SYLLABUS

INTEGRATED MCA

2024 SCHEME

Signed By:Devassia V P
Reason: Approved by SJCET Academic Council held on 13.05.2025

Programme Outcomes (POs)

PO1(Foundation Knowledge): Apply knowledge of mathematics, programming logic, and coding fundamentals for solution architecture and problem-solving.

PO2 (Problem Analysis): Identify, review, formulate, and analyze problems primarily focusing on customer requirements using critical thinking frameworks.

PO3 (Development of Solutions): Design, develop, and investigate problems with an innovative approach for solutions incorporating ESG/SDG goals.

PO4 (Modern Tool Usage): Select, adapt, and apply modern computational tools, such as the development of algorithms, with an understanding of the limitations, including human biases.

PO5 (Individual and Teamwork): Function and communicate effectively as an individual or team leader in diverse and multidisciplinary groups, using methodologies such as agile.

PO6 (Project Management and Finance): Apply the principles of project management, including scheduling and work breakdown structure, and be knowledgeable about finance principles for profitable project management.

PO7 (Ethics): Commit to professional ethics in managing software projects, especially in financial aspects. Learn to use new technologies for cybersecurity and insulate customers from malware.

PO8 (Life-long Learning): Continuously enhance management skills and the ability to learn, keeping up with contemporary technologies and ways of working.

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ST. JOSEPH'S
COLLEGE OF ENGINEERING
AND TECHNOLOGY,
- PALAI -
AUTONOMOUS

MCA Integrated

SEMESTER 3

24SJINMCA201	COMPUTER ORGANIZATION	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble:	This course provides a solid theoretical foundation that furnishes the student with insight into the innermost workings of the modern digital computer, together with a thorough understanding of the organization and architecture of real computers.
Prerequisite:	24SJINMCA105: Introduction to Programming, 24SJINMCA 106: Introduction to Digital Systems & Logic Designs

Course Outcomes: After the completion of the course the student will be able to:		**K Level**
CO1	Understand the internal organization and operations of a computer.	K2
CO2	Examine the different types of control logic designs in processors.	K2
CO3	Understand arithmetic procedures used in the design of the Arithmetic Logic Unit.	K2
CO4	Analyze Input/Output (I/O) management from the perspective of a processor.	K3
CO5	Distinguish the organization of various parts of a system memory hierarchy.	K2

Mapping of course outcomes with program outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	1					2
CO2	3	2	2	1				1
CO3	3	2	2	1				1
CO4	3	2	2	1	1			1
CO5	2	2	2	2	1			1

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance	: 8 marks
Continuous Assessment Test (2 numbers)	: 20 marks
Assignment/Quiz/Course project	: 12 marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contains10 compulsory short answer questions, 2 from each module. Each question carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 6 marks

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. List out the functional units of a computer system with a diagram.(**K1**)
2. Describe any 4 addressing modes in detail. **(K2)**
3. Compare direct and indirect addressing modes with relevant diagrams. **(K3)**

Course Outcome 2 (CO2):

1. Develop the control sequence for the execution of the instruction ADD (R3), R1. **(K3)**
2. With necessary diagrams and examples, explain single bus organization.**(K2)**
3. Demonstrate the operations required for executing an instruction in a processor.**(K3)**

Course Outcome 3(CO3):

1. Describe 4-bit ripple carry adder. **(K2)**
2. With a diagram, explain the working of Carry look Ahead Adder. **(K2)**
3. Describe Booth Algorithm with an example. **(K2)**

Course Outcome 4 (CO4):

1. With a proper diagram, explain the DMA controller **(K2)**.
2. Differentiate memory mapped I/O and program controlled I/O **(K2)**
3. What are interrupts? Illustrate how multiple requests for IO devices are handled. **(K3)**

Course Outcome 5 (CO5):

1. What is cache memory? Differentiate between associative and set associative cache mapping with examples. **(K2)**

2. Compare asynchronous DRAMS with synchronous DRAMs. **(K4)**

3. Differentiate between PROM, EPROM and EEPROM. **(K2)**

Syllabus

Module	Contents	Hours
I	**Basic Structure of Computers:** Functional Units, Basic Operational Concepts, Bus Structures, Software. Memory locations and addresses, Memory Operations, Instructions and Instruction Sequencing–Instruction Types, Instruction Execution and Straight Line sequencing, Branching. Addressing Modes, Basic Input/Output Operations.	10
II	**Basic Processing Unit**: Fundamental Concepts, Single Bus Organization- Execution of a Complete Instruction, Multiple Bus Organization, Hardwired control, Microprogrammed Control-Basic Organization only.	8
III	**Basic Processing Unit**: Fundamental Concepts, Single Bus Organization- Execution of a Complete Instruction, Multiple Bus Organization, Hardwired control, Microprogrammed Control-Basic Organization only.	10
IV	**I/O Organization:** Accessing of I/O Devices, Interrupts– Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices. Direct Memory Access, Buses, Interface Circuits- Parallel Port, Serial Port. Pipelining – Basic Concepts.	11
V	**Memory System:** Basic Concepts, Semiconductor RAMs- Internal Organization of Memory Chips, Static Memories, Asynchronous DRAMs, Synchronous DRAMs. Read Only Memories, Cache Memory-Mapping Functions.	9

Textbooks:

1. Hamachar, Vranesic & Zaky, "Computer Organization" (5th Ed), McGraw Hill.

Reference Books:

1. William Stallings, "Computer Organization and Architecture" (10th Ed), Pearson.
2. John P. Hayes, "Computer Architecture and Organization" (3rd Ed), McGraw Hill.
3. Mano M. M, "Digital Logic & Computer Design" (4th Ed), Pearson Education.

MOOC Courses

1. https://nptel.ac.in/courses/106/103/106103068/

Course Contents and Lecture Schedule

Topic	No. of lectures
Module 1	**10 hrs.**
Basic Structure of Computers: Functional Units	1
Basic Operational Concepts	1
Bus Structures, Software	1
Memory locations and addresses, Memory Operations	1
Instructions and Instruction Sequencing–Instruction Types	1
Instruction Execution and Straight Line sequencing, Branching	2
Addressing Modes	2
Basic Input/output Operations	1
Module 2	**8 hrs.**
Basic Processing Unit: Fundamental Concepts	2
Single Bus Organization-Execution of a Complete Instruction	2
Multiple Bus Organization	1
Hardwired control	2
Microprogrammed Control-Basic Organization only	1
Module 3	**10 hrs.**
Arithmetic & Logic Unit: Number Representation	1
Addition of Positive Numbers	1
Addition and Subtraction of Signed Numbers	2
Design of Fast Adders- Carry Look Ahead Addition	2
Multiplication of Positive Numbers	2

Signed Operand Multiplication (Booth's algorithm)	2
Module 4	**11 hrs.**
I/O Organization: Accessing of I/O Devices	1
Interrupts–Interrupt Hardware, Enabling and Disabling Interrupts	2
Handling Multiple Devices	1
Direct Memory Access	2
Buses	2
Interface Circuits-Parallel Port, Serial Port	2
Pipelining – Basic Concepts	1
Module 5	**9 hrs.**
Memory System: Basic Concepts	1
Semiconductor RAMs- Internal Organization of Memory Chips	2
Static Memories	1
Asynchronous DRAMs	1
Synchronous DRAMs	1
Read Only Memories	1
Cache Memory-Mapping Functions	2

24SJINMCA203	PROBABILITY AND STATISTICS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble:	This course introduces the concepts and application of measures of central tendency, measures of dispersion, permutations and combinations, probability theory and probability distributions. The topics treated in this course have found many applications in Computer Science.
Prerequisite:	NIL

Course Outcomes: After the completion of the course the student will be able to:		**K Level**
CO1	Understand various measures of central tendency and dispersion.	K2
CO2	Understand the concepts of permutations and combinations.	K2
CO3	Apply the concept of probability theory to solve different real life problems.	K3
CO4	Apply random variables and apply various discrete probability distributions in solving different problems.	K3
CO5	Apply various continuous probability distributions in solving different problems.	K3

Mapping of course outcomes with program outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	3	1					1
CO2	3	3	1					1
CO3	3	3	1					1
CO4	3	3	1					1
CO5	3	3	1					1

Mark Distribution

Total Marks	CIA	ESE	ESE Duration
100	40	60	3 Hours

Continuous Internal Evaluation Pattern:

Attendance :8 marks
Continuous Assessment Test (2 numbers) :20 marks
Assignment :12 marks

End Semester Examination Pattern:

There will be two parts: Part A and Part B. Part A contains 10 compulsory short answer questions, 2 from each module. Each question carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 6 marks.

Course Level Assessment Questions
Course Outcome 1 (CO1):

1. Distinguish between measures of central tendency and measures of dispersion. (K2)
2. Define standard deviation. State its merits and demerits. (K1)
3. Calculate standard deviation from the following data. (K2)

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
No. of students	5	7	14	5	9	6	2

4. The following table shows the distribution of 100 families according to their expenditure per week. The number of families corresponding to expenditure group Rs. (10 – 20) and Rs. (30 – 40) are missing table. The median and mode are given to be Rs. 25 and Rs. 24. Calculate the missing frequency and then mean of the data. (K2)

Expenditure	0 – 10	10 - 20	20 - 30	30 - 40	40 - 50
Families	14	?	27	?	15

Course Outcome 2 (CO2):

1. State sum and product rule. (K1)
2. How many 3digit numbers can be formed by using digits in 735621, if repetitions are not allowed? (K2)
3. Evaluate the number of ways in which a 7 digit telephone number can be made if
   (i) only even digits can be used
   (ii) first three digits are 111 and the remaining are even digits. (K2)
4. A committee of 12 is to be formed from 9 women and 8 men. Calculate the number of ways this can be done if at least 5 women have to be included in a committee? In how many of these committees
   (i) the women are in majority
   (ii) the men are in majority? (K2)

Course Outcome 3(CO3):

1. State addition theorem on probability for two events. (K1)
2. Distinguish between equally likely events and independent events. (K3)
3. In a class of 100 students 75 are boys and 25 are girls. The chance that a boy gets a first class is 0.25 and the probability that a girl gets first class is 0.27. Find the probability that a student selected at random gets a first class. (K3)
4. A committee of four has to be formed from among 3 economists, 4 engineers, 2 statisticians and 1 doctor. (K2)
   (i) What is the probability that each of the four professions is represented on the committee?
   (ii) What is the probability that the committee consist of a doctor and at least one economist?

Course Outcome 4 (CO4):

1. Define discrete random variable. (K1)
2. Evaluate the mean of Poisson distribution. (K3)
3. In a Binomial distribution, if the mean is 4 and variance is 2, find n. (K3)
4. A random variable X has the following probability distribution values of X:

X	0	1	2	3	4	5	6	7	8	9
P(X)	a	3a	5a	7a	9a	11a	13a	15a	17a	19a

(i) Determine the value of 'a'.
(ii) Find $P(X<3)$, $P(2\leq X\leq 5)$. (K3)

Course Outcome 5 (CO5):

1. Define mean of a continuous random variable. (K1)
2. Derive the variance of Exponential distribution. (K3)
3. In a normal distribution, 7% of the items are under 35 and 10% of the items are above 55. Find the mean and standard deviation. (K3)
4. The time in minutes that girl speaks over phone is a random variable X with pdf

$$f(x) = Ae^{\frac{-x}{5}}, \quad x \geq 0$$
$$0, \text{ otherwise}$$

Find the probability that she uses the phone
(i) for at least 5 minutes
(ii) for at most 10 minutes
(iii) between 5 and 10 minutes. (K3)

Syllabus

Module 1 (Measures of Central Tendency and Dispersion)
Various measures of central tendency, Arithmetic Mean, Median, Mode, Measures of Dispersion- Absolute and relative measures of dispersion, Range, Standard Deviation.

Module 2 (Permutations and Combinations)
Rules of sum and product, Inclusion-Exclusion for two sets, Permutations and Combinations, Generalized permutations and Combinations.

Module 3 (Probability Theory)
Introduction to probability theory, Random Experiment, Sample Space, Events, definitions ofprobability, Addition and Multiplication Theorem of probability, Conditional probability, Independent Events, Pair wise and mutual independence, Bayes's Theorem.

Module 4 (Discrete Probability Distribution)
Random variables, Discrete random variables, Probability Mass Function, Cumulative Distribution Function, Mathematical expectation (proofs of theorems are not required), Variance in terms of expectation (proofs of theorems are not required).Theoretical distributions: Binomial distributions, probability function, mean, variance,fitting of distribution. Poisson distribution- probability function, Poisson distribution as

the limiting case of binomial distribution (derivation is not required), mean, variance, fitting of distribution.

Module 5 (Continuous probability distributions)
Continuous Random Variables, Probability density function, Cumulative distribution function, Mean and Variance of continuous random variables and their properties (Concepts of moments is not required), Continuous probability distributions: Exponential Distribution-Mean, variance, memory-less property.
Normal Distribution-Probability density function and their properties, Mean, Variance (derivation not required).

Text Books

1. S. C. Gupta, Fundamentals of Statistics, seventh edition, Himalaya Publishing House, India.
2. T. Veerarajan, Probability, Statistics and Random Processes", 3rd edition, Tata McGraw-Hill publishing company limited, India.
3. Kenneth H. Rosen, Discrete Mathematics and Applications, seventh edition, McGraw – Hill International Edition.

References

1. S.C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons (2014).
2. R. V., Hogg, T. Craig Allen, Introduction to Mathematical Statistics, fifth edition, Pearson education (Singapore), Pvt.Ltd.
3. John E. Freund's Mathematical Statistics with applications, Seventh edition, Pearson prentice hall, 2014.
4. Murray R. Spiegel, John Schiller, R. Alu Srinivasan, Probability and Statistics, Fourth edition, Schaums outline series, 2013.
5. Richard A. Brualdi, Introductory Combinatorics, Third Edition, Pearson Education Asia Limited.

Web Resources

1. http://wiki.stat.ucla.edu/socr/index.php/EBook
2. https://www.openintro.org/stat/textbook.php
3. https://nptel.ac.in/courses/111105090
4. https://www.khanacademy.org/math/statistics-probability/probability-library

Course Contents and Lecture Scheule

Topic	No. of Lectures
Module 1	**10 hrs**
Measures of dispersion-Arithmetic Mean, Median, Mode	4
Measures of dispersion- Absolute and relative measures of dispersion, Range	3

Mean Deviation and Standard deviation	3
Module 2	**9 hrs**
Rules of sum and product, Inclusion-Exclusion for two sets	2
Permutations and Combinations	3
Generalized permutations and Combinations.	4
Module 3	**9 hrs**
Introduction, Random Experiments, Sample Spaces & Events	1
Classical, empirical and axiomatic probabilities	2
Addition Theorem on Probability	1
Conditional Probability, Multiplication Theorem, Independent Events, pairwise and mutual independence.	3
Bayes's Theorem	2
Module 4	**10 hrs**
Random variables, Discrete random variables, Probability Mass Function.	2
Cumulative Distribution Function, Mathematical expectation (proofs of theorems are not required), Variance in terms of expectation (proofs of theorems are not required).	3
Binomial distributions, probability function, mean, variance, fitting of distribution.	3
Poisson distribution- probability function, Poisson distribution as the limiting case of binomial distribution (derivation is not required), mean, variance, fitting of distribution.	2
Module 5	**10 hrs**
Continuous Random Variable, Probability density function	2
Mean and Variance, CDF	2
Normal distribution	4
Exponential distribution	2

24SJINMCA205	INTRODUCTION TO OBJECT ORIENTED PROGRAMMING	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1		4

Preamble	This course aims at building object-oriented skills through programming in C++.The pioneer programming language to implement object-oriented features is C++. Real world problems can be best solved using an object-oriented approach. The course content covers the essential object-oriented programming fundamentals, which can be taught within the given slots in the curriculum.
Prerequisite	20SJINMCA105- Introduction to Programming.

Course Outcomes: After the completion of the course the student will be able to:		**K Level**
CO1	Understand object-oriented programming fundamentals.	Level 2 - Understand
CO2	Understand dynamic memory management techniques using pointers, constructors, and destructors	Level 2 - Understand
CO3	Apply the various object-oriented concepts to solve real life problems.	Level 3 - Apply
CO4	Illustrate how the stream classes support input/output operations in C++.	Level 3 - Apply
CO5	Demonstrate the advanced programming concepts Templates and Exception handling.	Level 3 - Apply

Mapping of course outcomes with program outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	2	2	1			2
CO2	3	3	2	2				2
CO3	3	3	3	2	2	1	1	2
CO4	3	2	2	3	2			2
CO5	3	3	3	3	2		1	2

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance	: 8 Marks
Continuous Assessment Test (2 numbers)	: 20 Marks
Assignment/Quiz/Course project	: 12 Marks
Total	: 40 Marks

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contains 10 compulsory short answer questions, 2 from each module. Each question carries 3 marks. Part B contains 2 questions from each module of which student should answer anyone. Each question can have a maximum 2 subdivisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. "The basic concepts of object-oriented programming allow the programmer to develop more efficient and easier to update software". Justify the statement with examples of each of the concepts. (K3)

2. Explain the role of header files. (K1)

3. Compare various programming paradigms. (K2)

Course Outcome 2 (CO2):

1. Explain how constructors are invoked. (K1)

2. Demonstrate the use of 'this' pointer using an example. (K3)

3. Illustrate the use of new and delete operators for dynamic memory management using a sample program. (K3)

Course Outcome 3(CO3):

1. Illustrate how run time polymorphism is implemented in C++. (K3)

2. Illustrate the concept of operator overloading by overloading unary minus. (K3)

3. Create a program to invoke the member function of the base class and derived class using the pointer of the base class. (K3)

Course Outcome 4 (CO4):

1. Describe two methods of opening a file. (K2)

2. Explain about file stream classes. (K2)

3. Differentiate between formatted I/O and unformatted I/O. (K2)

Course Outcome 5 (CO5):

1. Differentiate between class template and function template. (K2)

2. Discuss the need of exception handling in C++. (K2)

3. Create a C++ program to handle "division by zero "exception. (K4)

SYLLABUS

Module 1

Introductory concepts of OOP: Programming Paradigms, Preface to Object-Oriented Programming, Key Concepts OOP- Objects, Classes, Data Abstraction, Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing. Advantages of OOP. C++ Basics: Parts of C++ program, Classes in C++, Declaring Objects, public, private and protected keywords, Defining Member Functions, Characteristics of Member Functions, Array of Objects, Objects as FunctionArgument.

Module 2

C++ Functions: Inline Functions, Outside Member Function Inline, Rules for Inline Functions, Static member Variables and Functions- Static Member Variables, Static Member Functions, Default Arguments, Function Overloading, Principles of Function Overloading, Friend Functions. Constructors and Destructors: Constructors, Characteristics, Constructors with arguments, Overloading Constructors, Constructors with Default Arguments, Copy Constructor, Destructors

Module 3

Operator Overloading: Introduction, The keyword Operator, Overloading Unary Operators, Overloading Binary Operators using Member Function and Friend Function. Inheritance: Introduction, Access Specifiers and Simple Inheritance, Protected Data with Private Inheritance, Types of Inheritance, Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance. Virtual Base Classes, Abstract Classes.

Module 4

Pointers: Features of Pointers, Pointer Declaration, Void Pointers, Wild Pointers, Pointer to Class, Pointer to Object, this pointer, Pointer to Derived class and Base class Binding, Polymorphism and Virtual Functions: Binding in C++, Virtual Functions, Rules for Virtual Functions, Pure Virtual Functions, Virtual Destructors, new and delete operators.

Module 5

C++ Streams: C++ Stream Classes, Unformatted I/O operations, Formatted Console I/O Operations-width(), precision(), fill(). Managing Output with Manipulators. Working with Files: Classes for File Stream Operations, Opening and Closing a File, Detecting end-of-file, File Modes, File Pointers and Their Manipulations, Sequential Input and Output Operations Put(), get(), write() and read(). Templates and Exception Handling: Class Templates, Function Templates. Exception Handling: Introduction, Basics of Exception Handling, Exception Handling Mechanism, Throwing Mechanism, Catching Mechanism.

Textbooks

1. E Balaguruswamy, “Object Oriented Programming with C++”, McGraw-Hill, 4 th Edition (2008).

2. Robert Lafore, “Object Oriented Programming in Turbo C++”,Galgotia Publications,(2001) 15

3. Ashok N. Kamthane, “Object Oriented Programming with ANSI and Turbo C++”, (2005).

Reference Books

1. Steven Holzner, “C++ Programming, Black Book”, Dreamtech, (2001)

2. Herbert Schlitz, “The Complete Reference C++”, TMH

3. Debasish Jana, "C++ and Object Oriented Programming Paradigm", PHI Learning, 3rd Edition(2014)

4. Deitel and Deitel, "C++ How to Program", PHI Learning, 9th Edition

5. Saurav Sahay,"Object Oriented Programming with C++",Oxford University Press, 2nd Edition(2006)

MOOC

1. https://www.udemy.com/course/object-oriented-c-plus-plus-programming/

Web Resources

1.https://www.studytonight.com/courses/cpp-video-tutorial/

2.https://www.bcanotes.com/cpp-programs/

3. http://thatchna.weebly.com/uploads/4/1/9/3/4193382/std_c_notes_03.pdf

Course Contents and Lecture Schedule

No	Topic	No. of Lecture Hours
1	**Module 1**	**9 hrs.**
1.1	Introductory concepts of OOP: Programming Paradigms	1
1.2	Preface to Object-Oriented Programming, Key Concepts OOP-Objects, Classes	1
1.3	Data Abstraction, Encapsulation, Inheritance, Polymorphism	1
1.4	Dynamic Binding, Message Passing. Advantages of OOP.	1
1.5	C++ Basics: Parts of C++ program	1
1.6	Classes in C++, Declaring Objects	1
1.7	Public , private and protected keywords	1
1.8	Defining Member Functions, Characteristics of Member Functions	**1**
1.9	Array of Objects, Objects as Function Argument	1
2	**Module 2**	**10 hrs**
2.1	C++ Functions: Inline Functions ,Outside Member Function Inline, Rules for Inline Functions	1
2.2	Static member Variables and Functions- Static Member Variable	1
2.3	Static Member Functions, Default Arguments	**1**
2.4	Function Overloading, Principles of Function Overloading	1
2.5	Friend Functions	1

2.6	Constructors and Destructors: Constructors, Characteristics	1
2.7	Constructors with arguments, Overloading Constructors	2
2.8	Constructors with Default Arguments	1
2.9	Copy Constructor, Destructors	1
3	**Module 3**	**11 hrs**
3.1	Operator Overloading: Introduction, The keyword Operator	1
3.2	Overloading Unary Operators	1
3.3	Overloading Binary Operators using Member Function and Friend Function	2
3.4	Inheritance: Introduction, Access Specifiers and Simple Inheritance	1
3.5	Protected Data with Private Inheritance	1
3.6	Types of Inheritance, Single Inheritance, Multilevel Inheritance	2
3.7	Multiple Inheritance, Hierarchical Inheritance	1
3.8	Hybrid Inheritance	1
3.9	Virtual Base Classes, Abstract Classes	1
4	**Module 4**	**8 hrs**
4.1	Pointers: Features of Pointers, Pointer Declaration	1
4.2	Void Pointers, Wild Pointers, Pointer to Class	1
4.3	Pointer to Object, this pointe	1
4.4	Pointer to Derived class and Base class	1
4.5	Binding, Polymorphism and Virtual Functions: Binding in C++, Virtual Functions	1
4.6	Rules for Virtual Functions, Pure Virtual Functions	1
4.7	Virtual Destructors	1
4.8	new and delete operators.	1
5	**Module 5**	**10 hrs**
5.1	C++ Streams: C++ Stream Classes, Unformatted I/O operations	1
5.2	Formatted Console I/O Operations-width(), precision(), fill()	1
5.3	Managing Output with Manipulators	1
5.4	Working with Files: Classes for File Stream Operations, Opening and Closing a File	1
5.5	Detecting end-of-file, File Modes, File Pointers and Their Manipulations	1
5.6	Sequential Input and Output Operations- put(), get(), write() and read().	1
5.7	Templates and Exception Handling: Class Templates, Function Templates	2
5.8	Exception Handling: Introduction, Basics of Exception Handling	1
5.9	Exception Handling Mechanism, Throwing Mechanism, Catching Mechanism	1

24SJINMCA207	BASICS OF DATA ANALYTICS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble:	Data Analytics is an essential discipline that enables organizations to make informed decisions by extracting meaningful insights from data. This course introduces students to the fundamental concepts, techniques, and tools used in data analytics. Through structured learning, students will explore various types of data, data processing techniques, statistical analysis, and machine learning basics. By the end of this course, students will have a foundational understanding of data analytics and its real-world applications in business, healthcare, finance, and e-commerce.
Prerequisite:	Basic Mathematics & Statistics, Fundamentals of Programming, Basic Computer & Data Handling Skills, Logical & Analytical Thinking.

Course Outcomes: After the completion of the course the student will be able to:		**K Level**
CO1	Understand fundamental concepts of Data Analytics, including its significance, types, and applications across various industries.	K2
CO2	Apply data collection and pre-processing techniques, including handling missing values, encoding categorical data, and using SQL for data retrieval.	K3
CO3	Perform Exploratory Data Analysis (EDA) using statistical methods and data visualization techniques to derive meaningful insights.	K3
CO4	Demonstrate knowledge of basic Machine Learning techniques, including regression, classification, and clustering, and evaluate model performance.	K2
CO5	Utilize data analytics tools and understand the fundamentals of Big Data processing frameworks and cloud-based storage solutions.	K2

Mapping of course outcomes with program outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2		2	1			2
CO2	3	3		3	2			2
CO3	3	3	3	3	2			3
CO4	3	3	3	3	2			3
CO5	2	2	3	3	2	2		3

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance	: 8 Marks
Continuous Assessment Test (2 numbers)	: 20 Marks
Assignment/Quiz/Course project	: 12 Marks
Total	: 40 Marks

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contains 10 compulsory short answer questions, 2 from each module. Each question carries 3 marks. Part B contains 2 questions from each module of which student should answer anyone. Each question can have a maximum 2 subdivisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Define Data Analytics and explain its significance in real-world applications. **K1**
2. Differentiate between Descriptive, Diagnostic, Predictive, and Prescriptive Analytics with examples. **K2**
3. Explain the role of Data Analysts, Data Scientists, and Business Intelligence professionals in decision-making. **K3**
4. What are Structured, Semi-Structured, and Unstructured Data? Provide examples. **K3**
5. Compare different data analytics tools like Python, SQL, and Tableau. **K2**

Course Outcome 2 (CO2):

1. Explain different types of data sources (Primary vs. Secondary) with examples. **K1**
2. How does SQL help in retrieving data for analysis? Provide examples of basic SQL queries. **K2**
3. Describe different data cleaning techniques for handling missing values and outliers.**K2**
4. Explain One-Hot Encoding vs. Label Encoding with suitable examples. **K3**
5. What is the difference between Normalization and Standardization in data transformation? **K2**

Course Outcome 3(CO3):

1. Explain Measures of Central Tendency (Mean, Median, Mode) and their significance. **K1**

2. How do histograms, box plots, and scatter plots help in EDA? **K2**
3. What is Hypothesis Testing? Explain T-test, Chi-square test, and ANOVA with examples. **K2**
4. Explain Correlation vs. Regression Analysis with real-world examples. **K3**
5. What is the Central Limit Theorem (CLT) and why is it important in statistics? **K2**

Course Outcome 4 (CO4):

1. Differentiate between Supervised and Unsupervised Learning with examples. **K2**
2. Explain the steps involved in Linear Regression Model building with an example. **K3**
3. How does a Confusion Matrix help in evaluating classification models? **K3**
4. What are the key differences between Decision Trees and K-Means Clustering? **K2**
5. Explain Train-Test Split and Cross-Validation in model evaluation. **K3**

Course Outcome 5 (CO5):

1. What are the key features of Tableau and Power BI in data visualization? **K2**
2. Define Big Data and explain the 5Vs (Volume, Variety, Velocity, Veracity, Value). **K2**
3. Compare SQL vs NoSQL Databases for big data storage. **K3**
4. Explain the Hadoop Ecosystem and its components (HDFS, MapReduce, YARN). **K3**
5. How do cloud-based storage solutions (AWS S3, Google BigQuery, Azure Analytics) help in Big Data processing? **K3**

SYLLABUS

Module 1

Introduction to Data Analytics- Data Analytics-Definition and significance, Role of data analytics in decision-making, Importance and applications in business, healthcare, finance, and e-commerce, Types of Data Analytics: Descriptive, Diagnostic, Predictive, and Prescriptive Analytics, Role of Data Scientists, Data Analysts, and Business Intelligence professionals, Data Analytics Process: Steps, Types of Data: Structured, Semi-Structured, and Unstructured Data, Overview of Tools for Data Analytics: Python, Excel, SQL, Tableau, Power BI.

Module 2

Data Collection & Pre-processing- Types of Data Sources: Primary (Surveys, Experiments), Secondary: Web Scraping, APIs, Databases (SQL, NoSQL), Public Datasets like Kaggle, UCI. SQL for data retrieval (SELECT, JOIN, GROUP BY), Basics of Data Cleaning: Handling missing values, duplicate records, and outliers, Encoding categorical data (One-Hot Encoding, Label Encoding), Data transformation: Normalization and Standardization, Basic File Formats: CSV, JSON, Excel.

Module 3

Exploratory Data Analysis (EDA) & Statistical Analysis-

Descriptive Statistics: Measures of central tendency (Mean, Median, Mode), Measures of dispersion (Variance, Standard Deviation).

Data Visualization Techniques: Univariate (Histograms, Boxplots, Density Plots), Bivariate Analysis (Scatter Plots, Pair Plots) & Multivariate Analysis (Correlation Matrix & Heatmaps)

Basics of Probability & Statistics: Probability Distributions (Normal, Binomial, Poisson), Central Limit Theorem (CLT). Hypothesis Testing & Statistical Tests (T-test, Chi-square test, ANOVA), p-values & Confidence Intervals. Correlation & Regression Analysis, Correlation Coefficients (Pearson, Spearman).

Module 4

Introduction to Machine Learning & Predictive Analytics-

Machine Learning: Definition, Types, Importance, Applications, Data Preprocessing using ML, Supervised Learning: Linear Regression, Model evaluation metrics (MSE, RMSE, R-squared), Classification (Decision Tree), Model Performance Metrics: Confusion Matrix, Accuracy, Precision, Recall, F1-score, Unsupervised Learning: Clustering Techniques, Model Evaluation: Train-test split, Cross-validation, Basics of R: Overview of R and its importance in Data Analytics, Data Pre-processing using ML.

Module 5

Data Analytics Tools & Introduction to Big Data-

Data Visualization Tools: R, Python, Excel, Tableau, Power BI, SQL, Big Data: Definition, Characteristics, Challenges, Big Data Processing Frameworks: Hadoop Ecosystem (HDFS,

MapReduce, YARN), Apache Spark, SQL vs NoSQL Databases, Cloud-based storage for Big Data(AWS S3, Google BigQuery, Azure for Analytics).

Textbooks

1. "Data Science for Business: What You Need to Know About Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett, O'Reilly Media (2013).
2. "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython" by Wes McKinney, O'Reilly Media, 2nd Edition (2017).
3. "Introduction to Statistical Learning with Applications in R" by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, Springer, 2nd Edition (2021).
4. "Machine Learning with R, the tidyverse, and mlr" by Bradley Boehmke and Brandon Greenwell (2019).
5. "Hadoop: The Definitive Guide" by Tom White, O'Reilly Media, 4th Edition (2015).
6. "Spark: The Definitive Guide: Big Data Processing Made Simple" by Bill Chambers and Matei Zaharia, O'Reilly Media (2018).

Reference Books

1. "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph" by David Loshin, Morgan Kaufmann (2013).
2. "Practical SQL: A Beginner's Guide to Storytelling with Data" by Anthony DeBarros, No Starch Press (2018).
3. "Practical Statistics for Data Scientists: 50 Essential Concepts" by Peter Bruce and Andrew Bruce, O'Reilly Media, 2nd Edition (2020).
4. "R for Data Science" by Hadley Wickham and Garrett Grolemund, O'Reilly Media (2017).
5. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems" by Aurélien Géron, O'Reilly Media, 2nd Edition (2019).
6. "Learning Tableau 2020: Business Intelligence and data visualization that brings your data to life" by Joshua Milligan, Packt Publishing (2020).
7. "Microsoft Power BI Cookbook" by Brett Powell, Packt Publishing, 2nd Edition (2019).

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1- Introduction to Data Analytics**	**10 Hours**
1.1	Data Analytics-Definition and significance	1
1.2	Role of data analytics in decision-making	1
1.3	Importance and applications in business, healthcare, finance, and e-commerce.	1
1.4	Types of Data Analytics: Descriptive, Diagnostic, Predictive, and Prescriptive Analytics.	1
1.5	Role of Data Scientists, Data Analysts, and Business Intelligence professionals.	2
1.6	Data Analytics Process: Steps	1
1.7	Types of Data: Structured, Semi-Structured, and Unstructured Data.	2
1.8	Overview of Tools for Data Analytics: Python, Excel, SQL, Tableau, Power BI.	1
2	**Module 2- Data Collection & Preprocessing**	**9 Hours**
2.1	Types of Data Sources: Primary (Surveys, Experiments), Secondary: Web Scraping, APIs, Databases (SQL, NoSQL), Public Datasets like Kaggle, UCI	2
2.2	SQL for data retrieval (SELECT, JOIN, GROUP BY).	1
2.3	Basics of Data Cleaning: Handling missing values, duplicate records, and outliers	2
2.4	Encoding categorical data (One-Hot Encoding, Label Encoding).	1
2.5	Data transformation: Normalization and Standardization	2
2.6	Basic File Formats: CSV, JSON, Excel.	1
3	**Module 3- Exploratory Data Analysis (EDA) & Statistical Analysis**	**10 Hours**
3.1	**Descriptive Statistics:** Measures of central tendency (Mean, Median, Mode), Measures of dispersion (Variance, Standard Deviation).	2
3.2	**Data Visualization Techniques:** Univariate (Histograms, Boxplots, Density Plots), Bivariate Analysis (Scatter Plots, Pair Plots) & Multivariate Analysis (Correlation Matrix & Heatmaps)	2
3.3	**Basics of Probability & Statistics:** Probability Distributions (Normal, Binomial, Poisson), Central Limit Theorem (CLT).	2
3.4	Hypothesis Testing & Statistical Tests (T-test, Chi-square test, ANOVA), p-values & Confidence Intervals.	2
3.5	Correlation & Regression Analysis, Correlation Coefficients (Pearson, Spearman).	2
4	**Module 4- Introduction to Machine Learning & Predictive Analytics**	**10 Hours**
4.1	Machine Learning: Definition, Types, Importance, Applications	1
4.2	Data Preprocessing using ML	1
4.3	Supervised Learning: Linear Regression, Model evaluation	2

	metrics (MSE, RMSE, R-squared).	
4.4	Supervised Learning: Classification (Decision Tree), Model Performance Metrics: Confusion Matrix, Accuracy, Precision, Recall, F1-score.	2
4.5	Unsupervised Learning: Clustering Techniques	2
4.6	Model Evaluation: Train-test split, Cross-validation.	1
4.7	Basics of R: Overview of R and its importance in Data Analytics.	1
5	**Module 5- Data Analytics Tools & Introduction to Big Data**	**9 Hours**
5.1	Data Visualization Tools: R, Python, Excel, Tableau, Power BI, SQL.	2
5.2	Big Data: Definition, Characteristics, Challenges	1
5.3	Big Data Processing Frameworks: Hadoop Ecosystem (HDFS, MapReduce, YARN), Apache Spark	2
5.4	SQL vs NoSQL Databases	2
5.5	Cloud-based storage for Big Data (AWS S3, Google BigQuery, Azure for Analytics.).	2

24SJINMCA209	DATA STRUCTURES	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble:	This course introduces students to group data together and describe the attributes and actions that can be performed on a particular instance of the data.
Prerequisite:	Fundamentals of Programming.

Course Outcomes: After the completion of the course the student will be able to:		**K Level**
CO1	Identify suitable algorithms and data structures for different scenarios.	**K1**
CO2	Explain standard searching and sorting algorithms.	**K2**
CO3	Apply appropriate data structures and algorithms to solve problems using linear lists.	**K3**
CO4	Develop applications using basic data structures such as arrays, stacks, and queues.	**K3**
CO5	Explain and implement trees and graphs using fundamental data structures and algorithms.	**K2**

Mapping of course outcomes with program outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	3	2	1			2
CO2	3	3	3	2	1			2
CO3	3	3	3	3	2			2
CO4	3	3	3	3	2			2
CO5	3	3	3	3	2			2

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance	: 8 marks
Continuous Assessment Test (2 numbers)	: 20 marks
Assignment/Quiz/Course project	: 12 marks

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contains 10 compulsory short answer questions, 2 from each module. Each question caries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 6 marks

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Discuss algorithm analysis for time and space complexity with example. (K2)
2. Explain asymptotic notations used in analysis of an algorithm. (K2)
3. Explain Abstract Data Types? (K2)

Course Outcome 2 (CO2):

1. Compare linear search and binary search with example. (K4)
2. Show a sorted array using quick sort. (K3)
3. Demonstrate with an example explain merge sort. (K3)

Course Outcome 3(CO3):

1. Describe a procedure to perform the following operation in Single Linked List: (A) Insert a new node at the beginning. B) Insert a new node at the end. (K2)
2. Differentiate between array and linked list. (K2)
3. Explain with an algorithm to create a node in Doubly Linked list. (K2)

Course Outcome 4 (CO4):

1. Convert the infix expression (a+b)*c/d+(e+f) to postfix expression . (K1)
2. Explain the static implementation of queue. (K2)
3. Explain the dynamic implementation of stack. (K2)

Course Outcome 5 (CO5):

1. Explain a procedure to insert an element in a Binary Search tree? (K2)
2. Illustrate with an example explain AVL tree. (K4)
3. Explain BFS and DFS with example. (K2)

SYLLABUS

Module 1

Introduction to Data Structures: Introduction to data structures, Concept, Data type, Data object, ADT-Definition, Operations on Data Structure, Types of Data Structure,

Algorithm analysis: Algorithm-Definition-Properties, Performance Analysis- Space complexity, Time complexity, Asymptotic notation.

Module 2

Arrays: Concept of Arrays-Operations on Arrays, Two dimensional arrays-Row/column major representation

Searching and Sorting Techniques: Linear Search, Binary search, Bubble sort, Insertion sort, Merge sort, Quick Sort.

Module 3

Singly Linked List: Definition, Array vs Linked List**,** Insertion, Deletion, Traversal, Searching. **Circular Linked List**-Insertion, Deletion, Traversal. **Doubly Linked List**-Insertion, Deletion, Traversal.

Module 4

Stacks: Definition and concept, Operations on Stacks-Push and Pop, Static and Dynamic Implementation of Stack, Applications of stacks-Conversion of infix to postfix expression, Evaluation of postfix expression.

Queues: Definition and concept, Operations on queue-Enqueue and Dequeue, Static and Dynamic implementation of Queue, **Circular Queue** -Definition and example, **Doubly ended queue**-Definition and example, Types of Deque, Applications of Queues-Simulation, CPU Scheduling, Round Robin Algorithm

Module 5

Graph: Definition and terminologies, Graph Representation, Graph Traversals: BFS and

DFS- Informal Description and Example.

Tree: Definition and Terminology, Binary Tree, Representations of binary tree-Array and Linked Representation, Traversing Binary Tree using Recursion- Preorder, In-order, Post-order traversal with example, BST using recursion-insertion, deletion, searching, traversal. AVL Tree-Definition and Example.

Textbooks

1. D. Samanta," Classic Data Structures", Second Edition, PHI, 2006.
2. Rohit Khurana," Data Structures using C", First Edition, VIKAS, 2014.

Reference Books

1. Horowitz, Sahni,Anderson-Freed "Fundamentals Of Data Structure in C", Second Edition
2. Cormen T.H., Leiserson C.E, Rivest R.L. and Stein C, "Introduction to Algorithms", Prentice Hall India, New Delhi, 2004

Web Resources

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial
3. https://www.tutorialspoint.com/data_structures_algorithms/index.htm

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
1	**Module 1**	**10 hrs.**
1.1	Introduction to data structures	1
1.2	ADT	1
1.3	Operations on Data Structure	1
1.4	Types of Data Structure	1
1.5	Algorithm	1
1.6	Time Complexity	2
1.7	Space Complexity	1

1.8	Asymptotic notation	2
2	**Module 2**	**11 hrs.**
2.1	Operations on arrays	2
2.2	Row/column major representation	1
2.3	Algorithm for Linear Search	1
2.4	Algorithm for Binary search	1
2.5	Algorithm for Bubble sort.	1
2.6	Algorithm for Insertion sort	1
2.7	Algorithm for Merge sort	2
2.8	Algorithm for Quick Sort	2
3	**Module 3**	**7 hrs.**
3.1	Array vs Linked List	1
3.2	Concept of Singly Linked List	2
3.3	Concept of Doubly Linked List	2
3.4	Concept of Circular linked List	2
4	**Module 4**	**11 hrs.**
4.1	Definition of stack	1
4.2	Static(Array) and Dynamic (Linked List) Implementation of stack	2
4.3	Applications of Stack	2
4.4	Definition of Queue	1
4.5	Static(Array) and Dynamic (Linked List) Implementation of Queue	2
4.6	Circular Queue	1
4.7	Doubly Ended Queue	1
4.8	Applications of Queue	1
5	**Module 5**	**9 hrs.**
5.1	Definition and terminologies-Graph	1
5.2	Graph Representation	1
5.3	Concept of BFS and DFS	1
5.4	Definition and terminologies-Tree	1
5.5	Representations of binary tree	1

5.6	Concept of BST	2
5.7	AVL Tree	2

		CATEGORY	L	T	P	CREDIT
24SJINMCA231	**DATA STRUCTURES LAB**	**PRACTICAL**	**0**	**0**	**4**	**1**

Preamble:	To understand the different methods of organizing large amount of data and implement different data structures efficiently for specific problems using 'C' language.
Prerequisite:	20SJINMCA209 Data Structures

Course Outcomes: After the completion of the course the student will be able to:		**K Level**
CO1	Assess how the choice of data structures and algorithm design methods impacts the performance of programs.	K5
CO2	Choose the appropriate data structure and algorithm design method for a specified application.	K4
CO3	Critically analyze and evaluate various data structures.	K4
CO4	Solve problems using linear data structures such as stack and queue.	K4
CO5	Solve problems using Nonlinear data structures.	K4

Mapping of course outcomes with program outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	2	3	1			2
CO2	3	3	2	3	1			2
CO3	3	3	3	3	1			2
CO4	3	2	2	2				2
CO5	3	2	3	2				2

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern:

Maximum Marks: 50	
Attendance	15%
Maintenance of daily lab record and GitHub management	20%
Regular class viva	15%
Timely completion of day to day tasks	20%
Tests/Evaluation	30%

End Semester Examination Pattern:

Maximum Marks: 50			
Verification of Daily program record and Git Repository			5 marks
Viva			10 marks
Problem solving (Based on difficulty level, one or more questions may be given)	Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15%	35 marks
	Program correctness	50%	
	Code efficiency	15%	
	Formatted output and Pushing to remote Git repository	20%	
Total Marks			50 marks

Course Level Assessment Questions

Course Outcome 1 (CO1):
1. Illustrate various array operations using switch-case. (K4)

Course Outcome 2 (CO2):
1. Apply various Sorting techniques. (K3)
2. Illustrate Searching techniques. (K4)

Course Outcome 3 (CO3):
1. Demonstrate Single Linked list. (K3)
2. Create and manipulate Double Linked list. (K4)
3. Demonstrate Circular Linked list. (K4)

Course Outcome 4 (CO4):
1. Illustrate Stack operation using array and linked list. (K4)
2. Illustrate Queue operation using array and linked list. (K4)

Course Outcome 5 (CO5):
1. Evaluate Binary Tree traversal using a C program. (K4)
2. Create and manipulate BST. (K4)

SYLLABUS

Linear Data structures -Arrays, Sorting and Searching Methods, Linked Lists, Stacks, Queues
Non-Linear Data Structures-Trees-Binary tree, Binary search trees.

Reference Books

1. D. Samanta,"Classic Data Structures", Second Edition, PHI, 2006.
2. Rohit Khurana,"Data Structures using C", First Edition, VIKAS, 2014.
3. Horowitz,Sahni,Anderson-Freed "Fundamentals Of Data Structure in C",Second Edition
4. Cormen T.H., Leiserson C.E, Rivest R.L. and Stein C, "Introduction to Algorithms", Prentice Hall India, New Delhi, 2004

Web Resources

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial
3. https://www.tutorialspoint.com/data_structures_algorithms/index.htm

List of Lab Experiments

1. Create a menu driven program to perform various Array operations- Insertion, Updation, Deletion, and Traversal
2. Develop a program to find an element in an array using Linear Search
3. Develop a program to find an element in an array using Binary Search
4. Develop a program to sort an array using Bubble Sort
5. Develop a program to sort an array using Merge Sort
6. Develop a program to sort an array using Quick Sort
7. Develop a program to sort an array using Insertion Sort
8. Develop a program in C to create a singly linked list of n nodes and count the number of nodes
9. Develop a program in C to search an existing element in an unsorted singly linked list
10. Develop a C program to concatenate two singly Linked List.
11. Create a menu driven program in C to do following function in a singly Linked List
    a) Insert a new node at the beginning of a Singly Linked List.
    b) Delete first node of Singly Linked List.
    c) Display all nodes
12. Create a menu driven program in C to do following function in a singly Linked List
    a. Insert a new node after a given location of Singly Linked List.
    b. Delete a node from a specified location of Singly Linked List.
    c. Display all nodes
13. Create a menu driven program in C to do following function in a singly Linked List
    a. Insert a new node at the end of a Singly Linked List
    b. Delete the last node of Singly Linked List.
    c. Display all nodes
14. Create a menu driven program in C to do following function in a Circular Linked List
    a. Insert a new node at the beginning.
    b. Delete node from Beginning.
    c. Insert a new node at the end. d) Delete end node. e) Display all nodes.
15. Create a menu driven program in C to do following function in a Circular Linked List

d) Insert a new node after a given location of Circular Linked List.
e) Delete a node from a specified location of Circular Linked List.
f) Display all nodes

16. Create a menu driven program in C to do following function in a Doubly Linked List
    a. Insert a new node at the beginning. b) Delete node from Beginning. c) Insert a new node at the end. d) Delete end node. g) Display all nodes.
17. Create a menu driven program to implement Stack operation using array
    a) **Push:** Adds an item in the stack. If the stack is full, then it is said to be an Overflow condition.
    b) **Pop:** Removes an item from the stack. If the stack is empty, then it is said to be an Underflow condition.
    c) **Peek or Top:** Returns top element of stack.
    d) **Traverse:** Display all items
18. Create a menu driven program to implement Stack operation using Linked List
    a) **Push:** Adds an item in the stack. If the stack is full, then it is said to be an Overflow condition.
    b) **Pop:** Removes an item from the stack. If the stack is empty, then it is said to be an Underflow condition.
    c) **Peek or Top:** Returns top element of stack.
    d) **Traverse:** Display all items.
19. Create a menu driven program to implement Queue operation using Array.
    a) **Enqueue**: Add element to end of queue
    b) **Dequeue**: Remove element from front of queue
    c) **Peek:** Get the value of the front of queue
    d) **Traverse:** Display all elements.
20. Create a menu driven program to implement Queue operation using Linked List.
    a) **Enqueue**: Add element to end of queue
    b) **Dequeue**: Remove element from front of queue
    c) **Peek:** Get the value of the front of queue
    d) **Traverse:** Display all elements
21. Develop a program to implement Binary Tree traversal (Preorder, Inorder, Postorder) using recursion
22. Create a menu driven program to implement Binary Search Tree using recursion
    a) Insertion b) Deletion c) Traversal (Preorder, Inorder, Postorder).d)Search.

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	**2 hrs**
1.1	Array Operations-Insertion, Updation, Deletion, Traversal	2
2	**Module 2**	**13 hrs**
2.1	Linear Search	1
2.2	Binary Search	1

2.3	Bubble Sort	2
2.4	Insertion Sort	3
2.5	Merge Sort	3
2.6	Quick Sort	3
3	**Module 3**	**18 hrs**
3.1	Singly linked list: Insertion, Deletion, Traversal	4
3.2	Searching in an unsorted single linked list	2
3.3	Concatenating two unsorted single linked lists	2
3.4	Double Linked list: Insertion, Deletion, Traversal	6
3.5	Circular Linked List: : Insertion, Deletion, Traversal	4
4	**Module 4**	**7 hrs**
4.1	Implementation of stack using array and linked list.	3
4.2	Implementation of Queue using array and linked list	4
5	**Module 5**	**8 hrs**
5.1	Binary Tree using recursion: Traversal (Preorder, In-order, Postorder)	3
5.2	Binary Search Tree using recursion: Insertion, Deletion, Traversal (Preorder, Inorder, Postorder)	5

24SJINMCA233	BASIC OBJECT ORIENTED PROGRAMMING LAB	CATEGORY	L	T	P	CREDIT
		PRACTICAL	0	0	4	1

Preamble	The students will develop adequate programming skills to implement the characteristics of an object-oriented programming language. The students can explore various programming constructs and data structures for the basic problem solving in C++ language
Prerequisite	20MCA108: Problem Solving and Structured Programming, 20MCA105: Introduction to Programming, 20INMCA205: Introduction to Object Oriented Programming.

Course Outcomes: After the completion of the course the student will be able to:		**K Level**
CO1	Understand the difference between procedural and object oriented programming.	K2
CO2	Recognize and understand the syntax and construction of object oriented programming language with functions.	K2
CO3	Create applications using constructors and destructors.	K3
CO4	Apply various inheritance concepts and polymorphism in programming.	K3
CO5	Use advanced features like templates and exception handling	K3

Mapping of course outcomes with program outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	1					
CO2	3	2	1					
CO3	3	1	1					
CO4	3	1	2	2				
CO5	3	1	2					

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern:

Maximum Marks: 50	
Attendance	15%
Maintenance of daily lab record and GitHub management	20%
Regular class viva	15%
Timely completion of day to day tasks	20%
Tests/Evaluation	30%

End Semester Examination Pattern:

Maximum Marks: 50			
Verification of Daily program record and Git Repository			5 marks
Viva			10 marks
Problem solving (Based on difficulty level, one or more questions may be given)	Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15%	35 marks
	Program correctness	50%	
	Code efficiency	15%	
	Formatted output and Pushing to remote Git repository	20%	
Total Marks			50 marks

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Demonstrate a program to check whether the given number is prime or not using class. (K3).
2. Tabulate and demonstrate the Student Record using class and object for getting the student marks, computing total marks and displaying the results. (K3)

Course Outcome 2 (CO2)

1. Apply the implementation functions. (K3)
2. Determine the area of a circle and rectangle using polymorphism. (K3).

Course Outcome 3(CO3):

1. Describe and discuss a copy constructor with demonstration(K2).
2. Determine the factorial of a number using a parameterized constructor (K3).

Course Outcome 4(CO4):

1. Create a class Student with data members name, roll no and age and member function getdata() to get the details. Derive a class Mark from students with data members to store the marks obtained by the student in 3 subjects and total. Define member functions getmarks() to accept the marks , calculate() to find the total and display() to print all the student details. (K4)
2. Create a class Student contains data members roll no, name, age and marks of 3 subjects of the students and member function getdata() to get the student details. Another class Sports contains the sports score of the student. Create a class Reports derived from Student and Sports, which contains data members total to store the total mark obtained by the student. Using the object of the class Report displays the details of the student. (K4)
3. Explain with a program to overload unary operators using member and non-member functions. (K2).

Course Outcome 5(CO5):

1. Analyse “division by zero“ situation and manage it with exception(K4)
2. Recall linear search in an array and solve it using a function template. (K3)

SYLLABUS

Preparation of programs demonstrating the following concepts

1. Classes and Objects

2. Functions

2.1. Member functions and Inline functions

2.2. Static data and static functions

2.3. Default Arguments

2.4. Friend Functions

3. Constructors and Destructors

3.1. Default Constructor

3.2. Parameterized Constructor

3.3. Default Argument Constructor

3.4. Copy Constructor

4. Overloading

4.1. Function Overloading

4.2. Operator Overloading

5. Inheritance

5.1. Single

5.2. Multiple

5.3. Multi-level

5.4. Hybrid

6. Pointers

7. Virtual Functions

8. I/O streams and functions

10. Exception Handling

11. Templates

Reference Book

1. Ashok N Kamthane, “Object Oriented Programming with ANSI and Turbo C++”, (2005)

2. E Balaguruswamy, “Object Oriented Programming with C++”, McGraw-Hill, 4th Edition(2008).

Web Reference

1. https://nptel.ac.in/courses/106/105/106105151/

2. https://www.bcanotes.com/cpp-programs/

List of Lab Experiments

1. Program to check whether the given number is prime or not.
2. Program to find the reverse of a number.
3. Program to check if the number is palindrome or not.
4. Program to print the Fibonacci series.
5. Program to find the sum of digits of a number.
6. Program to demonstrate static data and functions.
7. Program to demonstrate friend functions.
8. Program to perform Arithmetic Operations using Inline Function.
9. Program to demonstrate working of default arguments
10. Create a class for counting the number of objects created and destroyed within various blocks using constructor and destructor.
11. Create a program to demonstrate copy constructor
12. Create a program to generate Fibonacci Series using default constructor.
13. Create a program to the factorial of a number using a parameterized constructor
14. Program to calculate the area of circle and Rectangle using function overloading.
15. Create a program to overload plus operator for adding two time objects expressed in hour minutes and seconds using member function.
16. Program to demonstrate single inheritance.
17. Program to demonstrate multiple inheritance
18. Create a program to find the biggest among 3 numbers using multilevel inheritance.
19. Create a program to illustrate hybrid inheritance
20. Create a program to illustrate virtual base class
21. Create a program to invoke the member function of the base class and derived class using the pointer of the base class.

22. Create a program to demonstrate the use of virtual functions

23. Create a program to demonstrate the I/O Streams and functions

24. Open a text input file and count the number of characters, words and lines in it.

25. Create a program to demonstrate templates.

26. Create a program to implement exception handling.

Course Contents and Lecture Schedule

SI No	Topic	Hours
1	**Classes and Objects.**	**9 hrs.**
1.1	Functions: Member functions and Inline functions, Static data and static functions, Default Arguments, Friend Functions.	1
1.2	Constructors and Destructors: Default Constructor, Parameterized Constructor, Default Argument Constructor, Copy Constructor.	1
1.3	Overloading: Function Overloading, Operator Overloading.	1
1.4	Inheritance: Single, Multiple, Multi-level, Hybrid.	1
1.5	Pointers, Virtual Functions.	1
1.6	I/O streams and functions, File Accessing.	1
1.7	Exception Handling, Templates.	1

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MCA Integrated

SEMESTER 4

24SJINMCA202	LINUX/UNIX FUNDAMENTALS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1		4

Preamble	This course introduces students to some basic Linux/Unix ideas and tools which are at the core of MCA course. It introduces the concepts of shell programming.
Prerequisite	Basic knowledge of Computer System.

Course Outcomes: After the completion of the course the student will be able to:		**K Level**
CO1	Demonstrate the fundamental concepts of open source operating system Linux.	K2
CO2	Understand the basic set of commands and editors of Linux. Create their own shell programs for practical level problems.	K1
CO3	Illustrate to manage documents and control process execution.	K2
CO4	Demonstrate the roles and responsibilities of Linux System Administrator.	K2
CO5	Understand different packages and various server commands.	K2

Mapping of course outcomes with program outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	1	1				2
CO2	3	3	3	2	1			2
CO3	3	2	2	2		1	1	2
CO4	3	2	2	2			1	2
CO5	3	2	2	2				2

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 8 Marks

Continuous Assessment Test (2 numbers) : 20 Marks

Assignment/Quiz/Course project : 12 Marks

Total : 40 Marks

End Semester Examination Pattern:

There will be two parts; Part A and Part B. Part A contains 10 compulsory short answer questions, 2 from each module. Each question carries 3 marks. Part B contains 2 questions from each module of which student should answer anyone. Each question can have a maximum 2 subdivisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Illustrate different types of File Access Permissions. (K2)

2. Demonstrate different features and facilities of Linux. (K2)

3. Describe how to create a file and display its contents. (K2)

Course Outcome 2 (CO2):

1. Summarize different shell variables. (K3)

2. Design a shell program to add all even numbers upto 100. (K3)

3. Categorize different text editors available in Linux. (K2)

Course Outcome 3(CO3):

1. Illustrate the command to terminate the background process. (K3)

2. Generate the command to combine redirection and pipes. (K2)

3. Describe the scheduling of tasks. (K2)

Course Outcome 4 (CO4):

1. Explain compression of files. (K2)

2. Recommend how different users communicate in Linux. (K2)

3. Describe the need of making backups. (K2)

Course Outcome 5 (CO5):

1. Demonstrate the packages in Linux. (K2)

2. Evaluate Cron Command. (K2)

3. Show how RPM can be diagnosed. (K2)

SYLLABUS

Module 1

The Linux Operating System - The History of Linux, Linux Architecture, Linux Compared to UNIX, Features and Facilities in Linux, Shells Available in Linux. Managing Files and Directories - Linux File System, File naming Conventions, Relative Path Names, Types of Files in Linux, Types of Users in Linux, Directory Commands in Linux - Identifying the Current Directory Path, Changing the Current directory, Creating a Directory, Removing a Directory, Listing the Contents of a Directory, File Commands in Linux - Displaying the Content of Files, The head and tail Commands, Copying Files, Removing Files, Moving and Renaming Files, Displaying the Contents Pagewise. Securing Files in Linux - File Access Permissions [FAPs], Viewing File Access Permissions, Changing File Access Permissions.

Module 2

Creating Files Using the vi Editor - Text Editors, Functions of a Text Editor, Editors Available with Linux, The vi Editor, Getting Started with the vi Editor, Commands Used in the vi Editor. Automating Tasks Using Shell Scripts - Introduction, Variables Local and Global Shell Variables, Command Substitution. Using Conditional Execution in Shell Scripts - Conditional Execution, The case...esac Construct. Managing Repetitive Tasks Using Shell Scripts - Using Iteration in Shell Scripts, Parameter-Handling in Shell Scripts, The shift command.

Module 3

Managing Documents - Locating Files in Linux, Standard Files, Redirection, Filters, Pipes. Controlling Process Execution - Requesting for Background Processing, Checking a Background Processing, The top Command, Terminating a Background Process, Finding the Time Taken to Complete a Command, Scheduling Tasks.

Module 4

Backing up, Restoring and Compressing Files - The need for Making Backups, Backup Strategies, Selecting a Backup Medium, Compressing Files. Using Basic Networking Commands in Linux - Communicating with Other Users in Linux, Using File Transfer Protocol in Linux, E-mail in Linux.

Module 5

Installing Packages - Applications in Linux, Red Hat Package Manager (RPM), Working with RPM - Installing Packages, Upgrading Packages, Uninstalling Packages, Querying Packages, Verifying Packages, Checking Signatures, Diagnosing with RPM. Daemons - Cron and Atd Scheduling Commands, Xinetd and Inetd Manage Daemons, Kernel Daemons, Printing Daemons, File Service Daemons, Administrative Database Daemons, Electronic Mail Daemons, Remote Login and Command Execution Daemons, Booting and Configuration Daemons, Other Network Daemons.

Textbooks

1. "Operating System - Linux", NIIT Press, PHI Publisher

2. Evi Nemeth, Garth Snyder, Trent R Hein, "Linux Administration Handbook" Second Edition, Pearson Education.

Reference Books

1. Christopher Negus, "Red Hat Linux Bible", Wiley Dreamtech India

2. Neil Mathew, Richard Stones, "Beginning Linux Programming", Fourth Edition, Wiley

3. Yeswant Kanetkar, "UNIX Shell Programming", BPB

MOOC

https://www.udemy.com/course/linux-command-line-volume1/

Web Resources

1. https://www.udemy.com/course/linux-shell-scripting-projects/
2. https://www.udemy.com/course/learn-linux-in-5-days/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lecture Hrs.
1	**Module 1**	**12**
1.1	The History of Linux, Linux Architecture	1
1.2	Linux Compared to UNIX, Features and Facilities in Linux	1
1.3	Shells Available in Linux, Linux File System	1
1.4	File naming Conventions, Relative Path Names, Types of Files in Linux	1
1.5	Types of Users in Linux, Directory Commands in Linux - Identifying the Current Directory Path, Changing the Current directory	1
1.6	Creating a Directory, Removing a Directory, Listing the Contents of a Directory	1
1.7	File Commands in Linux - Displaying the Content of Files, The head and tail Commands	1
1.8	Copying Files, Removing Files	1
1.9	Moving and Renaming Files, Displaying the Contents Pagewise.	1
1.10	File Access Permissions [FAPs]	1
1.11	Viewing File Access Permissions	1
1.12	Changing File Access Permissions	1
2	**Module 2**	**12**
2.1	Text Editors, Functions of a Text Editor, Editors Available with Linux	1
2.2	The vi Editor, Getting Started with the vi Editor	1
2.3	Commands Used in the vi Editor	1
2.4	Automating Tasks Using Shell Scripts - Introduction	1
2.5	Variables Local and Global Shell Variables	1
2.6	Command Substitution	1
2.7	Using Conditional Execution in Shell Scripts	1
2.8	Conditional Execution	1
2.9	The case...esac Construct.	1
2.10	Managing Repetitive Tasks Using Shell Scripts - Using Iteration in Shell Scripts	1
2.11	Parameter-Handling in Shell Scripts	1
2.12	The shift command	1
3	**Module 3**	**8**
3.1	Managing Documents - Locating Files in Linux	1
3.2	Standard Files	1
3.3	Redirection	1

3.4	Filters, Pipes	1
3.5	Controlling Process Execution - Requesting for Background Processing	1
3.6	Checking a Background Processing	1
3.7	The top Command, Terminating a Background Process	1
3.8	Finding the Time Taken to Complete a Command, Scheduling Tasks	1
4	**Module 4**	**8**
4.1	Backing up, Restoring and Compressing Files - The need for Making Backups	1
4.2	Backup Strategies	1
4.3	Selecting a Backup Medium	1
4.4	Compressing Files	1
4.5	Using Basic Networking Commands in Linux	1
4.6	Communicating with Other in Linux	1
4.7	Using File Transfer Protocol in Linux	1
4.8	E-mail in Linux	1
5	**Module 5**	**8**
5.1	Installing Packages - Applications in Linux	1
5.2	Red Hat Package Manager (RPM), Working with RPM - Installing Packages, Upgrading Packages, Uninstalling Packages	1
5.3	Querying Packages, Verifying Packages	1
5.4	Checking Signatures, Diagnosing with RPM	1
5.5	Daemons - Cron and Atd Scheduling Commands, Xinetd and Inetd Manage Daemons	1
5.6	Kernel Daemons , Printing Daemons, File Service Daemons, Administrative Database Daemons, Electronic Mail Daemons	1
5.7	Remote Login and Command Execution Daemons	1
5.8	Booting and Configuration Daemons, Other Network Daemons	1

24SJINMCA204	STATISTICAL APPLICATIONS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble:	This course introduces the concepts and applications of correlation, regression and testing of hypothesis. The topics treated in this course have applications in Computer Science.
Prerequisite:	**NIL**

Course Outcomes: After the completion of the course the student will be able to:		**K Level**
CO1	Apply principles of correlation for solving practical problems.	**K3**
CO2	Apply principles of regression for solving practical problems.	**K3**
CO3	Describe about sample parameters using different methods.	**K3**
CO4	Understand the concept of statistical inference and apply them in large sample tests.	**K2**
CO5	Describe parameters for small samples and apply them in small sample tests.	**K3**

Mapping of course outcomes with program outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	3		3				1
CO2	3	3		3				1
CO3	3	3		3				1
CO4	3	3		3				1
CO5	3	3		3				1

Mark Distribution

Continuous Internal Evaluation Pattern:

Attendance :8 marks
Continuous Assessment Test (2 numbers) :20 marks
Assignment :12 marks

End Semester Examination Pattern:
There will be two parts: Part A and Part B. Part A contains 10 compulsory short answer questions, 2 from each module. Each question carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1.Define positive and negative correlation with examples. (K1)

2. The ranks of students in Mathematics and Physics are as follows. Calculate the rank correlation coefficient for proficiencies of same 16 students in Mathematics and Physics. (1,1) (2,10) (3,3) (4,4) (5,5) (6,7) (7,2) (8,6) (9,8) (10,11) (11,15) (12,9) (13,14) (14,12) (15,16) (16,13). (Two numbers within brackets denote the ranks of the students in Mathematics and Physics). (K3)

3. The competitors in a musical test were ranked by the three judges A, B and C in the following order:

Ranks by A: 1 6 5 10 3 2 4 9 7 8
Ranks by B: 3 5 8 4 7 10 2 1 6 9
Ranks by C: 6 4 9 8 1 2 3 10 5 7

Using rank correlation method, discuss which pair of judges has the nearest approach to common likings in music. (K3)

Course Outcome 2 (CO2):

1.What is linear regression? (K1)

2. From the data given below (K3)

Age of Husband: 25 30 40 42 50 28 34 27 23 31
Age of Wife: 24 26 32 39 46 22 30 23 20 30

Find out
i) The two regression Equations
ii) Most likely age of wife when husband's age is 25
iii) Most likely age of husband when wife's age is 19

3. In the estimation of regression equation of two variables X and Y the following results were obtained.
X= 90, Y= 70, n=10, ΣX^2 = 6360, ΣY^2= 2860, $\sum$XY = 3900
where X and Y are deviations from respective means. Obtain two equations. (K3)

Course Outcome 3(CO3):

1. What are the merits and demerits of simple random sampling? (K2)
2. Out of 20,000 customer's ledger accounts, a sample of 600 accounts was taken to test the accuracy of posting and balancing wherein 45 mistakes were found. Assign limits within which the number of defective cases can be expected at 95% level. (K3)
3. Explain various sampling techniques in detail. (K3)

Course Outcome 4 (CO4):

1. Explain the Level of significance and Critical values. (K2)
2. A stenographer claims that she can take dictation at the rate of 120 words per minute. Can we reject her claim on the basis of 100 trials in which she demonstrates a mean Of 116 words with a standard deviation of 15 words? Use 5% significance level. (K2)
3. In a big city 325 men out of 600 men were found to be smokers. Does this information support the conclusion that the majority of the men in this city are smokers? (K2)

Course Outcome 5 (CO5):

1. Define Degrees of freedom. (K2)

2. The time taken by workers in performing a job by method I and method II is given by

Method I 20 16 26 27 23 22
Method II 27 33 42 35 32 34 38

Do the data show that the variances of time distribution from population from which these samples are drawn do not differ significantly? (K3)

3. Certain pesticide is packed into bags by a machine. A random sample of 10 bags is drawn and their contents are found to weigh as follows: 50, 49, 52, 44, 45, 48, 46, 45, 49, 45. Test if the average packing can be taken to be 50 Kg. (K3)

Syllabus

Module 1: (Correlation Analysis) [(Derivations are not required)]
Correlation: Introduction, Types of Correlation, Karl Pearson's Correlation Coefficient, Properties of Karl Pearson's Correlation Coefficient, Rank Correlation-Spearman's Rank Correlation-Coefficient.

Module 2: (Regression Analysis)
[(Derivations are not required)]
Regression: Introduction, Lines of Regression, Regression Coefficient, Correlation Analysis vs Regression Analysis**.**

Module 3: (Sampling Distribution & Estimation Theory)
Population, Sampling, Parameter and statistic, Sampling distribution, Standard errors, Limitations of Sampling-Types of Sampling-Estimation of Parameter: Point Estimation-Properties of a good estimator-unbiasedness, consistency, sufficiency, Efficiency-Methods of Point Estimation- Maximum Likelihood Estimation -Interval Estimation.

Module 4: (Testing of Hypotheses and Large Sample Test)
Concepts of Hypothesis, Simple and Composite Hypothesis, Null Hypothesis, Alternate

Hypothesis, Types of errors, Level of significance, Critical region, Power of test, Procedure for testing of Hypothesis (Rejection region method only)- Large Sample Test: Large sample tests concerning mean, equality of means, proportions, equality of proportion.

Module 5: (Small Sample Test)
Tests based on Chi square distribution for variance, Chi square test for Goodness of fit, Chi square test for independence of attributes-Small Sample Test: t-test for mean, Equality of Means and Paired t-test, Tests based on F-distribution**.**

Text Books

1. S. C. Gupta, Fundamentals of Statistics, seventh edition, Himalaya Publishing House, India.
2. S.C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons (2014).

References

1. John E. Freund's "Mathematical Statistics with applications", Seventh Edition, Pearson Prentice Hall, 2014.
2. Murray R. Spiegel, John Schiller, R. Alu Srinivasan, "Probability and Statistics", Fourth Edition, Schaums Outline Series, 2013.
3. Richard A. Johnson, Miller & Freund's "Probability & Statistics for engineers", Fifth Edition, Prentice Hall, 1994.
4. T. Veerarajan, "Probability, Statistics and Random Processes", Third Edition, Mc Graw Hill Education, New Delhi, 2010.

Web Resources

1. Probability and statistics EBook: http://wiki.stat.ucla.edu/socr/index.php/EBook
2. https://www.openintro.org/stat/textbook.php
3. http://www.math.uah.edu/stat/index.html

MOOC References

1 http://nptel.ac.in/courses/111105041/17

1. https://www.coursetalk.com/subjects/statistics/courses
2. http://nptel.ac.in/courses/111105090/

Course Contents and Lecture Scheule

Topic	No. of Lectures
Module 1: Correlation Analysis	8 hrs

Correlation: Introduction, Types of Correlation	2
Karl Pearson's Correlation Coefficient	2
Properties of Karl Pearson's Correlation Coefficient	2
Rank Correlation-Spearman's Rank Correlation	2
Module 2: Regression Analysis	7 hrs
Regression: Introduction, Lines of Regression	3
Regression Coefficient	3
Correlation Analysis vs Regression Analysis	1
Module 3: Sampling Distribution & Estimation Theory	11 hrs
Population, Sampling, Parameter and statistic, Sampling distribution, Standard errors, Limitations of sampling.	3
Types of sampling	2
Estimation of Parameter: Point Estimation, Properties of a good estimator-unbiasedness, consistency, sufficiency, efficiency	2
Methods of Point Estimation- Maximum Likelihood Estimation	1
Interval Estimation	3
Module 4: Testing of Hypotheses and Large Sample Test	11 hrs
Concepts of Hypothesis, Simple and Composite Hypothesis, Null Hypothesis, Alternate Hypothesis, Types of errors, Level of significance, Critical region, Power of test, Procedure for testing of Hypothesis (Rejection region method only)	4
Large Sample Test: Large sample tests concerning mean, equality of means	4
Large Sample Test: Proportions, Equality of Proportions.	3
Module 5: Small Sample Test	11 hrs
Tests based on Chi Square Distribution for Variance, Chi Square Test for Goodness of Fit	3
Chi Square Test for independence of attributes	2
Small Sample Test: t-test for mean, Equality of means and Paired t-test	3
Tests based on F-distribution	3

ST JOSEPH'S COLLEGE OF ENGINEERING & TECHNOLOGY
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24SJINMCA206	OPERATING SYSTEMS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble:	This course aims to give a clear understanding of the purpose and functions of an operating system, classical internal algorithms and structures of operating systems including CPU scheduling, memory management and device management. This course introduces the fundamentals of Operating Systems concepts and helps to make a more effective programmer.
Prerequisite:	24SJINMCA201- Computer Organization, 24SJINMCA107- Introduction to Computers & PC hardware.

Course Outcomes: After the completion of the course the student will be able to:		**K Level**
CO1	Understand the Basic Concept of Operating Systems concepts	(K2)
CO2	Explain the concepts of process management and different process scheduling algorithms.	(K3)
CO3	Understand the concepts of process synchronization and deadlock management.	(K2)
CO4	Understand the concepts of memory management.	(K2)
CO5	Understand the concepts of I/O and file system management.	(K2)

Mapping of course outcomes with program outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	2	-	-	-	-	-
CO2	2	-	3	1	-	-	1	-
CO3	3	2	2	1	-	-	-	-
CO4	3	2	3	2	-	-	-	-
CO5	2	-	3	1	-	-	-	-

Mark distribution

Continuous Internal Evaluation Pattern:

Attendance : 8 marks

Continuous Assessment Test (2 numbers) : 20 marks

Assignment/Quiz/Course project : 12 marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which

student should answer any one. Each question can have maximum 2 sub-divisions and carry 6 marks.

Total	CIE	ESE	ESE Duration
100	40	60	3 hours

Sample Course Level Assessment Questions

Course Outcome 1 (CO1):

1. List the Functions of operating systems (K1).
2. Explain the characteristics of the Real time system (K2).

Course Outcome 2 (CO2)

1. Explain process state transition diagram with the help of a diagram (K2).
2. Demonstrate FCFS Scheduling Algorithms with an example (K3).

Course Outcome 3 (CO3):

1. Compare shared memory and message passing mechanism (K2).
2. Explain Resource allocation graph with the help of a neat diagram (K2).

Course Outcome 4 (CO4):

1. Explain Paging with the help of diagram (K2).
2. Define Thrashing. List the Causes of thrashing(K1).

Course Outcome 5 (CO5):

1. Explain in detail about RAID Structure (K2).
2. Describe File Attributes (K2).
3. Compare different File Allocation Methods (K2).

Syllabus

MODULE	CONTENTS	HOURS
I	**Introduction to Operating System:** OS Definition, Functions, types of OS - Batch Operating System, Multi programming, Time sharing, Real time, Distributed operating systems, Embedded systems. Operating System Operations, Operating System Services, User Operating System Interface, System Calls, Types of System Calls.	**8**

II	**Process:** Basic Concepts, process state transition diagram, PCB (Process control block), Threads - Multi threading Models, Operations on processes – process creation and termination. **Processor scheduling:** queues – schedulers –long, short & medium – context switch. Process Scheduling – pre emptive and non-pre-emptive. Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling.	**10**
III	**Process Synchronization & Communication:** Inter process communication – shared memory – message passing. Cooperating Process, Critical Section Problem, Mutex, Semaphores. **Deadlocks:** Definition – Deadlock characterization, Resource allocation graph, methods for handling deadlocks, deadlock prevention, deadlock avoidance-safe state, Resource Allocation Graph Algorithm- Banker's Algorithm, Deadlock Detection, Recovery from Deadlock.	**10**
IV	**Memory Management**: Preliminaries - Address Binding, logical and physical address space, Dynamic Linking and Loading. Swapping, Contiguous memory allocation, Paging, Page table structure, Segmentation, Segmentation with paging. **Virtual Memory:** Demand paging, Page replacement- Page replacement algorithms – FIFO Page replacement, Optimal Page replacement, LRU Page replacement. Thrashing – Cause of thrashing.	**12**
V	**Device Management:** Disk scheduling-FCFS-SSTF, SCAN, C-Scan, LOOK, Disk management, Disk reliability – RAID Structure. **File Management:** File Concept, File Attributes, File Operations, File Types, File Access Methods. Directories - Introduction, Directory Structure. Allocation Methods - Contiguous Allocation, Linked Allocation, Indexed allocation.	**8**

Text Books

1. Abraham Silberschatz and Peter Baer Galvin, Greg Gange, "Operating System Concepts", Ninth Edition, Wiley - India.

Reference Books

1. Andrew S. Tanenbaum, "Modern Operating System", Prentice Hall India.
2. Milan Milenkovic, "Operating systems", TATA Mc GrawHill.
3. D. M. Dhamdhare, "Operating System, A Concept based approach", 2nd Ed, Tata McGraw-Hill.
4. Deitel. H.M., "Operating system principles", 3rd Ed, Pearson

MOOC:

1. https://nptel.ac.in/courses/106/105/106105214/
2. https://www.studytonight.com/operating-system/classical-synchronization-problems

Web Resources:

1. https://www.geeksforgeeks.org/difference-between-paging-and-segmentation/
2. https://www.w3schools.in/operating-system-tutorial/interprocess-communication-ipc/

Course Contents and Lecture Schedule:

No	Topic	No: of Lectures
1	**Module 1**	
1.1	**Introduction to Operating System**: OS Definition, Functions.	1 hr
1.2	Types of OS - Batch Operating System, Multi programming, Time sharing, Real time, Distributed operating systems, Embedded systems.	3 hrs
1.3	Operating System Operations	1 hr
1.4	Operating System Services.	1 hr
1.5	User Operating System Interface.	1 hr
	System Calls, Types of System Calls.	1 hr
2	**Module 2**	
2.1	**Process & Processor scheduling:** Basic Concepts, process state transition diagram, PCB (Process control block).	1 hr
2.2	Threads - Multi threading Models.	1 hr
2.3	Process scheduling – queues – schedulers – long, short & medium – context switch.	2 hrs
2.4	Operations on processes – process creation and termination.	1 hr
2.5	Process Scheduling – pre-emptive and non-pre-emptive - Scheduling Criteria.	1 hr
2.6	Scheduling Algorithms, Multiple Processor Scheduling	4 hrs
3	**Module 3**	
3.1	**Process Synchronization & Communication:** Inter process communication – shared memory – message passing.	2 hrs
3.2	Cooperating Process, Critical Section Problem, Mutex, Semaphores.	2 hrs
3.3	**Deadlocks:** Definition – Deadlock characterization, Resource allocation graph	2 hrs
3.4	Methods for handling deadlocks, deadlock prevention, deadlock avoidance-safe state.	2 hrs
3.5	Resource Allocation Graph Algorithm- Banker's Algorithm, Deadlock Detection, Recovery from Deadlock.	2 hrs
4	**Module 4**	
4.1	**Memory Management:** Preliminaries - Address Binding, logical and physical address space, Dynamic Linking and Loading	2 hrs
4.2	Swapping, Contiguous memory allocation.	2 hrs
4.3	Paging, Page table structure, Segmentation, Segmentation with paging.	2 hrs
4.4	**Virtual Memory:** Demand paging	1 hr
4.5	Page replacement- Page replacement algorithms – FIFO Page replacement, Optimal Page replacement, LRU Page replacement.	4 hrs

4.6	Thrashing – Cause of thrashing.	1 hr
5	**Module 5**	
5.1	**Device Management:** Disk scheduling-FCFS-SSTF, SCAN, C-Scan, LOOK	3 hrs
5.2	Disk management, Disk reliability – RAID Structure.	2 hrs
5.3	**File Management:** File Concept, File Attributes, File Operations, File Types, File Access Methods	1 hr
5.4	Directories-Introduction, Directory Structure	1 hr
5.5	Allocation Methods - Contiguous Allocation, Linked Allocation, Indexed allocation.	1 hr

24SJINMCA208	ELEMENTS OF BUSINESS MANAGEMENT	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble:	The primary aim of this course is to understand basic principles of management. Managers will have to manage many resources due to a complex business environment. By effective and efficient management the goals of the organisation can be attained. This course is intended to give an idea regarding managing the resources for the effective performance of the organisation and decision making in everyday life. Basic ideas regarding marketing management are also required for managers to take decisions and take the organisation forward.
Prerequisite:	NIL

Course Outcomes: After the completion of the course the student will be able to:		**K Level**
CO1	Describe management as a process and Critically analyse and evaluate management theories and practice	K2
CO2	Perform planning and organising for an organisation	K2
CO3	Do staffing and related human resource development function	K3
CO4	Take proper decisions to get competitive advantage	K3
CO5	Describe and analyse basic functions of marketing management	K2

Mapping of course outcomes with program outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	2	3	2					2
CO2		2	3		2	3		2
CO3		2			3	2		2
CO4		3	3					2
CO5	2	2	3			2		2

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 8 marks
Continuous Assessment Test (2 numbers) : 20 marks
Assignment/Quiz/Course project : 12 marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 6 marks.

Course Level Assessment Sample Questions

Course Outcome1 (CO1):

1. Describe various functions of management. (K2)
2. Explain different theories of management thought. (K2)
3. Define management. What are the levels of management? (K1)

Course Outcome2 (CO2):

1. Demonstrate different steps in planning. (K3)

Course Outcome3 (CO3):

1. Describe different types of training methods for employees in an organisation. (K2)

Course Outcome4 (CO4):

1. Explain the decision process in an organisation with a case example. (K2)

Course Outcome5 (CO5):

1. Illustrate the marketing process. (K4)

Syllabus

Module I (Introduction to Management)

Basic Managerial Concepts, Levels of management, Managerial Skills, Managerial role. Management functions- Planning, Organising, Staffing, Directing and Controlling. Early Contributions in Management: Management thought - Classical approach, scientific management, contributions of Taylor, Gilbreths, Fayol's 14 principles of management.

Human relation approach - contribution of Elton Mayo, Systems approach - organization as an open system and Contingency approach.

Module II (Planning & Organising)

Planning: Nature and importance of planning, types of plans - Steps in planning, Levels of planning- MBO definition and process, SWOT Analysis, importance.

Organising: Nature of organizing,-span of control in management, factors affecting span of control- Authority and responsibility. Organisation structure - Formal and informal, Types of organization structure line, line and staff, functional, divisional, project, matrix, virtual form of organisations.

Module III (Staffing and Directing)

Staffing:meaning, nature, staffing process, Job analysis and manpower planning, job description and job specification, Recruitment & selection, selection process, Tests and interviews, Training Methods, Performance appraisal- concept and methods

Directing: meaning, elements, Manages vs leaders, leadership styles. Motivation – significance, motivational theories- Maslow's need hierarchy, McGregor's Theory X & Theory Y.

Module IV (Managerial Decision Making and Controlling)

Decision making –types of decisions, decision making process, Controlling-Meaning and definition, Importance of controlling, steps in control process, Techniques of controlling- Break Even Analysis, Budgetary Control - Benchmarking –importance and limitations of benchmarking, Total Quality Management-

Module V (Marketing Management)

Introduction to marketing management, Core Marketing Concepts, -Marketing mix- Pricing Strategies, Distribution Channels, Promotions – Sales promotions, advertising and public relations. Product life cycle. Digital marketing basics.

Text Books

1. L M Prasad, "Principles of Management", Sultan Chand & Sons, 8th Edition(2010)
2. RN Gupta, Principles of Management", Sultan Chand & Sons, 8th Edition(2005)

References

1. Philip Kotler and Keller, "Marketing Management", Fifteenth Edition, Pearson Education.
2. Peter F Drucker, "The Practice of Management", Butterworth-Heinemann publication, 2nd Edition (2007)
3. Harold Koontz and Heinz Weihrich, "Essentials of Management", McGraw Hill Education, 10th Edition (2015).
4. Robbins and Coulter, Management, Pearson Education 13th Edition, 2016,

5. Tripathi, "Principles of Management", McGraw Hill Education, 5th Edition (2012)

6. http://www.ibscdc.org/Case_Studies/Social%20Networking/SNW0002.htm (for casestudy)

7. https://www.researchgate.net/publication/235362523_Marketing_Management_The_Millenn ium_Edition

Suggested MOOCs

1. Management Functions http://nptel.ac.in/courses/122108038/
2. Leadership http://nptel.ac.in/courses/110105033/33
3. https://learndigital.withgoogle.com/digitalunlocked/course/digital-marketing

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module I**	**10**
1.1	Introduction to Management: Basic Managerial concept	2
1.2	Levels of management, Managerial Skills	2
1.3	Management roles	1
1.4	Management functions	1
1.5	Early Contributions in Management: Management thought - Classical approach, scientific management, contributions of Taylor, Gilbreths, Fayol's 14 principles of management.	3
1.6	Recent developments in management	1
2	**Module II**	**8**
2.1	Planning: Nature and importance of planning, types of plans - Steps in planning, Levels of planning - The Planning Process	2
2.2	MBO definition and process, SWOT Analysis, importance.	1
2.3	Organising : Nature of organizing,-span of control in management, factors affecting span of control- authority and responsibility.	2

2.4	Organisation structure - Formal and informal, Types of organization structure line, line and staff, functional, divisional, project, matrix, virtual form of organisations	3
3	**Module III**	**10**
3.1	Staffing and Directing: meaning, nature, staffing process.	1
3.2	Job analysis and manpower planning, job description and job specification	2
3.3	Recruitment & selection, selection process, Tests and interviews. Training Methods	3
3.4	Performance appraisal - concept and methods.	1
3.5	**Directing:** meaning, elements, Managers vs leaders leadership styles.	1
3.6	Motivation – significance, motivational theories- Maslow's need hierarchy, McGregor's Theory X & Theory Y,	2
4	**ModuleIV**	**10**
4.1	Managerial Decision Making and controlling : Decision making –types of decisions, decision making process	2
4.2	Importance of controlling, Techniques of controlling- Break Even Analysis, Budgetary Control	2
4.3	Benchmarking –importance and limitations of benchmarking	2
4.4	Total Quality Management-	2
5	**Module V**	**10**
5.1	Introduction to marketing management:	1
5.2	Marketing mix.	2
5.3	Product life cycle.	2

		CATEGORY	L	T	P	CREDIT
24SJINMCA210	INTERNET CONCEPTS AND WEB TECHNOLOGY	GENERAL	3	1	0	4

Preamble:	The World Wide Web with its widespread usefulness has become an integral part of the Internet. This course will introduce you to the realm of web design. The course introduces the basic internet concepts and web designing along with practical knowledge.
Prerequisite:	Nil

Course Outcomes: After the completion of the course the student will be able to:		**K Level**
CO1	Understand the basic network concepts and domain name systems.	K2
CO2	Understand the architecture of World Wide Web and gain knowledge in the internet service protocols	K2
CO3	Apply tags and elements in HTML for the creation of web page.	K3
CO4	Apply CSS styles to page elements	K3
CO5	Apply JavaScript as an interactive tool for web development	K3

Mapping of course outcomes with program outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	1	2				2
CO2	3	2	1	2				2
CO3	2	1	2	2	1			2
CO4	2	1	2	2	1			2
CO5	2	2	3	2	1			2

Mark Distribution

Total Marks	CIA	ESE	ESE Duration
100	40	60	3 Hours

Continuous Internal Evaluation Pattern:
Attendance : 8 marks
Continuous Assessment Test (2 numbers) : 20 marks
Assignment/Quiz/Course project : 12 marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contains 10 compulsory short answer questions, 2 from each module. Each question caries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 6 marks

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Classify the different types of network. (K4)
2. Explain the layers of OSI reference model. (K2)
3. Differentiate Flat Namespace and Hierarchical Namespace. (K2)

Course Outcome 2 (CO2):

1. Define URL. (K1)
2. Examine the architecture of WWW (K3)
3. Compare HTTP and HTTPS protocol (K4)

Course Outcome 3(CO3):

1. Explain the formatting tags in HTML. (K2)
2. Write HTML code to create a web page which displays an image. Create a hyperlink so that when the image is clicked it should be redirected to a new page. (K4)
3. Examine the attributes of Font Tag. (K3)
4. Design HTML Form with following HTML Form controls. (K4)
   - Text Field Control
   - Radio Button Control
   - Checkboxes Control
   - Select Box Control
   - Submit Button Control

Course Outcome 4 (CO4):

1. Compare Inline, Internal and External CSS. (K4)
2. Demonstrate CSS Box Model. (K3).
3. Examine the different types of selectors with example. (K3)

Course Outcome 5 (CO5):

1. JavaScript Types are Dynamic. Justify the statement (K4)
2. Given an array named Vegetables with elements Mushroom, Carrot, Broccoli, Onion. Apply the array properties and methods. (K3)
   - Write the suitable piece of JavaScript code to Sort the array in ascending order
   - Insert the element Pumpkin to the second position.
   - Remove the last element from the array.
   - Display the array in given format: Broccoli#Carrot#Pumpkin#Mushroom
3. Examine the list of JavaScript events. (K3)

SYLLABUS

Module I

Networks-Categories of Networks, The Internet-A Brief History, Protocols and Standards, Network Models-OSI Model (Brief treatment of the Layers), TCP/IP Protocol Suite (Brief treatment of the Layers), Domain Name System, Namespace-Flat and Hierarchical Namespace, Domain Name-Fully Qualified and Partially Qualified, Resolution.

Module II

WWW-Architecture, Uniform Resource Locator-Absolute URL and Relative URL, Port Number and Socket address, Web Documents-Static, Dynamic, Active, HTTP and HTTPS, FTP, Email Protocols-SMTP, POP and IMAP (Brief treatment)

Module III
Introduction to HTML, HTML Tags and Elements-Basic Text Formatting, Presentational Elements, Phrase Elements, HTML Fonts, Lists, Graphics and Image, Links and Navigation, Tables, Frames, Forms.
Module IV
Cascading style sheets, defining styles-Inline, Internal, External, CSS properties-Controlling Text, Text Formatting, Selectors, Introducing the Box Model, Formatting blocks of information.
Module V
JavaScript: Introduction to JavaScript, Variables, String, Operators, Functions, Events, Arrays, Regular expressions, Form Validation.

Textbooks
1. Behrouz A. Forouzan, "Data Communications and Networking", Fourth Edition, Tata McGraw Hill.
2. Jon Duckett, "Beginning HTML, XHTML, CSS, and JavaScript", Wiley-India Edition.

Reference Books
1. Harvey Deitel and Abbey Deitel, "Internet and World Wide Web – How to program", Fifth Edition, Pearson Education.
2. Jennifer Niederst Robbins, "A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics", Fourth Edition.
3. Steven Holzner, "HTML 5 Black Book", Dreamtech Publishers.
4. Thomas A. Powell, Fritz Schneider, "JavaScript: The Complete Reference", Third edition, Tata McGraw Hills

MOOC Courses
1. https://www.coursera.org/learn/html-css-javascript-for-web-developers

Web Resources
1. https://www.w3schools.com/html/
2. https://www.w3schools.com/css/default.asp
3. https://www.w3schools.com/js/default.asp

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	**10 hrs**
1.1	Introduction, Networks-Categories of Networks	1
1.2	The Internet-A Brief History, Protocols and Standards	1
1.3	Network Models-OSI Model	2
1.4	TCP/IP Protocol Suite	1
1.5	Domain Name System	1
1.6	Registering Domain name	1
1.7	Namespace-Flat and Hierarchical Namespace, Domain Name-Fully Qualified and Partially Qualified,	1

1.8	Resolution	2
2	**Module 2**	**8 hrs**
2.1	WWW-Architecture	1
2.2	Uniform Resource Locator- Absolute URL and Relative URL	1
2.3	Port number and Socket address	1
2.4	Web Documents-Static, Dynamic, Active	1
2.5	HTTP and HTTPS	1
2.6	FTP	1
2.7	Email Protocols-SMTP, POP and IMAP	2
3	**Module 3**	**12 hrs**
3.1	Introduction to HTML	1
3.2	HTML Tags and Elements-Basic Text Formatting	1
3.3	Presentational Elements, Phrase Elements	2
3.4	HTML Fonts	1
3.5	Lists	1
3.6	Graphics and Image	1
3.7	Links and Navigation	1
3.8	Tables	1
3.9	Frames	1
3.10	Forms	2
4	**Module 4**	**8 hrs**
4.1	Introduction to Cascading style sheets, defining styles-Inline, Internal, External	2
4.2	CSS properties-Controlling Text, Text Formatting	1
4.3	Selectors	1
4.4	Introducing the Box Model	2
4.5	Formatting blocks of information.	2
5	**Module 5**	**10 hrs**
5.1	Java script: Introduction to Java script, Variables	1
5.2	String	1
5.3	Operators	1
5.4	Functions	1
5.5	Events	2
5.6	Arrays	1
5.7	Regular expressions	1
5.8	Form Validation	2

24SJINMCA232	SCRIPTING LAB	CATEGORY	L	T	P	CREDIT
		GENERAL	0	0	4	1

Preamble:	This course aims to give a basic understanding of scripting languages to the students, along with various scripting libraries in use
Prerequisite:	Nil

Course Outcomes: After the completion of the course the student will be able to:		**K Level**
CO1	Create animation on a web page and dynamic styles	K3
CO2	Apply and analyse operators, variables, arrays, control structures	K3
CO3	Implement functions ,objects and JavaScript validations in forms	K3
CO4	Use regular expressions for form validation and JavaScript functions	K2
CO5	Implement jQuery AND AJAX in web pages	K3

Mapping of course outcomes with program outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	2	3	2			2
CO2	3	3	2	3				2
CO3	3	3	3	3	2			2
CO4	3	3	3	3	2			2
CO5	3	3	3	3	2			2

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern:

Maximum Marks: 50	
Attendance	15%
Maintenance of daily lab record and GitHub management	20%
Regular class viva	15%
Timely completion of day to day tasks	20%
Tests/Evaluation	30%

End Semester Examination Pattern:

<table>
<tr><th colspan="4">Maximum Marks: 50</th></tr>
<tr><td colspan="3">Verification of Daily program record and Git Repository</td><td>5 marks</td></tr>
<tr><td colspan="3">Viva</td><td>10 marks</td></tr>
<tr><td rowspan="4">Problem solving

(Based on

difficulty level, one
or more questions

may be given)</td><td>Flowchart / Algorithm / Structured description
of problem to explain how the problem can be

solved / Interface Design</td><td>15 %</td><td rowspan="4">35 marks</td></tr>
<tr><td>Program correctness</td><td>50 %</td></tr>
<tr><td>Code efficiency</td><td>15 %</td></tr>
<tr><td>Formatted output and Pushing to remote Git

repository</td><td>20 %</td></tr>
<tr><td colspan="3">Total Marks</td><td>50 marks</td></tr>
</table>

Course Level Assessment Questions

Course Outcome 1 (C01):

1. Illustrate the tags in html and Create a homepage for your department (include Paragraph, images, links). (K3)

2. Create a web page displaying your time table. (K3)

Course Outcome 2 (C02):

1. Illustrate operators in JavaScript using a program to check whether a year is leap year or not.? (K3)

2. Write a JavaScript program to sort the items of an array. (K3)

Course Outcome 3 (C03):

1. Design Simple Calculator Using JavaScript. (K3)

2. Classify the functions in JavaScript and develop a function to get the last element of an array.(K3)

Course Outcome 4 (C04):

1. Write a jQuery Code to get a single element from a selection.(K3)

2. Design jquery to access the position of an element. (K3)

Course Outcome 5 (C05):

1. Create a simple XMLHttpRequest, and retrieve data from a TXT file.(K3)

2. Illustrate XMLHttpRequest to retrieve data from an XML file. (K3)

SYLLABUS

Demonstrate HTML5 tags for text, links, lists and web standards for images/videos/audios, Demonstrate Simple layouts, Illustrate HTML tags for tables, Demonstrate HTML5 tags for styles. JavaScript: Syntax Basics, JS Operators and JavaScript Implementations. JQuery: Syntax, jQuery Selectors, jQuery Events, jQuery Effects, jQuery Callbacks, jQuery and HTML. AJAX: XML Http Request Object, creating a request object, sending a request to server, Receiving a response from the server.

Reference Books

● Ferguson, Russ, Heilmann and Christian, "Beginning JavaScript with DOM Scripting and Ajax", Second Edition, APRESS, 2013

● "HTML5 Black Book", Second Edition, Dreamtech Press; 2016

Web Resources

- https://alison.com/courses/JavaScript-and-jQuery
- https://www.codecademy.com/learn/javascript
- https://www.codeschool.com/courses/javascript-road-trip-part-1
- https://www.udacity.com/course/javascript-basics--ud804

List of Lab Experiments

1. Write a JavaScript program that accepts two integers and displays the larger?
2. Write a JavaScript conditional statement to sort three numbers. Display an alert box to show the result?
3. Write a JavaScript conditional statement to find the largest of five numbers. Display an alert box to show the result?
4. Write a JavaScript program to read the age of a candidate and determine whether it is eligible for casting his/her own vote.?

5. Write a JavaScript program to read temperature in centigrade and display a 73 suitable message according to temperature state below :

   Temp < 0 then Freezing weather

   Temp 0-10 then Very Cold weather

   Temp 10-20 then Cold weather

   Temp 20-30 then Normal in Temp

   Temp 30-40 then Its Hot

   Temp >=40 then Its Very Hot

6. Write a JavaScript program to accept the height of a person in centimetre and categorize the person according to their height.?
7. Write a JavaScript program to enter two numbers and perform all arithmetic operations.
8. Write a javascript program to remove the last element from an array
9. Write a javascript program that returns the element that was shifted out from the array.
10. Write a javascript program to slice out a part of an array
11. Write a JavaScript function to get the last element of an array.
12. Write a JavaScript program to input marks of five subjects Physics, Chemistry, Biology, Mathematics and Computer. Calculate percentage and grade according to following:

    Percentage >= 90% : Grade A

    Percentage >= 80% : Grade B

    Percentage >= 70% : Grade C

    Percentage >= 60% : Grade D

    Percentage >= 40% : Grade E

    Percentage < 40% : Grade F

13. Find the highest number in an array using Math.max()
14. Create a homepage for your department (include Paragraph, images, links)
15. Create a web page displaying your personal information.
16. Write a JavaScript program to find the most frequent item of an array.
17. Write a program to Find the outer Height and outer Width of an element.
18. Write a program to find the outerHeight and outerWidth of an element.
19. Write a program to get the background color of an 74 element.
20. Write a program to animate an element, by changing its height and width.
21. Write a program to fade in and fade out all division elements.

22. Create a simple XMLHttpRequest, and retrieve data from a TXT file.
23. Create an XMLHttpRequest to retrieve data from an XML file.

24SJINMCA234	STATISTICS LAB	CATEGORY	L	T	P	CREDIT
		GENERAL	0	0	4	1

Preamble:	This course encourages the students to explore the statistical applications by implementing relevant statistical methods and techniques. This course aims to introduce modern statistical tools and prepare students for big data analysis course.
Prerequisite:	**24SJINMCA203** Probability and Statistics.

Course Outcomes: After the completion of the course the student will be able to:		**K Level**
CO1	Understand the basics of R and evaluate graphical and numerical summaries of data based on the type of data and the context in which the data is collected.	**K3**
CO2	Apply measures of central tendency and dispersion for statistical analysis.	**K3**
CO3	Apply discrete, continuous probability density functions and special probability distributions in practical situations.	**K3**
CO4	Apply correlation and regression analysis for the purpose of comparison and prediction.	**K3**
CO5	Apply sampled data for statistical tests.	**K3**

Mapping of course outcomes with program outcomes								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	2					1
CO2	3	2	2					1
CO3	3	2	2					1
CO4	3	2	2					1
CO5	3	2	2					1

Mark Distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern:

Maximum Marks: 50	
Attendance	15%
Maintenance of daily lab record and GitHub management	20%
Regular class viva	15%

Maximum Marks: 50	
Attendance	15%
Timely completion of day to day tasks	20%
Tests/Evaluation	30%

End Semester Examination Pattern:

Maximum Marks: 50			
Verification of Daily program record and Git Repository			5 marks
Viva			10 marks
Problem solving (Based on difficulty level, one or more questions may be given)	Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 %	35 marks
	Program correctness	50 %	
	Code efficiency	15 %	
	Formatted output and Pushing to remote Git repository	20 %	
Total Marks			50 marks

Course Level Assessment Questions
Course Outcome 1 (CO1):

1. Describe about the set of arithmetic operations in R. (K3)
2. Describe the set of functions in R (K3)
3. Identify different graphical techniques for visualisation of data. (K1)

Course Outcome 2 (CO2):

1. Calculate the Mean, median, standard deviation and quartiles of a set of observations(K3)
2. Understand the Skewness and Kurtosis of the given distribution (K2)

Course Outcome 3(CO3):

1. Calculate the mass function of a binomial distribution. (K3)

2. Generate and draw the cdf and pdf of a normal distribution. (K3)

Course Outcome 4 (CO4):

1. Compute Karl Pearson's coefficient of correlation. (K3)
2. Compute the Spearman rank correlation. (K3)

Course Outcome 5 (CO5):

1. Create a simple random sample from the data. (K3)
2. Calculate confidence intervals for the mean when the standard deviation is known. (K3)
3. Perform T test for equality of mean. (K3)
4. Compare Z test for single mean and Z test for difference in mean. (K3)

Syllabus

Module 1
The R Basics: Simple Arithmetic's, Basic R functions. Exploratory Data Analysis: Graphical techniques in EDA-Boxplot, Histogram, Pareto Chart, Stemand-Leaf Plot, Scatter Plot, Bar Chart, Pie Chart.
Module 2
Evaluating Measures of central tendency and dispersion, Mean, median, standard deviation and quartiles of a set of observations, Skewness and Kurtosis, Implementation of Baye's rule.
Module 3
Generate and Visualize Discrete and continuous distributions using the statistical environment, Demonstration of CDF and PDF- Binomial, Poisson, Uniform, Exponential and Normal distributions, Fitting distributions, Central Limit Theorem.
Module 4
Correlation- Karl Pearson's Coefficient of Correlation, Spearman Rank Correlation, Regression, Lines of Regression, Regression Coefficients
Module 5
Random number generation. Confidence Intervals. Statistical Test: Z Test-Single Proportion, Difference in proportion, Single mean, Difference in mean, T Test-T test for mean, Equality of means and Paired T test, F test, Chi-Square test -Independents of attributes, Goodness of fit.

References

1. John E. Freund's "Mathematical Statistics with applications", Seventh Edition, Pearson Prentice Hall, 2014
2. Prabhanjan Narayanachar Tattar, Suresh Ramaiah, B.G Manjunath "A course in Statistics with R", First Edition, John Wiley & Sons Ltd, 2016

3. S. C. Gupta, Fundamentals of Statistics, seventh edition, Himalaya Publishing House, India.
4. T. Veerarajan, Probability, Statistics and Random Processes", 3rd edition, Tata McGraw- Hill publishing company limited, India.

Web Resources

1. http://www.math.csi.cuny.edu/Statistics/R/simpleR/

List of Lab Experiments

1 Familiarization of environment – R
2 Perform simple arithmetic's using R.
3 Perform basic R functions.
4 Use various graphical techniques in EDA
5 Create different charts for visualisation of given set of data.
6 Draw a Pareto chart to illustrate the Pareto principle.
7 Find the mean, median, standard deviation and quartiles of a set of observations.
8 Find the Skewness and Kurtosis of a given data set distribution.
9 Given the scenario, implement the Bayes rule by finding the posterior probability.
10 Find the mass function of a binomial distribution with n=20, p=0.4. Also draw the graphs of the mass function and cumulative distribution function.
11 Given the data n=50, mean=25, use appropriate function to find the mass function of a Poisson distribution. Also draw the graphs of the mass function and cumulative distribution function.
12 Use appropriate function to generate the pdf of the exponential distribution with λ=3, take x values 0 to 6 with 0.25 difference. Draw the graph of the density function.
13 Generate and draw the cdf and pdf of a normal distribution with mean = 10 and standard deviation = 3. Use values of x from 0 to 20 in intervals of 1.
14 The following data shows the result of throwing 12 fair dice 4,096 times; a throw of 4, 5, or 6 being called success.

Success(X) 0 1 2 3 4 5 6 7 8 9 10 11 12
Frequency(f) 0 7 60 198 430 731 948 847 536 257 71 11

Fit a binomial distribution and find the expected frequencies. Compare the graphs of the observed frequency and theoretical frequency
15 From the following data compute Karl Pearson's coefficient of correlation. (using actual mean method).

Price (Rupees) 10 20 30 40 50 60 70
Supply (Units) 8 6 14 16 10 20 24

16 From the following data compute correlation between height of father and height of daughters by Karl Pearson's coefficient of correlation. (using assumed mean method).
Height of Father (Cms) 65 66 67 67 68 69 71 73
Height of Daughter (cms) 67 68 64 69 72 70 69 73
17 The scores for nine students in history and algebra are as follows:
History: 35, 23, 47, 17, 10, 43, 9, 6, 28
Algebra: 30, 33, 45, 23, 8, 49, 12, 4, 31
Compute the Spearman rank correlation.
18 Calculate the regression coefficient and obtain the lines of regression for the given data.

19 Construct a scatter plot to investigate the relationship between two variables.
20 Compute confidence intervals for the mean when the standard deviation is known.
21 Perform the Z test for single proportion.
22 Perform the Z test for difference in proportion.
23 Perform the Z test for single mean.
24 Perform the Z test for difference in mean.
25 Perform t test for mean.
26 Perform t test for equality of mean.
27 Perform Paired t test.
28 Perform F test
29 Perform Chi-Square test.

Course Contents and Lecture Scheule

TOPIC	No of Hrs
MODULE 1	**8**
Familiarization of environment, The R Basics: Simple Arithmetic's	2
Basic R functions	2
Exploratory Data Analysis: Graphical techniques in EDA-Boxplot, Histogram, Stem-and-Leaf Plot, Scatter Plot	2
Bar Chart, Pie Chart., Pareto Chart	2
MODULE 2	**8**
Evaluating Measures of Central Tendency, Mean, median	2
Measures of dispersion: Standard deviation, quartiles and percentiles of a set of observations	2
Skewness and Kurtosis	2
Implementation of Baye's rule.	2
MODULE 3	**12**
Demonstration of CDF and PDF- Binomial, Poisson	4
Uniform, Exponential and Normal distributions	4
Fitting distributions	2
Implementation of Central limit theorem	2
MODULE 4	**6**
Demonstration of Karl Pearson's Coefficient of Correlation	2
Demonstration of Spearman Rank Correlation	2
Regression Lines	2
MODULE 5	**14**
Generation of random numbers	1
Computation of confidence interval	1
Implementation of Z test	4
Implementation of F test	2
Implementation of T test	4
Implementation of Chi-Square test	2

The students are expected to write code for statistical applications using the R environment. The instructor may choose a standard data set and ask the students to work with it.