science. Produce Python code to statistically analyze a dataset and critically evaluate data visualizations based on their design and use for communicating stories from data.	

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs /	Credit	Internal Marks			External Marks		
					T	C E	P	T	P	
3		2	-	4	2	2	2	6	3	15
					0	0	0	0	0	0

SEE - Semester End Examination, CIA - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

Course Content		W - Weightage (%) , T - Teaching hours	
Sr.	Topics	W	T
1	An Introduction to PYTHON Introductory Remark about Python, A Brief History of Python, How Python is different from other languages, Python Version, Installing Python, IDLE, Getting Help, How to execute a Python program, Writing your first program Python keywords and Identifiers, Python statements, Comments in python, Basic Syntax ,Printing on screen ,Getting user input -Reading data from keyboard ,Exercise, Key Takeaways	15	7

2	Variables, data types, Arrays and looping	15	1
	Introduction, Variables, Data types, Numbers, Strings, Lists, Tuples, Dictionar, Exercise, Control flow and syntax, The if statement, Python operators, The while Loop, Break and continue, The for Loop, Pass statement		0
3	Function, Modules and Packages	15	8
	Introduction of Function, Calling a function, Function arguments, Built in function, Scope of variables, Decorators, Passing function to a function, Introduction of Modules and Packages, Importing Modules, Standard Modules- sys, Standard Modules- OS, The dir() Function Packages		
4	Exception Handling, File Handling in Python	20	1
	Introduction of Exception Handling, Errors, Run Time Errors, Handling IO Exception, Try....except statement, Raise, Assert, Introduction of Exception Handling, Introduction to File Handling in Python, Files and Directories, Writing Data to a file, Reading data from a file, Additional file methods, Working with files ,Working with Directories, The pickle Module		0
5	Data visualization using Matplotlib	15	7
	Learning objectives, Data Visualization, Considerations of Data Visualization, Factors of Data Visualization, Python Libraries, Create Your First Plot Using Matplotlib, Line Properties, Create a Line Plot for Football Analytics, Multiple Plots and Subplots, Create a Plot with Annotation, Create Multiple Plots to Analyze the Skills of the Players, Create Multiple Subplots Using plt.subplots, Types of plots, Create a Stacked Histogram, Create a Scatter Plot of Pretest scores and Posttest Scores, Create a Pie Chart, Create a Bar Chart, Create Box Plots, Analyzing Variables Individually, Key Takeaways		
6	Pandas	20	8
	Introduction to Pandas, Data structures of Pandas ,Pandas Series, Pandas DataFrames, Pandas Object creation, Viewing Pandas data, Selection on Pandas Data, Operations on Pandas Data, Essential basic functionality on Pandas DataFrame, Head and tail on Pandas DataFrame, Attributes and underlying data, Grouping, Sorting, Importing and exporting data, Indexing and selecting data		
	TOTAL	100%	50

Reference Books

1. Rao, R. Nageswara : Core Python Programming, 2nd Edition, Dreamtech Press, 2018.
2. Dr. Simon Monk: Programming the Raspberry Pi: Getting Started with Python, McGraw Hill Publication
3. The Elements of Statistical Learning, by Trevor Hastie, Robert Tibshirani, Jerome H. Friedman (freely available online)
4. Pattern Recognition and Machine Learning, by Christopher Bishop (optional)

Semester 2

(1)

- **Course Name : English and Mathematical Aptitude**
- **Course Code: 05293252**
- **Prerequisite:**
- **Rationale :**
- **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

- **Course Learning Outcomes:**

CLO 1	comprehend day to day English.
CLO 2	respond to familiar issues / topics in English.
CLO 3	speak confidently on stage.
CLO 4	able to solve aptitude questions.
CLO 5	able to crack the technical exam for IT companies.

- **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				T	CE	P	Theory	P	
2	-	-	2	-	100	-	-		100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

- **Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
1	Numbers system: This session will prepare students on Number system which is one of the sub-topic of quantitative ability section of Aptitude test of various companies.	5%	2

2	Reading comprehension: The student will be taught different ways to solve Reading Comprehension questions when it comes to Placements or different competitive exams.	5%	2
3	Time and work: This topic covers different type problems on Time and Work and also the short trick method to solve them.	5%	2
4	Sentence correction: This topic contains an important role to solve Verbal section in an Aptitude exam for any company	5%	2
5	Coding & Decoding, Series, Analogy, Odd man out and Visual reasoning: Solving different types of series, visual reasoning questions which comes in Personal Interview as well as Logical section of any Aptitude Exam.	5%	2
6	Time, speed and distance: This topic covers the upstream, downstream questions and short trick to solve it.	5%	2
7	Vocabulary: Will include to How learn new words and remember those words with different methodology, it also includes different types anagrams and puzzles .	5%	2
8	Recap on C++: Case Studies, Coding, MCQ questions from different technical exams will be discussed to prepare for technical test and PI.	8%	6
9	Recap on Data structure: Case Studies, Coding on C and C++, MCQ questions from different technical exams will be discussed to prepare for technical test and PI.	7%	6
10	Ratio and Proportion:	5%	2
11	Logical connectives, Syllogism and Venn diagrams:	5%	2
12	Worksheet on – Adjective and Adverb:	5%	2

13	Worksheet on - Collocation, Gerund and Infinitives:	5%	2
14	Worksheet on - Determiners and Articles:	5%	2
15	Worksheet on - Nouns and Pronouns:	5%	2
16	Worksheet on - PREPOSITION:	5%	2
17	Worksheet on - PRONOUN ANTECEDENT AGREEMENT:	5%	2
18	Worksheet on - Subject Verb Agreement:	5%	2
19	Worksheet on - Tenses:	5%	1
	TOTAL	100%	45

- **Text Book and Reference Book:**

1. Handouts on communication confidence
2. Norman Lewis, Word Power Made Easy, Goyal Publishers, Delhi
3. Understanding and Using English Grammar
Betty Azar & Stacy Hagen; Pearson Education
4. Let Us C++
5. Fundamentals of Data Structure Ellis Horowitz

Semester 3

(1)

- **Course Name : Mobile Apps Development using Android**
- **Course Code:** 05202206
- **Prerequisite:** Exposure to java and basic RDBMS.
- **Rationale :** To provide awareness of the mobile application development using android
- **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

- **Course Learning Outcomes:**

CLO 1	appreciate the mobility landscape.
CLO 2	familiarize with mobile apps development aspects.
CLO 3	design and develop user friendly, data driven and responsive mobile applications using Android as development platform
CLO 4	escalate nuances such as native hardware play, location awareness, graphics, and multimedia.

CLO 5	perform testing, signing, packaging and distribution of mobile apps.
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- Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				T	CE	P	Theory	P	
3	0	6	6	20	20	20	60	30	150

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

- Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
1	Getting started with Mobility: Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, Architecture for Mobile Computing - 3- tier architecture, Design considerations for mobile computing, Setting up the mobile app development environment along with an emulator, Case study - Mobile app development.	20%	10
2	Building blocks of Mobile apps: App user interface designing – mobile UI resources (layout, UI elements, drawable, menu), Activity - states and life cycle, interaction amongst activities, App functionality beyond user interface - threads, async task, Services – states and life cycle, Notifications, Broadcast receivers, Telephony and SMS APIs, Native data handling – on device file I/O, Shared preferences, Mobile databases such as SQLite and enterprise data access (via Internet/Intranet).	25%	11
3	Sprucing up Mobile apps: Graphics and animation – custom views, canvas, animation APIs, multimedia – audio/video playback and record, Location awareness and native hardware access (sensors such as accelerometer and gyroscope).	25%	10
4	Testing Mobile apps: Debugging mobile apps, White box testing, Black box testing and test automation of mobile apps, JUnit for Android, Robotium, MonkeyTalk.	15%	7
5	Taking apps to Market and Wireless Languages: Versioning, signing and packaging mobile apps, distributing apps on mobile market place, Wireless Languages - markup languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.	15%	7
	TOTAL	100%	45

- **Text Book and Reference Book:**
- Android Application Development All in one for Dummies Barry Burd
- Teach Yourself Android Application Development In 24 Hours
 - ; Sams teach yourself; 3rd
- Mobile Apps Development
- Anubhav Pradhan, Anil V Deshpande
- Android Wireless Application Development
- Lauren Darcey and Shane Conder; Pearson Education; First Edition
- Professional Android 2 Application Development Reto Meier; Wiley India Pvt Ltd, 2011

Semester 3

(1)

- **Course Name : Minor Project**
- **Course Code:** 05202208
- **Prerequisite:** Knowledge of Software Engineering, DBMS, programming language/tool.
- **Rationale :**
- **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

- **Course Learning Outcomes:**

CLO 1	identify suitable tools and technologies for given problem.
CLO 2	analyze, design and develop ICT solution.
CLO 3	test, validate and deploy ICT applications.
CLO 4	work as an individual or in a team.
CLO 5	document and communicate relevant milestones and deliverables.

- **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme		
L	T	P	C	Internal Evaluation	ESE	Total

				T	CE	P	Theory	P	
0	0	2	1	-	20	20	-	60	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

- Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
1	Guidelines: Student will be assigned one or more Information Technology (IT) system development projects. The IT project development involves part or all phases of System Development Life Cycle (SDLC), thus providing student with experience of analyzing, designing, testing, implementing and evaluating information systems. The domain area of the project should be related to the current or future status of IT and computer applications. Major components of the project should include identification of the system, deciding the aims & objectives to be achieved and modules to be studied. It also includes analysis, innovations / research, laboratory / applications studies.	100%	

Semester 3

Advanced Web Development Using React-JS

Course	Master of Science in Information Technology (M.Sc. (IT))	Semester - 3
Type of Course	-	
Prerequisite	Knowledge of HTML, CSS and JavaScript	
Course Objective	The students should be able to develop web application using React-JS and perform CRUD operations in NoSQL database	

Teaching Scheme (Contact Hours)				Examination Scheme				
Lecture	Tutorial	Lab	Credit	Theory Marks		Practical Marks		Total Marks
				External Marks	Internal Marks	External Marks	Internal Marks	
3	0	2	4.00	60	40	30	20	150

SEE - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

Course Content	T - Teaching Hours W - Weightage
Sr. Topics	T W
1 ReactJS Fundamentals	6 15
React Introduction, ReactJS vs Angular, React Native and Vue, Setting	

Environment, create an app using create-react-app, understanding basics of react app, Understanding JSX, Understanding virtual DOMS, Single page apps, Class components vs functions components

2 SET UP REACT JS ENVIRONMENT 8 25

What is CLI: create-react-app project name, Advantage using CLI, How to debug React JS application, Installation CLI, Install Node JS, Install React JS, Installation CLI, Create a hello world example, Create React JS Project, Understanding of Folder Structure, How to debug React JS application, Introduction of Babel

3 BASIC FEATURES OF REACTJS AND COMPONENTS 10 20

React Concepts, JSX, Render Elements, Types of Components, Class Components, Life Cycle Method of Class components, Functional Components, HOOKS in detail, Use of HOOK, State, React Forms
Components and Props, State and Lifecycle Handling Events.

4 ROUTING WITH REACT ROUTER 8 20

Setting Up React router, Install/ Uninstall React router, setting up react router
Understand routing in single page applications, Working with Browser Router components
Configuring route with Route component, making routes dynamic using Route params
Navigating to pages using Link and Nav Link Component, Redirect routes using Redirect Component

5	EVENT HANDLING IN REACT React API's Introduction to REDUX	8	15
6	Project Deployment & Hosting	5	5
	TOTAL	45	100 %

Reference Books

1. Zak Ruvalcaba, Anne Boehm, "HTML5 and CSS3", Murach.
2. Dane Cameron, "HTML5, JavaScript and jQuery", Wrox publication.
3. Beginning ReactJS Foundations Building User Interfaces with ReactJS: An Approachable Guide

Semester 3

(1)

1. Course Name : Employability Skills

- **Course Code:** 05293302
- **Prerequisite:**
- **Rationale :** Cracking GD & PI is imperative during campus placements
- **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

- **Course Learning Outcomes:**

CLO 1	Have good understanding of the English grammar required for placements
CLO 2	Preparation to crack GD and PI of any company
CLO 3	Preparation for different competitive examination

- **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				T	CE	P	Theory	P	
0	2	-	2	-	100	-	-	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; **MSE**- Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE**- End Semester Examination

- **Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
1	Listening-Skill Building IL16-01W:	5%	1
2	Listening-Skill Building IL16-02W:	5%	1
3	Listening-Skill Building IL16-03W:	5%	1
4	Paragraph Completion:	5%	1
5	Paragraph Jumbles:	5%	1
6	Reading Comprehension:	5%	1
7	Writing-Skill Building IW 16-01W:	5%	1
8	Writing-Skill Building IW 16-02:	5%	1
9	Writing-Skill Building IW 16-03W:	3%	1
10	Speaking-Skill Building IS 16-01W:	5%	1
11	Speaking-Skill Building IS 16-02W:	5%	1
12	Speaking-Skill Building IS 16-03W:	5%	1

13	GD Mock:	5%	2
14	PI Mock:	5%	2
15	Resume Writing and checking the resume:	5%	2
16	Debate Mock:	5%	2
17	Extempore Mock:	5%	2
18	Sentence Completion:	5%	1
19	Reading-Skill Building IS 16-01W:	2%	1
20	Extra Worksheet:	5%	1
21	Case Studies: Design Solutions, Focus on Value, Engage Deeply, Think in Enlightened Self-Interest, Practice Imaginative Sympathy, Demonstrate Trust Behavior:	5%	5
	TOTAL	100%	30

- **Text Book and Reference Book:**
- How to Crack Group Discussion & Personal Interview M.B.Sivaramakrishnan
- Word Power Made Easy Norman Lewis; Goyal Publishers

Semester 3 (Elective-II)

(1)

- **Course Name : Software Testing and Quality Assurance**
- **Course Code:** 05202286
- **Prerequisite:** Basic knowledge of software engineering.
- **Rationale :** To enable student to learn software quality and assurance practices and various software testing techniques
- **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

- **Course Learning Outcomes:**

CLO 1	define significance of software quality and software reliability.
CLO 2	describe software testing life cycle and testing phases.
CLO 3	design test cases.

CLO 4	explain various quality assurance techniques and standards to produce high-quality software.
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- **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				T	CE	P	Theory	P	
3	1	0	4	20	20	-	60	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

- **Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
1	Software Testing Fundamentals: Introduction, Testing objectives, Test information flow, Testing lifecycle, Test Cases, Designing test cases.	15%	7
2	Levels of Testing: Unit testing, Integration testing, System testing, Acceptance testing- alpha testing, beta testing, Static and dynamic testing, Manual and automation testing, Case study on testing.	15%	10
3	Types of Testing: Installation testing, Usability testing, Regression testing, Performance testing, Load testing, Stress testing, Security testing, Case study on types of testing.	15%	8
4	Black Box & White Box Testing: Black Box Testing (Functional testing) - equivalence partitioning, Boundary Value Analysis, cause effect graphing, Overview of syntax testing, White Box Testing (Structural testing) - coverage testing, statement coverage, branch and decision coverage, Path coverage, Comparison of black box and white box testing, Case study on black box and white box testing.	20%	10
5	Software Quality and Reliability: Software quality – introduction, definition, Software quality-quality control, quality assurance, Software reliability –introduction, measures, models, Software Safety.	15%	7
6	Software Quality Assurance: Elements of Software Quality Assurance(SQA), SQA-need, activities, tasks, goals, metrics, Statistical software quality assurance, Six sigma for software engineering, SQA planning and standards - International Organization for Standardization [ISO] quality standards.	20%	8
	TOTAL	100%	50

- **Text Book and Reference Book:**

- Software Engineering (TextBook)
R. Pressmen; 6th

- Software Engineering
Sommerville; Pearson;
8th
- Introducing Software
Testing Louise Tamres
- Effective Methods for Software
Testing William Perry
- Software Testing in Real
World Edward Kit
- Software Testing
Techniques Boris Beizer
- Software quality assurance: Principles and
Practices Nina Godbole; Narosa Publishing

Semester 3 (Elective-II)

(1)

- **Course Name : Software Project Management**
- **Course Code:** 05202181
- **Prerequisite:** Basic knowledge of system analysis, system design and software engineering
- **Rationale :** To provide a foundation to prepare students as future IT project managers, IT engineers or system architects, to play leading roles in the application and management of e-business system construction.
- **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

- **Course Learning Outcomes:**

CLO 1	explain importance of software project management and challenges therein.
CLO 2	create execution plan for software project life cycle.
CLO 3	estimate software project.
CLO 4	recognize and monitor various risks involved in software projects.
CLO 5	describe significance of software quality, ISO standards and techniques to enhance software quality.

- **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				T	CE	P	Theory	P	

4	-	0	4	-	20	20	60		100
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L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

- Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
1	Introduction: Project, Importance of Software Project Management (SPM), Comparison of software projects and other types of project, Some ways of categorizing software projects, Stakeholders, Setting objectives, Project success and failure, Management control, Comparison of traditional and modern project management practices.	15%	7
2	Project Evaluation and Overview of Project Planning: Introduction to evaluation of individual projects, Cost benefit evaluation techniques, Risk evaluation, Introduction to step wise project planning - select project, identify project scope and objectives, identify project infrastructure, analyse project characteristics, identify project products and activities, estimate effort for each activity, identify activity risks, allocate resources, review/publicize plan, execute plan/lower levels of planning.	20%	10
3	Software Effort Estimation: Overview of software effort estimation, Problems with over and underestimates, Basis for software estimating, Software effort estimation techniques, Bottom up estimating, Top down approach and parametric models, Albrecht function point analysis, Common Software Measurement International Consortium (COSMIC) full function points, Cost estimation, Staffing pattern, Effect of schedule compression.	20%	10
4	Risk Management: Introduction to risk, Categories of risk, Framework for dealing with risk, Risk - identification, assessment, planning, management, Evaluating risks to the schedule, Applying the Program Evaluation Review Technique (PERT), Monte carlo simulation, Critical chain concepts.	15%	7
5	Monitoring and Control: Introduction to monitoring and control, Creating the framework, Review, Project termination review visualizing, Cost monitoring, Earned value analysis, Prioritizing monitoring, Getting the project back to target, Change control, Software Configuration Management (SCM).	15%	7
6	Software Quality: Introduction to software quality, Place of software quality in project planning, Importance of software quality, ISO standards, Product and process metrics, Comparison of Product and process quality management, Quality management systems, Process capability models, Techniques to enhance software quality testing, Quality	15%	6

	plans.		
	TOTAL	100%	48

● **Text Book and Reference Book:**

1. Software Project Management (TextBook)
Bob Hughes, Mike Cotterell, Rajib Mall; Tata McGraw Hill; 5th Edition
2. Software Project Management A Concise Study
S. A. Kelkar; PHI Learning; 3rd Edition
3. Project Management in IT
Kathy Schwalbe; Cengage Learning; Indian Edition
4. Software Project Management for DUMMIES
Teresa Luckey and Joseph Phillips; Wiley Publishing

Semester 3 (Elective-II)
IoT

Course	Master of Science in Information Technology(M.Sc.(IT))	Semester-3
Type of Course	-	
Prerequisite	Basics of AI & ML	
Course Objective	Introduce the fundamental concepts relevant to design issues related to Internet of Things. Learn how to interface sensors and Actuators with embedded IoT devices and implement connectivity and communication IoT protocols. ● implement IoT applications with concepts of AI.	

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs /	Credit	Internal Marks			External Marks		
					T	C	P	T	P	
						E				
3	1	0	-	4	2	2	-	6	-	10
					0	0		0		0

SEE - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

Course Content	W-Weightage(%),T-Teaching hours	
Sr. Topics	W	T
1 IOT Introduction	15	7
Concepts and Definitions of The Internet of Things(IoT), HistoryofIoT, Requirements, Functionalists,and structure of IOT, IoTenabling technologies, IoT Architecture,The major component of IOT (Hardware&Software), Sensors overview, IoT communication and networking protocols, Role of wired and wireless communication, IoT services and applications,IoT Standards,Connectivity		

2	IOT Case Studies	20	10
	Project Case Study, Project Requirements(hardware&software), How to Design IOT Applications(Web,Mobile,Device),Projects on every technology(Atleast4Projects),DataGenerator		
3	IOT Data Acquisition &Platforms	20	10
	Micro Controllers(Arduinouno/mega2560,Raspberry-Pi,ARM),Real-time systems, and embedded software, OS and Drivers(EndDeviceProgram),Hardware & Software Requirements		
4	IOT Data Communication	15	7
	How to transfer data by Wireless/Wired connectivity,Ipv4/Ipv6, Ethernet/GigE, MIPI,M-PHY, UniPro, SPMI, BIF, Super Speed USB Inter-Chip(SSIC),Mobile PC Ie(M-PCIe)and SPI,GSM, 2g,3g ,4g&5g,IEEE802.15.4,IEEE802.15.4e,802.11ah,RelayAccessPoint (AP),Grouping of station,TargetWake Time (TWT)		
	IOT Data Storage & Retrieval		
5	Overview and Role of Storage in Cloud /Server/Inhouse Storage, Databases Connectivity with IOT and uses, Case Study over Mysql/NoSql /NewSql ,Case Study over Cloud Services And Administration, Case Study Of Big Data & Hadoop Platforms	15	6
6	IOT Security	15	5
	Attack Defense, and Network Robustness of Internet of Things, Malware Propagation and Control in the Internet of Things, Privacy Preservation Data Dissemination, Trust and Trust Models for the IoT, Authentication in IoT, Computational Security for the IoT, Security Protocols for IoT Access Networks, SecurityTesting		
	TOTAL	100%	45

Reference Books

1. Internet of Things from Hype to Reality, The Road to Digitization, Ammar Rayes and Samer Salam, Second Edition, Springer
2. Internet of Things (IoT) Technology, Economic View And Technical Standardization, Etienne Schneider, Version 1.0, ILNAS
3. Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies, DimitriosSerpanos and Marilyn Wolf, Springer

4. Data Communications and Networking, Behrouz A Forouzan, Fourth Edition, McGraw Hill Education

Course Outcome

After Learning the Course the students shall be able to:

1. Explain basic terminology of Internet of Things.
2. Illustrate the role of communication in IoT.
3. Identify and use various protocols devices that are used in IoT.
4. Classify networking, cloud and fog computing concept for data management.
5. Investigate challenges, security and privacy.
6. Discuss different IoT enabled techniques behind interaction between thing

Semester 4

(1)

- **Course Name : Major Project**
- **Course Code:** 05202256
- **Prerequisite:** Knowledge of Software Engineering, DBMS, programming language/tool..
- **Rationale :** To solve real life problem of Industry or any other organization, to plan, schedule, monitor and develop software project and to document software project.
- **Course Learning Objective:**

CLOBJ 1	Identify significance of object relational database management system.
CLOBJ 2	Apply programming construct such as stored procedure, stored function, cursor and triggers.
CLOBJ 3	Define different types of index and database security mechanism.
CLOBJ 4	Describe database recovery techniques.
CLOBJ 5	discuss emerging database technology such as mobile database, multimedia database and geographical information system database.

- **Course Learning Outcomes:**

CLO 1	apply fact finding techniques for gathering information and analyze existing systems.
CLO 2	identify and apply relevant software engineering model and apply project management.
CLO 3	identify relevant tools and technologies to develop ICT solutions.
CLO 4	prepare requirement specification document and produce design document.
CLO 5	develop ICT solution as per industry / societal need.
CLO 6	identify suitable test strategy; design and execute test cases.
CLO 7	integrate and communicate related milestones and deliverables.

CLO 8	comprehend significance of organizational and ethical practices.

- **Teaching & Examination Scheme:**

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				T	CE	P	Theory	P	
0	0	36	18	-	100	100	-	300	500

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

- **Course Content:**

Sr.	Topic	Weightage	Teaching Hrs.
1	Guidelines: Student will be assigned one or more Information Technology (IT) system development projects. The IT project development involves part or all phases of System Development Life Cycle (SDLC), thus providing student with experience of analyzing, designing, testing, implementing and evaluating information systems. The domain area of the project should be related to the current or future status of IT and computer applications. Major components of the project should include identification of the system, deciding the aims & objectives to be achieved and modules to be studied. It also includes analysis, innovations / research, laboratory / applications studies.	100%	