INTEGRATED MCA

KTU 2020

DRAFT SYLLABUS
SEMESTER 1 & 2

20INMCA101	ENGLISH	CATEGORY	L	T	P	CREDIT
		GENERAL	4	-	-	4

Preamble: Language is an empowering attribute that helps us to express ourselves in an exquisite manner. The objective of this course is to help students understand the structure and different learning strategies of language. The study of language focuses on effective communication in various life situations and is also an important criteria for success in workplaces.

Prerequisite: Basic Communication Skills

Course Outcomes: After the completion of the course the students will be able to;

CO 1	Apply language skills in professional and real-life situations
CO 2	Identify various strategies to actively listen and comprehend messages
CO 3	Evaluate various contexts and demonstrate appropriate speaking skills
CO 4	Analyze and interpret various technical and non- technical texts using appropriate reading methodologies.
CO 5	Show the ability to write well- organized academic and professional documents
CO 6	Develop sentence structures and lexical ability

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1							3		3	2	3	2
CO 2							1		3		3	
CO 3									3		3	1
CO 4							3		3	2	3	
CO 5									3		3	1
CO 6									3		3	1

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	5	5	10
Understand(K2)	5	5	10
Apply(K3)	15	15	10
Analyse(K4)	5	5	10
Evaluate(K5)	5	5	10
Create(K6)	15	15	10

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 should contain 10 compulsory short answer questions, 2 from each module which carries 3 marks. Part B should contain 2 questions from each module with maximum 2 sub- divisions which carries 6 marks, of which the student should answer any one.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Examine the importance of language learning. (K3)
2. Discuss the emergence of English as a global language. (K2)
3. Summarize the different language learning strategies. (K5)

Course Outcome 2 (CO2):

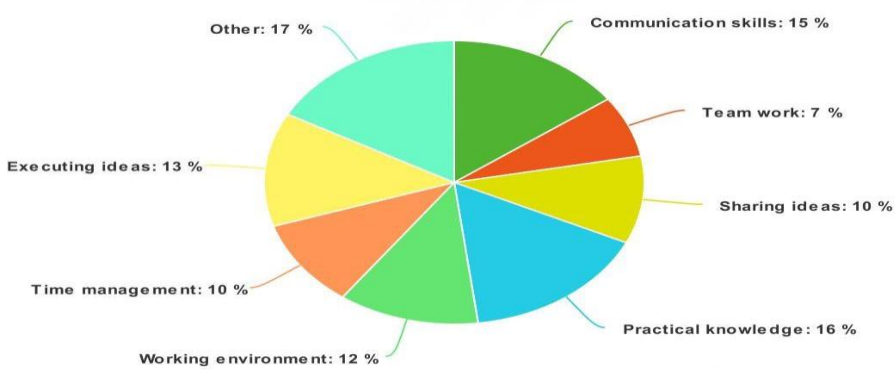
1. Compare active and intensive listening. (K5)
2. Outline the strategies for listening. (K4)
3. Create notes while listening to a video on a particular topic by using outline method. (K6)

Course Outcome 3 (CO3):

1. Predict the phonetic transcription of the following words. (K3)
   a) Occasion
   b) Farmer
   c) Shipment
   d) Elements
2. Create a telephone conversation making an appointment to consult your doctor. (K6)
3. Describe the remedies to overcome mother tongue influence. (K1)

Course Outcome 4 (CO4):

1. Outline the steps for critical reading. (K4)
2. The chart shows the survey result of technical students about the important aspects in working for a company that they learned from the internships they did in various companies. Understand the chart and summarize the information given. (K5)



3. Explain the steps to make inferences. (K2)

Course Outcome 5 (CO5):

1. Create a letter asking permission to your class teacher for taking leave for attending a two- day seminar on 'Artificial Intelligence' in IIT, Mumbai. (K6)
2. Assume that you recently bought a printer for your desktop and found that it is not working properly. Compose a letter to be sent to the Sales Manager of the company which you bought the printer from, informing about your dissatisfaction about the product and an immediate replacement. (K6)
3. Describe about your home town in not more than 50 words. (K2)

Course Outcome 6 (CO6):

1. Choose the right prefix and suffix for the following words. (K5)
   a) Wrap
   b) Sense
   c) Manage
   d) Child
2. Modify the following phrases into compound words. (K3)
   a) A ball made out of snow.
   b) A parent of one's father or mother.
   c) The time from lunch time to evening.
   d) A shelf on which book can be stored.
3. Modify the sentences from active to passive voice. (K6)
   a) Somebody stole my purse.
   b) John explained the event to the students.
   c) They say she sang well.
   d) We can generate heat for welding in many ways.

SYLLABUS

Module 1

Introduction to Language Learning: - Language Learning Strategies -Oxford taxonomy, English as a Global, Second Language and Foreign Language. **Listening**: Objectives, Myths, Types of Listeners. **Speaking**: Phonetics -Introduction to Vowels, Consonants & Diphthongs. Introducing basic steps of a conversation -Initiating, Interrupting, Sustaining & Closing. **Reading:** Importance & Strategies. **Writing:** Importance (AIDA model), Writing process steps, Practice writing on descriptions of people and places. **Grammar & Vocabulary:** Common errors in Tenses, One word substitutions.

Module 2

Intermediate Language Skills: - Listening: Active Listening Process, Traits of a good listener, Intensive Listening. **Speaking:** Phonetics -Transcribing words, Word Stress & Rhythm, Intonation, Sentence Stress, Pause and Sense groups, Interactional and transactional pattern of conversations. **Reading:** Reading with a purpose, making intelligent guesses, use of signposts, making inferences. **Writing:** Descriptions on events and products. **Grammar & Vocabulary:** Active-Passive Voice, Synonyms.

Module 3

Pre- Advanced Language Skills:- Listening: Joseph Devito's Five levels of Listening, Listening for

General Content, Listening for Specific Information. **Speaking:** Fluency and Pace of Delivery. Telephone Communication -Agreeing and Disagreeing, Making Appointments, Cancelling and Rescheduling Appointments. Conversations on Seeking Clarification, Extending an Apology, Giving an Opinion. **Reading:** Reading Critically, Reading for Research. **Writing:** Framing short speeches - Welcome address, Vote of thanks and Farewell speech. **Grammar & Vocabulary:** Subject –Verb Agreement, Antonyms.

Module 4

Advanced Language Skills:- Listening: Barriers, Strategies to improve listening, Academic Listening. **Speaking:** Greetings on different occasions, Introducing oneself and others, Making Requests, Asking for Permission, Denying Permission. **Reading**: Reading and understanding Graphs and Charts. **Writing**: Framing Leave letters, Apology and Permission letter. **Grammar & Vocabulary:** Question tags, Suffixes & Prefixes.

Module 5

Very Advanced Language Skills:- Listening: Keyword Outline Method of Note-taking. **Reading:** Note-taking- Cornell method, Mind-mapping, Sentence method. **Speaking:** Awareness of different accents (British & American), Influence of Mother Tongue in Language, Remedies for Speech defects. **Writing:** Framing letters of Enquiry and Complaints. **Grammar & Vocabulary:** Articles & Prepositions, Compound Words & Abbreviations.

Text Books

1. Sasikumar.V, Kiranmai Dutt. P, Geetha Rajeevan, “Communication Skills in English”,Cambridge University Press, Chennai, (2014).
2. Kumar Sanjay & Lata Pushp, “Communication Skills in English”, Oxford University Press, (2015).
3. Meenakshi Raman and Sangeetha Sharma, “Technical Communication: Principles and practice”, 2nd Edition, Oxford University Press, 2011.
4. Ashraf Rizvi, “Effective Technical Communication”, 2nd Edition, McGraw Hill Education, 2017.

Web Resources

Grammar

Sno	Topic	Exercise Link	Video Link
1	Tenses	https://www.englishpage.com/verbpage/verbtenseintro.html	https://www.youtube.com/watch?v=84jVz0D-KkY
2	Active – Passive Voice	https://www.englisch-hilfen.de/en/exercises/active_passive/active_or_passive2.htm	https://www.youtube.com/watch?v=ofsHKOch8B4
3	Subject – Verb Agreement	https://www.englishgrammar.org/subject-verb-agreement-exercise/	https://www.youtube.com/watch?v=BU1LEaDnZMo
4	Question tags	https://www.englisch-hilfen.de/en/exercises/questions/question_tags3.htm	https://www.youtube.com/watch?v=beCqCLgbrnc

5	Articles	https://www.englishpage.com/articles/index.htm	https://www.youtube.com/watch?v=-zZau_dttRY
6	Preposition	https://www.englishgrammar.org/prepositions-exercise-30/	https://www.youtube.com/watch?v=IutZFSXfgYs

Vocabulary

Sno	Topics	Exercise Link
1	One word substitutions	https://www.indiabix.com/verbal-ability/one-word-substitutes/
2	Synonyms	https://agendaweb.org/vocabulary/homonyms_synonyms-exercises.html
3	Antonyms	https://agendaweb.org/grammar/opposites-antonyms-exercises.html
4	Suffixes & Prefixes	https://www.myenglishpages.com/site_php_files/vocabulary-exercise-affixes.php
5	Compound words	https://www.englisch-hilfen.de/en/exercises/structures/compounds.htm
6	Abbreviations	https://www.englisch-hilfen.de/en/words/abbreviations.htm

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Introduction to Language Learning**	**10 hrs**
1.1	Language Learning Strategies	1
1.2	Objectives, myths & types of listening	2
1.3	Phonetics & Introducing basic steps of a conversation	2
1.4	Importance & Strategies of reading	1
1.5	Importance of writing and description of places and events	2
1.6	Errors in tenses and one-word substitution	2
2	**Intermediate Language Skills**	**9 hrs**
2.1	Active & Intensive Listening, Traits of a good listener	2
2.2	Phonetics	1
2.3	Reading, signposts, making inferences	2
2.4	Description of places and products	2
2.5	Active passive voice, Synonyms	2
3	**Pre- advanced Language Skills**	**9 hrs**
3.1	Levels and different purpose of listening	2
3.2	Fluency and Pace of Delivery & Telephone Communication	2
3.3	Critical reading & Reading for research	2
3.4	Framing short speeches	1
3.5	Subject- verb agreement & Antonyms	2
4	**Advanced Language Skills**	**10 hrs**
4.1	Academic listening, barriers & strategies for improving listening	2
4.2	Greetings on different occasions, Introducing oneself and others, Making Requests, Asking for Permission, Denying Permission.	2
4.3	Reading and understanding Graphs and Charts	2

4.4	Framing apology, permission and leave letters	3
4.5	Question tags, Prefix and Suffix	1
5	**Very Advanced Language Skills**	**10 hrs**
5.1	Listening and note making	1
5.2	Reading and note making	2
5.3	Awareness of different accents, Influence of Mother Tongue in Language, Remedies for Speech defects	2
5.4	Framing letters of Enquiry and Complaints	2
5.5	Articles & Prepositions, Compound Words & Abbreviations	3

20INMCA103	BASIC MATHEMATICS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course introduces students to some basic mathematical ideas and tools which are at the core of MCA course. It introduces the concepts of set theory, relations, functions and calculus.

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

CO 1	Apply the operations of sets and use Venn diagrams to solve applied problems; solve problems using the principle of inclusion-exclusion.
CO 2	Describe binary relations between two sets; check their properties and combine relations using set operations and composition.
CO 3	Explain the concept and check the properties of functions which correspond to input output combinations in computer science
CO 4	Understand the concept of differentiation as a rate of change and evaluate the derivative of simple functions
CO 5	Compute the indefinite and definite integrals of standard functions

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3					1		1			
CO 2	3	3					1		1			
CO 3	3	3					1		1			
CO 4	3	3					1		1			
CO 5	3	3					1		1			

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	5	5	6
Understand(K2)	10	10	15
Apply(K3)	20	20	18
Analyse(K4)	10	10	15
Evaluate(K5)	5	5	6
Create(K6)			

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. Define Cartesian product of two sets with an example (K1)
2. State and prove De Morgan's laws (K2)
3. There are 21 players in a cricket team and out of this, 6 players participate in one day matches, 7 players participate in T20 matches and 5 players participate in both matches. Construct the diagram and find the number of players who participate in
   (a) at least one match (ODI or T20)?
   (b) neither of the matches? (K3)

Course Outcome 2 (CO2):

1. Let $R = \{(a,b),(c,d),(b,b)\}$ and $S = \{(d,b),(b.e),(c,a),(a.c)\}$
   Find $(a)\ RoR, (b)\ SoR, (c)\ RoS$ (K2)
2. Let A={1,2,3,4} and R={(1,1),(1,4),(4,1),(4,4),(2,2),(2,3),(3,2),(3,3)}.Write the matrix of R and sketch its graph. (K4)
3. A relation is defined on the set of integers as $(a,b)\epsilon R$ if and only if $1 + ab > 0$ Determine whether the relation is an equivalence relation. (K5)

Course Outcome 3(CO3):

1. Distinguish between one-one and onto functions (K4)
2. Show that the function $f: R \to R$ defined by $f(x) = 2x + 3$ is a bijection (K3)
3. Let $f, g: Z \to Z$ be defined by $f(x) = x + 1, g(x) = 2x^2 + 3$, find fog and gof. Examine whether $fog = gof$ (K4)

Course Outcome 4 (CO4):

1. Find $y'(x)$ for $y(x) = \frac{x^3+2x^2-1}{x-5}$ (K1)
2. Evaluate $\frac{d^2y}{dx^2}$ for $y(x) = xsinx - 3cosx$ (K4)
3. Calculate the value of the derivative for $y(x) = (x - \frac{1}{x})^3$ at $x = 1$. (K3)

Course Outcome 5 (CO5):

1. Compute $\int [5x + \frac{2}{3x^5}]\, dx$ (K2)
2. Calculate the value of the definite integral $\int_{1/2}^{5} f(x)dx$ where $f(x) = \begin{cases} 2x, & x < 1 \\ 2, & x \geq 1 \end{cases}$ (K3)
3. Evaluate $\int t^4 \sqrt[3]{3 - 5t^5}$dt (K4)

SYLLABUS

Module 1(Sets)

(Text 1: Relevant topics from sections 2.1, 2.2, 8.5)

Introduction, Venn Diagrams, Subsets, The Size of a Set, Power Sets, Cartesian Product, Set Operations –Introduction, Set Identities, Generalized Unions and Intersections, Principles of inclusion and exclusion

Module 2 (Relations)

(Text 1: Relevant topics from sections 9.1, 9.2, 9.3, 9.5, 9.6)
Introduction, Relations on a Set, Properties of Relations, Combining Relations, n-ary Relations (definition and examples), Representing Relations Using Matrices and Digraphs, Equivalence Relations (definition and examples), Partial Orderings (definition and examples)

Module 3 (Functions)

(Text 1: Relevant topics from section 2.3)
Introduction, Functions as Relations, One-to-One and onto Functions, Inverse Functions and Compositions of Functions

Module 4 (Differential Calculus)

(Text 2: Relevant topics from sections 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.2, 3.3) (Simple problems only)
Limits, Tangent Lines, Slopes and Rates of Change (concept only - not for examination)
Differentiability-Physical and Geometrical interpretation, Derivatives - Constant, Power Functions, Constant multiple of a Function, Sums & Differences, Trigonometric Functions, Logarithmic Functions and Exponential Functions, Higher Derivatives, Product rule, Quotient rule, Chain rule.

Module 5 (Integral Calculus)

(Text 2: Relevant topics from 5.2, 5.3, 5.6) (Simple problems only)
The Indefinite Integral, Properties of the Indefinite Integral, U-Substitution, The Definite Integral-area under the curve, Properties of the Definite Integral, The Fundamental Theorem of Calculus, Integration by parts.

Text Books

1. Kenneth H. Rosen, “Discrete mathematics and its applications”, McGraw-Hill, 7th Edition.
2. H. Anton, I. Bivens, S. Davis, “Calculus”, Wiley, 9th Edition.

Reference Books

1. C. Liu, “Elements of Discrete Mathematics: A Computer Oriented Approach”, McGraw-Hill, 4th Edition (2012).
2. J. P. Tremblay and R Manohar, “Discrete Mathematical Structures with Application to Computer Science”, Tata McGraw-Hill Publications, (1997).
3. Ralph P Grimaldi, “Discrete and Computational Mathematics: An applied introduction”, Pearson Education, 5th Edition, (2007).
4. Ralph. P. Grimaldi, “Discrete and Combinatorial Mathematics: An Applied Introduction”, Pearson Education Asia, Delhi, 4th Edition (2002).
5. Seymour Lipschutz and Mark Lipson, “Discrete Mathematics”, Schaum’s Outlines, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 2nd Edition, (2007).
6. Thomas Koshy, “Discrete Mathematics with Applications”, Elsevier Publications, (2006).
7. J. Stewart, Essential Calculus, Cengage, 2nd Edition, (2017).

8. G.B. Thomas and R.L. Finney, "Calculus and Analytic geometry", 9th Edition, Pearson, (2002).

Web Resources

1.https://nptel.ac.in/courses/111/107/111107058/
2.http://nptel.ac.in/courses/111104026/2
3.https://nptel.ac.in/courses/111/104/111104085/#

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	**9 hrs.**
1.1	Introduction, Venn Diagrams	1
1.2	Subsets	1
1.3	The Size of a Set, Power Sets	1
1.4	Cartesian Product	1
1.5	Set Operations –Introduction	1
1.6	Set Identities	1
1.7	Generalized Unions and Intersections	1
1.8	Principles of inclusion and exclusion	2
2	**Module 2**	**10 hrs.**
2.1	Relations on a Set	1
2.2	Properties of Relations	2
2.3	Combining Relations	1
2.4	n-ary Relations(definition and examples)	1
2.5	Representing Relations Using Matrices and Digraphs	1
2.6	Equivalence Relations (definition and examples)	2
2.7	Partial Orderings (definition and examples)	2
3	**Module 3**	**8 hrs.**
3.1	Function - introduction	1
3.2	One-to-One and Onto Functions	2
3.3	Inverse Functions	2
3.4	Compositions of Functions	3
4	**Module 4**	**10 hrs.**
4.1	Limits Tangent Lines, Slopes and Rates of Change *(concept only - not for examination*)	1
4.2	Differentiability- Physical and Geometrical interpretation	1
4.3	Derivative of- Constant, Power Functions, Constant multiple of a Function, Sums & Differences	1
4.4	Higher Derivatives	1
4.5	Product rule	1
4.6	Quotient rule	1
4.7	Derivatives of Trigonometric Functions	1
4.8	Derivatives of Logarithmic and Exponential Functions	1

4.9	Chain rule	2
5	**Module 5**	**11 hrs.**
5.1	The Indefinite Integral	2
5.2	Properties of the Indefinite Integral	1
5.3	U-Substitution	2
5.4	The Definite Integral-area under the curve	1
5.5	Properties of the Definite Integral	1
5.6	The Fundamental Theorem of Calculus	2
5.7	Integration by parts	2

20INMCA105	INTRODUCTION TO PROGRAMMING	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course introduces students to some basic problem solving ideas and tools which are at the core of MCA course. It introduces the concepts of algorithm, flow chart and problem solving methods.

Prerequisite: A basic problem solving ideas in computer fundamentals.

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

CO 1	Understand computer system fundamentals.
CO 2	Develops basic understanding of the concept of algorithm and algorithmic thinking.
CO 3	Write algorithms and to draw flowcharts for solving problems.
CO 4	Develops the ability to analyse a problem and develop an algorithm to solve it.
CO 5	Apply the concept of algorithm and flowchart to translating algorithms to flowchart programs.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1										
CO 2	3	2	1				1					
CO 3	3	3	3	1	1							
CO 4	3	3	3	1	1							
CO 5	3	3	3	1	1							

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	3	3	6
Understand(K2)	3	3	6
Apply(K3)	8	8	12
Analyse(K4)	12	12	6
Evaluate(K5)	12	12	9
Create(K6)	12	12	21

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. Define Algorithm (K1)
2. Define Data, Information and Program (K1)

Course Outcome 2 (CO2)

1. Explain different symbols using in flowcharts (K2)
2. Discuss steps in Algorithm (K2)

Course Outcome 3 (CO3):

1. Calculate the area of a Circle of radius r. (K3)
2. Illustrate an algorithm to read two numbers and find their sum. (K3)
3. Evaluate an algorithm and flowchart to convert temperature from Celsius to Fahrenheit. (K5).

Course Outcome 4 (CO4):

1. Demonstrate an algorithm to find the greater number between two numbers. (K3)
2. Evaluate Repetition and Iteration Structure (K5)
3. Design an algorithm to find the largest value of any three numbers. (K6)
4. Design an algorithm to calculate even numbers between 0 and 99. (K6)

Course Outcome 5 (CO5):

1. Analyse and trace the problem to gets a natural value, n, as its input and calculate odd numbers equal or less than n. (K4)
2. Design an algorithm and flowcharts to find the sum of first 100 natural numbers. (K6)
3. Design an algorithm and flowchart to find the sum of series 1+3+5+….+N, where N is positive odd Integer. (K6)

SYLLABUS

Module 1

Basics of Computers: Introduction, what is a Computer, Data, Information, Program. Flowchart: Kinds of Flowcharts – System flowcharts and Program flowcharts; Symbols used in flowcharts, General rules for flowcharting, Advantages of flowcharts, Example.

Module 2

Operators: Arithmetic operators, Relational operators, Logical operators. Constants and Variables: Constants, Variables, Types of variables – Integer variables, Real variables, String Variables, Logical variables; Expressions and Assignment operator, Writing expressions in computer languages. Algorithm: Definition, Type of Algorithms, Properties of an Algorithm, Example. Pseudocode: Definition, Examples.

Module 3

Control Structures or Logical Structures: The sequence structure, Decision structures - If-then-else structure, Nested Else-If structure, illustrating examples – Sum of two numbers, Radius of a Circle, Celsius to Fahrenheit, Area of a Triangle, Greater of two numbers, Largest value of any three numbers, One's complement, Factorial of a number, Swapping two numbers.

Module 4

Repetition and Iteration Structure: Repeat Until loop, The While loop, the for loop, and Nested loops Illustrating examples - Sum and average of N numbers, Sum of squares of first N positive integers, Even numbers between 0 and 99, Odd numbers equal or less than n, sum of first 100 natural numbers, Pattern printing.

Number series: Different Number series, solving problems using Number sequence and Iterations – Print first N positive integers, Sum of first N positive integers, Sum of squares of first N positive integers without any loop structure, Fibonacci sequence, Check the number is prime or not, Reverse a number, sum of series 1+3+5+….+N.

Module 5

Subscripted Variables: Introduction, Basic concepts of subscripted variables, One-dimensional arrays, illustrating examples – Average of an Array, Maximum of an Array, Addition of two Arrays, Mean and Standard Deviation, Appending two Arrays, Frequency Count, Inversion of an Array, Logical OR operation for Boolean Arrays, Linear Search.

Text Books

1. Raj K. Jain, "Insight into Flowcharting", S. Chand & Company Ltd (2000).

Reference Books

1. Anil Bikas Chaudhuri, "The Art of Programming through Flowcharts & Algorithms", Laxmi Publications (2018).
2. Brajendra Singh, Pathik Rawal and Jignesh Rawal, " Algorithm, Pseudocode and Flowchart for Kids: Learn Algorithm in Simple Steps", BeITReady (2015).

MOOC

1. **https://www.geeksforgeeks.org/raptor-tool-flowchart-interpreter/**

Web Resources

1. https://faradars.org/wp-content/uploads/2015/07/Algorithm-and-Flow-Chart.pdf
2. http://www.yspuniversity.ac.in/cic/algorithm-manual.pdf
3. http://archive.mu.ac.in/myweb_test/syllFybscit/C++.pdf
4. http://ceng.eskisehir.edu.tr/emrekacmaz/bil158/Algorithms3.pdf
5. https://www.multidots.com/importance-of-code-quality-and-coding-standard-in-software-development/

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	**4 hrs.**
1.1	Introduction, What is a Computer, Data, Information, Program.	1
1.2	Kinds of Flowcharts – System flowcharts and Program flowcharts; Symbols used in flowcharts, General rules for flowcharting.	1
1.3	Advantages of flowcharts, Example.	2
2	**Module 2**	**4 hrs.**
2.1	Operators: Arithmetic operators, Relational operators, Logical operators.	1
2.2	Constants and Variables: Constants, Variables, Types of variables – Integer variables, Real variables, String Variables, Logical variables; Expressions and Assignment operator, Writing expressions in computer languages.	2
2.3	Algorithm: Definition, Type of Algorithms, Properties of an Algorithm, Examples, Pseudocode: Definition, Examples.	1
3	**Module 3**	**11 hrs.**
3.1	Control Structures or Logical Structures: The sequence structure, Decision structures - If-Then-Else structure, Nested Else-If structure.	2
3.2	Illustrating examples of Control Structures or Logical Structures - Sum of two numbers, Radius of a Circle, Celsius to Fahrenheit, Area of a Triangle, Greater of two numbers, Largest value of any three numbers, One’s complement, Factorial of a number, Swapping two numbers.	9
4	**Module 4**	**15 hrs.**
4.1	Repeat Until loop, The While loop, The For loop and Nested loops	2
4.2	Illustrating examples of Repetition and Iteration Structure - Sum and average of N numbers, Sum of squares of first N positive integers, Even numbers between 0 and 99, Odd numbers equal or less than n, sum of first 100 natural numbers, Pattern printing.	6
4.3	Different Number series	1
4.4	Solving problems using Number sequence and Iterations – Print first N positive integers, Sum of first N positive integers, Sum of squares of first N positive integers without any loop structure, Fibonacci sequence, Check the number is prime or not, Reverse a number, sum of series 1+3+5+….+N.	6
5	**Module 5**	**14 hrs.**
5.1	Basic concepts of subscripted variables, One-dimensional arrays, Illustrating examples – Average of an Array, Maximum of an Array, Addition of two Arrays, Mean and Standard Deviation.	7
5.2	Appending two Arrays, Frequency Count, Inversion of an Array, Logical OR operation for Boolean Arrays, Linear Search.	7

20INMCA107	INTRODUCTION TO COMPUTERS & PC HARDWARE	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course introduces the basic knowledge in using computer by studying the various components like I/O devices, CPU etc. Gain knowledge in fundamental concepts, Basic architecture of PC.

Prerequisite: Basic knowledge in using computer.

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

CO 1	Explain how a PC works and understand the relationship between hardware and software.
CO 2	Understand Motherboards, Power supply and cooling systems.
CO 3	Understand purpose and functions of Mass storage interface.
CO 4	Understand I/O ports and Devices, Keyboards and pointing devices, Video and audio subsystem. Understand the purpose and functions of the computer peripherals.
CO 5	Understand diagnostic procedures and troubleshooting techniques to personal computers, portable devices and computer peripherals.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3							2			
CO 2	3	3							2			
CO 3	3	3							2			
CO 4	3	3							2			
CO 5	3	3							2			

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10	10	10
Understand(K2)	20	20	20
Apply(K3)	20	20	30
Analyse(K4)			
Evaluate(K5)			
Create(K6)			

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. Identification of PC Components. (K1)
2. Understand the basic architecture. (K1 & K2)
3. Understand different Memory Concepts. (K2)

Course Outcome 2 (CO2):

1. Examine each PC Component. (K3)
2. Describe motherboards and its functionality. (K1)
3. Model Functionalities of each component associated with motherboard. (K3)

Course Outcome 3 (CO3):

1. Understanding BIOS set up. (K2)
2. Understanding Storage mechanism and concepts. (K1&K2)
3. Examine the working of operating system on Hardware. (K3)

Course Outcome 4 (CO4):

1. Identify peripherals and its functionalities. (K1)
2. Understand the importance of each peripheral components. (K1 & K2)
3. Examine the connection of various peripherals together. (K3)
4. Understand Modems and Communications. (K2)
5. Understand the importance of Networking. (K1 & K2)
6. Model Printers and portable PC. (K3)

Course Outcome 5 (CO5):

1. Connecting various components in PC. (K1 & K2)
2. Assembling basic components to form PC. (K3)
3. Troubleshooting and installation of components. (K1 & K2)

SYLLABUS

Module 1

Fundamentals of PC technology: Fundamental building block of PC. The Microprocessor: CPU Operation, Troubleshooting. Memory: How memory works? Memory chips and modules, Advanced memory technology.

Module 2

Motherboards: Motherboard controllers and system resources, I/O system bus, on-board I/O devices, Chipsets, ROM BIOS, ROM POST, CMOS setup, Motherboard physical form factors. Power supply, cooling and protection: The power supply, Ventilation and cooling protection, Power protection and backup.

Module 3

Mass storage Interfaces: The IDE interface, The SCSI interface, Comparisons. Magnetic Storage devices: Magnetic Storage, Hard disk drive. Optical storage Devices: Optical storage Media, DVD-ROM drives, Recordable drives. SSD.

Module 4

I/O ports and Devices: Serial ports, parallel ports, Universal serial bus. Keyboards and pointing Devices, The video Subsystem: Video adapters, Monitors. The audio Subsystem: Audio applications, storing sound, Audio adapter architecture and standards, selecting audio components. PC peripherals: Modems and communications: modems, ISDN, CATV network modems, DSL. Networking: Networking fundamentals, Networking hardware, networking protocol. Printers: Printer types, printer attributes, printer maintenance. Portable PCs: Portable PC designs, Portable system components.

Module 5

PC Troubleshooting: Troubleshooting tools and techniques: Tools of the trade, basic PC handling techniques. Basic Data Recovery and Disaster Recovery: Disk structure and data recovery, Disaster recovery.

Text Books

1. Craig Zacher, John Rourke “PC Hardware The complete reference” Tata McGraw-Hill Edition 2012.

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1: Fundamentals of PC technology**	**7 hrs**
1.1	Fundamental building block of PC. The Microprocessor : CPU Operation, Troubleshooting.	3
1.2	Memory: How memory works? Memory chips and modules, Advanced memory technology.	4
2	**Module 2: Motherboards**	**9 hrs**
2.1	Motherboard controllers and system resources, I/O system bus	2
2.2	on-board I/O devices, Chipsets, ROM BIOS, ROM POST, CMOS setup	2
2.3	Motherboard physical form factors	2
2.4	Power supply, cooling and protection: The power supply	2
2.5	Ventilation and cooling protection, Power protection and backup	1
3	**Module 3: Mass storage Interfaces**	**10 hrs**
3.1	The IDE interface, The SCSI interface, Comparisons.	2
3.2	Magnetic Storage devices: Magnetic Storage, Hard disk drive.	2
3.3	Optical storage Devices: Optical storage Media, DVD-ROM drives, Recordable drives	3

3.4	SSD	3
4	**Module 4: I/O ports and Devices**	**14 hrs**
4.1	Serial ports, parallel ports, Universal serial bus.	2
4.2	Keyboards and pointing Devices	1
4.3	The video Subsystem: Video adapters, Monitors.	2
4.4	The audio Subsystem: Audio applications, storing sound, Audio adapter architecture and standards, selecting audio components	2
4.5	PC peripherals	1
4.5.1	Modems and communications: modems, ISDN, CATV network modems, DSL.	2
4.5.2	Networking: Networking fundamentals, Networking hardware, Networking Protocol	2
4.5.3	Printers: Printer types, printer attributes, printer maintenance. Portable PCs: Portable PC designs, Portable system components	2
5	**Module 5: PC Troubleshooting**	**8 hrs**
5.1	Troubleshooting tools and techniques: Tools of the trade, basic PC handling techniques.	4
5.2	Basic Data Recovery and Disaster Recovery: Disk structure and data recovery, Disaster recovery.	4

20INMCA109	FUNDAMENTALS OF ACCOUNTANCY	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course introduces the concept of accounting and its application. It helps the students to prepare income statement, balance sheet and get idea about the various financial statements used in companies. It provides skills that can be applied in analyzing these statements.

Prerequisite: None

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

CO 1	Describe accounting terminology.
CO 2	Apply theoretical and practical aspects of recording transactions in books of accounts.
CO 3	Prepare various financial statements.
CO 4	Prepare final accounts of a company with adjustments.
CO 5	Describe and apply depreciation methods.
CO 6	Analyze the financial statements of a company using various methods.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1								3	1			2
CO 2								3	1			2
CO 3								3	1			2
CO 4								3	1			2
CO 5								3	1			2
CO 6								3	1			2

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	5	5	15
Understand(K2)	10	10	15
Apply(K3)	20	20	10
Analyse(K4)	5	5	10
Evaluate(K5)	5	5	5
Create(K6)	5	5	5

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3hrs

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. Describe the accounting terminology with its basic concepts and principles (K1)
2. Solve the basic accounting equation (K3)
3. Describe the forms of organisation (K1)
4. Explain the users of accounting information (K1)

Course Outcome 2 (CO2):

1. Describe the concepts of basic books of accounts: journal, ledger and Trial balance (K1)
2. Classify and prepare the books of accounts (K4)
3. Explain the journalising process (K1)

Course Outcome 3 (CO3):

1. Evaluate various financial statements of a company (K5)
2. Determine the profit or loss by prepare the Trading and Profit and loss accounts (K3)

Course Outcome 4 (CO4):

1. Describe the basic adjustments needed for the preparation of final accounts of a company (K1)
2. Summarize the financial statements of a company (K5)
3. Create final accounts with adjustments (K6)

Course Outcome 5 (CO5):

1. Explain the concept of Depreciation (K1)
2. Describe the various methods used for calculating depreciation (K1)
3. Solve the depreciation problems (K3)

Course Outcome 6 (CO6):

1. Explain the concept of financial statement analysis (K1)
2. Analyse comparative and common size statements (K4)

SYLLABUS

Module 1

Introduction to Accountancy- Accounting and its Functions, Scope of Accounting, Book Keeping and accounting, Basic terminologies in accounting. Basic Concepts and Principles of Accounting. Internal and external users of accounting information. Double entry and single entry Accounting Equation, Classification of Accounts, Traditional and Modern classifications. Forms of organization - sole proprietorship, partnership and company.

Module 2

Recording of transactions- Definition of Journal, Journalizing Process, Subsidiary books, Ledger Posting, Balancing an Account, Trial Balance. Objectives of Preparing Trial Balance.

Preparation and Analysis of Final Accounts: Trading Account, Profit and Loss Account, Preparation of Balance Sheet, horizontal and vertical format.

Module 3

Balance Sheet with Adjustment: Adjustment with respect to Closing stock, outstanding expenses, prepaid expenses, Accrued income, Income received in advance, Depreciation, Bad debts, Provision for doubtful debts, Provision for discount on debtors.

Module 4

Depreciation: Meaning and Need for charging depreciation. Methods of depreciation- straight line method, diminishing value method, sum of the digits method, sinking fund method, Insurance premium method.

Module 5

Financial statements: Analysis and interpretation (basics). Meaning and types of financial statements, Nature of financial statements, Analysis and interpretation of financial statements, Common Size Statement, Comparative Balance Sheet.

Reference Books

1. S.N Maheshwari, Maheshwari S K, "Introduction to Accountancy". Eleventh Edition, Vikas Publications, New Delhi. (2013)
2. S.P. Jain and K L Narang, "Fundamentals of Accounting". Eighth Edition, Kalyani Publications (2014)
3. Srinivasan & Murugan, "Accounting for Management", First Edition, S Chand & Company Ltd, (2006)
4. T.S. Grewal, "Double Entry Book Keeping", Sultan Chand, (2016)

Web References:

Fundamentals of Managerial Accounting- http://nptel.ac.in/courses/110101003/2

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1: Introduction to Accountancy**	**7 hrs**
1.1	Accounting and its Functions, Scope of Accounting, Book Keeping and accounting, Basic terminologies in accounting.	2
1.2	Basic Concepts and Principles of Accounting	1
1.3	Internal and external users of accounting information. Double entry and single entry. Accounting Equation	2

1.4	Classification of Accounts, Traditional and Modern classifications. Forms of organization - sole proprietorship, partnership and company.	2
2	**Module 2: Recording of Transactions**	**12 hrs**
2.1	Definition of Journal, Journalizing Process, Subsidiary books, Ledger Posting -Theory	3
2.2	Journalising-problems	1
2.3	Ledger, balancing an account - problems	1
2.4	Trial Balance. Objectives of Preparing Trial Balance	1
2.5	Trial balance- problems	1
2.6	Preparation and Analysis of Final Accounts	1
2.7	Trading Account, Profit and Loss Account- problems	2
2.8	Balance sheet- problems	1
2.9	Balance sheet- horizontal and vertical format problems	1
3	**Module 3: Balance Sheet with Adjustment**	**12 hrs**
3.1	Balance Sheet with Adjustment	1
3.2	Adjustment with respect to Closing stock, Outstanding expenses, Prepaid expenses, Accrued income, Income received in advance, Depreciation, Bad debts, Provision for doubtful debts, Provision for discount on debtors	5
3.3	Final account problems with all adjustments.	6
4	**Module 4: Depreciation**	**9 hrs**
4.1	Meaning and Need for charging depreciation	1
4.2	Methods of depreciation- straight line method, diminishing value method, sum of the digit's method, sinking fund method, Insurance premium method.	4
4.3	Problems relating to depreciation	4
5	**Module 5: Analysis of financial statements**	**8 hrs**
5.1	Meaning and types of financial statements	2
5.2	Nature of financial statements, Analysis and interpretation of financial statements	2
5.3	Common Size Statement, Comparative Balance Sheet- problems	4

20INMCA131	OFFICE AUTOMATION LAB	CATEGORY	L	T	P	CREDIT
		GENERAL	0	0	5	1

Preamble: Office tools course would enable the students in crafting professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools. To familiarize the students in preparation of documents and presentations with office automation tools.

Prerequisite: Basic knowledge in using computer. A computer with MS Office 2016 or higher version installed.

Course Objectives: To impart hands-on experience on the widely used office automation software

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

CO 1	Understand the features and functionalities of most commonly used office automation tools.
CO 2	Prepare professional documents, perform accounting operations, and prepare professional multimedia presentations.
CO 3	Organize and perform accounting operations on a large volume of data across multiple worksheets or pages of information in the file.
CO 4	Construct formulas, including the use of built-in functions, and relative and absolute references.
CO 5	Translate raw data into a meaningful information by creating charts and pivot tables.
CO 6	Save time, effort and minimize human errors by making use of features like Master templates, Formulas, Mail Merge, Macros etc.

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2				2			2	2		1	
CO 2	1	1			3			1	3		2	
CO 3	3	3			3			2	3		1	
CO 4	2	1			3			2	2		1	
CO 5	2	1			3			2	3		1	
CO 6	2	1			3			2	2		2	

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember (K1)	10		
Understand (K2)	10		
Apply (K3)	10	10	10
Analyse (K4)	10	10	10
Evaluate (K5)	10	10	10
Create (K6)		20	20

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern

Attendance : 08 Marks
Continuous Assessment Test (2 numbers) : 30 Marks
Assignment/Quiz/Course project : 12 Marks

End Semester Examination Pattern

Lab exam will be conducted by internal examiner.

Course Level Assessment

Course Outcome 1 (C01):

1. Explore User Interface and Quick Introduction to MS Word, Excel and PowerPoint. (K1)
2. Explore File Tab options. (K1)

Course Outcome 2 (C02):

1. Basic editing and formatting in MS Word. (K2)
2. Basic Formatting and Management in MS Excel. (K2)
3. PowerPoint preparations and basic formatting. (K2)
4. Designing and adding features and effects in MS Word and PowerPoint preparation. (K3)

Course Outcome 3 (C03):

1. Performing mathematical operations in MS Excel. (K4)
2. Using in-build tools in MS Word. (K5)

Course Outcome 4 (C04):

1. Using inbuilt tools in MS Excel. (K5)
2. Setting formula in MS Excel. (K5)

Course Outcome 5 (C05):

1. Prepare charts and Pivot tables in MS Excel. (K4)

Course Outcome 6 (CO6):

1. Creating Master slides in PowerPoint presentations. (K6)
2. Create Mail merge in MS Word. (K6)
3. Create Macros MS Word. (K6)

SYLLABUS

Microsoft Word : Documentation Software
Microsoft Excel : Spreadsheets
Microsoft Power Point : Presentation Software

Reference Books

1. Curtis Frye and Joan Lambert, "Microsoft Office 2016 Step by Step" Microsoft Press 2015.
2. Stewart Melart, "Microsoft Office 2016: The Complete Guide", Conceptual Kings, (2015).
3. Christopher N. Cain and Riley W. Walker, “OpenOffice 3.4 Volume I: Writer”, Quantum Scientific Publishing, (2012).
4. Christopher N. Cain and Riley W. Walker, “OpenOffice 3.4 Volume II: Calc”, Quantum Scientific Publishing, (2012).
5. Koch, Michael, “Special Edition Using Star Office 6.0”, Que Corporation.
6. Prof. James Steinberg, “Open Office Basic: An Introduction”, Gold Turtle Publishing, December (2012).
7. Wells, Nicholas D. & Taylor, Dean, “Sams Teach Yourself StarOffice 5 for Linux in 24 Hours”, Publishers: Sams Publishing.

Web References

- http://www.myonlinetraininghub.com/
- https://www.microsoft.com/en-us/learning/training.aspx
- https://support.office.com/en-us/article/Word-2010-videos-and-tutorials-cfa75118-e522-4ea5-963e-2b56d25fb9a5
- https://support.office.com/en-us/office-training-center
- https://edu.gcfglobal.org/en/topics/office2016/
- https://officeskills.org/microsoft-office-tutorials.html

MOOC Courses

- https://www.eduonix.com/courses/Office-Productivity/quick-and-easy-guide-to-microsoft-word
- https://www.coursera.org/learn/excel-essentials
- https://www.udemy.com/courses/search/?q=microsoft%20office%202016&src=sac&kw=microsoft%20office
- https://www.edx.org/course/introduction-to-data-analysis-using-excel-2

List of Lab Experiments

Lab exams may include customized question combining various elements, features, tools and functionalities from Word, Excel and PowerPoint, covered in below topics.

1. Quick Introduction to MS Word, MS Excel and MS Power Point (2016 Version).
2. Explore User Interface: Menu Bar, Ribbon, Tabs, Tab Groups, Quick Access Toolbar, Document Area, Ruler, Scroll Bar, Status Bar, View layout shortcuts, Zoom, Ribbon display options.
3. Explore File Tab: Document protection, Creating a new file, Using templates, Opening and document, Save and Save-As options, Print options, Document options and general settings.
4. Explore the common short-cut keys for fast and convenient use of automation software’s.
5. MS Word: Editing text documents- Cut, Copy, Paste, Undo, Redo, Find, Advanced find using search options, Replace, Using help.
6. Set Font styles- Font selection, Size, Text Colour and Highlighting, Bold, Italic, Underline, Strikethrough, Format painter, Subscript and Superscript, Case settings, Text effects, Clear formatting.
7. Paragraph and document styles- Alignments, Line and paragraph spacing, Bullets & Numbering, Indents, Applying document styles, Border & Shading, Sorting.

8. Inserting Cover Page, Blank Page, Page Break, Insert Pictures and its formatting, Shapes, SmartArt and Charts, Hyperlinks using different methods, Bookmarks, Header & footer, Page numbering, Adding Textbox, Auto Text, WordArt, Drop Cap, Adding Objects, Equations and Symbols to document.
9. Tables-Adding Tables, Insertion, Deletion, Merging, Splitting, Borders.
10. Designing: Setting Themes, Watermark, Page colour, Page border.
11. Layout Settings: Setting Page Size and Margins, Orientation, Columns, Page and Section Brakes, Hyphenation.
12. Setting Image/object position and arrangements, Wrap Text, Align objects, Grouping, Rotate, Adding Table of contents, Mail Merge using DB and excel.
13. Review options: Using Spelling and Grammar check, Thesaurus, Tracking changes.
14. View Options: Page views, Ruler, Split Window, Recording and Using Macros.
15. Spreadsheets-User Interface: Formula Bar, Managing and Protecting Sheets, Addressing Rows/Columns/Cells.
16. Basic Formatting and Data Management-Entering data, Filling Continuous rows and columns, Text Align and Orientation, Wrap Text, Merge and Centre.
17. Cell Management- Insert and Delete Cells/Columns/Rows, Cell styles, Row Height, Column Width, Column Headers, Hide/Unhide, Locking Cells.
18. Conditional Formatting, Sort, Custom Sort and Filter, Find, Search & Replace.
19. Using Tools- Insert Tables, Table Formatting, Pivot Tables, Pictures, Charts, Pivot Charts.
20. Visibility- Sheet formatting using Themes, Colours, Background.
21. Setting Formula- Basic Math Functions, Mathematical operations (Addition, Subtraction, Multiplication, Division, Exponentiation).
22. Data Management- Add data from external files, Text to columns, Duplicate removal, Data validation, Consolidate.
23. View Settings- Freeze Panes, Split, Hide/Unhide.
24. Presentation Software-User Interface: Normal Presentation View, Notes Area, Options in Status bar.
25. Basic Presentation- Choose Template, Add New Slide, Enter and Arrange Text, Format Text Placeholders, Text formatting, Text direction and Alignment, Add Shapes, Shape Fill/Outline/Effects, Arrange objects, Quick styles.
26. Slide Operations- Duplicate, Delete, Re-Arrange, Hide, Unhide, Format Slide Background, Choose Slide Layout, Add Section, Set Themes, Side size.
27. Adding Graphical Objects to a Presentation- Pictures, Smart Art, WordArt, Objects, Video and Audio.
28. Insert Tables in a Slide, Format Tables, Insert Charts in a Slide, Chart customization.
29. Adding Effects to the Presentation- Setting Animation & Transition Effects.
30. Create Master Slides.

Course Contents

No	Topics	No. of Lectures
1	**Module 1**	**2 hrs**
1.1	Explore User Interface and Quick Introduction to MS Word, Excel and Power Point.	1
1.2	Explore File Tab options.	1

2	**Module 2**	**11 hrs**
2.1	MS Word: Basic editing and formatting	7
2.2	Inserting objects and customizing	4
3	**Module 3**	**11 hrs**
3.1	MS Word: Designing and adding features	7
3.2	Using inbuilt tools	4
4	**Module 4**	**14 hrs**
4.1	MS Excel: Basic Formatting and Management	5
4.2	Using Tools	4
4.3	Setting formula	5
5	**Module 5**	**10 hrs**
5.1	MS PowerPoint: Slide preparations and basic formatting	5
5.2	Using Objects and Adding Effects	4
5.3	Creating Master Slides	1

20INMCA133	INTRODUCTION - PC HARDWARE LAB	CATEGORY	L	T	P	CREDIT
		GENERAL	0	0	4	1

Preamble: This course introduces the various components like I/O devices, CPU etc. Gain knowledge in fundamental concepts, Basic architecture of PC. Working of Operating System, Troubleshooting etc.

Prerequisite: Basic knowledge in using computer.

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

CO 1	Explain how a PC works and understand the relationship between hardware and software.
CO 2	Understand purpose and functions of an operating system (OS).
CO 3	Understand the purpose and functions of the computer peripherals.
CO 4	Install, troubleshoot and Format Windows and Linux Operating System.
CO 5	Understand and perform diagnostic procedures and troubleshooting techniques to personal computers, portable devices, operating systems and computer peripherals.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	2		3	3				
CO 2	3	3	3	2	2		3	3	1			
CO 3	3	3	3	2	2		3	3				
CO 4	3	3	3	2	2		3	3				2
CO 5	3	3	3	3	3		3	3			2	2

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)			
Understand(K2)			
Apply(K3)	10	10	10
Analyse(K4)	10	10	10
Evaluate(K5)	10	10	10
Create(K6)	20	20	20

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 8 marks
Continuous Assessment Test (2 numbers) : 30 marks
Assignment/Quiz/Course project : 12 marks

End Semester Examination Pattern:

Lab exam will be conducted by internal examiner.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Identification of PC Components. (K4)
2. Understand the basic architecture of PC Components. (K4)
3. Relationship between hardware and software. (K5)

Course Outcome 2 (CO2):

1. Examine each PC Component. (K6)
2. Categorize PC components based on functionality. (K6)
3. Model Functionalities of each component. (K6)

Course Outcome 3(CO3):

1. Understanding BIOS set up. (K6)
2. Storage mechanism and operating system concepts. (K6)
3. Working of operating system on Hardware. (K6)

Course Outcome 4 (CO4):

1. Identify peripherals and its functionalities. (K6)
2. Importance of each peripheral components. (K6)
3. Connecting various peripherals together. (K6)

Course Outcome 5 (CO5):

1. Connecting various components in PC. (K6)
2. Assembling basic components to form PC. (K6)
3. Troubleshooting and installation of components. (K6)
4. Install, configure and update/upgrade Hardware. (K6)
5. Install, configure and update/upgrade Software. (K6)
6. Install, configure and update/upgrade OS. (K6)

SYLLABUS

- Identification of PC Components, Understanding BIOS set up.
- Assembling and dissembling of internal components of PC, Installation of different OS (Windows, Linux).
- Analyze File system (FAT, NTFS, ext4), Installation of Software Packages in windows and Linux.
- Reframe Hard disk partitioning and formatting, Analyze and apply Virus removal and disc scan.
- Plan trouble shooting of the PC, Identification of Basic and Special Components of Mobile Phone.
- Installation of driver software, Analyze Disc Managers and its use.
- Checking the Basic Component of Mobile Phone and its Faults.
- Troubleshooting of the OS.

Reference Books

1. Craig Zacker, John Rourke "PC Hardware The Complete Reference" Tata McGraw-Hill Edition.

Web Resources

1. https://www.bleepingcomputer.com/tutorials/hardware/
2. https://www.inetdaemon.com/tutorials/computers/hardware/

3. http://www.karbosguide.com

List of Lab Experiments/Exercises

1. Identification of PC Components.
2. Understanding BIOS set up.
3. Assembling and dissembling of internal components of PC.
4. Installation of different OS (Windows, Linux).
5. Analyze File system (FAT, NTFS, ext4).
6. Installation of Software Packages in windows and Linux.
7. Reframe Hard disk partitioning and formatting.
8. Analyze and apply Virus removal and disc scan.
9. Plan trouble shooting of the PC.
10. Identification of Basic and Special Components of Mobile Phone.
11. Installation of driver software.
12. Analyze Disc Managers and its use.
13. Checking the Basic Component of Mobile Phone and its Faults.
14. Troubleshooting of the OS.

Note: *Students can be given a group micro project, so that they learn to work in a team environment. They can also be trained on project management tools.*

Course Contents and Lecture Schedule

No	**Topic**	**No. of Hours**
1	Identification of PC Components	3 hr.
2	Understanding BIOS set up	3 hr.
3	Assembling and dissembling of internal components of PC	4 hr.
4	Installation of different OS (Windows, Linux)	4 hr.
5	Analyze File system (FAT, NTFS, ext4)	3 hr.
6	Installation of Software Packages in windows and Linux	4 hr.
7	Reframe Hard disk partitioning and formatting	4 hr.
8	Analyze and apply Virus removal and disc scan	3 hr.
9	Plan trouble shooting of the PC	3 hr.
10	Identification of Basic and Special Components of Mobile Phone	3 hr.
11	Installation of driver software	3 hr.
12	Analyze Disc Managers and its use	4 hr.
13	Checking the Basic Component of Mobile Phone and its Faults	3 hr.
14	Troubleshooting of the OS	4 hr.

SEMESTER 2

20INMCA102	TECHNICAL COMMUNICATION	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	-	4

Preamble: Technical communication is a means to convey scientific, engineering, or other technical information and in an organizational context it is the key to better productivity and professional interaction. This course enables the students to master advanced level communication skills and helps to convey specific information to specific audiences.

Prerequisite: Basic Language Skills

Course Outcomes: After the completion of the course the students will be able to

CO 1	Apply effective technical communication skills in a professional environment.
CO 2	Analyze and evaluate professional documents by implementing various strategies of reading.
CO 3	Create various technical and non- technical documents in an organized, clear and precise manner.
CO 4	Identify various listening strategies to analyze technical knowledge and information.
CO 5	Discuss and present ideas and opinions in an effective manner.
CO 6	Develop, choose and apply vocabulary and grammar skills.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1							3		3	2	3	2
CO 2							3		3	2	3	
CO 3									3		3	1
CO 4							1		3		3	
CO 5									3		3	1
CO 6									3		3	1

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	5	5	10
Understand(K2)	5	5	10
Apply(K3)	15	15	10
Analyse(K4)	5	5	10
Evaluate(K5)	5	5	10
Create(K6)	15	15	10

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 : 12 marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A should contain 10 compulsory short answer questions, 2 from each module which carries 3 marks. Part B should contain 2 questions from each module with maximum 2 sub- divisions which carries 6 marks, of which the student should answer any one.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain the importance of technical communication in a professional environment. (K2)
2. List the objectives of technical communication. (K1)
3. Outline the characteristics of technical communication. (K4)

Course Outcome 2 (CO2):

1. Compare active and emphatic listening. (K5)
2. Listen to a video lecture on any topic and summarize the main points. (K5)
3. Summarize the steps to do analytical listening. (K5)

Course Outcome 3 (CO3):

1. Outline the dos and don'ts in a debate. (K4)
2. Assume that you are attending your college farewell party and you were asked to deliver a speech about the reminiscences of your college life. Create an impromptu speech in not more than 50 words. (K6)
3. Describe the various elements of a presentation. (K2)

Course Outcome 4 (CO4):

1. Create a KWL table on effective reading and reading techniques. (K6)
2. Compare efficient and inefficient readers. (K5)
3. Summarize the barriers to effective reading. (K2)

Course Outcome 5 (CO5):

1. Create a persuasive essay on the topic "Say No to Plastic". (K6)
2. Compose a letter to the Editor of the newspaper 'The Hindu' pointing out the poor condition of roads in your home town. (K6)
3. Develop a newspaper report on an accident that you saw on the way to your college. (K6)

Course Outcome 6 (CO6):

1. Modify the conditional sentences by filling the correct word. (K3)

a) (Second conditional) If she___________________________(have) her mobile with her, she ________(call) me.

b) (First conditional) If she___________________________(not go) to school tomorrow, I_______(not go) either.

c) (First conditional) If our boss___________________________(give) us lots of work this weekend, I ___________________________(not be) happy.

d) (Third conditional) If we___________________________(tidy) our house, we___________________(not lose) the documents.

2. Choose the right word among the homophones. (K5)

a) I saw you car keys over___________________(there/ their).

b) ________(its/ it's) not my book.

c) I_______(warn/ worn) you. Do not keep the box opened.
d) He______(threw/ through) the papers through the window.
3. Modify the tenses into its correct form with regular and irregular verbs. (K3)
a) When she saw them she______________(cry) and I__________(put) down my book on the desk.
b) She____(draw) the pictures yesterday and we___________________(send) them right away.
c) After few hours we_________________(find) the lost document and we_________(sit) down and relaxed for a while.
d) Yesterday John________________(hurt) his leg during the final round of the competition. I_______(take) the early morning train.

SYLLABUS

Module 1

Introduction to Technical Communication: Importance, Objectives & Characteristics **Listening:** Importance & Benefits of Active Listening, Appreciative Listening - Practice listening to motivational speeches. **Speaking:** Importance of Vocal Cues, Roleplays -Definition, Types, Significance, Steps of a Role Play, Practicing Role Plays in different situations. **Reading:** Introduction to Effective Reading, Benefits of Effective Reading, KWL technique, Speed of Reading, Tips to develop Reading Habits, Practice the art of Skimming documents. **Writing:** Structure of Paragraphs, Types-Descriptive, Narrative, Persuasive & Creative, Steps to write a Paragraph. **Grammar & Vocabulary**: Simple, Compound and Complex sentences, Imperatives, Compound words.

Module 2

English for Business Communication: Listening -Emphatic Listening-Stages & Strategies. Practice listening to Panel discussions to understand different viewpoints. **Speaking:** The three Vs of communication, Telephonic Conversation Practice. **Reading:** Efficient & Inefficient readers, four basic steps to reading, Comprehensive Reading, Comprehensive Reading techniques -SQ3R method, Practice the art of Scanning documents. **Writing**: Format of Letter, The Seven C's of Letter Writing, Letter to the Editor, Business Letters -Acknowledgement letter, Appreciation letter, Permission Letter. **Grammar & Vocabulary**: Regular /Irregular Verbs, Transitive /Intransitive Verbs, Acronyms.

Module 3

English for Academic Purposes: Listening: Comprehensive Listening Strategies, Practice listening to lectures or directions. **Speaking:** Barriers to effective speaking, Debate -Purpose, Features, Dos & Don'ts, Practice Debates on various topics. **Reading:** Barriers to effective reading, Critical reading, Practice the art of Intensive Reading. **Writing:** Introduction to Review Writing, Parts of a Review - Book review & Film Review **Grammar & Vocabulary**: Conditionals, Framing Questions, Guessing meaning from the context.

Module 4

English for Organizational Skills: Listening: Critical or Analytical listening, Practice listening to Political Speeches. **Speaking:** Reasons for Incorrect pronunciation, Received Pronunciation, Practice Impromptu speeches. **Reading**: Predicting and Problem Solving, Surveying a text using an Index, Practice the art of Extensive Reading**. Writing:** Importance, structure & types of reports. Preparing Technical and Newspaper reports. **Grammar & Vocabulary**: Conjunctions, Sequencers, Homophones.

Module 5

English for Professional Communication: Listening: Three basic listening models **Speaking:** Strategies for Speaking, Tips for effective Presentation, Practice Presentation Skills. **Reading:** Methods of Reading -Sub-vocalized, Speed reading, Photo reading, SPE, Multiple intelligences-based method. Approaches to Reading -Phonics approach, Whole Word Approach, Language Experience Approach. **Writing:** Difference between Technical & Creative Writing, Poster Designing, Advertisements, Tweeting & Blogging. **Grammar & Vocabulary**: Phrases and Clauses, Direct and Indirect Speech, Blend words.

Textbooks

1. Mindscapes: English for Technologists and Engineers, Orient Black Swan, 2012.
2. Kumar Sanjay & Lata Pushp, "Communication Skills in English", Oxford University Press, 2015.
3. Raman, Meenakshi and Sangeeta Sharma, Technical communication: Principles and practice, Oxford University Press, 2015.

Web resources

Sno	Topic	Exercise Link	Video Link
1	Simple, Compound and Complex sentences	https://www.englishgrammar.org/sim ple-compound-or-complex-sentence/	https://www.youtube.com/watch?v=m9Avsw-kK-s
2	Imperatives	https://www.englisch-hilfen.de/en/exercises/various/imperative.htm	https://www.youtube.com/watch?v=1mJJ3UL jWYQ
3	Regular/Irregular Verbs	https://www.englisch-hilfen.de/en/exercises_list/verbs.htm	https://www.youtube.com/watch?v=LciKb0uuFEc
4	Transitive/Intransitive Verbs	https://www.learnenglishfeelgood.co m/transitive-intransitive-verbs1.html	https://www.youtube.com/watch?v=NG7MY2_A0Ew
5	Conditionals	https://www.ego4u.com/en/cram-up/tests/conditional-sentences-3	https://www.youtube.com/watch?v=xyq9eJn9W0Q
6	Framing Questions	https://www.englisch-hilfen.de/en/exercises/questions/form.htm	https://www.youtube.com/watch?v=mLefVAv KsRk
7	Conjunctions	https://www.englisch-hilfen.de/en/exercises/word_order/conjunctions2.htm	https://www.youtube.com/watch?v=- FdEaeD1MdY
8	Sequencers	https://www.liveworksheets.com/wor ksheets/en/English_as_a_Second_Lan guage_(ESL)/Sequence_words/Sequencer_hd35532qf	https://www.youtube.com/watch?v=sFrHK7c HzkA
9	Phrases and Clauses	https://www.softschools.com/quizzes/grammar/phrase_or_clause/quiz282 5.html	https://www.youtube.com/watch?v=z45UdL0 WTro

10	Direct and Indirect Speech	https://www.perfect-english-grammar.com/reported-speech-exercise-10.html	https://www.youtube.com/watch?v=LVB4O0 BSZBQ

Vocabulary

Sno	Topic	Link
1	Compound Words	https://www.englisch-hilfen.de/en/exercises/structures/compounds.htm
2	Acronyms	https://www.tolearnenglish.com/exercises/exercise-english-2/exercise-english-113150.php
3	Guessing meaning from context	https://www.grammarbank.com/context-clues-worksheet.html
4	Homophones	https://agendaweb.org/vocabulary/homonyms-exercises.html
5	Blend words	https://www.myenglishpages.com/site_php_files/grammar-lesson-blending.php

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1: Introduction to Technical Communication**	**9 hrs**
1.1	Importance & Benefits of Active Listening, Appreciative Listening	2
1.2	Importance of vocal cues, Role Plays	2
1.3	Introduction to Effective Reading, Benefits of Effective Reading, KWL technique, Speed of Reading, Tips to develop Reading Habits, Skimming documents	2
1.4	Structure and Types of Paragraphs	1
1.5	Simple, Compound & Complex sentences, Imperatives, Compound words	2
2	**Module 2: English for Business Communication**	**9 hrs**
2.1	Emphatic listening- Strategies and practice	2
2.2	The three Vs of communication, Telephonic Conversation Practice	1
2.3	Efficient & Inefficient readers, Four basic steps to reading, Comprehensive Reading, Comprehensive Reading techniques	2
2.4	Letter to the Editor and Business Letters	2
2.5	Regular /Irregular Verbs, Transitive /Intransitive Verbs, Acronyms	2
3	**Module 3: English for Academic Purposes**	**10 hrs**
3.1	Comprehensive Listening Strategies & Practice	2
3.2	Barriers to effective speaking, Debate	1
3.3	Barriers to effective reading, Critical reading	1
3.4	Introduction to Review Writing, Parts of a Review	2
3.5	Conditionals, Framing Questions, Guessing meaning from the context	4
4	**Module 4: English for Organizational Skills**	**10 hrs**
4.1	Critical or Analytical listening & Practice	2
4.2	Reasons for Incorrect pronunciation, Received Pronunciation, Practice Impromptu speeches	2
4.3	Predicting and Problem Solving, Surveying a text using an Index, Practice the art of Extensive Reading	2

4.4	Importance, structure & types of reports, Preparing Technical and Newspaper reports	2
4.5	Conjunctions, Sequencers, Homophones	2
5	**Module 5: English for Professional Communication**	**10 hrs**
5.1	Three basic listening models	2
5.2	Strategies for Speaking, Tips for effective Presentation, Practice Presentation Skills	2
5.3	Methods of Reading -Sub-vocalized, Speed reading, Photo reading, SPE, Multiple intelligences-based method Approaches to Reading	2
5.4	Difference between Technical & Creative Writing, Poster Designing, Advertisements, Tweeting & Blogging	2
5.5	Phrases and Clauses, Direct and Indirect Speech, Blend words	2

20INMCA104	INTRODUCTION TO DISCRETE MATHEMATICS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: Concepts and notations from discrete mathematics are useful in studying and describing objects and problems in branches of computer science. This course introduces the concepts of Logic, Mathematical induction, Number Theory and Graph theory.

Prerequisite: Nil

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

CO 1	Recognize and apply the concepts needed to test the logic of a program using propositions.
CO 2	Apply the principle of mathematical induction and pigeon hole principle to solve problems.
CO 3	Explain number theory and apply it to ensure secure communication.
CO 4	Use a combination of theoretical knowledge and independent mathematical thinking in creative evaluation of questions in graph theory.
CO 5	Analyse the properties of trees and implement tree algorithms.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3					1		1			
CO 2	3	3					1		1			
CO 3	3	3					1		1			
CO 4	3	3					1		1			
CO 5	3	3					1		1			

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	5	5	6
Understand(K2)	10	10	15
Apply(K3)	20	20	18
Analyse(K4)	10	10	15
Evaluate(K5)	5	5	6
Create(K6)			

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. Describe the Logical Operators Conjunction, Disjunction, Negation. (K1)
2. Differentiate between Tautology and Contradiction. (K2)
3. Show that given propositions are logically equivalent without using truth table. (K3)

Course Outcome 2 (CO2):

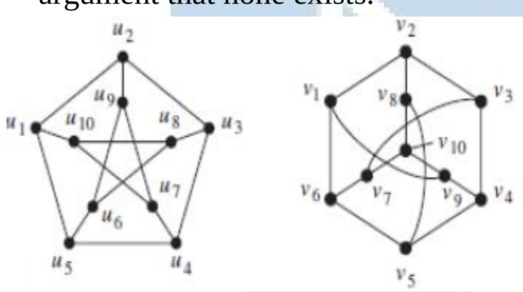
1. Describe the principle of mathematical induction. (K1)
2. Explain the generalized pigeonhole principle. (K2)
3. Use pigeonhole principle to show that among any n+1 positive integers not exceeding 2n there must be integer that divides one of the other integers. (K3)

Course Outcome 3(CO3):

1. Determine the gcd and lcm of (231, 1575). (K3)
2. Explain the fundamental theorem of arithmetic. (K2)
3. Evaluate the smallest positive integer which leaves the remainder 1,2,3,4 when divided by the prime numbers 2, 3, 5, 11 respectively using Chinese remainder theorem. (K5)

Course Outcome 4 (CO4):

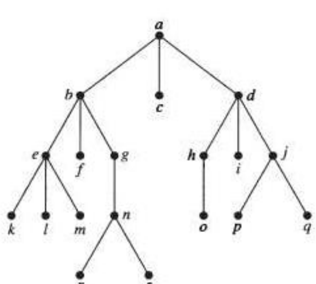
1. Determine the adjacency matrix for K_n. (K3)
2. Determine the given pair of graph is isomorphic. Exhibit an isomorphism or provide a rigorous argument that none exists. (K3)



3. Describe Dijkstra's algorithm. (K2)

Course Outcome 5 (CO5):

1. Differentiate between tree and forest. (K2)
2. Discuss about the traversal algorithms. (K2)
3. Illustrate the order in which a preorder, inorder, postorder traversal visits the vertices of the given ordered rooted tree. (K4)



SYLLABUS

Module 1

Logic: Logical operators Conjunction, Disjunction, Negation, Conditional and biconditional, Truth tables, Equivalence and Implication, Tautology and Contradiction, Inference Theory, Validity by Truth Table, Rules of Inference for propositional logic, Predicates, Quantifiers, De-Morgan's law for Quantifiers.

Module 2

Mathematical Induction and Pigeonhole Principle: Mathematical Induction, strong form of Mathematical Induction, Pigeonhole Principle.

Module 3

Number Theory: Introduction, Division, Primes Division Algorithm, LCM and GCF, Modulo Arithmetic, Euclidean Algorithm (without proof), Linear Congruences, Chinese Remainder Theorem (without proof).

Module 4

Graph Theory: Basic terminology: Different Types of Graphs Directed and Undirected, Simple, Pseudo, Complete, Regular, Bipartite, Incidence and Degree, Pendant and Isolated Vertex and Null graph, Isomorphism, Sub Graphs. Operations on Graphs, Matrix Representation of Graphs, Walk, Path and Circuit, Connected and Disconnected Graphs, Euler Circuits and Paths, Necessary and Sufficient Conditions (without proof) Hamiltonian Circuits and Paths, Dirac's and Ore's theorem (without proof), Dijkstra's algorithm (Section 10.2-excluding matchings and colorings).

Module 5

Trees: Introduction, Properties, Rooted Trees, Binary and m- ary Trees, Tree Traversal, Spanning Trees (definition and examples only), Kruskal's and Prim's Algorithm.

Text Books

1. Kenneth H Rosen, "Discrete Mathematics and Its Applications", 7th Edition, Tata McGraw Hill

Reference Books

1. J.P.Tremblay and R Manohar, "Discrete Mathematical Structures with Applications to Computer Science", 1997 Edition, Tata McGraw-Hill Publications.
2. Narsingh Deo, "Graph Theory", 2nd Edition, Prentice Hall of India
3. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics", 4th Edition, Tata McGraw-Hill.

Suggested MOOC

1. Graph Theory: http://www.nptel.ac.in/courses/106108054/2#
2. Chinese Reminder Theorem: http://nptel.ac.in/courses/106103015/11

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1: Logic**	**10 hrs**
1.1	Logical operators Conjunction, Disjunction, Negation, Conditional and bi conditional	1
1.2	Truth tables	1
1.3	Equivalence and Implication	1
1.4	Tautology and Contradiction	1
1.5	Inference Theory	1
1.6	Validity by Truth Table	1
1.7	Rules of Inference for propositional logic	1
1.8	Predicates, Quantifiers	1
1.9	De-Morgan's law for Quantifiers	2
2	**Module 2: Mathematical Induction and Pigeonhole Principle**	**7 hrs**
2.1	Mathematical Induction	2
2.2	Strong form of Mathematical Induction	2
2.3	Pigeonhole Principle	3
3	**Module 3: Number Theory**	**8 hrs**
3.1	Introduction	1
3.2	Division, Primes Division Algorithm	2
3.3	LCM and GCF	1
3.4	Modulo Arithmetic, Euclidean Algorithm (without proof),	1
3.5	Linear Congruence	1
3.6	Chinese Remainder Theorem(without proof)	2
4	**Module 4: Graph Theory**	**14 hrs**
4.1	Basic terminology: Different Types of Graphs Directed and Undirected Graphs	1
4.2	Simple, Pseudo, Complete, Regular, Bipartite, Incidence and Degree, Pendant and Isolated Vertex and Null graph	2
4.3	Isomorphism	2
4.4	Sub Graphs, Operations on Graphs	1
4.5	Matrix Representation of Graphs	1
4.6	Walk, Path and Circuit, Connected and Disconnected Graphs	2
4.7	Euler Circuits and Paths, Necessary and Sufficient Conditions(without proof)	2
4.8	Hamiltonian Circuits and Paths, Dirac's and Ore's theorem(without proof)	2
4.9	Dijkstra's algorithm	1
5	**Module 5: Trees**	**9 hrs**
5.1	Introduction, Properties	2
5.2	Rooted Trees, Binary and m- ary Trees, Tree Traversal	2
5.3	Spanning Trees	3
5.4	Kruskal's and Prim's Algorithm	2

20INMCA106	INTRODUCTION TO DIGITAL SYSTEMS & LOGIC DESIGNS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course introduces students to some basic digital electronics and Single Board Computers which are the core of MCA course. It also introduces the concepts of Boolean algebra, Sequential Circuits, Combinational Circuits, Registers and System-on-Chip.

Prerequisite: A basic knowledge of arithmetic operations.

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

CO 1	Gain knowledge in different types of number systems and their conversions.
CO 2	Understand the basics of Boolean Algebra.
CO 3	Minimization technique to implement Boolean functions.
CO 4	Design various complex logic gates.
CO 5	Analyze and design various sequential and combinational circuits.
CO 6	Examine the structure of shift registers, counters and programmable logic chip.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3						2					
CO 2	3	2										
CO 3	3	2										
CO 4	3	3	3	2	3					1		2
CO 5	3			2	3							2
CO 6	3		3		3		2			1		3

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10	10	10
Understand(K2)	10	10	15
Apply(K3)	10	10	15
Analyse(K4)	10	10	10
Evaluate(K5)	10	10	10
Create(K6)			

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 various methods for the representation of signed numbers? (K2)
2. Convert the following hexadecimal number to decimal number $(FACE)_{16.}$ (K5)
3. Generate 8-bit sign magnitude, 1's complement and 2's complement representation for $(57)_{10}$. (K6)

Course Outcome 2 (CO2):

1. Define basic laws of Boolean Algebra. (K1)
2. State and prove Demorgan's Theorem. (K1)
3. Apply DeMorgan's theorem to the expression $\overline{\overline{ABC} + D + E}$ (K3)

Course Outcome 3 (CO3):

1. Describe standard forms of Boolean Expression? (K1)
2. Illustrate the working of S-R flip flop with neat diagram. (K3)
3. Minimize the following Boolean function using K-Map – A'+AB'+ABC'+AD'. (K5)

Course Outcome 4 (CO4):

1. Draw the logic symbol and truth table of XNOR. (K2)
2. With logic symbol, truth table explain the operations of basic logic gates. (K2)
3. Demonstrate the negative-OR equivalent operation of a NAND gate. (K3)

Course Outcome 5 (CO5):

1. Draw and explain BCD to Decimal Decoder. (K2)
2. Illustrate the working of JK Flip Flop with neat diagram. (K3)
3. Compare latches and flip-flops. (K5)

Course Outcome 6 (CO6):

1. Write the applications of registers. (K3)
2. Compare synchronous and asynchronous counters. (K5)
3. With the diagrammatic illustration discuss the working of Serial In Parallel Out shift register. (K4)

SYLLABUS

Module I

Number System - Decimal, Binary, Octal, Hexadecimal, Conversion of one number system to other number system, Arithmetic operations on Binary numbers - Addition and Subtraction, Multiplication, Division. Representation of signed numbers – sign magnitude form, 1's and 2's Compliment form.

Module II

Logic Gates - AND, OR, NOT, XOR, XNOR - logic functions, logic symbols, truth tables. Universal Gates - NOR, NAND - logic functions, logic symbols, truth tables.
Introduction to Boolean Algebra - Laws and Rules of Boolean Algebra, De Morgan's Theorem.

Module III

Standard forms of Boolean Expressions, Minimization of Boolean function using K-map method - SOP, POS.
Sequential Circuits: Introduction to Latches, Flip-Flops - SR, JK, T, D, MS.

Module IV

Combinational Circuits: Full Adder, Half Adder, Full Subtractor, Half Subtractor.
Decoders – Basic Binary Decoder, 4-bits decoder, BCD to Decimal Decoder, Encoders – Decimal to BCD Encoder, Multiplexer – 4x1 and 8x1, Demultiplexer – 1x4 and 1x8.
Comparator-1-bit magnitude and 2-bit magnitude comparator.

Module V

Registers - Serial in serial out, Serial in parallel out, Parallel in serial out, parallel in parallel out. Counters – 2, 3, 4 bits Synchronous Counters and 2, 3, 4 bits Asynchronous Counters.
Introduction to System-On-Chip – A basic SOC system model.

Text Books

1. Floyd, "Digital Fundamentals", Pearson Education, 10th Edition (2011).
2. A. Anand Kumar, "Fundamentals of Digital Circuits", PHI Learning Pvt. Ltd., (2003).
3. Michael J. Flynn, Wayne Luk, "Computer System Design System-on-Chip", Wiley (2011).

Reference Books

1. Mano, "Digital Design: With an Introduction to Verilog HDL", Pearson Education, 5th Edition (2014).
2. Morris Mano, "Logic and Computer Design Fundamentals",4th Edition (2013).
3. Wael Badawy, Graham A. Jullien, "System-on-Chip for Real-Time Applications", Springer Science + Business Media (2003).
4. Morris Mano, "Digital logic and Computer design", Pearson Education, 1st Edition (2004).

Web Resources

1. Digital Systems - http://nptel.ac.in/courses/106108099/
2. Digital Systems Design - http://nptel.ac.in/courses/117105080/
3. Introduction to Digital Circuits - http://nptel.ac.in/courses/117106086/1
4. Build a Modern Computer from First Principles - https://www.coursera.org/learn/build-a-computer

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
1	**Module 1**	**10 hrs**
1.1	Number Systems	3

1.2	Conversions	4
1.3	Arithmetic operations on Binary Numbers	2
1.4	Representation of signed numbers	1
2	**Module 2**	**8 hrs**
2.1	Logic Gates	4
2.2	Universal Gates	2
2.4	De Morgan's Theorem	2
3	**Module 3**	**10 hrs**
3.1	K-Map	3
3.2	Minimization of Boolean function using K-Map	3
3.3	Latches	1
3.4	Flip-Flops	3
4	**Module 4**	**10 hrs**
4.1	Adders	2
4.2	Subtractors	1
4.3	Encoder	1
4.4	Decoder	1
4.5	Multiplexer	2
4.6	Demultiplexer	2
4.7	Comparator	1
5	**Module 5**	**10 hrs**
5.1	Registers	4
5.2	Counters	4
5.3	System-on-Chip	2

20INMCA108	PROBLEM SOLVING AND STRUCTURED PROGRAMMING	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: The syllabus is prepared with the view of preparing the MCA Graduates capable of writing readable C programs to solve computational problems that they may have to solve in their professional life. The course content is decided to cover the essential programming fundamentals which can be taught within the given slots in the curriculum.

Prerequisite: 20INMCA105 Introduction to Programming.

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

CO 1	Understand computer programming fundamentals.
CO 2	Learn about different control statements in C programming.
CO 3	Apply the concept of implementing C programs with arrays and strings.
CO 4	Divide a given computational problem into a number of modules by defining user defined functions and to understand the concept of structure and union in C programming language.
CO 5	Understand the concept of pointers and file handling.
CO 6	Develop readable* C programs, to solve real life computational problems.
Readable* - readability of a program means the following: 1. Logic used is easy to follow 2. Standards to be followed for indentation and formatting 3. Meaningful names are given to variables 4. Concise comments are provided wherever needed	

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	3	2		3				3	3	3
CO 2	3	2	3	3	2					3		3
CO 3	3	3	3	3	3					3		3
CO 4	3	3	3	3	3					3	2	3
CO 5	3	3	3		2					3	2	3
CO 6	3	3	3		3					3		3

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	3	3	6
Understand(K2)	3	3	6
Apply(K3)	8	8	12
Analyse(K4)	12	12	3
Evaluate(K5)	12	12	12
Create(K6)	12	12	21

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. Define three types of computer Languages. (K1)
2. Define C Tokens. (K1)

Course Outcome 2 (CO2):

1. Explain single character Input and Output. (K2)
2. Discuss User-Defined Data Type. (K2)

Course Outcome 3(CO3):

1. Apply the area of a Circle of radius r, in C program. (K3)
2. Apply the logic to write a C program to process the marks obtained by n students of a class and prepare their rank list based on the sum of the marks obtained. There are 3 subjects for which examinations are conducted and the third subject is an elective where a student is allowed to take any one of the two courses offered. (K3)
3. Evaluate C program to process a set of n natural numbers and to find the Biggest number and smallest number from the given set of numbers. (K5)

Course Outcome 4 (CO4):

1. Demonstrate basic concepts of Array, Initialization of Array, with an example program. (K3)
2. Evaluate Nested Loop Statement in C with example. (K5)
3. Design a C program to find the value of a mathematical function f, which is defined as follows. f(n) = n! / (sum of factors of n), if n is not prime and f(n) = n! / (sum of digits of n), if n is prime. (K6)
4. Design a C program to generate Armstrong numbers between 2 limits. (K6)

Course Outcome 5 (CO5):

1. Analyse different random accessing file functions, with example. (K4)
2. Design a C program to generate Mark List of N students, each students having roll no, name, marks of three subjects and total, using array of structure. (K6)

Course Outcome 6 (CO6):

1. Design a C program to process a text file and to print the Palindrome words. (K6)

SYLLABUS

Module 1

Introductory concepts: Machine, Assembly and High level Language. Introduction to C Language, The C character set, C Tokens: Keywords, Identifiers, Constant, Operators, Special Characters and Strings. Data Types: Basic Data Type, Derived Data Type and User-defined Type, Void Data Type. Integer Data Type, Characters, Floats and Doubles.

Data Input and Output: Single Character Input, Single Character Output, Entering Input Data, Writing Output Data, **gets()** and **puts()** function, Interactive programming, Type Conversion.

Module 2

Control Statements: Introduction, the **if** statement, **if-else** statement, **nested if-else** statement, **if-else-if ladder** statement, **break** statement, **continue** statement, **goto** statement.

Loop Control- **for loop**, **while loop**, **do-while** loop, nested **for** loops.

Module 3

Arrays and strings: Arrays Introduction, declaration and Initialization, One-Dimensional Array, Operations with Array, Two-Dimensional Array and Operations.

String: Declaration and Initialization of String, programs without standard string functions, String handling functions.

Module 4

Functions: Introduction, Function Definition, the return Statement, Types of Function, Call by Value, Recursion.

Storage Classes: Introduction, Automatic variables, External Variables, Static variables, Register Variables.

Sructure and union: Introduction, Declaration and Initialization of Structures, Array of Structures, Structure and Function, Union: introduction, difference between structure and union.

Module 5

Pointers and Files:

Pointers: Introduction, Features, Pointers and Address, **void** Pointer, wild Pointers, constant Pointers, Pointers and Array, Array of Pointers, Pointers and Two-Dimensional Array, Pointers and Strings, function call by Reference.

Files: Introduction, file operations, other file functions.

Text Books

1. Ashok N. Kamthane, “Programming in C”, Pearson Education, 2nd Edition (2013).
2. Byron S Gottfried, “Programming with C”, Schaum’s outline, 2nd Edition, McGraw Hill (2006).

Reference Books

1. E. Balagurusamy “Programming in ANSI C “6th Edition, McGraw Hill (2012).

2. Brian W Kernighan & Dennis Ritchie, "The C programming language", 2nd Edition, Prentice Hall (2015).
3. K N King, "C Programming: A Modern Approach", W. W. Norton & Co, 2nd Edition (1996).
4. Reema. Thareja, "Programming in C", Oxford University Press, 2nd Edition (2016).
5. Stephen Prata K, "C Primer Plus", Pearson Education, 5th Edition (2013).

Web Resources

1. https://www.edx.org/course/programming-basics-iitbombayx-cs101-1x

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
1	**Module 1**	**7 hrs.**
1.1	Introductory concepts: Machine, Assembly and High level Language. Introduction to C Language, The C character set, C Tokens: Keywords, Identifiers, Constant, Operators, Special Characters and Strings. Data Types: Basic Data Type, Derived Data Type and User-defined Type, Void Data Type. Integer Data Type, Characters and Floats and Doubles.	5
1.2	Data Input and Output: Single Character Input, Single Character Output, Entering Input Data, Writing Output Data, **gets()** and **puts()** function, Interactive programming. Type Conversion	2
2	**Module 2**	**8 hrs**
2.1	Control Statements: Introduction, the **if** statement, **if-else** statement, **nested if-else** statement, **if-else-if ladder** statement, **break** statement, **continue** statement, **goto** statement.	4
2.2	Loop Control- **for loop**, **while loop**, **do-while loop**, nested **for loops**.	4
3	**Module 3**	**12 Hrs**
3.1	Arrays and strings, Arrays Introduction, declaration and Initialization, One-Dimensional Array, Operations with Array, Two-Dimensional Array and Operations	7
3.2	String: Declaration and Initialization of String, programs without standard string functions, String handling functions.	5
4	**Module 4**	**12 hrs**
4.1	Functions: Introduction, Function Definition, the return Statement, Types of Function, Call by Value, Recursion.	4
4.2	Storage Classes: Introduction, Automatic variables, External Variables, Static variables, Register Variables.	2
4.3	Structure and union: Introduction, Declaration and Initialization of Structures, Array of Structures, Structure and Function, Union: introduction, difference between structure and union	6
5	**Module 5**	**9 hrs**
5.1	Pointers: Introduction, Features, Pointers and Address, **void** Pointer, wild Pointers, constant Pointers, Pointers and Array, Array of Pointers, Pointers and Two-Dimensional Array, Pointers and Strings, function call by Reference	5
5.2	Files: Introduction, file operations, other file functions.	4

20INMCA110	PERSONALITY DEVELOPMENT AND SOFT SKILLS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: Soft skills are those competencies that help an individual to be resourceful and positive while taking on life's ups and downs. Development of one's personality by being aware of the self, connecting with others, leading and generating change, and staying rooted in values and principles is being aimed at. This course is designed to enhance the employability and maximize the potential of the students by introducing them to various aspects that help in personal and professional success, and help them acquire the skills needed to apply various principles in their lives and careers.

Prerequisite: None

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

CO 1	Describe personality types and interpersonal skills.
CO 2	Create a SWOT analysis to assess their career perspective.
CO 3	Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.
CO 4	Demonstrate appropriate etiquettes in meetings, group discussions and interviews.
CO 5	Develop creative CVs and present their skills and abilities to employers.
CO 6	Identify an e-learning course suitable for their career growth.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1						3	1				3	
CO 2						3	1				3	
CO 3						3	1				3	
CO 4						3	1		2		3	
CO 5						3	1		3		3	
CO 6						3	1		3		3	

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	5	5	15
Understand(K2)	10	10	15
Apply(K3)	25	25	10
Analyse(K4)	5	5	10
Evaluate(K5)			5
Create(K6)	5	5	5

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

Regular assessment

Group Discussion (Marks: 5)

Create groups of about 6 students each and engage them on a GD on a suitable topic for about 20 minutes.
Parameters to be used for evaluation are as follows:

- Communication Skills : 2 marks
- Subject Clarity : 2 marks
- Group Dynamics : 1 marks

Presentation Skills (Marks: 5)

Identify a suitable topic and ask the students to prepare a presentation (preferably a power point presentation) for about 10 minutes.
Parameters to be used for evaluation are as follows:

- Communication Skills : 2 marks
- Platform Skills : 2 marks
- Subject Clarity : 1 marks

CV preparation (Marks: 2)

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. Explain various personality types. (K1)
2. Describe about interpersonal skills. (K1)

Course Outcome 2 (CO2):

1. Perform a personal SWOT analysis. (K5)
2. Prepare a time management policy for yourself. (K6)

Course Outcome 3(CO3):

1. Explain how the personality types affect the interpersonal communication. (K2)
2. Describe the reasons for interpersonal conflicts. (K2)

Course Outcome 4 (CO4):

1. Elucidate on the body language skills that can be applied to become successful in interviews and group discussions? (K3)
2. Suggest few points to become successful in interviews. (K3)

Course Outcome 5 (CO5):

1. Describe various interview techniques. (K1)
2. Prepare a personal CV. (K6)

Course Outcome 6 (CO6):

1. Suggest appropriate e-learning courses for professional development. (K6)
2. List out the benefits of e-learning. (K2)

SYLLABUS

Module 1

Personality Development: Definition Personality, Interpersonal Skills Personality Types and Leadership Qualities, Personality Tests

Module 2

Self-awareness – Self-awareness: definition, need for self-awareness; tools and techniques of SA: questionnaires, journaling, reflective questions, meditation, mindfulness, psychometric tests, feedback.
Stress Management: Stress, reasons and effects, identifying stress, stress diaries, the four A's of stress management, techniques, Time management, Attitude, Confidence building, Personal SWOT

Module 3

Soft Skills - Creativity and Lateral thinking, Morals, Values and Ethics: Integrity, Respect for Others, Living Peacefully. Caring, Sharing, Honesty, Courage, Avoiding Procrastination, Empathy
Emotional intelligence/Emotional Quotient, Coping with emotions: Identifying and managing emotions, harmful ways of dealing with emotions, PATH method and relaxation techniques.
Interpersonal skills –conflict management, types of conflict, Conflict resolution skills-seeking a win – win solution.

Module 4

Non-verbal Communication and Body Language: Forms of non-verbal communication, Emotions displayed through Body Language, Handshakes, Eyes, Personal Zones; Effective use of body language, Body Language at Professional Interactions: Interviews, Group; Discussions & Video-conference.

Module 5

Job Interviews: Preparing Curriculum Vitae, Group Discussions: Types of GD, Active Listening and Skills exhibited in a GD, Types of Interviews, Probable Interview Questions;

e-learning Concepts and Techniques: e-learning, Benefits, Disadvantages, Types of e-learning, e-learning Technologies, Career Growth Benefits and Future of e-learning.

Text Books

1. Barun K. Mitra, "Personality Development & Soft Skills", 1st Edition, Oxford Publishers (2011)
2. Remesh S., Vishnu R.G., "Life Skills for Engineers", Ridhima Publications, First Edition, 2016.

Reference Books

1. Alessio Robertio, "The ultimate introduction to Neuro-linguistic Programming", Harpercollins (2013)
2. Maxwell John, "The 5 Levels of Leadership", Centre Street, A Hachette Book Group Inc. New York (2015)
3. Mishra B K, "Psychology the study of human behavior", PHI Learning Pvt Ltd, New Delhi (2008)
4. Shalini Verma, "Development of Life Skills and Professional Practice", 1st Edition, Vikas Publishing House, New Delhi (2014)
5. Subramaniam R., "Professional Ethics", Oxford University Press (2013)
6. https://2012books.lardbucket.org/books/a-primer-on-communication-studies/s06-02-conflict-and- interpersonal-com.html
7. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education; 1 edition, 2013.

Suggested MOOC

1. Introduction to Time Management: https://alison.com/courses/Introduction-to-Time-Management

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
1	**Module 1: Personality Development**	**8 hrs**
1.1	Personality Development: Definition Personality,	2
1.2	Interpersonal Skills Personality Types and Leadership Qualities,	4
1.3	Personality Tests	2
2	**Module 2: Self-awareness**	**10 hrs**
2.1	Self-awareness: definition, need for self-awareness	1
2.2	Tools and techniques of SA: questionnaires,	1
2.3	Journaling, reflective questions	1
2.4	Meditation, mindfulness,.	1
2.5	Psychometric tests, feedback	1
2.6	Stress Management:,	1
2.7	Stress, reasons and effects, identifying stress	1
2.8	Stress diaries, the four A's of stress management, techniques	1
2.9	Time management, Attitude	1

2.10	Confidence building, Personal SWOT;	1
3	**Module 3: Soft Skills -**	**10 hrs**
3.1	Creativity and Lateral thinking,.	1
3.2	Morals, Values and Ethics: Integrity, Respect for Others, Living Peacefully	1
3.3	Caring, Sharing, Honesty, Courage, Avoiding Procrastination,Empathy	1
3.4	Emotional intelligence/Emotional Quotient, Coping with emotions:	1
3.5	Identifying and managing emotions, harmful ways of dealing with emotions,	2
3.6	PATH method and relaxation techniques.	2
3.7	Interpersonal skills – Conflict management ,types of conflict	1
3.8	Conflict resolution skills-seeking a win –win solution,	1
4	**Module 4: Non-verbal Communication and Body Language**	**10 hrs**
4.1	Forms of non-verbal communication,	2
4.2	Emotions displayed through Body Language	2
4.3	Handshakes, Eyes, Personal Zones;	1
4.4	Effective use of body language,.	1
4.5	Body Language at Professional Interactions: Interviews,	2
4.6	Body Language at Professional Interactions: Group; Discussions & Video-conference	2
5	**Module 5: Job Interviews**	**10 hrs**
5.1	Job Interviews: Preparing Curriculum Vitae,	2
5.2	Group Discussions: Types of GD, Active Listening and Skills exhibited in a GD,	2
5.3	Types of Interviews, Probable Interview Questions;	2
5.4	E-learning Concepts and Techniques:	1
5.5	E learning, Benefits, Disadvantages	1
5.6	Types of E-learning, E-learning Technologies	1
5.7	Career Growth Benefits and Future of e-learning	1

20INMCA132	PROBLEM SOLVING AND STRUCTURED PROGRAMMING LAB	CATEGORY	L	T	P	CREDIT
		GENERAL	0	0	5	1

Preamble: The syllabus is prepared with the view of preparing the MCA Graduates capable of writing C programs to solve computational problems that they may have to solve in their professional life. The students can explore various programming constructs and data structures for the basic problem solving in C language. The course content is decided to cover the essential programming fundamentals. The students are expected to come prepared with the required program written in the rough record for the lab classes.

Prerequisite: 20INMCA108 Problem Solving and Structured Programming, 20INMCA105 Introduction to Programming.

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

CO 1	Analyse a computational problem and develop an algorithm/flowchart to find its solution.
CO 2	Apply the basic concepts of data input and output, operators and expression and control statement.
CO 3	Implement structured programming using various programming constructs.
CO 4	Illustrate the use of various data types with demonstration programs.
CO 5	Implement lab experiments in Linux and Windows platforms.
CO 6	Identify the use of structure and file in program development.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	3	2		3				3	3	
CO 2	3	2	3	3	2					3		
CO 3	3	3	3	3	3					3		
CO 4	3	3	3	3	3					3	2	
CO 5	3	3	3		2					3	2	
CO 6	3	3	3		3					3		

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	10		
Understand(K2)	10		
Apply(K3)	10	10	10
Analyse(K4)	10	10	10
Evaluate(K5)	10	10	10
Create(K6)		20	20

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern

Attendance : 08 Marks
Continuous Assessment Test (2 numbers) : 30 Marks
Assignment/Quiz/Course project : 12 Marks

End Semester Examination Pattern

Lab exam will be conducted by internal examiner.

Course Level Assessment

Course Outcome 1 (C01):

1. Explore and draw flowchart of the problem of biggest among 2 nos. (K1)
2. Analyse and draw flow chart of the problem of the biggest of 3 nos. (K1)

Course Outcome 2 (C02):

1. Basic inputting and formatting in C program. (K2)
2. Basic outputting and formatting in C program. (K2)

Course Outcome 3 (C03):

1. Design C program to find biggest among 3 nos. (K3)
2. Design C program to calculate the grade of a student. (K3)

Course Outcome 4 (C04):

1. Use inbuilt formatting methods to input and output data. (K5)

Course Outcome 5 (C05):

1. Create a menu driven program for performing matrix addition, multiplication and finding the transpose. Use functions to (i) read a matrix, (ii) find the sum of two matrices, (iii) find the product of two matrices, (i) find the transpose of a matrix and (v) display a matrix. (K4)

Course Outcome 6 (CO6):

1. Creating structure and file program to store and retrieve students total mark (K6)

SYLLABUS

Computing basics, Data input and output, operators and expressions, Control statement, Arrays, Functions, Program structure, pointers, structures and unions, files, additional features of C.

Reference Books

1. Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, 2nd Edition, Prentice Hall of India (2015).
2. Byron Gottfried, “Schaum's Outline of Programming with C”, 2nd Edition, McGraw-Hill.
3. Deitel & Deitel, “C – How to Program”, 6th Edition, Pearson Education Asia (2009).
4. E. Balaguruswamy, “Programming in ANSI C”, 5th Edition, Tata McGraw-Hill (2011).
5. Forouzan, “Computer Science: A Structured Programming Approach Using C”, 3rd Edition, Cengage Learning (2007).
6. PradipDey, Manas Ghosh, “Programming in C”, 2nd Edition, Oxford Higher Education (2012).
7. Yashavant Kanetkar, “Understanding pointers in C”, 4th Edition, BPB Publication (2009).

Web Resources

1. https://www.tutoriaspoint.com/cprogramming/
2. https://www.programiz.com/c-programming
3. https://www.edx.org/course/subject/computer-science
4. https://www.edx.org/course/programming-basics-iitbombayx-cs101-1x-0#

List of Lab Experiments

1. Familiarization of Hardware Components of a Computer.
2. Familiarization of environment – How to do Programming in C in the editor.
3. Familiarization of console I/O and operators in C
   a. Display “Hello World”.
   b. Read two numbers, add them and display their sum.
   c. Read the radius of a circle, calculate its area and display it.
   d. Evaluate the arithmetic expression ((a -b / c * d + e) * (f +g)) and display its solution. Read the values of the variables from the user through console.
4. Read 3 integer values and find the largest among them.
5. Read a Natural Number and check whether the number is prime or not.
6. Read a Natural Number and check whether the number is Armstrong or not.
7. Read n integers, store them in an array and find their sum and average.
8. Read n integers, store them in an array and search for an element in the array using an algorithm for Linear Search.
9. Read n integers, store them in an array and sort the elements in the array using Selection Sort algorithm.
10. Read a string (word), store it in an array and check whether it is a palindrome word or not.
11. Read two strings, store them in arrays and concatenate them without using library functions.
12. Read a string, store it in an array and count the number of vowels, consonants and spaces in it.
13. Read a string and convert into upper case without using library functions.
14. Using structure, read and print data of n employees (Name, Employee Id and Salary)
15. Using structure, read and print Rank list of n students (Name, Roll no, 3 Marks and Total).
16. Find the factorial of a given Natural Number n using recursive and non-recursive functions.
17. Read a string (word), store it in an array and obtain its reverse by using a user defined function.

18. Write a menu driven program for performing matrix addition, multiplication and finding the transpose. Use functions to (i) read a matrix, (ii) find the sum of two matrices, (iii) find the product of two matrices, (iv) find the transpose of a matrix and (v) display a matrix.
19. Do the following using pointers
    a. add two numbers.
    b. swap two numbers using a user defined function.
20. Input and print the elements of an array using pointers.
21. Compute sum of the elements stored in an array using pointers and user defined function.
22. Create a file and perform the following
    a. Write data to the file.
    b. Read the data in a given file.
    c. Display the file content on console.
    d. Append new data and display on console.
23. Open a text input file and count number of characters, words and lines in it; and store the results in an output file.

Course Contents and Lecture Schedule

No.	Topic	No. of Hours
1	**Module 1**	**4 hrs.**
1.1	Application of Various Input O/P operations and format.	2
1.2	Demonstration of different Data types and control strings.	2
2	**Module 2**	**8 hrs.**
2.1	Demonstration of decision making and branching statements (Hint: Use if, if-else, nested if, else if ladder).	6
2.2	Demonstration of switch case structure and control operators. (Hint: Menu driven programs).	2
3	**Module 3**	**12 hrs.**
3.1	Demonstration of loops (Hint: Entry controlled and exit controlled).	5
3.2	Demonstration of nested loops (Hint: Pattern printing, between range programs).	7
4	**Module 4**	**12 hrs.**
4.1	Implementation of Single and Multi-dimensional arrays.	3
4.2	Demonstration of sorting & searching techniques.	3
4.3	Demonstration of various string operations (Hint: with and without String handling functions).	3
4.4	Pointers: Demonstration of pointer operations. Implementation of pointer to array and array of pointers, String pointers.	3
5	**Module 5**	**12 hrs.**
5.1	Implementation of functions (Hint: Demonstrate call by value, call by reference and passing of arrays).	3
5.2	Demonstration of recursion.	3
5.3	Implementation of structures (Hint: simple structure operations, array of structures, structures variable as an array, pointers to structures).	3
5.4	Demonstration of various file operations. (Hint: Text file).	3

20INMCA134	TECHNICAL COMMUNICATION LAB	CATEGORY	L	T	P	CREDIT
		GENERAL	0	0	4	1

Preamble: Technical Communication is a means of conveying advanced technical concepts in a clear, accurate and comprehensive manner to the intended audience. The objective of this course is to equip the students with practical knowledge of advanced language skills**.**

Prerequisite: Basic Language Skills

Course Outcomes: After the completion of the course the students will be able to

CO 1	Develop effective communication skills in various situations.
CO 2	Show efficiency in participating in formal discussions and delivering presentations through effective speaking skills.
CO 3	Demonstrate advanced listening skills, draw conclusions from discussions & oral presentations.
CO 4	Compose letters, emails and other technical documents in well- organized and precise structure.
CO 5	Illustrate reading skills in comprehending and critically analyzing technical and non-technical texts.
CO 6	Develop technical and non- technical vocabulary for implementing in various contexts.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1							3		3	2	3	2
CO 2									3		3	1
CO 3							1		3		3	
CO 4									3	2	3	1
CO 5							3		3		3	
CO 6									3		3	1

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	5	5	5
Understand(K2)	5	5	5
Apply(K3)	10	10	10
Analyse(K4)	10	10	10
Evaluate(K5)	10	10	10
Create(K6)	10	10	10

Mark distribution

Total Marks	**CIE**	**ESE**	**ESE Duration**
100	50	50	3 hours

Continuous Internal Evaluation Pattern

Attendance	: 08 Marks
Continuous Assessment Test (2 numbers)	: 30 Marks
Assignment/Quiz/Course project	: 12 Marks

End Semester Examination Pattern

Lab exam will be conducted by internal examiner.

Course Assessment Questions

Course Outcome 1 (CO1):

1. Explain the importance of Judgmental listening in workplace. (K2)
2. Analyse any article of your choice and get the meaning of 10 unfamiliar words and create sentences using them. (K4)
3. Summarize the different techniques for reading comprehension. (K5)

Course Outcome 2 (CO2):

1. Identify and practice the right pronunciation of the following words. (K1)
   a) Entrepreneur
   b) Vehicle
   c) Atheist
   d) Aesthetic
2. Create and practice self- introduction for job interviews. (K6)
3. Mark the intonation for the following sentences (K3)
   a) The box was empty.
   b) Is today Thursday?
   c) Cheer up!
   d) Would you like to have some tea?

Course Outcome 3 (CO3):

1. Analyze any Ted Talk of your choice and summarize the main points. (K4)
2. Listen to debates and evaluate the points shared. (K5)
3. Listen to any documentary and practice discriminative listening by identifying the voices and opinions. (K1)

Course Outcome 4 (CO4):

1. Assume that you are doing research in Marketing Management and you would like to know about the marketing activities of ABC Company Pvt. Ltd. Create an e- mail to the Marketing Manager of the company asking for an appointment to discuss the same. (K6)
2. Assume that you are the Purchase Manager of your company and you had ordered for 12 HP scanners. After receiving the orders, you found out that you have received only half the number of your order, but got the bill for 12 scanners. Compose a letter to be sent to the Sales Manager of ABC Company, complaining about the matter and asking to send the remaining scanners. (K6)

3. Assume that you are the General Manager of your company and you are organizing a training programme for the newly joined employees of your company. Create an e- mail to be sent to a consultancy, who had been conducting training programmes in your company for many years, requesting their service, along with the list of the participants and other programme details. (K6)

Course Outcome 5 (CO5):

1. Read the passage and answer the following questions. (K4)

An electron microscope is a sophisticated microscope that can magnify objects up to one million times their original size. Unlike a traditional microscope, an electron microscope can reveal some details of molecular structure and can be effectively used for chemical analysis. It has become an invaluable analytical tool, widely used in medical and industrial research establishments.

There are two types of electron microscope: the transmission electron microscope (TEM) and the scanning electron microscope (SEM). TEM have extremely high resolution and can provide detailed information about the structure of organisms most of which are far too small to be seen at all with a normal optical microscope. In fact, they are effectively used, both, to give information about the microstructure of new materials as they are being designed and also to help in the analysis of failures of materials. Most TEMs operate at accelerating voltage in the range of 50- 100,000 V.

On the other hand, SEM have very different uses as they are very useful for looking at the surfaces of objects and can provide a completely different range of information. They may produce an extremely fine beam of electrons, which is swept to- and- fro across the specimen. They are extremely useful in studying the details and contours of different surfaces. They provide many other striking views of plant and animal cells that cannot be obtained by other means.

(Passage referred from Ashraf Rizvi, “Effective Technical Communication”, 2nd Edition, McGraw Hill Education, 2017.)

a) What are the most remarkable features of TEM?
b) Do TEM and SEM serve different functions?
c) Why does TEMs allow us to see very fine details of specimens?
d) Can electron microscope accurately describe the nature of the material under examination?

2. Outline the steps for arranging sentences in a paragraph. (K4)
3. Compare paired, echo and choral reading. (K5)

Course outcome 6 (CO6):

1. Choose from the following options: order, in advance, view, reception**.** (K5)
   a) The __________ is fantastic. We can see the whole city from here.
   b) I locked my key in my room and I couldn’t find anyone at the ________. Where can I get the duplicate keys?
   c) Do I have to pay _________ for the whole package?
   d) Sure, can I get the _________for 7 PM?
2. Find the meaning of the following words. (K4)
   a) Hub
   b) Transmit

c) Breakthrough
d) Default

3. Predict the right meaning and create sentences. (K4)
   a) Diligent
   b) Spreadsheet
   c) Commute
   d) Flexi- time

SYLLABUS

Listening: Comprehensive, Specific Information, Judgemental, Analytical & Discriminative Listening. **Speaking**: Identifying mispronounced words, Self-introduction sessions, JAM sessions, Understanding stress & Intonation through News Reading & Dictionary Skills. **Reading**: Reading comprehension passages, Arranging sentences in a Paragraph, Fluency, Paired, Echo & Choral Reading, Analytical Reading (Case studies), Reading for Research. **Writing**: Creating short messages with emoticons, Framing e-mails, Preparing Flowcharts, Slides, Abstract for technical documents. **Verbal Ability**: Vocabulary on Workplace, Personality, Hobbies & Interest, Travel & Scientific Vocabulary.

Textbooks

1. Mindscapes: English for Technologists and Engineers, Orient Black Swan, 2012
2. Kumar Sanjay & Lata Pushp, "Communication Skills in English", Oxford University Press,(2015)

Web Resources

Introduction to Vocabulary	https://www.youtube.com/watch?v=53SIKuCuHv0
Workplace Vocabulary	https://www.youtube.com/watch?v=hoHCQboEyMA
Vocabulary on Personality	https://www.youtube.com/watch?v=-1k6wRsX0Q8
Vocabulary on Hobbies and Interest	https://www.youtube.com/watch?v=oADRAv9zmRA
Travel Vocabulary	https://www.youtube.com/watch?v=f7aaJ7d6QlQ
Scientific Vocabulary	https://www.youtube.com/watch?v=j0AlzkSrIfo

Suggested MOOC Course

1. English for Workplace
   https://www.futurelearn.com/courses/workplaceenglish?utm_source=BC_India_webiste&u medium=web
2. Business Communication
   https://www.edx.org/course/business-communication
3. Improving your English Communication Skills
   https://www.coursera.org/specializations/improve-english

Experiments

1. Practice comprehensive listening by identifying the main points from Ted talks.
2. Research and find the commonly mispronounced words in English.
3. Practice comprehensive reading by working out Reading Comprehensions.

4. Identify the speed of reading by taking a Speed Reading test.
5. Enhance the ability to communicate through SMS writing & through the use of emoticons.
6. Listen and understand how to build vocabulary through a video on Vocabulary building.
7. Listen to a video on Workplace vocabulary and use the phrases learnt in different contexts.
8. Practice listening to specific information through telephonic communication.
9. Participating in Self Introduction session to improve confidence in speaking.
10. Arrange sentences in a Paragraph for effective reading.
11. Design e-mails for effective communication in workplaces.
12. Listen to a video on vocabulary to describe personality and use those phrases to describe different personalities.
13. Listen to debates and practice the art of judging the opinion of the opposing teams.
14. Participate in JAM sessions to improve fluency.
15. Practice fluency in reading through Paired, Echo & Choral reading.
16. Prepare Flowcharts to explain various processes.
17. Listen to vocabulary on Hobbies and Interest and use them in appropriate contexts.
18. Listen to Group Discussions and analyse the different opinions given.
19. Participate in Newspaper Reading to understand stress and intonation.
20. Read and analyse the different opinion presented in a case study.
21. Frame slides to do a presentation on a topic of social relevance.
22. Listen to a video on Travel vocabulary and use them in appropriate contexts.
23. Listen to documentaries and practice discriminative listening.
24. Apply dictionary skills to understand pronunciation and vocabulary.
25. Identify knowledge gaps in any area of interest –Reading for Research.
26. Practice the art of condensation by preparing abstracts for technical documents.
27. Listen to a video on scientific vocabulary and use the words learnt in appropriate context.

Course Contents and Lecture Schedule

No.	**Topic**	**No. of Hours**
1	**Listening, Reading, Speaking, Writing & Verbal ability**	**10 hrs**
1.1	Practice Comprehensive Listening -Ted Talks	2
1.2	Practice reading comprehension , Speed Reading	2
1.3	Identifying commonly mispronounced words	2
1.4	Framing SMS , Effective use of Emoticons	2
1.5	Introduction to Vocabulary ,Workplace Vocabulary	2
2	**Listening, Reading, Speaking, Writing & Verbal ability**	**10 hrs**
2.1	Practice listening to specific information through telephonic communication	2
2.2	Improve confidence by practicing Self introduction sessions	2
2.3	Arranging sentences in a Paragraph	2
2.4	Framing effective e-mails	2
2.5	Vocabulary on Personality	2
3	**Listening, Reading, Speaking, Writing & Verbal ability**	**9 hrs**
3.1	Practice judgmental listening through debates	2
3.2	Improve fluency by participating in JAM sessions	2
3.3	Improving Fluency-Practice Paired reading , Echo reading & Choral reading	2

3.4	Preparing Flowcharts	2
3.5	Vocabulary on Hobbies and Interest	1
4	**Listening, Reading, Speaking, Writing & Verbal ability**	**9 hrs**
4.1	Practice Analytical Listening through Group Discussions	2
4.2	Understanding Stress & Intonation through News Reading	2
4.3	Analytical Reading - Understanding case studies using comparing and contrasting techniques	2
4.4	Preparing slides for Presentations	2
4.5	Travel Vocabulary	1
5	**Listening, Reading, Speaking, Writing & Verbal ability**	**10 hrs**
5.1	Practice discriminative listening through documentaries	2
5.2	Understanding pronunciation & vocabulary through dictionary skills	2
5.3	Practice reading for research by identifying Knowledge gaps in any area of interest	2
5.4	Precise writing - Practice writing abstract for a technical document	3
5.5	Scientific Vocabulary	1

SEMESTER 3

20INMCA201	Computer Organization	CATEGORY	L	T	P	CREDIT
		General	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: 20INMCA105: Introduction to Programming, 20INMCA106: Introduction to Digital Systems & Logic Designs

Course Outcomes: After the completion of the course, the student will be able to

CO 1	Understand the internal organization and operations of a computer.
CO 2	Examine the different types of control logic designs in processors.
CO 3	Understand arithmetic procedures used in the design of the Arithmetic Logic Unit.
CO 4	Analyze Input/Output (I/O) management from the perspective of a processor.
CO 5	Distinguish the organization of various parts of a system memory hierarchy.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2		2				1		1			
CO 2	3	2	2									1
CO 3	2	3	2	3	1							
CO 4	2	2	2	2	1	1						
CO 5	1	2	3	2		1						

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10	10	10

Understand(K2)	15	15	20
Apply(K3)	15	15	20
Analyse(K4)	10	10	10
Evaluate(K5)			
Create(K6)			

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 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):

Que 1. List out the functional units of a computer system with a diagram. **(K1)**

Que 2. Describe any 4 addressing modes in detail. **(K2)**

Que 3. Compare direct and indirect addressing modes with relevant diagrams. **(K5)**

Course Outcome 2 (CO2)

Que 1. Develop the control sequence for the execution of the instruction ADD (R3), R1. **(K4)**

Que 2. With necessary diagrams and examples, explain single bus organization. **(K2)**

Que 3. Demonstrate the operations required for executing an instruction in a processor.**(K3)**

Course Outcome 3 (CO3):

Que 1. Describe 4-bit ripple carry adder. **(K2)**

Que 2. With a diagram, explain the working of Carry look Ahead Adder. **(K2)**

Que 3. Describe Booth Algorithm with an example. **(K2)**

Course Outcome 4 (CO4):

Que 1. With a proper diagram, explain the DMA controller. **(K2)**

Que 2. Differentiate memory mapped I/O and program controlled I/O. **(K2)**

Que 3. What are interrupts? Illustrate how multiple requests for IO devices are handled. **(K3)**

Course Outcome 5 (CO5):

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

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

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

Syllabus

Module 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.

Module II

Basic Processing Unit: Fundamental Concepts, Single Bus Organization- Execution of a Complete Instruction, Multiple Bus Organization, Hardwired control, Microprogrammed Control-Basic Organization only.

Module III

Arithmetic & Logic Unit: Number Representation, Addition of Positive Numbers, Addition and Subtraction of Signed Numbers, Design of Fast Adders- Carry Look Ahead Addition, Multiplication of Positive Numbers, Signed Operand Multiplication (Booth's algorithm).

Module 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.

Module 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.

Text Books

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/

Web Resources

1. https://rb.gy/gabfqs
2. https://diz.ae/lFcxl
3. https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/

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

20INMCA203	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.

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

CO 1	Evaluate various measures of central tendency and dispersion.
CO 2	Understand the concepts of permutations and combinations.
CO 3	Apply concept of probability theory to solve different real life problems.
CO 4	Describe random variables, discrete probability distributions and related problems.
CO 5	Analyze various continuous probability distributions in solving different problems.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	1	3			1					
CO 2	3	3	1	3			1					
CO 3	3	3	1	3			1					
CO 4	3	3	1	3			1					
CO 5	3	3	1	3			1					

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10	10	15
Understand(K2)	30	30	25
Apply(K3)	10	10	20
Analyse(K4)			
Evaluate(K5)			
Create(K6)			

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. Distinguish between measures of central tendency and measures of dispersion. (K4)
2. Define standard deviation. State its merits and demerits. (K1)
3. Calculate standard deviation from the following data. (K3)

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. (K4)

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 3 digit numbers can be formed by using digits in 735621, if repetitions are not allowed? (K3)
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. (K4)
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 ?(K3)

Course Outcome 3(CO3):

1. State addition theorem on probability for two events. (K1)
2. Distinguish between equally likely events and independent events. (K4)
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. (K4)
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 $P(X<3)$, $P(2\le X\le 5)$ (K5)

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. (K4)
4. The time in minutes that girl speaks over phone is a random variable X with pdf

   $f(x) = Ae^{-\frac{x}{5}}$, x > 0 .

   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 of probability, 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.

Reference Text Books

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 Schedule

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

20INMCA205	INTRODUCTION TO OBJECT ORIENTED PROGRAMMING	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	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: 20INMCA105 Introduction to Programming.

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

CO 1	Understand object-oriented programming fundamentals.
CO 2	Understand dynamic memory management techniques using pointers, constructors, and destructors.
CO 3	Apply the various object-oriented concepts to solve real life problems.
CO 4	Illustrate how the stream classes support input/output operations in C++.
CO 5	Demonstrate the advanced programming concepts Templates and Exception handling.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	1		1		2	2	1		1	
CO 2	3	1	1		1		1					
CO 3	3	3	3	1		1	2	1			1	1
CO 4	3	1	1		1							
CO 5	1	1	3		2							

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10	10	15
Understand (K2)	15	15	15
Apply(K3)	10	10	10
Analyse(K4)	15	15	20
Evaluate(K5)			
Create(K6)			

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 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. "The basic concepts of object-oriented programming allow the programmer todevelop more efficient and easier to update software". Justify the statement with examples of each of the concepts. (K4)
2. Explain the role of header files. (K1)
3. Compare various programming paradigms. (K4)

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++. (K4)
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. (K4)

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 Function Argument.

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)

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

Topic	No. of Lectures
Module 1	**9 hrs.**
Introductory concepts of OOP: Programming Paradigms	1
Preface to Object-Oriented Programming, Key Concepts OOP- Objects, Classes	1
Data Abstraction, Encapsulation, Inheritance, Polymorphism	1
Dynamic Binding, Message Passing. Advantages of OOP.	1
C++ Basics: Parts of C++ program	1
Classes in C++, Declaring Objects	1
public , private and protected keywords	1
Defining Member Functions, Characteristics of Member Functions	1
Array of Objects, Objects as Function Argument	1
Module 2	**10 hrs**
C++ Functions: Inline Functions ,Outside Member Function Inline, Rules for Inline Functions	1
Static member Variables and Functions- Static Member Variable	1
Static Member Functions, Default Arguments	1
Function Overloading, Principles of Function Overloading	1
Friend Functions	1
Constructors and Destructors: Constructors, Characteristics	1
Constructors with arguments, Overloading Constructors	2
Constructors with Default Arguments	1
Copy Constructor, Destructors	1

Module 3	**11 hrs**
Operator Overloading: Introduction, The keyword Operator	1
Overloading Unary Operators	1
Overloading Binary Operators using Member Function and Friend Function	2
Inheritance: Introduction, Access Specifiers and Simple Inheritance	1
Protected Data with Private Inheritance	1
Types of Inheritance, Single Inheritance, Multilevel Inheritance	2
Multiple Inheritance, Hierarchical Inheritance	1
Hybrid Inheritance	1
Virtual Base Classes, Abstract Classes.	1
Module 4	**8 hrs**
Pointers: Features of Pointers, Pointer Declaration	1
Void Pointers, Wild Pointers, Pointer to Class	1
Pointer to Object, this pointer	1
Pointer to Derived class and Base class	1
Binding, Polymorphism and Virtual Functions: Binding in C++, Virtual Functions	1
Rules for Virtual Functions, Pure Virtual Functions	1
Virtual Destructors	1
new and delete operators.	1
Module 5	**10 hrs**
C++ Streams: C++ Stream Classes, Unformatted I/O operations	1
Formatted Console I/O Operations-width(), precision(), fill()	1
Managing Output with Manipulators	1
Working with Files: Classes for File Stream Operations, Opening and Closing a File	1
Detecting end-of-file, File Modes, File Pointers and Their Manipulations	1
Sequential Input and Output Operations- put(), get(), write() and read().	1
Templates and Exception Handling: Class Templates, Function Templates	2
Exception Handling: Introduction, Basics of Exception Handling	1
Exception Handling Mechanism, Throwing Mechanism, Catching Mechanism	1

20INMCA207	ACCOUNTING AND FINANCIAL MANAGEMENT	CATEGORY	L	T	P	CREDI T
			3	1	0	4

Preamble: This course introduces the Concept of Financial Management and its application. It helps the students to prepare a Fund flow statement, cash flow statement and get an idea about the various financial statements used in companies. It provides skills that can be applied in analysing these statements.

Prerequisite: Fundamentals of Accounting

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

CO 1	Equip the students to gain basic knowledge on Financial Management.
CO 2	Analyse theoretical and practical aspects of ratio analysis and prepare fund flow statement
CO 3	Prepare of cash flow statement
CO 4	Implement various cost control measures.
CO 5	Understand the Indian Financial System and short term money markets
CO 6	Take decisions related to capital markets and other long-term fund sources.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO 1								**3**	**1**			**2**
CO 2								**3**	**1**			**2**
CO 3								**3**	**1**			**2**
CO 4								**3**	**1**			**2**
CO 5								**3**	**1**			**2**
CO 6								**3**	**1**			**2**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	10	10	15
Understand (K2)	15	15	15
Apply(K3)	10	10	10
Analyse(K4)	15	15	20

Evaluate(K5)			
Create(K6)			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3hrs

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 in the Question paper - **Part A and Part B.**

Part A will have 8 short answer questions of 3 marks each (8 X 3 M = 24 M). There will be no choice questions.

Part B will have 6 essay questions one from each module of 6 marks each, with an alternative choice question from the same module (6 x 6M=36M). The maximum number of sub-part questions in **Part B** to be limited to 2.

Course Level Assessment Questions Course Outcome 1 (CO1):

1. Describe the financial management with its basic concepts and functions (K1)
2. Describe the various functions of financial management. (K1)
3. Describe the significance and objective of financial management. (K1)
4. Describe the various goals of financial management. (K1)

Course Outcome 2 (CO2):

1. Describe the concepts of ratio analysis.(K1)
2. Classify and prepare ratios for analysis. (K4)
3. Prepare fund flow statement. (K1)

Course Outcome 3 (CO3):

1. Evaluate various Sources and application of fund. (K4)
2. Create Cash flow Statement. (K4)

Course Outcome 4 (CO4):

1. Evaluate various costing techniques. (K4)
2. Determine Break even analysis. (K3)

Course Outcome 5 (CO5):

1. Describe the Indian Financial System. (K1)
2. Summarize the various money market instruments. (K4)

Course Outcome 6 (CO6):

1. Explain the concept of capital markets. (K1)
2. Analyse long term sources of funds. (K4)

Syllabus

MODULE 1

Financial Management: Introduction, nature and scope, Functions of financial management, investment decision, financing decision, dividend decision and liquidity decision, Financial goal, profit maximization/wealth maximization.

MODULE 2

Financial analysis, planning and control: Ratio Analysis: Ratio meaning, profitability ratios, profit in relation to sales, profit in relation to investments, Liquid ratios, Solvency ratios, other ratios, Activity ratios, Fund Flow Statement, Meaning, Importance, Definition of terms, Funds and Flow, Sources and use of funds, Changes in working capital, Preparation of funds flow statements (Basics).

MODULE 3

Cash flow statements: Sources of cash, cash from operations, cash from investing activities and financing activities, Uses of cash flow statement, preparation.

MODULE 4

Cost accounting: Costing, elements of cost material, cost, labor cost, overheads and components of cost, prime cost, works cost, cost of production and total cost. Costing Techniques, cost volume profit analysis, Break-even analysis.
Cost Reduction: Difference between cost control and cost reduction, steps involved in introducing a cost reduction program.

MODULE 5

Indian financial system: Meaning, Components Institutions, types of financial institutions, banking and non-banking, Financial markets, money market and capital market, Functions of money market, Money Market Instruments. **Long term sources of finance**: Indian capital markets, objectives, functions, components. Stock markets, new issue market and secondary markets, Long term financing, debentures, venture capital financing, private equity, crowd funding.

Text Book

1. Srinivasan & Murugan, "Accounting for Management", First Edition, S Chand & Company ltd, (2006)

Reference Books

1. S.N Maheshwari, Maheshwari S K, "Introduction to Accountancy". Elevanth Edition, Vikas Publications, New Delhi. (2013)
2. S.P. Jain and K L Narang, "Fundamentals of Accounting". Eighth Edition, Kalyani Publications (2014)
3. CA C Rama Gopal Accounting for Managers, New Age International (P) Ltd., Publishers(2009).

Web Reference

1. Fundamentals of Managerial Accounting- http://nptel.ac.in/courses/110101003/2

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
1	**Financial Management:**	**6**
1.1	Introduction, nature and scope.	1
1.2	Functions of financial management.	2
1.3	Investment decision, financing decision.	1
1.4	Dividend decision and liquidity decision, Financial goal, profit maximization/wealth maximization.	2
2	**Financial analysis, planning and control:**	**10**
2.1	Ratio Analysis: Ratio meaning, profitability ratios, profit in relation to sales.	2
2.2	profit in relation to investments.	1
2.3	Liquid ratios, Solvency ratios, other ratios, Activity ratios.	1
2.4	Fund Flow Statement, Meaning, Importance, Definition of terms, Funds and Flow, Sources and use of funds.	4
2.5	Changes in working capital, Preparation of funds flow statements (Basics).	2

3.	**Cash flow statements:**	**14**
3.1	Sources of cash	2
3.2	Cash from operations.	4
3.3	Cash from investing activities and financing activities.	4
3.4	Uses of cash flow statement, preparations.	4
4	**Cost accounting:**	**10**
4.1	Costing, elements of cost, material cost, labor cost, overheads.	2
4.2	Components of cost, prime cost, works cost, cost of production and total cost. Costing Techniques, cost volume profit analysis, Break even analysis	4
4.3	**Cost Reduction:** Difference between cost control and cost reduction, steps involved in introducing a cost reduction program.	4
5	**Indian financial system**	**8**
5.1	Meaning, Components Institutions, types of financial institutions, banking and non-banking	2
5.2	Financial markets, money market and capital market, Functions of money market, Money Market Instruments.	2
5.3	**Long-term sources of finance**: Indian capital markets, objectives, functions, components. Stock markets, new issue market and secondary markets, Long term financing, debentures, venture capital financing, private equity, crowdfunding	4

20INMCA209	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.

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

CO 1	Relate which algorithm or data structure to use in different scenarios;
CO 2	Implement standard algorithms for searching and sorting;
CO 3	Use appropriate data structure and algorithms to solve a problem using Linear List;
CO 4	Implement applications using basic data structures such as array, stack, queue;
CO 5	Analyse the concept of trees and graphs and their implementation using basic data structures and algorithms;

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**P O**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO 1	3	3	3	2	1							
CO 2	3	3	3	2	1		1		1			
CO 3	3	3			1		1		1			
CO 4	3	3			1		1		1			
CO 5	3	3			1		1		1			

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	10	10	15
Understand (K2)	15	15	15
Apply(K3)	10	10	10
Analyse(K4)	15	15	20
Evaluate(K5)			
Create(K6)			

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 “52,38,81,22,48,13,69,93,14,45,58,79,72”. (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

20INMCA231	DATA STRUCTURES LAB	CATEGORY	L	T	P	CREDIT
		GENERAL	0	0	5	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: 20INMCA209 Introduction to Data Structure

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

CO 1	Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
CO 2	Choose the appropriate data structure and algorithm design method for a specified application.
CO 3	Critically analyze and evaluate various data structures.
CO 4	Solve problems using linear data structures such as stack and queue.
CO 5	Solve problems using Nonlinear data structures.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2				1				
CO 2	3	3	3	2	1		1		1			
CO 3	3	3					1		1			
CO 4	3	3					1		1			
CO 5	3	3					1		1			

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	10	10	15
Understand (K2)	15	15	15
Apply(K3)	10	10	10
Analyse(K4)	15	15	20
Evaluate(K5)			
Create(K6)			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern

Attendance : 08 Marks
Continuous Assessment Test (2 numbers) : 30 Marks
Assignment/Quiz/Course project : 12 Marks

End Semester Examination Pattern

Lab exam will be conducted by External examiner.

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. Creat 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 Hours
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

20INMCA233	BASIC OBJECT ORIENTED PROGRAMMING LAB	CATEGORY	L	T	P	CREDIT
		GENERAL	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

CO 1	Understand the difference between procedural and object oriented programming.
CO 2	Recognize and understand the syntax and construction of object oriented programming language with functions.
CO 3	Create applications using constructors and destructors.
CO 4	Apply various inheritance concepts and polymorphism in programming.
CO 5	Use advanced features like templates and exception handling.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO 1	3	3	1	1	2		2	1	1			
CO 2	3	3	3	2	1		2	1				
CO 3	2	2	1	1	2							
CO 4	3	3	2		2							
CO 5	3	2			1							

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	10	10	15
Understand (K2)	15	15	15
Apply(K3)	10	10	10
Analyse(K4)	15	15	20
Evaluate(K5)			

Create(K6)			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern

Attendance : 08 Marks
Continuous Assessment Test (2 numbers) : 30 Marks
Assignment/Quiz/Course project : 12 Marks

End Semester Examination Pattern

Lab exam will be conducted by an internal examiner.

Course Level
Assessment 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 – operator 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 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
9. File Accessing

10. Exception Handling
11. Templates

Reference Books

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 Resources

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 all arithmetic operations using inline functions.
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 destructors.
11. Create a program to demonstrate a copy constructor.
12. Create a program to generate Fibonacci series using default constructor.
13. Create a program to find the factorial of a number using a parameterized constructor.
14. Program to calculate the area of a circle and rectangle using function overloading.
15. Create a program to overload + operator for adding two time objects expressed in hour, minute and second using member function.
16. Program to demonstrate single inheritance.
17. Program to demonstrate multiple inheritance.
18. Create a program to find the biggest among three 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 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

Topic	No. of Hours
Classes and Objects.	5
Functions: Member functions and Inline functions, Static data and static functions, Default Arguments, Friend Functions.	10
Constructors and Destructors: Default Constructor, Parameterized Constructor, Default Argument Constructor, Copy Constructor.	5
Overloading: Function Overloading, Operator Overloading.	5
Inheritance: Single, Multiple, Multi-level, Hybrid.	5
Pointers, Virtual Functions.	5
I/O streams and functions, File Accessing.	5
Exception Handling, Templates.	8

SEMESTER 4

20INMCA202	LINUX/UNIX FUNDAMENTALS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	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.

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

CO 1	Demonstrate the fundamental concepts of open source operating system Linux.
CO 2	Understand the basic set of commands and editors of Linux. Create their own shell programs for practical level problems.
CO 3	Illustrate to manage documents and control process execution.
CO 4	Demonstrate the roles and responsibilities of Linux System Administrator.
CO 5	Understand different packages and various server commands.

Mapping of course outcomes with program outcomes

	PO	PO	PO 3	PO 4	PO	PO 6	PO7	PO	PO	PO 10	PO 11	PO 12
CO 1	1											
CO 2	2	3	3	1				3				3
CO 3	1											
CO 4	3	1	1		1		1	1	1			1
CO 5	3		1	1								1

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	10	10	15
Understand (K2)	15	15	15
Apply(K3)	10	10	10
Analyse(K4)	15	15	20
Evaluate(K5)			
Create(K6)			

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 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. Illustrate different types of File Access Permissions. (K4)
2. Demonstrate different features and facilities of Linux. (K3)
3. Describe how to create a file and display its contents. (K2)

Course Outcome 2 (CO2):

1. Summarize different shell variables. (K4)
2. Design a shell program to add all even numbers upto 100. (K4)
3. Categorize different text editors available in Linux. (K4)

Course Outcome 3(CO3):

1. Illustrate the command to terminate the background process. (K4)
2. Generate the command to combine redirection and pipes. (K4)
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. (K4)
3. Describe the need of making backups. (K1)

Course Outcome 5 (CO5):

1. Demonstrate the packages in Linux. (K3)
2. Evaluate Cron Command. (K4)
3. Show how RPM can be diagnosed. (K1)

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.

Reference Books

1. "Operating System - Linux", NIIT Press, PHI Publisher, 2009 Edition
2. Evi Nemeth, Garth Snyder, Trent R Hein, "Linux Administration Handbook" Second Edition, Pearson Education, 2009
3. Christopher Negus, "Red Hat Linux Bible", Wiley Dreamtech India
4. Neil Mathew, Richard Stones, "Beginning Linux Programming", Fourth Edition, Wiley Dreamtech, 2008
5. Yeswant Kanetkar, "UNIX Shell Programming", BPB

MOOC

1. 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

No	Topic	No. of Lectures
1	**Module 1**	**12 hrs.**
1.1	**The Linux Operating System** - The History of Linux, Linux Architecture, Linux Compared to UNIX, Features and Facilities in Linux, Shells Available in Linux.	3
1.2	**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.	6
1.3	**Securing Files in Linux** - File Access Permissions [FAPs], Viewing File Access Permissions, Changing File Access Permissions.	3

2	**Module 2**	**12 hrs.**
2.1	**Creating Files Using the vi Editor** - Text Editors, Functions of a Text Editor, Ed Available with Linux, The vi Editor, Getting Started with the vi Editor, Comm Used in the vi Editor	3
2.2	**Automating Tasks Using Shell Scripts** - Introduction, Variables Local and Global Shell Variables, Command Substitution.	3
2.3	**Using Conditional Execution in Shell Scripts** - Conditional Execution, The case...esac Construct.	3
2.4	**Managing Repetitive Tasks Using Shell Scripts** - Using Iteration in Shell Scripts, Parameter-Handling in Shell Scripts, The shift command	3
3	**Module 3**	**8 hrs.**
3.1	**Managing Documents** - Locating Files in Linux, Standard Files, Redirection, Filters, Pipes	4
3.2	**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	4
4	**Module 4**	**8 hrs.**
4.1	**Backing up, Restoring and Compressing Files** - The need for Making Backups, Backup Strategies, Selecting a Backup Medium, Compressing Files	4
4.2	**Using Basic Networking Commands in Linux** - Communicating with Other in Linux, Using File Transfer Protocol in Linux, E-mail in Linux	4
5	**Module 5**	**8 hrs.**
5.1	**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.	3
5.2	**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.	5

20INMCA204	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.

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

CO 1	Analyse practical problems using the principles of correlation.
CO 2	Analyse practical problems using the principles of regression.
CO 3	Estimate sample parameters using different methods.
CO 4	Explain the concept of statistical inference.
CO 5	Evaluate parameters for small samples.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO 1	3	3		3			1				1	
CO 2	3	3		3			1				1	
CO 3	3	3		3			1				1	
CO 4	3	3		3			1				1	
CO 5	3	3		3			1				1	

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	10	10	15
Understand (K2)	15	15	15
Apply(K3)	10	10	10
Analyse(K4)	15	15	20
Evaluate(K5)			
Create(K6)			

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 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. (K4)

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.

$\underline{X}= 90$, $\underline{Y}= 70$, n =10 , $\Sigma X^2 = 6360$, $\Sigma Y^2= 2860$, $\sum XY= 3900$

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. (K4)

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. (K3)
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? (K4)

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. (K4)

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 proportions.

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, 2012.
2. S. C. Gupta V.K. Kapoor, "Fundamentals of Mathematical Statistics", Tenth Edition, Sultan Chand Publications, 2010.

Reference Books

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

Course Contents and Lecture Schedule

No.	Topic	No. of lectures
1	**Module 1: Correlation Analysis**	**8hrs**
1.1	Correlation: Introduction, Types of Correlation	2
1.2	Karl Pearson's Correlation Coefficient,	2
1.3	Properties of Karl Pearson's Correlation Coefficient	2
1.4	Rank Correlation-Spearman's Rank Correlation	2
2	**Module 2: Regression Analysis**	**7hrs**
2.1	Regression: Introduction, Lines of Regression,	3
2.2	Regression Coefficient.	3
2.3	Correlation Analysis vs Regression Analysis	1
3	**Module 3: Sampling Distribution & Estimation Theory**	**11hrs**

3.1	Population, Sampling, Parameter and statistic, Sampling distribution, Standard errors, Limitations of sampling.	3
3.2	Types of sampling	2
3.3	Estimation of Parameter: Point Estimation, Properties of a good estimator-unbiasedness, consistency, sufficiency, efficiency	2
3.4	Methods of Point Estimation- Maximum Likelihood Estimation	1
3.5	Interval Estimation	3
4	**Module 4: Testing of Hypotheses and Large Sample Test**	**11hrs**
4.1	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
4.2	Large Sample Test: Large sample tests concerning mean, equality of means	4
4.3	Large Sample Test: proportions, equality of proportions	3
5	**Module 5: Small Sample Test**	**11hrs**
5.1	Tests based on Chi square distribution for variance, Chi square test for Goodness of fit	3
5.2	Chi square test for independence of attributes	2
5.3	Small Sample Test: t-test for mean, Equality of Means and Paired t-test	3
5.4	Tests based on F-distribution	3

20INMCA206	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:
20INMCA201 Computer Organization.
20INMCA107 Introduction to Computers & PC hardware

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

CO 1	Understand the Basic Concept of Operating Systems concepts.
CO 2	Understand the concepts of process management.
CO 3	Understand the concepts of process synchronization and deadlock management.
CO 4	Understand the concepts of memory management.
CO 5	Understand the concepts of I/O and file system management.

Mapping of course outcomes with program outcomes

	P O	**P O**	**P O**	**P O**	**P O**	**PO 6**	**PO 7**	**P O**	**P O**	**P O**	**P O**	**P O**
CO 1	**3**	**2**	**2**	**1**								
CO 2	**2**		**3**	**2**	**1**	1			1			**1**
CO 3	**3**	**2**	**2**		**1**							
CO 4	**3**	**2**	**3**	**2**	**2**							
CO 5	**2**		**3**		**1**							

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10	10	15
Understand (K2)	15	15	15
Apply(K3)	10	10	10
Analyse(K4)	15	15	20
Evaluate(K5)			
Create(K6)			

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

Course Outcome 2 (CO2):

1. Define process state transition diagram with the help of a diagram (K4).

2. Demonstrate FCFS Scheduling Algorithms with an example (K3).

Course Outcome 3(CO3):

1. Compare shared memory and message passing mechanism(K4).
2. Explain Resource allocation graph with the help of a neat diagram (K4).

Course Outcome 4 (CO4):

1. Illustrate Paging with the help of diagram(K4).
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. Summarize different File Allocation Methods(K4).

Syllabus

Module 1

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.

Module 2

Process & Processor scheduling: Basic Concepts, process state transition diagram, PCB (Process control block), Threads - Multi threading Models, Process scheduling – queues – schedulers – long, short & medium – context switch. Operations on processes – process creation and termination, Process Scheduling – pre-emptive and non-pre-emptive - Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling.

Module 3

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.

Module 4

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 – FIFOPage replacement, Optimal Page replacement, LRU Page replacement. Thrashing – Cause of thrashing.

Module 5

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.

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

	Topic	No. of lectures
1	**Module 1**	**8 hrs.**
1.1	**Introduction to Operating System:** OS Definition, Functions.	1
1.2	Types of OS - Batch Operating System, Multi programming, Time sharing, Real time, Distributed operating systems, Embedded systems.	3
1.3	Operating System Operations.	1
1.4	Operating System Services.	1
1.5	User Operating System Interface.	1
1.6	System Calls, Types of System Calls.	1
2	**Module 2**	**10 hrs**
2.1	**Process & Processor scheduling:** Basic Concepts, process state transition diagram, PCB (Process control block).	1
2.2	Threads - Multi threading Models.	1
2.3	Process scheduling – queues – schedulers – long, short & medium – context switch.	2
2.4	Operations on processes – process creation and termination.	1
2.5	Process Scheduling – pre-emptive and non-pre-emptive - Scheduling Criteria.	1
2.6	Scheduling Algorithms, Multiple Processor Scheduling.	4
3	**Module 3**	**10 hrs**
3.1	**Process Synchronization & Communication:** Inter process communication – shared memory – message passing.	2
3.2	Cooperating Process, Critical Section Problem, Mutex, Semaphores.	2
3.3	**Deadlocks:** Definition – Deadlock characterization, Resource allocation graph.	2
3.4	methods for handling deadlocks, deadlock prevention, deadlock avoidance-safe state.	2
3.5	Resource Allocation Graph Algorithm- Banker's Algorithm, Deadlock Detection, Recovery from Deadlock.	2
4	**Module 4**	**12 hrs**

4.1	**Memory Management:** Preliminaries - Address Binding, logical and physical address space, Dynamic Linking and Loading.	2
4.2	Swapping, Contiguous memory allocation.	2
4.3	Paging, Page table structure, Segmentation, Segmentation with paging.	2
4.4	**Virtual Memory:** Demand paging.	1
4.5	Page replacement- Page replacement algorithms – FIFO Page replacement, Optimal Page replacement, LRU Page replacement.	4
4.6	Thrashing – Cause of thrashing.	1
5	**Module 5**	**8 hrs**
5.1	**Device Management:** Disk scheduling-FCFS-SSTF, SCAN, C-Scan, LOOK.	3
5.2	Disk management, Disk reliability – RAID Structure.	2
5.3	**File Management:** File Concept, File Attributes, File Operations, File Types, File Access Methods.	1
5.4	Directories-Introduction, Directory Structure.	1
5.5	Allocation Methods - Contiguous Allocation, Linked Allocation, Indexed allocation.	1

20INMCA208	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

CO 1	Describe management as a process and Critically analyse and evaluate management theories and practice
CO 2	Perform planning and organising for an organisation
CO 3	Do staffing and related human resource development function
CO 4	Take proper decisions to get competitive advantage
CO 5	Describe and analyse basic functions of marketing management

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1								2				1
CO 2								2				1
CO 3								2			3	
CO 4								2			2	1
CO 5								2				1

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	10
Understand	10	10	20
Apply	20	20	20
Analyse	10	10	10
Evaluate			
Create			

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)

		Total Pages:
Reg No.:_______________		Name:_______________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER M.C.A. DEGREE EXAMINATION

Course Code:

Course Name: ELEMENTS OF BUSINESS MANAGEMENT

Max. Marks: 60	Duration: 3 Hours

PART A

		Marks
	Answer all questions, each carries3 marks.	
1	Define management. What are the levels of management?	(3)

2		Distinguish between efficiency and effectiveness in management.	(3)
3		Explain system approach in management.	(3)
4		Illustrate different types of plans	(3)
5		Explain matrix form of organisation.	(3)
6		What is meant by job analysis?	(3)
7		Explain benchmarking.	(3)
8		What is product life cycle?	(3)
9		Illustrate Maslow's need theory	(3)
10		Differentiate between promotion and sales promotions	(3)
PART B			
Answer six questions, one full question from each module and carry 6 marks.			
Module I			
11		What are the different roles that managers play in an organisation?	(6)
OR			
12		Explain the major contributions of F W Taylor to scientific management.	(6)
Module II			
13		Explain various steps involved in planning with a case example.	(6)
OR			
14		Explain any 3 types of organisation structures.	(6)
Module III			
15		Explain various steps involved in selection of employees for an organisation.	(6)
OR			
16		Discuss in detail the elements of directing. Describe different types of leadership styles	(6)
Module IV			
17		Illustrate the decision process in an industry by giving different steps involved in it.	(6)
OR			
18		Explain in detail the steps involved in the control process.	(6)
Module V			
19		What is marketing management? Explain the marketing concept	(6)
OR			
20		Explain the marketing mix elements with a case example.	(6)

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_Millennium_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. Human relation approach – contribution of Elton Mayo Systems	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

5.4	Pricing Strategies,.	1
5.5	Distribution, Promotions – Sales promotions, advertising and public relations.	2
5.6	Digital marketing basics	2

20INMCA210	INTERNET CONCEPTS AND WEB TECHNOLOGY	CATEGORY	L	T	P	CREDIT
		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.

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

CO 1	Understand the basic network concepts and domain name systems.
CO 2	Understand the architecture of World Wide Web and gain knowledge in the internet service protocols
CO 3	Apply tags and elements in HTML for the creation of web page.
CO 4	Apply CSS styles to page elements
CO 5	Apply JavaScript as an interactive tool for web development

Mapping of course outcomes with program outcomes

	PO	PO	PO	PO 4	PO	PO 6	PO	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	1	3		1		1					2
CO 2	1	1	3		1		1					2
CO 3	1	1	3		1		1					2
CO 4	1	1	3		1		1					2
CO 5	1	1	3		1		1					2

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	10	10	15
Understand (K2)	15	15	15
Apply(K3)	10	10	10
Analyse(K4)	15	15	20
Evaluate(K5)			
Create(K6)			

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. 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

20INMCA232	SCRIPTING LAB	CATEGOR	L	T	P	CRED IT
		GENERAL	0	0	5	1

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

Prerequisite:

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

CO 1	Create animation on a web page and dynamic styles
CO 2	Apply and analyse operators, variables, arrays, control structures
CO 3	Implement functions ,objects and JavaScript validations in forms
CO 4	Use regular expressions for form validation and JavaScript functions
CO 5	Implement jQuery AND AJAX in web pages

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO	PO 7	PO 8	PO 9	PO 10	PO	PO
CO 1	2	2	3		1				1			
CO 2	2	2	1	1				2		2		
CO 3	3	3	1	3	2		2				1	
CO 4	3	2	3	2	2					2		
CO 5	3	2	3	2	1	1			1			1

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	10	10	15
Understand (K2)	15	15	15
Apply(K3)	10	10	10
Analyse(K4)	15	15	20
Evaluate(K5)			
Create(K6)			

Mark distribution

Total Marks	**CIE**	**ESE**	**ESE Duration**
100	50	50	3 hours

Continuous Internal Evaluation Pattern

Attendance	: 8 Marks
Continuous Assessment Test (2 numbers)	:30 Marks
Assignment/Quiz/Course project	: 12 Marks

End Semester Examination Pattern

Lab exam will be conducted by an internal examiner.

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. (K4)

Course Outcome 2 (C02):

1. Illustrate operators in JavaScript using a program to check whether a year is leap year or not.? (K4)

2. Write a JavaScript program to sort the items of an array. (K4)

Course Outcome 3 (C03):

1. Design Simple Calculator Using JavaScript. (K4)
2. Classify the functions in JavaScript and develop a function to get the last element of an array.(K4)

Course Outcome 4 (C04):

1. Write a jQuery Code to get a single element from a selection. (K4)
2. Design jquery to access the position of an element. (K4)

Course Outcome 5 (C05):

1. Create a simple XMLHttpRequest, and retrieve data from a TXT file. (K4)

2. Illustrate XMLHttpRequest to retrieve data from an XML file. (K4)

**SY
LL
AB
US**

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

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 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 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.

Course Contents and Lecture Schedule

No.	Topic	No. of Hours
1	**Module 1**	**10hrs.**
1.1	HTML5: HTML5 skeleton, HTML5 tags for text, links, lists	4
1.2	Illustrate HTML5 tags and web standards for images (graphics), Simple layouts, HTML5 tags for tables, HTML5 tags for styles.	6
2	**Module 2**	**13 hrs.**
2.1	Demonstration of JAVASCRIPT:-Syntax Basics :JS Statements, JS Comments, JS Variables, JS Data types, JS Operators, JS Comparisons, JS Conditional Statements, JS Loops JS Events	5
2.2	Demonstration of JS Objects :String Functions, JS Math Functions, JS Date Functions, JS Array Functions and Property	8
3	**Module 3**	**5hrs.**
3.1	JS User Defined Functions, JavaScript Implementations: Simple Calculator Using JavaScript, JS Validations using Regular Expression.	5
4	**Module 4**	**10hrs.**
4.1	Implementation of JQuery: -Syntax, jQuery Selectors, jQuery Events.	4
4.2	jQuery Effects: -jQuery Hide and Show Effect, jQuery Fade Effect, jQuery Slide Effect, jQuery Animate.	6
5	**Module 5**	**10hrs.**
5.1	Implementation of AJAX: XMLHttpRequest Object, creating a request object	6
5.2	sending a request to server, Receiving a response from the server.	4

20INMCA234	STATISTICS LAB	CATEGOR	L	T	P	CREDIT
		GENERAL	0	0	5	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: 20INMCA203 Probability and Statistics.

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

CO 1	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.
CO 2	Evaluate Measures of central tendency and dispersion
CO 3	Understand discrete, continuous probability density functions and special probability distributions in practical situations.
CO 4	Use correlation and regression analysis applications for purposes of comparison and prediction.
CO 5	Analyse sampled data using statistical tests

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	1	3	3		1					
CO 2	3	3	1	3	3		1					
CO 3	3	3	1	3	3		1					
CO 4	3	3	1	3	3		1					
CO 5	3	3	1	3	3		1					

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	10	10	15
Understand (K2)	15	15	15
Apply(K3)	10	10	10
Analyse(K4)	15	15	20
Evaluate(K5)			
Create(K6)			

Mark distribution

Total Marks	**CIE**	**ESE**	**ESE Duration**
100	50	50	3 hours

Continuous Internal Evaluation Pattern

Attendance	: 08 Marks
Continuous Assessment Test (2 numbers)	: 30 Marks
Assignment/Quiz/Course project	: 12 Marks

End Semester Examination Pattern

Lab exam will be conducted by internal examiner.

Course Level Assessment Questions

Course Outcome 1 (C01):

1. Analyse the set of arithmetic operations in R. (K4)
2. Analyse the set of functions in R (K4)
3. Identify different graphical techniques for visualisation of data. (K1)

Course Outcome 2 (C02):

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 (C03):

1. Calculate the mass function of a binomial distribution. (K3)
2. Generate and draw the cdf and pdf of a normal distribution. (K4)

Course Outcome 4 (C04):

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

Course Outcome 5 (C05):

1. Create a simple random sample from the data. (K4)
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.(K4)

SYLLABUS

Module 1

The R Basics: Simple Arithmetic's, Basic R functions.
Exploratory Data Analysis: Graphical techniques in EDA-Boxplot, Histogram, Pareto Chart, Stem-and-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.

Reference Books

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 $\lambda=3$, 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	0

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 Schedule

No.	Topic	No. of Hours
1	**Module 1**	**8 hrs.**
1.1	Familiarization of environment, The R Basics: Simple Arithmetic's	2
1.2	Basic R functions	2
1.3	Exploratory Data Analysis: Graphical techniques in EDA-Boxplot, Histogram, Stem-and-Leaf Plot, Scatter Plot	2
1.4	Bar Chart, Pie Chart., Pareto Chart	2
2	**Module 2**	**8 hrs.**
2.1	Evaluating Measures of Central Tendency, Mean, median	2
2.2	Measures of dispersion : Standard deviation, quartiles and percentiles of a set of observations	2
2.3	Skewness and Kurtosis	2
2.4	Implementation of Baye's rule.	2
3	**Module 3**	**12 hrs.**
3.1	Demonstration of CDF and PDF- Binomial, Poisson	4
3.2	Uniform, Exponential and Normal distributions	4
3.3	Fitting distributions	2
3.4	Implementation of Central limit theorem	2

4	**Module 4**	**6 hrs.**
4.1	Demonstration of Karl Pearson's Coefficient of Correlation	2

4.2	Demonstration of Spearman Rank Correlation	2
4.3	Regression Lines	2
5	**Module 5**	**14 hrs.**
5.1	Generation of random numbers	1
5.2	Computation of confidence interval	1
5.3	Implementation of Z test	4
5.4	Implementation of F test	2
5.5	Implementation of T test	4
5.6	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

SEMESTER V

INT MCA SEMESTER V	
Course No	**Course**
20INMCA301	Numerical Methods
20INMCA303	User Interface Design
20INMCA305	Introduction to RDBMS and SQL
20INMCA307	Fundamentals of Information Systems Security
20INMCA309	Introduction to Operations Research
20INMCA331	RDBMS Lab
20INMCA333	User Interface Design Lab

20INMCA301	NUMERICAL METHODS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course provides an introduction to the basic concepts and techniques of matrices and its operations, Numerical solution of Linear and Non-Linear equations, Curve Fitting, Numerical integration and differentiation

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

CO 1	Identify special type of matrices and Elementary row operations of a matrix.
CO 2	Apply the concept of rank of the matrix to solve system of linear equations .
CO 3	Find Eigen values and Eigen vectors of a matrix numerically.
CO 4	Apply concept of curve fitting to fit the best curve using experimental observations.
CO 5	Describe interpolation and approximations.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	1	3			1					
CO 2	3	3	1	3			1					
CO 3	3	3	1	3			1					
CO 4	3	3	1	3			1					
CO 5	3	3	1	3			1					

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination
	Test 1	Test 2	
Remember(K1)	5	5	6
Understand(K2)	10	10	15
Apply(K3)	20	20	18
Analyze(K4)	10	10	15
Evaluate(K5)	5	5	6
Create(K6)			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 Hours

Continuous Internal Evaluation Pattern:

Attendance : 8marks
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. Identify whether the matrix $A=\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 3 \end{bmatrix}$ is Symmetric?(K1)
2. Show that AB ≠BA for the matrices $A=\begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$ and $B=\begin{bmatrix} 1 & 2 \\ 5 & 3 \\ 2 & -1 \end{bmatrix}$(K3)
3. Illustrate the row Echelon form of the matrix $A=\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$ (K4)
4. Evaluate A^{-1} where $A=\begin{bmatrix} -3 & -1 & -1 \\ -1 & -3 & 1 \\ -1 & 1 & -3 \end{bmatrix}$(K5)

Course Outcome 2 (CO2)

1. Identify whether the vectors (1,2,1),(4,1,2),(6,5,4),(-3,8,1) are linearly dependent?((K1)

2. Solve the system of linear equations $\begin{aligned} 2x + 3y + 4z &= 11 \\ x + 5y + 7z &= 15 \\ 3x + 11y + 13z &= 25 \\ 2x + y + z &= 5 \end{aligned}$ (K3)

3. Determine the rank of the matrix $A = \begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$ (K3)

4. Evaluate the values of x,yand $\begin{aligned} 45x + 2y + 3z &= 58 \\ -3x+22y+2z&=47 \\ 5x + y + 20z &= 67 \end{aligned}$ usingGauss Seidel method?(K5)

Course Outcome 3(CO3):

1. Determine the Eigen values of $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{bmatrix}$,given that 1 is an Eigen value of A?(K1)

2. Determine the Eigen values and Eigen vectors of the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$?(K3)

3. Examine whether the matrix $A = \begin{bmatrix} 2 & 1 & -1 \\ 1 & 1 & -2 \\ -1 & -2 & 1 \end{bmatrix}$ is diagonalizable?(K3)

4. Evaluate the largest Eigen value and the corresponding Eigen vector of the matrix $A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ (K5)

Course Outcome 4 (CO4):

1. Define principle of least squares.(K1)

2. Explain the normal equations of $y = ax^2 + \frac{b}{x}$ (K2)

3. Apply principle of least squares to fit a straight line to the data given below :(K3)

x	1	2	3	4	5
y	14	27	40	55	68

4. Analyze the following data to fit a second degree polynomial of the form $y = a+bx+cx^2$: (K4)

X	1	2	3	4	5	6	7	8	9
Y	2	6	7	8	10	11	11	10	9

Course Outcome 5 (CO5):

1. Identify the polynomial using Lagrange's Interpolation formula, given: y (1) = -3, y (3) = 9, y (4) = 30, y (6) = 132. (K1)

2. Calculate f(1.2) using Newton's Forward Interpolation Formula from the following data : (K3)

x	1	1.4	1.8	2.2
f(x)	3.49	4.82	5.96	6.5

3. Analyze the data given below to find sin 45^0 using Gauss Backward Formula:(K4)

θ	20	30	40	50	60	70	80
$sin\theta$	0.34202	0.502	0.64279	0.76604	0.86603	0.93969	0.98481

4. Evaluate U(3) given that U(1) = -26, U(2) = 12, U(4) = 256, U(6) = 844 using Newton's Divided Difference Formula.(K5)

Syllabus

Module 1(Matrices)

Basic concepts, Matrix multiplication, Special matrices, Elementary row operations, Inverse of a matrix using Gauss Jordan Method [Ref 1 Sections 1.1, 1.2, 1.3, Ref 2.Sections 1.2.1,1.2.2.3.]

Module 2 (Linear Independence)

Linear dependence and Independence of vectors, Rank of a matrix, Homogeneous and non-homogeneous linear equations-uniqueness and consistency-Gauss Elimination Method, Gauss Seidel Method. [Ref 1 Sections 2.3,2.6, Ref 2.Sections 1.2.2.1,1.2.3.2.]

Module 3 (Eigen values and Eigen vectors)

Eigen values and Eigen vectors, Properties of Eigen values and Eigen vectors, Diagonalization , Eigen values and Eigenvectors of a matrix by power method.[Ref 1.Sections 4.1,4.2,4.3,4.5]

Module 4 (Curve Fitting):

Introduction, Principle of Least Squares,Method of Least Squares, Fitting of Linear Equations, Fitting second degree polynomial function. [Ref 3 Sections 9.1.1,9.1.2,9.1.3]

Module 5 (Interpolation and Approximation): Interpolation with equal intervals - Newton's forward and backward Interpolation, Gauss's forward and backward interpolation, Interpolation with unequal Intervals-Lagrange's Interpolation formula and Newton's Divided difference Formula

Textbooks

1. Richard Bronson and Gabriel B. Costa, "Linear Algebra - An Introduction", Second Edition, Elsevier Publishers.
2. S RK Iyengar, R K JAIN, "Numerical Methods" ,New Age International Publishers.
3. S.C GUPTA,V K KAPOOR, "Fundamentals Of Mathematical Statistics"10th revised edition, S Chand and Sons, Educational Publishers, NewDelhi.

Reference Text Books

1. T. Veerarajan and T. Ramachandran, "Numerical methods with programming in 'C' ",Second Editiion, Tata McGraw-Hill Publishing.Co.Ltd, 2007.
2. C. F. Gerald and P.O. Wheatley, "Applied Numerical Analysis", 6th Edition, Pearson Education Asia, NewDelhi,2006.
3. M.KJain,R.KIyengar,R.KJain,"Numerical Methods for Scientific and Engineering Computation", New Age International Hill Publishers, NewDelhi-1997.

Web Resources

1.https://nptel.ac.in/courses/111/106/111106051/

2.https://nptel.ac.in/courses/111/107/111107106/

3. https://nptel.ac.in/courses/111/104/111104137/

4.https://nptel.ac.in/courses/111/101/111101003/

5. https://nptel.ac.in/courses/111/107/111107105/

Course Contents and Lecture Schedule

Topic	No. of Lectures
Module 1	**9hours**
Definition, Operations on matrix – Matrix Addition, subtraction,	2 hours
Matrix multiplication	1 hours
Special Matrices	2 hours
Elementary row operations, Row Echelon form.	2 hour
Inverse of a matrix using Gauss Jordan Method [	2 hours
Module 2	**10 hours**
Linear dependence and Independence of vectors	2 hours
Rank of a matrix	2 hours
Homogeneous and non-homogeneous linear equations	1 hour
Uniqueness and consistency	1 hour
Gauss Elimination method	2 hours
Iterative methods of Solution: Gauss-Seidel method.	2 hours
Module 3	**10 hours**
Eigen values and Eigen vectors	3 hours

Properties of Eigen values and Eigen vectors	2 hour
Diagonalization	3 hours
Eigen values and Eigenvectors of a matrix by power method.	2 hours
Module 4	**9 hours**
Introduction	2 hour
Principle of Least Squares	2 hours
Method of Least Squares	2 hours
Fitting of Linear Equations	2 hours
Fitting second degree polynomial function	2 hours
Module 5	**10 hours**
Introduction	1 hour
Newton's forward and backward Interpolation	2 hours
Gauss'sforward and backward interpolation	2 hours
Lagrange's Interpolation formula	2 hours
Newton's Divided difference Formula	3 hours

20INMCA303	USER INTERFACE DESIGN	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course introduces students to develop skills to create server-side scripts using PHP. Introduces server-side programming concepts and terminology. Explores a variety of server-side techniques and MySQL database manipulation.

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

CO 1	Identify and define key terms related to user interfaces and user interface design and implementation
CO 2	Identify and describe common abstract user interface components, such as menu selection and Dialog Boxes.
CO 3	Distinguish PHP as a server side programming language
CO 4	Know about the basic concepts of Functions, Array and Strings in PHP
CO 5	Outline the principles behind using MySQL as a backend DBMS with PHP

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO 1	3	3	3	2	2		3	3				
CO 2	3	3	3	2	2		3	3	1			
CO 3	3	3	3	2	2		3	3				
CO 4	3	3	3	2	2		3	3				2
CO 5	3	3	3	3	3		3	3			2	2

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	10	10	12
Understand(K2)	10	10	12
Apply(K3)	5	5	4
Analyse(K4)	5	5	4
Evaluate(K5)	10	10	9
Create(K6)	10	10	18

Mark distribution

Total Marks	**CIE**	**ESE**	**ESE Duration**
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

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

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. Explain the Four Pillars of Design (K2)
2. List the steps involved in the contextual design method? (K1)

Course Outcome 2 (CO2):

1. Explain Direct manipulation (K2)
2. Explain the elements of form fill-indesign (K2)

Course Outcome 3(CO3):

1. Is PHP case sensitive? Justify your answer (K5)
2. Demonstrate with an example explain data types in PHP (K3)

Course Outcome 4 (CO4):

1. Convert strings and arrays using implode and explode (K1)
2. Compare include and require statement in PHP (K5)

Course Outcome 5 (CO5):

1. Create a procedure to perform database connectivity in PHP? (K6)
2. Illustrate with an example to explain how data is stored in Sessions. (K4)

Syllabus

Module 1

Usability of interactive System-Introduction, Usability goals and measure, Usability Motivations.
Managing Design Processes-The four pillars of Design, Development Methodologies.

Module 2

Direct manipulation and Virtual Environments- Introduction, Examples of Direct Manipulation, 3-D Interfaces, Teleoperation, Virtual and Augmented Reality.
Menu Selection, Form Fill-in and Dialog Boxes-Single Menus, Data Entry with Menus: Form Fill-In, Dialog Boxes and Alternatives.

Module 3

Essential PHP-Creating a first PHP Page, Mixing HTML and PHP, Printing some text, Printing some HTML, Adding comments to PHP code, Working with variables, Storing Data in variables, Creating Constants, Understanding PHP's Internal Data Types.

Operators- PHP Arithmetic Operators, Working with Assignment Operator, Comparison Operator, Increment/Decrement Operator, Logical Operator, String Operator, Bitwise Operator, Comparison Operator, Ternary Operator

Module 4

PHP Conditional Statements-The if statement, the else statement, the elseif statement, the switch statement, for loops, while loops, do..while loops, foreach loop, Terminating loops(break/continue).

Strings and Arrays-The String functions, converting to and from strings, Creating an array, ModifyingthedatainArrays,DeletingArrayElements,HandlingarraywithLoops,PHPArray Functions, Converting between strings and arrays using implode and explode, Sorting Arrays, Using PHP's ArrayOperators

Functions:-Creating Functions in php, passing functions some data, passing arrays to Functions, Passing by References, Using default Arguments, Returning data from functions, Returning Arrays, Introducing Variable Scope in PHP, Accessing Global data, Working with Static Variables ,Creating include files.

Module 5

PHP Forms-Reading data in Web Pages(Get and Post), handling text fields, handling text areas, handling Check boxes, handling Radio Buttons, handling Password Controls, handling hidden controls,handling file uploads.

Web features - Sessions-Storing data in Sessions, Retrieving data from sessions, destroy sessions, Cookies-Setting a cookie, reading a Cookie, Setting Cookies' Expiration, deleting Cookies.

Accessing The Database in PHP((Using MySQL/MySQLi procedural):-Connecting to the databaseserver,ConnectingtotheDatabase,Displayingthetabledata,ClosingtheConnection, Updating database, Inserting new data items into a database, delete records, Creating new tables, creating new Database.

Text Books

1. Ben Shneiderman,Catherine Palisant,Maxine Cohen,Steven Jacobs "Designing the user Interface, 5thedition"
2. Steven Holzner "The Complete Reference PHP,Mc Graw HillEducation"

Reference Books

1. Steve Suehiring,Tim Converse and Joyce Park "PHP6 and Mysql Bible",Wiley

Web Resources

1. https://www.w3schools.com/php/default.asp
2. https://www.tutorialspoint.com/php/index.htm

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	**6 hrs.**
1.1	Usability of interactive System	3
1.2	Managing Design Processes	3
2	**Module 2**	**9 hrs**
2.1	Direct manipulation and Virtual Environment	5
2.2	Menu Selection, Form Fill-in and Dialog Boxes	4
3	**Module 3**	**6 hrs.**
2.1	Essential PHP	3
2.2	Operators	3
4	**Module 4**	**12 hrs.**
4.1	Conditional Statements	3
4.2	Strings	3
4.3	Arrays	3
4.4	Functions	3
5	**Module 5**	**15 hrs.**
5.1	PHP Forms	3
5.2	Sessions	3
5.3	Cookies	3
5.4	Accessing the database in PHP	6

20INMCA305	INTRODUCTION TO RDBMS AND SQL	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course provides a clear understanding of fundamental principles of Database Management Systems (DBMS) with special focus on Relational Databases to the learners. The topics covered in this course are basic concepts of DBMS, Entity Relationship (ER) model, Relational Database principles, Structured Query Language (SQL), and Normalization.

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

CO 1	Summarize and exemplify fundamental nature and characteristics of database systems
CO 2	Conceptualize data using the relational model and describe relational database concepts
CO 3	Develop queries for relational database in the context of practical applications
CO 4	Model and design relational databases following the design principles
CO 5	Solve database problems using SQL and PLSQL.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	2	1	1			1	1	2	2	2
CO 2	3	2	1	1	2			1		2	3	3
CO 3	3	2	3	2	2	2		1		2	3	3
CO 4	3	2	3	1	2			1		2	1	1
CO 5	3	2	3	2	2	2		1		2	3	3

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	5	5	5
Understand(K2)	15	15	20
Apply(K3)	20	20	25
Analyse(K4)	10	10	10
Evaluate(K5)			
Create(K6)			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

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

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. What is data independence, and why is it lacking in file systems?(K2)
2. What is a DBMS, and what are its functions?(K1)

Course Outcome 2 (CO2):

1. Why are entity integrity and referential integrity important in a database?(K2)
2. Discuss two ways in which the 1:M relationship between COURSE and CLASS can be implemented(K3)

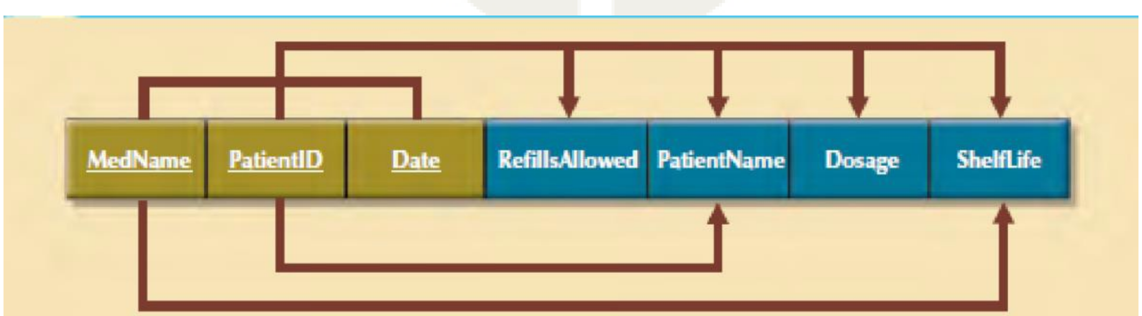
Course Outcome 3(CO3):

1. Rewrite the following WHERE clause without the use of the IN special operator. WHERESTATE IN ('TN', 'KL', 'KA')(K4)
2. Write the SQL code required to list all employees whose last names start with Smith. In other words, the rows for both *Smith* and *Smithfield* should be included in the listing. Assume case sensitivity.(K4)

EMP_NUM	EMP_LNAME	EMP_FNAME	EMP_INTIAL	EMP_HIREDATE	JOB_CODE
101	Smith	John	G	08-Nov-00	502
102	Senior	David	H	12-Jul-89	501
103	Arbough	June	E	01-Dec-96	500
104	Ramoras	Annae	K	15-Nov-87	501
105	Johnson	Alice	K	01-Feb-93	502
106	Smithfield	William		22-Jun-04	500
107	Alonzo	Maria	D	10-Oct-93	500

Course Outcome 4 (CO4):

1. What is a partial dependency? With what normal form is it associated?(K3)
2. The dependency diagram in Figure Q6.8 indicates that a patient can receive many prescriptions for one or more medicines over time. Based on the dependency diagram, create a databasewhose tables are in at least 2NF, showing the dependency diagram for each table.(K4)



Course Outcome 5 (CO5):

1. The relational set operators UNION, INTERSECT, and MINUS work properly only when the relations are union-compatible. What does union-compatible mean, and how would you check for thiscondition?(K3)
2. Whydoestheorderoftheoperands(tables)matterinaMINUSquerybutnotinaUNIONquery? (K3)

Syllabus

Module 1

Database Management System Concepts: Introduction, Data, information, Introducing the Database, Importance of Database Design, Evolution of File System Data Processing, Problems with file system data processing, Database Systems- The database system environment, DBMS Functions. Degrees of Data Abstraction

Data Models- Data Modeling and Data Models, Entity Relationship (ER) Modeling – The entity RelationshipModel,DevelopinganERDiagram,ExtendedERFeatures:Specialization,Generalization, Aggregation.

Module 2

Introduction to the Relational Database Model: Structure of relational database, Degree and Cardinality, Database Schema, Schema Diagrams, Keys, Integrity constraints, Indexes, Codds Relational Database Rules. Relationships within the Relational Database, Difference between DBMS and RDBMS

Module 3

Introduction to SQL: Introduction to SQL, Data Definition Commands, Data Manipulation Commands,TransactionControlCommands,DataControlCommands,NullValues,SELECTQueries, Additional Data Definition Commands, Additional SELECT Query Keywords, Group by and Having Clause, Aggregate Functions, Numeric functions, String functions, Datefunctions.

Module 4

Normalization: Functional Dependency, Types of Functional Dependency, Armstrong's Axioms (proofs not required), Closures and their computation, Equivalence of Functional Dependencies (FD), The need for Normalization, First Normalization, Second Normal Form Relation, Third Normal Form, Boyce-Codd Normal Form (BNCF), Fourth and Fifth Normal Form.

Module 5

AdvancedSQL: RelationalSetOperators,JoiningDatabaseTables.Differenttypesofjoins,Subqueries and Correlated Queries, Views, Updatable Views, Functions and Procedures, Cursors,Triggers.

Text Books

1. Peter Rob and Carlos Coronel, “Database Principles: Fundamentals of Design, Implementation and Management”, 9th Edition(2012)
2. Henry Korth and A. Silberschatz, “Database System Concepts”, Sixth Edition, McGraw-Hill,2011
3. Ramez Elmasri & Shamkant B. Navathe, “Fundamentals of Database Systems”,7th Edition, Pearson Education(2016).
4. Ashutosh Kumar Dubay, “Database Management Concepts”, S.K. Kataria & Sons, 1st Edition (2012).
5. Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems”,McGraw Hill, 3rd Edition(2014).

Web Resources

1. Introduction to Databases (nptel):https://nptel.ac.in/courses/106/106/106106220
2. Database Systems Concepts & Design: https://www.udacity.com/course/database-systems-concepts-design--ud150

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	**9 hrs.**
1.1	Introduction, Data, information, Introducing the Database, Importance of Database Design	1
1.2	Evolution of File System Data Processing, Problems with file system data processing	1
1.3	Database Systems- The database system environment	1
1.4	DBMS Functions	1
1.5	Degrees of Data Abstraction	1
1.6	Data Models- Data Modeling and Data Models	1
1.7	Entity Relationship(ER) Modeling – The entity Relationship Model	1
1.8	Developing an ER Diagram	1
1.9	Extended ER Features: Specialization, Generalization, Aggregation.	1
2	**Module 2**	**9 hrs.**

2.1	Structure of relational database	1
2.2	Degree and Cardinality	1
2.3	Database Schema, Schema Diagrams	1
2.4	Keys, Integrity Constraints	2
2.5	Indexes, Codds Relational Database Rules.	2
2.6	Relationships within the Relational Database, Difference between DBMS and RDBMS	2
3	**Module 3**	**12 hrs.**
3.1	Introduction to SQL, Data Definition Commands	1
3.2	Data Manipulation Commands	2
3.3	Data Control Commands, Null Values	1
3.4	SELECT Queries	2
3.5	Additional Data Definition Commands	1
3.6	Additional SELECT Query Keywords	1
3.7	Group by and Having Clause	2
3.8	Aggregate Functions, Numeric functions, String functions, Date functions	2
4	**Module 4**	**9 hrs.**
4.1	Functional Dependency, Types of Functional Dependency	1
4.2	Armstrong’s Axioms (proofs not required)	1
4.3	Closures and their computation, Equivalence of Functional Dependencies (FD)	1
4.4	The need for Normalization, First Normalization	1
4.5	Second Normal Form Relation	1
4.6	Third Normal Form	1
4.7	Boyce-Codd Normal Form (BNCF)	1
4.8	Fourth and Fifth Normal Form	2
5	**Module 5**	**9 hrs.**
5.1	Relational Set Operators	1
5.2	Joining Database Tables	1
5.3	Different types of joins	1
5.4	Subqueries and Correlated Queries	2
5.5	Views, Updatable Views	1
5.6	Functions and Procedures	1
5.7	Cursors	1
5.8	Triggers	1

20INMCA307	FUNDAMENTALS OF INFORMATION SYSTEMS SECURITY	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course provides a solid theoretical foundation of information security to protect information and information systems from unauthorized access, use, disclosure, disruption, modification, or destruction.

Prerequisite: 20INMCA210 Internet Concepts and Web Technology, 20INMCA206 Operating Systems Concepts.

Course Outcomes: After the completion of the course, the student will be able to

CO 1	Understand and explain fundamental security concepts
CO 2	Recognize common threats and vulnerabilities of information systems.
CO 3	Identify how the Risk Management performs.
CO 4	Explain and apply cryptographic algorithms.
CO 5	Understand and apply network security enumeration and monitoring tools.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2		2				1		1			
CO 2	3	2	2									1
CO 3	2	3	2	3	1							
CO 4	2	2	2	2	1	1						
CO 5	1	2	3	2		1						

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10	10	10
Understand(K2)	10	10	15
Apply(K3)	5	5	10
Analyse(K4)	10	10	10
Evaluate(K5)	10	10	10
Create(K6)	5	5	5

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 8 marks
Continuous Assessment Test(2numbers) : 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 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 6marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

Que 1. List out the components of an information system (K1)
Que 2. Describe the goals of information security. (K2)
Que 3. Summarize Security in the Systems Life Cycle (K5)

Course Outcome 2 (CO2):

Que 1. Explain Espionage or Trespass (K2)
Que 2.Illustrate alternative approaches for password cracking (K3)
Que 3.Categorize Social Engineering Attacks (K4)

Course Outcome 3 (CO3):

Que 1. Explain security and privacy issues in Cloud Computing (K2)
Que 2. With necessary diagram, demonstrate components of risk management (K3)
Que 3. Recommend the steps for risk identification. (K5)
Que 4. Compose steps for protecting your personal computer. (K6)

Course Outcome 4 (CO4):

Que 1. Outline Firewall processing modes (K4)
Que 2. Diagrammatically explain digital signature (K4)
Que 3. Compare HTTP and HTTPS protocol (K5)

Course Outcome 5 (CO5):

Que 1. Differentiate physical security controls (K2)
Que 2. Outline Security Management Maintenance Models (K4)
Que 3. Explain the methods of data interception (K2)

Syllabus

Module I

Introduction to Information System Security: History, Key Concept in Information Security, Information and Characteristics, Goals of information security, Need for Security, Components, Balancing security and access, Implementation issues of the goals of information security, Security in the Systems Life Cycle, Security professional in the organization.

Module II

TheNeedforSecurity:BusinessNeeds-Protectingthefunctionality,Enablingthesafeoperations, Protecting the data, safe guarding the technology assets, Threats and Attacks: Threats-compromises to Intellectual property, deliberate software attacks, Espionage and trespass, sabotageandvandalism,Attacks-MaliciousCodes,BackDoors,DenialofServiceandDistributed Denial of Service, Spoofing, sniffing, Spam, Social Engineering,Theft.

Module III

Risk Management: Definition**,** Risk Identification**,** Risk Assessment**,** Risk Control.

Information Technology in Today's World: Protecting your Personal Computer, Challenges, attacks, Security measures, Securing Mobile and Portable Systems, Cloud Computing, Deployment, Security and Privacy Issues, Trust and Risk.

Module IV

Security Technology: Access Control, password Security, Firewalls, Protecting Remote Connections, Intrusion Detection and Prevention Systems, Honeypots, Honeynets, and Padded Cell Systems, Scanning and Analysis Tools.

Cryptography: Cipher Methods, Cryptographic Algorithms, Cryptographic Tools, Public Key Infrastructure (PKI), Digital Signatures, Digital Certificates, Protocols for Secure Communications- S-HTTP, S/MIME, SET, and SSH, WPA, IPSec, PGP.

Module V

Physical Security, Implementation and Maintenance: Physical Access Controls, Interception ofData,ImplementingInformationsecurity**:**InformationSecurityProjectManagement,Technical Aspects of Implementation, Nontechnical Aspects of Implementation, Information Systems Security Certification and Accreditation. Information Security Maintenance: Security Management Maintenance Models, DigitalForensics.

Text Books

1. Michael E. Whitman & Herbert J. Mattord, "Principles of Information Security" (Fifth Edition), CengageLearning.

Reference Books

1. Thomas R. Peltier, "Information Security Risk Analysis" (Third Edition), Auerbach Publications.
2. MarkStamp,"Informationsecurity:PrinciplesandPractice"(SecondEdition),JohnWiley & Sons, Inc.PUBLICATION
3. Wm.ArthurConking,GregoryB.White,etal**"**PrinciplesofComputerSecurity:Security+ and Beyond" (Fifth Edition) McGrawHill
4. William Stallings ,"Cryptography and Network Security - Principles and Practice"(Sixth Edition) PearsonEducation

MOOC Courses

1. https://nptel.ac.in/courses/106/106/106106129/
2. https://www.coursera.org/learn/information-security-data

Web Resources

1. https://www.geeksforgeeks.org/what-is-information-security/
2. https://en.wikibooks.org/wiki/Fundamentals_of_Information_Systems_Security/Information_Security_and_Risk_Management
3. https://bus206.pressbooks.com/chapter/chapter-6-information-systems-security/

Course Contents and Lecture Schedule

Topic	No. of lectures
Module 1	**10 hrs.**
Introduction, History, Key Concept in Information Security	1
Information and Characteristics , Goals of information security	2
Need for Security, Components	2
Balancing security and access, ,Implementation issues of the goals of information security	2
Security in the Systems Life Cycle	2
Security professional in the organization	1
Module 2	**8 hrs.**

Business Needs-Protecting the functionality, Enabling the safe operations, Protecting the data, safe guarding the technology assets	2
Threats and Attacks: Threats-compromises to Intellectual property, deliberate software attacks, Espionage and trespass	2
sabotage and vandalism, Attacks-Malicious Codes, Back Doors, Denial of Service and Distributed Denial of Service	2
Spoofing, sniffing, Spam, Social Engineering, Theft	2
Module 3	**6 hrs.**
Risk Management**:** Definition**,** Risk Identification**,** Risk Assessment**,** Risk Control	2
Protecting your Personal Computer, Challenges, attacks, Security measures	1
Securing Mobile and Portable Systems	1
Cloud Computing, Deployment, Security and Privacy Issues, Trust and Risk	2
Module 4	**16 hrs.**
Security Technology: Access Control, password Security	1
Firewalls, Protecting Remote Connections, Intrusion Detection and Prevention Systems	2
Honeypots, Honeynets, and Padded Cell Systems, Scanning and Analysis Tools	1
Cryptography: Cipher Methods	2
Cryptographic Algorithms	2
Cryptographic Tools	3
Public Key Infrastructure (PKI), Digital Signatures	2
Digital Certificates	1
Protocols for Secure Communications- S-HTTP, S/MIME, SET, and SSH, WPA, IPSec, PGP	2
Module 5	**8 hrs.**
Physical Security: Physical Access Controls, Interception of Data	2
Implementing information security**:** Information Security Project Management	1
Technical Aspects of Implementation, Nontechnical Aspects of Implementation	1
Information Systems Security Certification and Accreditation	1
Information Security Maintenance: Security Management Maintenance Models	2
Digital Forensics	1

20INMCA309	INTRODUCTION TO OPERATIONS RESEARCH	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: Operations research (OR) is an analytical method of problem-solving and decision-making. The topics Linear Programming, Transportation and Assignment problems, game theory and queuing models are introduced here.

Prerequisite: A basic course in matrix algebra and statistics.

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

CO 1	Model and solve decision making problems using Linear Programing techniques
CO 2	Solve linear programming problems using artificial variables and duality .
CO 3	Apply the concepts of transportation and assignment problem to solve different practical problems.
CO 4	Use game theory to solve real world problems.
CO 5	Understand and extend queuing models to analyse real world systems

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3		1			1				1	
CO 2	3	3		1			1				1	
CO 3	3	3		1			1				1	
CO 4	3	3		1			1				1	
CO 5	3	3		1			1				1	

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	5	5	6
Understand(K2)	10	10	15
Apply(K3)	20	20	18
Analyse(K4)	10	10	15
Evaluate(K5)	5	5	6
Create(K6)			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 8 marks
Continuous Assessment Test(2numbers) : 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 6marks

Course Level Assessment

Questions Course Outcome 1

(CO1):

1. Define Slack variables and Surplus variable.(K1)

2. Solve by Graphical

method Maximise z

$= 5x_1 + 3x_2$

Subject to $_1 + x_2 \leq 6,\ 2x_1 + 3x_2 \geq 6, 0 \leq x_1 \leq 4, 0 \leq x_2 \leq 3$.(K3&K4)

3. Solve by Simplex method

Maximise $z = 5x_1 + 3x_2$

Subject to $_1 + x_2 \leq 2, 5x_1 + 2x_2 \leq 10, 3x_1 + 8x_2 \leq 12, x_1, x_2 \geq 0$. (K3)

Course Outcome 2 (CO2)

1. Solve by Big M method

   Maximise $= 3x_1 + 2x_2 + 3x_3$

   Subject to $2x_1 + x_2 +$

   $x_3 \leq 2 3x_1 + 4x_2 + 2x_3 \geq 8$

   $x_1, x_2, x_3 \geq 0$. (K3)

2. Use Two Phase method to

   Maximise $z = 3x_1 - x_2$

   Subject to $2x_1 + x_2 \geq 2,$

   $x_1 + 3x_2 \leq 2$

   $x_2 \leq 4$

   $x_1, x_2 \geq 0.$ (K3)

3. Evaluate the dual and solve

   Minimize $z = 15x_1 + 10x_2$

   Subject to $3x_1 + 5x_2 \geq 5, 5x_1 + 2x_2 \geq 3,\ x_1, x_2 \geq 0.$ (K5)

Course Outcome 3(CO3):

1. Find an initial basic feasible solution by Least Costmethod

	A	B	C	Availability
1	6	3	5	10
2	8	2	7	15
3	4	9	1	8
Requirement	15	7	11	

(K3)

2. Find the optimal solution of the following Transportation problem

Market

Plant	A	B	C	D	Available
X	14	9	18	6	11
Y	10	11	7	16	13
Z	25	20	11	34	19
Requirement	6	10	12	15	

(K5)

3. There are five jobs to be assigned, one each to five machines, and the associated cost matrix as follows. Select the optimum assignment of machines to jobs.

Job Machine

	1	2	3	4	5
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	15

(K4&K5)

Course Outcome 4 (CO4):

1. Define Maximin and Minimax Principle.(K1)
2. Apply dominance rule and solve

$$\begin{bmatrix} 8 & 10 & 9 & 14 \\ 10 & 11 & 8 & 12 \\ 13 & 12 & 14 & 13 \end{bmatrix} \qquad \text{(K3)}$$

3. Solve the following problem graphically

$$\begin{bmatrix} 1 & -3 \\ 3 & 5 \\ -1 & 6 \\ 4 & 1 \\ 2 & 2 \\ -5 & 0 \end{bmatrix} \qquad \text{(K3\&K4)}$$

Course Outcome 5 (CO5):

1. Classify different queuing models.(K4)
2. A T.V repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in, and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 - hour day, what is repairman's expected idle time each day? How many jobs are ahead of the average set just brought in? (K3)
3. On an average 96 patients per 24-hour day require the service of an emergency clinic. Also on an average a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs 100 per patient treated to obtain an average servicing time of 10 minutes, and that each minute of decrease in this average time would cost Rs 10 per patient treated. Howmuch would have to be budgeted by the clinic to decrease the average size of the queue from $1\frac{1}{3}$ patients to ½ a patient. (K5)

Syllabus

Module 1

Linear Programming Problem-Formulation-Graphical Method-Simplex method. (Theorems without proof)

Module 2

Big M Method-Two Phase Method-Duality-Solving Linear Programming Problem using duality. Theorems without proof)

Module 3

Transportation problem -Methods to find initial basic feasible solution -Northwest corner rule-Matrix minima method-Vogel's Approximation method. Solving a Transportation problem - MODI method - Degeneracy in Transportation problem -Unbalanced Transportation problem - Maximization in Transportation problem. Assignment problem -Hungarian Method of Assignment-Unbalanced Assignment Problem-Maximization case in Assignment Problem-Prohibited Assignments.

Module 4

Game Theory-Two person zero sum game -Basic terms-saddle point-Maximin-Minimax principle- Games without saddle points -Mixed strategies -Algebraic method for solving two person zero sum game-Graphical solution of 2xn and mx2 games-Dominance principle-Solving mxn game using dominance.

Module 5

Queuing Theory- Elements of a queuing system- Kendall 's notation- Operating characteristics.

Poisson process, Exponential distribution, Birth and death process (All without proof).

Queuing models based on Poisson process- Single server models with finite and infinite capacity-Multi sewer models with finite and infinite capacity. (Theorems without proof)

Text Books

1. Er. Prem Kumar Gupta and Dr. D.S. Hira "Operations Research", S Chand &company pvt.Ltd
2. KantiSwarup, P.K.Gupta and Man Mohan "Operations Research", Sultan Chand(2010).
3. Hamdy A.Taha, "Operations Research-An Introduction", Prentice Hall ofIndia
4. Ravindran, Philips and Solberg, Wiley, "Operations Research",Second edition(2007),Wiley

Reference Text Books

1. G Hadley, Linear programming, Narosa Publishing House, New Delhi,2002
2. Hillier & Lieberman, Introduction to Operations Research, Holden Day Inc.,1996
3. R Panneerselvam, Operation Research. PHI,2006

Web Resources

1. https://nptel.ac.in/courses/111/107/111107128/
2. https://faculty.psau.edu.sa/filedownload/doc-6-pdf-14b14198b6e26157b7eba06b390ab763-original.pdf
3. http://164.100.133.129:81/econtent/Uploads/Operations_Research.pdf
4. http://ebooks.lpude.in/commerce/bcom/term_5/DCOM303_DMGT504_OPERATION_RESEARCH.pdf

Course Contents and Lecture Schedule

Topic	No. of lectures
Module 1	**9 hrs**
Introduction to O.R-Linear Programming Problem	1
Formulation	2
Graphical Method	3
Simplex method	3
Module 2	**9 hrs**
Big M Method	3
Two Phase Method	3
Duality-Solving LPP using duality	3
Module 3	**11 hrs**
Transportation problem -Methods to find initial basic feasible solution	1
Northwest corner rule- Matrix minima method	1
Vogel's Approximation method	1
Solving a TP -MODI method	2
Degeneracy in TP	1
Unbalanced TP-Maximization in TP	1
Assignment problem -Hungarian Method of Assignment	3
Maximization in assignment problem	1
Module 4	**9 hrs**
Game Theory-Two person zero sum game -Basic notions-saddle point	1
Maximin-Minimax principle- Games without saddle point -Mixed strategies	2
Algebraic method for solving two person zero sum game	2
Graphical method for 2xn and mx2 games	2
Dominance Principle-Solving mxn game -using dominance	2
Module 5	**10 hrs**

Queuing Theory- Elements of a queuing system- Kendall 's notation- Operating characteristics	1
Poisson process, Exponential distribution, Birth and death process (All without proof).	3
Queuing models based on Poisson process- Single server models with finite and infinite capacity	3
Multi server models with finite and infinite capacity	3

20INMCA331	RDBMS LAB	CATEGORY	L	T	P	CREDIT
		GENERAL	0	0	5	1

Preamble: The syllabus is prepared with the view of preparing the MCA Graduates capable of writing SQL, PL/SQL to solve computational problems that they may have to solve in their professionallife.Thestudentscanexplorevariousdatamanipulationsforthebasicproblemsolving. The course content is decided to cover the essential RDBMS fundamentals. The students are expected to come prepared with the required program written in the rough record for the lab classes.

Prerequisite: 20INMCA305 Introduction to RDBMS and SQL

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

CO 1	Understand, appreciate and effectively explain the underlying concepts of database technologies
CO 2	Design and implement a database schema for a given problem-domain.
CO 3	Apply different normalization techniques
CO 4	Populate and query a database using SQL DML/DDL commands.
CO 5	Use any popular RDBMS for data access and updating.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3	2	1		2				2	2	3
CO 2	2	2	3	3	2					3		
CO 3	3	3	3	3	3					3		
CO 4	3	3	3	3	3					3	2	
CO 5	3	3	3	1	2			2		3	2	

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10		
Understand (K2)	10		
Apply(K3)	10	10	10
Analyse(K4)	10	10	10
Evaluate(K5)	10	10	10
Create(K6)		20	20

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern

Attendance	: 08 Marks
Continuous Assessment Test(2numbers)	:30 Marks
Assignment/Quiz/Courseproject	: 12 Marks

End Semester Examination Pattern

Lab exam will be conducted by internal examiner.

Course Level Assessment

Course Outcome 1 (CO1):

1. Explore the commands to retrieve the contents of the table(K1)
2. Analyse the structure of a database object.(K2)

Course Outcome 2 (CO2):

1. DDL commands for table creation(K6)
2. SQL to create aview(K6)

Course Outcome 3 (CO3):

1. Select/Display the Student name and grade by implementing a left outer join.(K4)
2. Select/Display the Student name, register no, and result by implementing a right outer join(K4)
3. List the records in the emp table order by salary in ascending order(K1)

Course Outcome 4 (CO4):

1. Grade setting for a student using trigger(K5)
2. Categorize the grades of students using cursor(K4)

Course Outcome 5 (CO5):

1. Design and implement payroll management system(K6)
2. Demonstrate and implement banking management system(K2)

Reference Books

1. Peter Rob and Carlos Coronel, “Database Principles: Fundamentals ofDesign, Implementation and Management”, 9th Edition(2012)
2. Ashutosh Kumar Dubay, “Database Management Concepts”, S.K. Kataria & Sons, 1st Edition (2012).
3. Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems”, McGraw Hill, 3rd Edition(2014).
4. Henry Korth and A. Silberschatz, “Database System Concepts”, Sixth Edition, McGraw-Hill,2011.

Web Resources

1. Introduction to Databases (nptel)https://nptel.ac.in/courses/106/106/106106220
2. Database Systems Concepts & Design
https://www.udacity.com/course/database-systems-concepts-design--ud150

List of Lab Experiments

1. Create a table called EMP with the following structure. EMPNO NUMBER(6) ENAME VARCHAR2(20) JOB VARCHAR2(10) DEPTNO NUMBER(3) SAL NUMBER(7,2) Allow NULL for all columns except ename and job
2. Add a column experience to the emptable.
3. Modify the column width of the job field of emptable
4. Create dept table with the following structure. DEPTNO NUMBER(2) DNAME VARCHAR2(10) LOC VARCHAR2(10) Deptno as the primary key
5. create the emp1 table with ename and empno, add constraints to check the empno value while entering (i.e) empno >100.
6. drop a column experience to the emptable.
7. Insert a single record into depttable
8. The organization wants to display only the details of the employees those who areASP.
9. The organization wants to display only the details like empno, empname, deptno, deptname of the employees. (Vertical portioning)
10. Display all the views generated
11. Drop aview.
12. Insert more than a record into emp table using a single insert command
13. Update the emp table to set the salary of all employees to Rs15000/- who are working as ASP
14. Create a pseudo table employee with the same structure as the table emp and insert rows into the table using select clauses.
15. select employee name, job from the emp table
16. Delete only those who are working as lecturer
17. List the records in the emp table order by salary in ascending order.
18. List the records in the emp table order by salary in descending order.
19. Display deptno from the table employee avoiding the duplicated values.
20. Site examples for the use of data and built in functions inSQL
21. Site examples for the use of date & time functions
22. Site examples for the use of Numeric & Math functions
23. Display all employee names and salary whose salary is greater than minimum salaryof the company and job title starts with_M‘.
24. Issue a query to find all the employees who work in the same job asArjun
25. Display all the dept numbers available with the dept and emp tables avoiding duplicates.
26. Display all the dept numbers available with the dept and emp tables.
27. Display all the dept numbers available in emp and not in dept tables and viceversa.
28. Display the employee details, departments that the departments are same in both the emp and dept.

29. Display the employee details, departments that the departments are not same in both the emp and dept. Solution: 1.Use select from clause. 2. Use non equi join in select clause to get theresult.
30. Display the Student name and grade by implementing a left outer join.
31. Display the Student name, register no, and result by implementing a right outer join
32. Display the Student name register no by implementing a full outer join.
33. Write a query to display their employee names
34. Display the details of those who draw the salary greater than the average salary.
35. Develop a query to grant all privileges of employees table into departments table
36. Develop a query to grant some privileges of employees table into departments table
37. Develop a query to revoke all privileges of employees table from departments table
38. Develop a query to revoke some privileges of employees table from departments table
39. Write a query to implement the save point
40. Write a query to implement the rollback
41. Write a query to implement the commit
42. Write a program to implement cursor for setting grades for a student group.
43. Use trigger for setting the grade for the student
44. Create a function to find the factorial of a number.
45. Implementation of embedded sql for finding the BONUS.
46. Design database and implement payroll processing
47. Design and implementation of banking system.
48. Design and implementation of library management system.
49. Create backup for database
50. How can you restore the database.

Course Contents and Lecture Schedule

No.	Topic	No. of Hours
1	**Module 1**	**12 hrs.**
1.1	Table Design- Using foreign key and Normalization	2
1.2	Practice SQL Data Definition Language(DDL) commands a) Table creation and alteration (include integrity constraints such as primary key, referential integrity constraints, check, unique and null constraints both column and table level b) Other database objects such as view, index, cluster, sequence, synonym etc.	10
2	**Module 2**	**12 hrs.**
2.1	Practice SQL Data Manipulation Language (DML) commands a) Row insertion, deletion and updating	12

	b) Retrieval of data i) Simple select query ii) Select with where options (include all relational and logical operators) iii) Functions: Numeric, Data, Character, Conversion and Group functions with having clause. iv) Set operators v) Sorting data vi) Sub query (returning single row, multiple rows, more than one column, correlated subquery) vii) Joining tables(single join, self-join, outerjoin)	
3	**Module 3**	**6 hrs.**
3.1	Practice Transaction Control Language (TCL) commands (Grant,revoke,commit and save point options)	6
4	**Module 4**	**6 hrs.**
4.1	Usage of triggers, functions and procedures using PL/SQL constructs	6
5	**Module 5**	**12 hrs.**
5.1	4 Development of sample applications using Oracleas Back End Sample applications may include i) Payroll Information System ii) Student Information System iii) Bank transaction iv) Library Information System etc.	10
5.2	How to take back up and restore using Oracle	2

20INMCA333	USER INTERFACE DESIGN LAB	CATEGORY	L	T	P	CREDIT
		GENERAL	0	0	4	1

Preamble: This course challenges the students how to make your pages dynamic based upon user interaction, interacting with HTML forms and store and retrieve information from local data sources which include a database.

Prerequisite: 20INMCA303 Introduction to PHP and MySQL

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

CO 1	Understand how server-side programming works on the web.
CO 2	Creating conditional structures, Storing data in arrays and strings
CO 3	Develop PHP Programs with functions
CO 4	Understanding POST and GET in form submission.
CO 5	Create a database in phpMyAdmin and develop a web application

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	2		3	3				
CO 2	3	3	3	2	2		3	3	1			
CO 3	3	3	3	2	2		3	3				
CO 4	3	3	3	2	2		3	3				2
CO 5	3	3	3	3	3		3	3			2	2

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)			
Understand(K2)			
Apply(K3)	10	10	10
Analyse(K4)	10	10	10
Evaluate(K5)	10	10	10
Create(K6)	20	20	20

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern

Attendance : 08 Marks
Continuous Assessment Test(2numbers) : 30 Marks
Assignment/Quiz/Course project : 12 Marks

End Semester Examination Pattern

Lab exam will be conducted by External examiner.

Course Level Assessment

Course Outcome 1 (C01):

1. Evaluate value of Z where Z= $(x^2 + y3)/24x$. (K5)
2. Develop a PHP program to swap the values without a third variable(K6)

Course Outcome 2 (C02):

1. Develop a menu driven program for performing to perform arithmetic operations a)Addition b)Subtraction c)Multiplication d),Division using Switch statement (K6)
2. Develop a PHP Program to find the largest element in an array (K6)

Course Outcome 3 (C03):

1. Develop a PHP program to include another file in PHP (K6)
2. Design a PHP program to find the factorial of a number. (K6)

Course Outcome 4 (C04):

1. Outline a registration form using PHP and do necessary validations.(K4)
2. Model a login and log out form having username and password and display the name in dashboard using Session. (K3)

Course Outcome 5 (C05):

1. Build a PHP program to implement database connectivity. (K6)
2. Generate a user profile (K6)

Syllabus

Server Side Scripting using PHP: Setting up the environment(Example-XAMPserver),PHP Programming basics – Print/echo, Variables and constants, Operators, Control structures and looping structures, Strings and Arrays, Functions, PHP include and require Statements,

Embedding PHP within HTML, Reading Data in Web Pages (GET and POST),Form Validation, Sessions , Establishing connectivity with database, Implement Web Application using PHP and Mysql, File upload.

Reference Books

1. Steven Holzner "The Complete Reference PHP,Mc Graw HillEducation
2. Steve Suehiring,Tim Converse and Joyce Park "PHP6 and MysqlBible",Wiley

Web Resources

1. https://www.javatpoint.com/php-programs
2. https://www.w3schools.com/php/php_mysql_connect.asp
3. https://www.tutorialspoint.com/php/create_mysql_database_using_php.htm

List of Lab Experiments

1. Read 3 integer values and find the largest among them.
2. Read a Natural Number and check whether the number is prime or not.
3. Read a Natural Number and check whether the number is Armstrong or not.
4. Read a Natural Number and find the reverse of the number
5. Read 2 integers values and swap the values without a third variable
6. Convert temperature from Fahrenheit to degree celcius.
7. Read a natural number and find the sum of digits
8. Develop a menu driven program for performing to perform arithmetic operations a)Addition b)Subtraction c)Multiplication d),Division using Switch statement
9. Find fibanocci series upto n
10. Find the largest and smallest element in an array
11. Develop a PHP program to display the odd and even numbers in a given set of numbers
12. Check the given matrix is symmetric or not
13. Find the length of a string using string function
14. Find the reverse of a string using string function
15. Read 2 integers values and swap the values using function
16. Find factorial of a number using function
17. Develop a PHP program to include PHP file in HTML.
18. Develop a registration form using PHP and do necessary validations (Name, Email,DOB,

Mobile number)

19. Develop a login and log out form having username and password and display the namein dashboard using Session.
20. Develop a PHP program to implement database connectivity.
21. Using PHP and MySQL, develop a program to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and Perform following Operations a)Insert the records b)Update the records d)delete the record d)search for a book with the title specified by the user e) display the search results with proper headings.
22. Using PHP and MySQL, develop a User profile to accept Name, Profile Picture, Address and Phone number from a web page and store the information in a database and display it in neat format

Course Contents and Lecture Schedule

No.	**Topic**	**No. of Hours**
1	**Module 1**	**6 hrs.**
1.1	Setting up the environment	2
1.2	PHP Programming basics	4
2	**Module 2**	**12 hrs.**
2.1	Control structures and looping structures	6
2.2	Arrays and String	6
3	**Module 3**	**6 hrs.**
3.1	Functions	3
3.2	PHP include and require Statements	3
4	**Module 4**	**12 hrs.**
4.1	Embedding PHP within HTML	3
4.2	Reading Data in Web Pages(GET and POST)	3
4.3	Form validation	3
4.4	Sessions	3
5	**Module 5**	**12 hrs.**
5.1	Establishing connectivity with database.	4
5.2	Implement Web application using PHP and Mysql	4
5.3	File Upload	4

SEMESTER VI

INT MCA SEMESTER VI	
Course No	**Course**
20INMCA302	Introduction to Software Engineering
20INMCA304	Fundamentals of Data Science
20INMCA306	Visual Programming
20INMCA308	Design & Analysis of Algorithms
20INMCA310	Mini Project 1
20INMCA332	Open Source Platforms - Lab
20INMCA334	Visual Programming Lab

20INMCA302	INTRODUCTION TO SOFTWARE ENGINEERING	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course introduces students to the basic theory of software engineering, and to the applications of these basic theoretical principles to a software development project.

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

CO 1	Understand the different development practices and its advantages
CO 2	Understand the different process models and choose the best model for their project
CO 3	Understand and meet ethical standards and legal responsibilities.
CO 4	Work as an effective member or leader of software engineering teams.
CO 5	Understand the environment and work culture in a software organization

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1			2		3		1	3	2	1	3	1
CO 2			2		3		1	3	2	1	3	1
CO 3			2		3		1	3	2	1	3	1
CO 4			2		3		1	3	2	1	3	1
CO 5			2		3		1	3	2	1	3	1

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	5	5	6
Understand(K2)	10	10	15
Apply(K3)	20	20	18
Analyse(K4)	10	10	15
Evaluate(K5)	5	5	6
Create(K6)			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

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

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. Summarize the various approaches for "Recording" the Requirements. (K2)
2. The high-level design should sketch out all the application's security needs. Evaluate the methods by which we can ensure security for our application (K5)
3. Imagine you are in a project team and the Team Leader asked you to sketch out an UML diagram for a particular scenario so that the diagram should focus on a sequence of messages. Which will be the best UML diagram you can draw in this particular scenario? Justify your answer with an example. (K5)

Course Outcome 2 (CO2):

1. Compare the waterfall with feedback model with the sashimi model? (K5)
2. The waterfall model and the prototyping model can be accommodated in the Spiral process model. Justify (K5)
3. Demonstrate any one project size estimation technique and its effort calculation using COCOMO with example. (K3)

Course Outcome 3(CO3):

1. Illustrate agile process? List out its characteristics. (K4)
2. Justify the importance of pair programming?(2) (K5)
3. Illustrate Refactoring? Justify its importance. List out different Refactoring techniques.(K4)

Course Outcome 4 (CO4):

1. Describe the characteristics of user stories. (K1)
2. Explain Scrum framework. (K1)
3. Illustrate the various tools for Agile project management. (K4)

Course Outcome 5 (CO5):

1. Demonstrate the importance of CI/CD (K3)
2. DevOps is a set of practices that works to automate and integrate the processes between software development and IT teams. Justify. (K5)
3. State the benefits of release monitoring (K4)

Syllabus

Module 1 (Introduction to Software Engineering)

What is Software Engineering - Why is software engineering important, Details around requirements gathering, Software design, Development, Testing, Deployment, Maintenance. Planning phase – project planning objective, software scope, empirical estimation, models, COCOMO, staffing and personal planning.

Module 2 (Software Engineering models)

Predictive software engineering models and its application - Model Approaches – Prerequisites - predictive and adaptive waterfall - waterfall with feedback - Sashimi - incremental waterfall - V model–System development lifecycle- IterativevsPredictive–prototypes-Spiral- unified process- Clean room - Rapid Application development principles – risk management.

Module 3 (Fundamentals of Agile Development)

Introduction to agility, Agile Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management. Design and development practices in Agile projects,Test Driven Development,PairProgramming,Simple Design, User Stories, Agile Testing, Agile Tools - Agile design practices- Refactoring, Need and significance of Refactoring, Refactoring Techniques.

The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), JUnit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester.

Module 4 (Scrum Framework)

Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective Daily scrum, Scrum roles - Product Owner, Scrum Master, Scrum Team, Scrum case study

Module 5 (Industry Trends)

Introduction to DevOps- A unified process between development and operations-Continuous Integration (CI), continuous testing, and continuous deployment - Configuration management, release management, and monitoring and learning.

Text Books

1. Rod Stephens, "Beginning Software Engineering", Wrox Series, Wiley India Pvt Ltd, (2015).

Reference Books

1. Alistair Cockburn, "Agile Software Development: The Cooperative Game",Addison Wesley, 2nd Edition(2006).
2. Andrew Hunt, David Thomas, "The Pragmatic Programmer: From Journeymanto Master", Pearson India, 1st Edition(2008).
3. Ken Schwaber, Mike Beedle, "Agile Software Development with Scrum", Pearson (2008).
4. Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide for Testers andAgile Teams", Addison Wesley Professional, 1st Edition(2008).
5. Mike Cohn, "User Stories Applied: For Agile Software Development", Addison Wesley, 1st Edition,(2004).
6. Pressman, R.S., "Software Engineering: A Practitioner's Approach", McGraw Hill SE, 7th
Edition, (2010).
7. Robert C. Martin, "Agile Software Development, Principles, Patterns andPractices", Prentice Hall Imprint, Pearson Education, 2nd Edition(2002).
8. Rod Stephens, "Beginning Software Engineering", Wrox Series, Wiley India Pvt Ltd (2015).
9. RyPress "Ry's Git Tutorial" (Freee-book)
10. Jennifer Davis & Katherine Daniels, Effective DevOps Building a Culture of Collaboration, Affinity, and Tooling at Scale, O'Reilly Media, Inc, FirstEdition,2016
11. Gene Kim, Jez Humble, Patrick Debois, John Willis," The DevOps Handbook How to create world-class agility, reliability and security in technology organizations", IT Revolution press, First Edition,2016

Web Resources

Introduction to DevOps

1. https://www.edx.org/course/introduction-to-devops-transforming-and-improving
2. https://courses.edx.org/courses/course-v1:Microsoft+DEV212x+4T2017/course/)
3. https://guides.github.com/introduction/git-handbook/

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	**9 hrs.**
1.1	What is Software Engineering - Why is software engineering important	1
1.2	Details around requirements gathering	2
1.3	Software design	1
1.4	Development, Testing	1
1.5	Deployment, Maintenance	1
1.6	Planning phase – project planning objective, software scope	1
1.7	Empirical estimation, models, COCOMO	1
1.8	Staffing and personal planning	1
2	Module 2	10 hrs.
2.1	Predictive software engineering models and its application	1
2.2	Model Approaches – Prerequisites - predictive and adaptive waterfall	2
2.3	Waterfall with feedback	1
2.4	Sashimi - incremental waterfall - V model	1
2.5	System development life cycle - Iterative vs Predictive – prototypes	1
2.6	Spiral - unified process	2
2.7	Cleanroom - Rapid Application development principles – risk management.	2
3	Module 3	8 hrs.
3.1	Introduction to agility, Agile Principles	1
3.2	Extreme Programming, FeatureDriven development, Lean Software	2
3.3	Design and development practices in Agile projects, Test Driven Development,	1
3.4	Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing,	
3.5	The Agile lifecycle and its impact on testing, Test-Driven Development (TDD),	
3.6	Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools	1
4	Module 4	10 hrs.
4.1	Introduction to Scrum, Project phases	1
4.2	Agile Estimation, Planning game	1
4.3	Product backlog, Sprint backlog, Iteration planning	1

4.4	User story definition, Characteristics and content of user stories, Acceptance tests	2
4.5	Project velocity, Burn down chart	1
4.6	Sprint planning and retrospective Daily scrum, Scrum roles - Product Owner,	2
4.7	Scrum case study	1
4.8	Tools for Agile project management.	1
5	Module 5	11 hrs.
5.1	Introduction to DevOps, A unified process between development and operations	2
5.2	Continuous Integration (CI), continuous testing	2
5.3	Continuous deployment	1
5.4	Configuration management	2
5.5	release management	2
5.6	monitoring and learning	2

20INMCA304	FUNDAMENTALS OF DATA SCIENCE	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course helps the students to learn, understand, and practice the basic concepts and techniques of data science. The students will be able to develop skills for implementing data science concepts for solving practical problems.

Prerequisite:

20INMCA107 Introduction to Computers & PC hardware

20INMCA305 Introduction to RDBMS and SQL

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

CO 1	Understand the fundamental concepts of data science
CO 2	Understand the storage concepts and technologies for data
CO 3	Understand data analysis techniques for applications handling large data
CO 4	Understand Apache Hadoop Framework
CO 5	Understand processing environments and applications of big data

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO 1	3	2	3	2		3				3	3	3
CO 2	3	2	3	3	2					3		3
CO 3	3	2	3	2	3	1				2		3
CO 4	3	2	3	2	3	1				2		3
CO 5	3	2	3	2	3	1				2		3

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10	10	12
Understand(K2)	12	12	12
Apply(K3)	8	8	10
Analyse(K4)	8	8	10
Evaluate(K5)	6	6	10
Create(K6)	6	6	6

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 8 marks
Continuous Assessment Test(2numbers) : 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 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 6marks

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Classify the different types of data handled in bigdata processing? (K2)
2. Illustrate classification with an example (K4)

Course Outcome 2 (CO2):

1. Compare sharding and replication (K2)
2. Summarise the concepts of NoSQL databases and New SQLDatabases. (K2)

Course Outcome 3(CO3):

1. Illustrate the steps involved in Data Analytics lifecycle (K4)

2. Illustrate qualitative Analysis techniques with example (K4)

Course Outcome 4 (CO4):

1. Sketch HDFS with a suitable diagram (K3)
2. Compare qualitative and quantitative analysis with suitable examples. (K2)

Course Outcome 5 (CO5):

1. Illustrate the role of data management layer in processing data (K4)

2. Illustrate the applications of bigdata (K4)

Syllabus

Module- I

Introduction to Big Data Platform–History of Data Management-Structuring Bigdata-Elements of Big Data, Big data Analytics

Introduction to Data Mining: Data Mining Process, Data Mining Techniques - Clustering - Classification - Regression - Outlier detection - Association rules - Prediction, Big Data Vs Data Mining

Module -II

Big Data Storage Concepts: Clusters - File Systems and Distributed File Systems- Sharding – Replication – CAP Theorem – ACID – BASE

Big Data Storage Technology : On-Disk Storage Devices – Distributed File Systems- RDBMS Databases-NoSQL Databases-NewSQL Databases , In-Memory Storage Devices: In-Memory Data Grids, In-Memory Databases

Module-III

Data Analytics Life Cycle**:** discovery- data preparation-model planning- model building-communicate results-Operationalize

Introduction to Big Data Analysis Techniques- Need for Analysis - Types of Analysis - Quantitative Analysis – Qualitative Analysis – Data Mining - Statistical Analysis – Machine Learning – Semantic Analysis – Visual Analysis

Module-IV

Data Analytics Tools: Introduction to Hadoop Ecosystem- Hadoop Distributed File System- HDFS Architecture-Features of HDFS-Map Reduce-Features of Map Reduce- Hadoop Yarn- HBase- Hive – Sqoop – ZooKeeper – Flume –Oozie.

Module-V

Understanding Big Data Technologies: Data Source Layer, Ingestion layer, Storage Layer, Physical Infrastructure Layer, Platform Management Layer , Security Layer, Monitoring Layer, Analytics Engine, Visualization Layer, Big Data Applications

Text Books

1. DreamTech Editorial Services, “Big Data Black Book”, Dreamtech Press, 2015Edition.
2. Thomas Erl ,”Big Data Fundamentals Concepts, Drivers and Techniques”, Pearson Education FirstEdition,2016
3. Data Science and Big Data Analytics, EMC Education Services, WileyPublications
4. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber, Morgan Kaufmann publications

Reference Books

1. Chandrakant Naikodi, “Managing Big Data”, Vikas Publishing, 2015

MOOC

1. https://www.coursera.org/specializations/jhu-data-science
2. https://www.tutorialspoint.com/hadoop/hadoop_big_data_overview.htm

Web Resources

1. https://www.udacity.com/course/intro-to-data-science--ud359

Course Contents and Lecture Schedule

Topic	No. of lectures
Module 1	**8 hrs.**
Introduction to Big Data Platform – History of Data Management-Structuring Big data -	2
Elements of Big Data, Big data Analytics	2
Introduction to Data Mining: Data Mining Process, Data Mining Techniques - Clustering - Classification - Regression -	2
Outlier detection - Association rules - Prediction ,Big Data Vs Data Mining	2
Module 2	**12 hrs**
BigData Storage Concepts: Clusters - File Systems and Distributed File Systems- Sharding	3
Replication – CAP Theorem – ACID – BASE	3
Big Data Storage Technology: On-Disk Storage Devices – Distributed File Systems	3
RDBMS Databases-NoSQL Databases-NewSQL Databases In-Memory Storage Devices: In-Memory Data Grids, In-Memory Databases	3
Module 3	**10 hrs**
Data Analytics Life Cycle: discovery- data preparation-model planning-model building- communicate results-Operationalize	3
Introduction to Big Data Analysis Techniques- Need for Analysis - Types of Analysis - Quantitative Analysis	3
Qualitative Analysis – DataMining- Statistical Analysis–Machine Learning – Semantic Analysis – VisualAnalysis	4
Module 4	**10 hrs**

Data Analytics Tools: Introduction to Hadoop Ecosystem - Hadoop Distributed File System-HDFS Architecture	3
Features of HDFS - Map Reduce- Features of Map Reduce- Hadoop Yarn	4
HBase- Hive – Sqoop – ZooKeeper – Flume – Oozie.	3
Module 5	**8 hrs**
Understanding Big Data Technologies: Data Source Layer, Ingestion layer, Storage Layer, Physical Infrastructure Layer	4
Platform Management Layer , Security Layer,Monitoring Layer, Analytics Engine, Visualization Layer, Big Data Applications	4

20INMCA306	VISUAL PROGRAMMING	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course provides a solid theoretical foundation that furnishes the student about the visual programming concepts using .NET library, and to enable them to design and code visual programs.

Prerequisite: 20INMCA303 User Interface Design

Course Outcomes: After the completion of the course, the student will be able to

CO 1	Explain the advantages of .NET technology, architecture and common run time environments
CO 2	Analyse and evaluate the use of various datatypes and access specifiers
CO 3	Understand and analyse various operators, control structures, functions for determining and performing different operations
CO 4	Examine various windows forms and controls
CO 5	Examine menu applications and evaluate ADO.NET

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1						3	2					
CO 2	1	2	2									
CO 3				2					2			
CO 4					2			1				
CO 5					3					1	1	1

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10	10	10
Understand(K2)	10	10	15
Apply(K3)	5	5	10
Analyse(K4)	10	10	10
Evaluate(K5)	10	10	10
Create(K6)	5	5	5

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

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

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 6marks.

Course Level Assessment Questions
Course Outcome 1 (CO1):
Que 1. Explain the components of .NET architecture (K2)
Que 2. Describe memory management in detail. (K2)
Que 3. Summarize the execution process in .NET (K5)

Course Outcome 2 (CO2)

Que 1. Evaluate various access control mechanisms in VB (K5)
Que 2. Summarize various datatypes in VB (K5)
Que 3. Examine the various scope of a variable (K3).

Course Outcome 3 (CO3):

Que 1. Illustrate various loop statements with proper examples (K4)
Que 2. Summarize various operators in VB (K5)
Que 3. Illustrate parameter passing mechanisms with proper examples (K4)

Course Outcome 4 (CO4):

Que 1. With a proper diagram, explain the MDI form creation steps (K2)
Que 2. Differentiate between list box and check box. (K2)
Que 3. Illustrate various properties and methods of radio button with example (K4)

Course Outcome 5 (CO5):

Que 1. Describe the generic procedure of creating a menu (K2)
Que 2. Compare between command and connection object providers (K5)
Que 3. Differentiate between data row and data column (K2)

Syllabus

Module I

Introduction to .NET Framework and Development Environment-Evolution of .NET, Introduction to .NET, Advantages of .NET Framework, Versions, Supported Applications, Architecture –Introduction and Components-CLR, Common Type System, Class Libraries. Namespaces, Assemblies, Execution Process, Memory Management, Object Oriented Features-Class, Objects, Abstraction, Encapsulation, Inheritance, Polymorphism. Code Access Security model, Exception handling.

VisualStudio.NET integrated development, Elements of IDE,Project templates,Writing a simple application using .NET, Visual Basic terms.

Module II

Data Types-Number, Character, Other, Default values of data types. Variables-Constants, Identifiers. Scope of the variables-Block Scope, Procedure scope, module, namespace scope, shadowing. Access control-public, private, protected, friend.

Module III

Operators: Arithmetic, Comparison, Assignment, Logical, Concatenation, Operator Precedence. **Control Structures**: Decision making, looping, other statements. **Arrays**-Static and Dynamic. Arrays and functions. **Procedures and functions**-sub procedures, function procedures, event procedures. Parameter passing -pass by value, pass by reference, optional arguments, named arguments. Predefined functions- Msgbox functions, Input box functions, other functions.

Module IV

WindowsFormsandcontrols,MenusandDialog-Boxes,Files-IntroductiontoWindowsForms, Windows Forms-Properties and Methods, Events, MDIForms.

Controls-Common properties and methods. Label, Text Box, Link Label, Button, Radio Button, Checkbox, List Box, Combo Box, Picture Box, Timer Control.

Module V

Menus-Basic elements of Menu, Generic procedure of creating menu, creating a simple menu application, modifying the existing menu, assigning and removing shortcut keys.

Evolution of ADO.NET, Features, ADO v/s ADO.NET. Overview of Data provider, provider objects - Connection, Command, Data adapter, Data Reader. Overview of Dataset-Types,Dataset object model-Data table, Data row and Data Column, DataRelations.

Reference Books

1. C. Komalavalli, Sanjib K Sahu, “Essentials of .Net Programming Theory and Application”, Ane Books Pvt. Ltd,2016.

2. Clayton E. Crooks, “Learning Visual Basic .NET Through Applications”, FirstEdition, Hingham, Mass: Charles River Media,C2003.

3. Shirish Chavan, “Visual Basic .NET”, First Edition, Pearson Educations,2004.

4. Steven Holzner, “Visual Basic .NET Programming. Black Book”, New Edition,Dreamtech Press,2005.

MOOC Courses

- https://www.udemy.com/course/introtovb/

Web Resources

- http://www.nptelvideos.com/visualbasic_net/visualbasicnet_video_tutorials.php
- http://www.vtc.com/products/Microsoft-Visual-Basic-for-Applications-(VBA)-Tutorials.htm

Course Contents and Lecture Schedule

	Topic	No. of lectures
1	**Module 1**	**10 hrs.**
1.1	Introduction to .NET Framework and Development Environment-Evolution of .NET, Introduction to .NET	1
1.2	Advantages of .NET Framework, Versions, Supported Applications	1
1.3	Architecture –Introduction and Components-CLR, Common Type System, Class Libraries	1
1.4	Namespaces, Assemblies, Execution Process	1
1.5	Memory Management, Object Oriented Features-Class, Objects, Abstraction, Encapsulation, Inheritance, Polymorphism	1
1.6	Code Access Security model, Exception handling. Visual Studio .NET integrated development	2
1.7	Visual Studio .NET integrated development, Elements of IDE, Project templates,	2
1.8	Writing a simple application using .NET, Visual Basic terms	1
2	**Module 2**	**8 hrs.**
2.1	Data Types-Number, Character, Other, Default values of data types	2

2.2	Variables-Constants, Identifiers	2
2.3	Scope of the variables-Block Scope, Procedure scope, module, namespace scope, shadowing.	2
2.4	Access control-public, private, protected, friend	2
3	**Module 3**	**10 hrs.**
3.1	Operators: Arithmetic, Comparison, Assignment, Logical, Concatenation, Operator Precedence	1
3.2	Control Structures-Decision making, looping, other statements	1
3.3	Arrays-Static and Dynamic. Arrays and functions	2
3.4	Procedures and functions-sub procedures, function procedures, event procedures	2
3.5	Parameter passing -pass by value, pass by reference, optional arguments, named arguments	2
3.6	Predefined functions- Msgbox functions, Input box functions, other functions	2
4	**Module 4**	**11 hrs.**
4.1	Introduction to Windows Forms	1
4.2	Windows Forms-Properties and Methods, Events	2
4.3	MDI Forms	1
4.4	Controls-Common properties and methods. Label, Text Box, Link Label, Button	2
4.5	Radio Button, Checkbox, List Box, Combo Box	2
4.6	Picture Box	1
4.7	Timer Control	2
5	**Module 5**	**9 hrs.**
5.1	Menus-Basic elements of Menu, Generic procedure of creating menu	1
5.2	Creating a simple menu application	1
5.3	Modifying the existing menu	1
5.4	Modifying the existing menu, assigning and removing shortcut keys	2
5.5	Evolution of ADO.NET	2
5.6	Overview of Data provider and data set	2

20INMCA308	DESIGN AND ANALYSIS OF ALGORITHMS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: The syllabus is prepared with the view of equipping the MCA Graduates with the techniques for effective problem solving in computing.. The course content is decided to cover the fundamentals of Design and Analysis of Algorithm which can be taught within the given slots in the curriculum.

Prerequisite: 20INMCA105-Introduction to Programming, 20INMCA108-Problem Solving and Structured Programming, 20INMCA209-Data Structures

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

CO 1	Implement design principles and analyze the asymptotic performance of algorithms.
CO 2	Derive and solve recurrences describing the performance of divide-and-conquer algorithms and greedy algorithms
CO 3	Synthesize dynamic-programming algorithms, and analyze them
CO 4	Explore various algorithm design instances like back tracking, Branch & Bound in solving common analytical problems.
CO 5	Infer basic computational concepts and the complexity classes P, NP, and NP-Complete.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	3									1
CO 2	2	3		2	2		1		1			
CO 3		3	2	2	1							
CO 4	3	2	3	2	1	1	1	1		2		
CO 5	3	3	3	2	1	1	1			1	1	1

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination
	1	2	
Remember(K1)	10	10	15
Understand(K2)	10	10	10
Apply(K3)	5	5	5
Analyse(K4)	10	10	10
Evaluate(K5)	5	5	10
Create(K6)	10	10	10

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

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

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 6marks

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Compare Priori and Posteriori analysis of algorithms(K5)
2. Illustrate the Properties of Algorithms(K3)
3. State master's theorem. Formulate T (n) = 4T (n/2) + n^2 using Master's theorem.(K3)

Course Outcome 2 (CO2):

1. Describe the Control Abstraction for Divide and Conquer(K2)
2. Illustrate merge sort algorithm with proper code sequence(K5)
3. Illustrate Binary Search Algorithm

Derive 31 from the given array using Divide and Conquer Strategy (K6)

10	14	19	26	27	31	33	35	42	44

Course Outcome 3(CO3):

1. Compare Divide and Conquer Method and Dynamic Programming(K5)
2. Compose an algorithm to find the shortest path in a weighted graph(K6)
3. Outline Principle of Optimality(K4)

Course Outcome 4 (CO4):

1. Define the Sum of Subsets Problem with suitable example(K1)
2. Illustrate the control abstraction of Backtracking(K4)
3. Summarize Least Cost (LC) Search with suitable example(K5)

Course Outcome 5 (CO5):

1. Explain non-deterministic algorithm(K2)
2. Compare Tractable and Intractable Problems(K5)
3. With the help of suitable code sequence convince Clique problem is an example of NP-Complete Problem(K5)

Syllabus

Module 1

Introduction to Algorithm Analysis: Definition of Algorithms, Properties of Algorithms , Types of Algorithm's Analysis- Priori and Posteriori analysis of algorithms ,Time and Space Complexity- Elementary Operation and Complexity Estimation of Simple Algorithms - Asymptotic notations - Recurrence Relations - Solution of Recurrence Relations - Iterative Method - Recurrence Tree Method
- Master Theorem (Proof not required)

Module 2

Divide and Conquer Method: Control Abstraction for Divide and Conquer, Binary Search, Merge Sort, Quick sort, Finding Maximum and minimum

Greedy Strategy: - Control Abstraction for Greedy Strategy, The Knapsack Problem, Minimum cost spanning Trees- Prims' and Kruskal's Algorithms, Job Sequencing Problem

Module 3

Dynamic Programming: -Characteristics of Dynamic Programming ,Divide and Conquer Vs Dynamic Programming, The Principle of Optimality- All Pair Shortest Path Problem-Travelling Sales Person Problem,

Module 4

Backtracking: Control Abstraction for Backtracking - The NQueen's Problem, Sum of Subsets Problem.

Branch and Bound: Least Cost (LC) Search - Control Abstraction ,The 15 Puzzle Problem

Module 5

Introduction to Computational Complexity: Tractable and Intractable Problems.

NP-Hard and NP -complete problems - Basic concepts, non-deterministic algorithm, class of NP- hard and NP-complete. Study of NP complete problems-Knapsack Problem-CliqueProblem,Vertex Cover Problem.

Text Books

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Orient Longman, Universities Press, 2nd Edition(2008)

2. Rajesh K.Shukla, "Analysis and Design of Algorithms, A Beginner's Approach", Wiley (2015)

3. Dr. R Vijayakumar, Dr.Juby Mathew, "Algorithm Design, Foundation, Analysis and Examples", Vimala Books and Publications,Ist Edition(2016)

MOOC

1.http://www.nptelvideos.com/course.php?id=4052.https://onlinecourses.nptel.ac.in/noc19_cs47/preview

Web Resources

1. https://www.javatpoint.com/daa-tutorial
2.https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	**8 hrs.**
1.1	Introduction, Definition of Algorithms, Properties of Algorithms , Types of Algorithm's Analysis- Priori and Posteriori analysis of algorithms	1
1.2	Space Complexity	1
1.3	Time Complexity and Complexity Estimation of Simple Algorithms	2
1.4	Asymptotic notations	1
1.5	Solution of Recurrence Relations - Iterative Method	1
1.6	Solution of Recurrence Relations - Recurrence Tree Method	1
1.7	Solution of Recurrence Relations -Master Theorem	1
2	**Module 2**	**15 hrs.**
2.1	**Divide and Conquer Method:** Introduction, Control Abstraction for Divide and Conquer	1
2.2	Binary Search	1

2.3	Merge sort	2
2.4	Quick sort	2
2.5	Finding Maximum and minimum	2
2.6	Control Abstraction for Greedy Strategy,The Knapsack Problem	1
2.7	Prims' Algorithm	2
2.8	Kruskal's Algorithm	2
2.9	Job Sequencing Problem	2
3	**Module 3**	**7 hrs.**
3.1	Introduction to Dynamic Programming,Divide and Conquer Vs Dynamic Programming.	2
3.2	The Principle of Optimality	1
3.3	All Pair Shortest Path Problem	2
3.4	Travelling Sales Person Problem,	2
4	**Module 4**	**10 hrs.**
4.1	Control Abstraction for Backtracking	1
4.2	The NQueen's Problem	2
4.3	Sum of Subsets Problem.	2
4.4	Least Cost (LC) Search - Control Abstraction ,	3
4.5	The 15 Puzzle Problem	2
5	**Module 5**	**8 hrs.**
5.1	Introduction to Computational Complexity: Tractable and Intractable Problems.	1
5.2	NP-Hard and NP -complete problems - Basic concepts, non-deterministic algorithm	1
5.3	class of NP- hard and NP- complete.	2
5.4	Study of NP complete problems - Knapsack Problem	1
5.5	Study of NP complete problems -Clique Problem	1
5.6	Study of NP complete problems - Vertex Cover Problem.	2

20INMCA310	MINI PROJECT 1	CATEGORY	L	T	P	CREDIT
		GENERAL	0	0	4	2

Preamble: The mini project is designed to develop practical ability and knowledge about tools/techniques in order to solve the actual problems related to the industry, academic institutions or similar areas.

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

CO 1	Practice acquired knowledge within the chosen area of technology for project
CO 2	Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
CO 3	Reproduce, improve and refine technical aspects for engineering projects.
CO 4	Work as an individual or in a team in development of technical projects.
CO 5	Communicate and report effectively project related activities and findings

Mapping of course outcomes with program outcomes

	PO	**PO 2**	**PO 3**	**PO 4**	**PO**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO**
CO	2		3	3	2		3	3			3	2
CO	2		3	3	2		3	3			3	2
CO	2		3	3	2		3	3			3	2
CO	2		3	3	2		3	3			3	2
CO	2		3	3	2		3	3			3	2

Syllabus

Students can take up any application level/system level experimental design/implementation tasks of relatively minor intensity and scope as compared to the major-project, pertaining to a relevant domain of study. Projects can be chosen either from the list provided by the faculty or in the field of interest of the student.

At the end of each phase, presentation and demonstration of the project should be conducted, which will be evaluated by a panel of examiners.

A detailed project report duly approved by the guide in the prescribed format should be submitted by the student for final evaluation.

Students as individual or a team of maximum 4 members may been trusted with providing solution to similar problems

Mini project will give an opportunity for the students to prepare for the main project and to achieve some of the objectives of the main project. This can also be used as an opportunity for producing and distributing socially useful softwares.

Internal Continuous Assessment (100 marks)

10% (10) - Project Synopsis / Proposal Evaluation

20% (20) - 1st Interim Project Evaluation

20% (20) - 2nd Interim Project Evaluation

50% (50) - End Semester Internal Project & Project Report Evaluation and Evaluation by Guide

Project Evaluation Rubrics

Review #	Agenda	Assessment	Review Assessment Weightage
Review 1	Project Synopsis / Proposal Evaluation	Rubric R1	10% (10)
Review 2	1st Interim Project Evaluation	Rubric R2	20% (20)
Review 3	2nd Interim Project Evaluation	Rubric R3	20% (20)
Review 4	End Semester Internal Project & Project Report Evaluation and Evaluation by Guide	Rubric R4, R5 & R6	50% (50)
Total			100% (100)

Sample Rubrics that can be followed for Internal Project Evaluation

Rubric #R1: Project Synopsis/Proposal Evaluation
Maximum Marks*: 10
Level of Achievement

		Excellent (10)	Good (8)	Average (6)	Poor (4)	Score
a	**Identification of Problem Domain and Detailed analysis of Feasibility, Objectives and Methodology of Project Proposal**	Detailed and extensive explanation of the purpose and need of the project All objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are clearly specified Detailed and extensive explanation of the specifications and the limitations of the existing systems	Good explanation of the purpose and need of the project Collects a great deal of information and good study of the existing systems; Good justification to the objectives; Methodology to be followed is specified but detailing is not done	Average explanation of the purpose and need of the project; Moderate study of the existing systems; collects some basic information Incomplete justification to the objectives proposed; Steps are mentioned but unclear; without justification to objectives	Moderate explanation of the purpose and need of the project Explanation of the specifications and the limitations of the existing systems not very satisfactory; limited information Only Some objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are not specified properly	

Rubric #R2: 1st Interim Project Evaluation						
Maximum Marks*: 20						
Level of Achievement						
		Excellent (20)	**Good (16)**	**Average (12)**	**Poor (8)**	**Score**
a	**Design Methodology**	Division of problem into modules and	Division of problem into modules and good	Division of problem into modules but	Partial division of problem into modules and	

		good selection of computing framework Appropriate design methodology and properly justification	selection of computing framework Design methodology not properly justified	inappropriate selection of computing Framework Design methodology not defined properly	inappropriate selection of computing framework Design methodology not defined properly	
b	**Planning of Project Work**	Time frame properly specified and being followed	Time frame properly specified but being followed partly	Time frame properly specified, but not being Followed	Time frame not properly specified	
c	**Demonstration and Presentation**	Objectives achieved as per time frame Contents of presentations are appropriate and well arranged Proper eye contact with audience and clear voice with good spoken language	Objectives achieved as per time frame Contents of presentations are appropriate but not well arranged Satisfactory demonstration, clear voice with good spoken language but eye contact not proper	Objectives achieved as per time frame Contents of presentations are appropriate but not well Arranged Eye contact with few people and unclear Voice	Objectives not achieved as per time frame Contents of presentations are not appropriate Demonstration not satisfactory	
TOTAL MARKS= (a+b+c)/3						

Rubric #R3: 2nd Interim Project Evaluation
Maximum Marks*: 20
Level of Achievement

		Excellent (20)	Good (16)	Average (12)	Poor (8)	Score
a	**Incorporation of Suggestions**	Changes are made as per modifications suggested during Interim evaluation and new innovations added	Changes are made as per modifications suggested during Interim evaluation and good justification	All major changes are made as per modifications suggested during Interim evaluation	Suggestions during Interim evaluation are not incorporated	
b	**Project Demonstration**	All defined objectives are achieved Each module working well and properly demonstrated All modules of project are well integrated and system working is accurate	All defined objectives are achieved Each module working well and properly demonstrated Integration of all modules not done and system working is not very satisfactory	All defined objectives are achieved Modules are working well in isolation and properly demonstrated Modules of project are not properly integrated	Only some of the defined objectives are achieved Modules are not in proper working form that further leads to failure of integrated system	
c	**Presentation**	Contents of presentations are appropriate and well delivered Proper eye contact with audience and clear voice with good spoken language	Contents of presentations are appropriate and well delivered Clear voice with good spoken language but less eye contact with audience	Contents of presentations are appropriate but not well delivered Eye contact with only few people and unclear voice	Contents of presentations are not appropriate and not well delivered Poor eye contact with audience and unclear voice	

TOTAL MARKS= (a+b+c)/3

Rubric #R4: End Semester Internal Project Evaluation						
Maximum Marks*: 20						
Level of Achievement						
		Excellent (20)	**Good (16)**	**Average (12)**	**Poor (8)**	**Score**
a	**Incorporation of Suggestions**	Changes are made as per modifications suggested during Interim evaluation and new innovations added	Changes are made as per modifications suggested during Interim evaluation and good justification	All major changes are made as per modifications suggested during Interim evaluation	Suggestions during Interim evaluation are not incorporated	
b	**Project Demonstration**	All defined objectives are achieved Each module working well and properly demonstrated All modules of project are well integrated and system working is accurate	All defined objectives are achieved system working is not very satisfactory Eachmodule working well and properly demonstrated Integration of all modules not done and	All defined objectives are achieved Modules are working well in isolation and properly demonstrated Modules of project are not properly integrated	Only some of the defined objectives are achieved Modules are not in proper working form that further leads to failure of integrated system	
c	**Presentation**	Contents of presentations are	Contents of presentations are	Contents of presentations are	Contents of presentations are not	

		appropriate and well delivered Proper eye contact with audience and clear voice with good spoken language	appropriate and well delivered Clear voice with good spoken language but less eye contact with audience	appropriate but not well delivered Eye contact with only few people and unclear voice	appropriate and not well delivered Poor eye contact with audience and unclear voice	
						TOTAL MARKS= (a+b+c)/3

Rubric #R5: Project Report Evaluation						
Maximum Marks*: 20						
Level of Achievement						
		Excellent (20)	**Good (16)**	**Average (12)**	**Poor (8)**	**Score**
a	**Project Report**	Project report is according to the specified format References and citations are appropriate and well mentioned	Project report is according to the specified format References and citations are appropriate but not mentioned well	Project report is according to the specified format but some mistakes In-sufficient references and citations	Project report not prepared according to the specified format Referencesand citations are notappropriate	

b	**Description of Concepts and Technical Details**	Complete explanation of the key concepts and strong description of the technical requirements of the project	Complete explanation of the key concepts but in-sufficient description of the technical requirements of the project	Incomplete explanation of the key concepts and in-sufficient description of the technical requirements of the project	Inappropriate explanation of the key concepts and poor description of the technical requirements of the project	
c	**Conclusion and Discussion**	Results are presented in very appropriate manner Project work is well summarized and concluded Future extensions in the project are well specified	Results are presented in good manner Project work summary and conclusion not very appropriate Future extensions in the project are specified	Results presented are not much satisfactory Project work summary and conclusion not very appropriate Future extensions in the project are not specified	Results are not presented properly Project work is not summarized and concluded Future extensions in the project are not specified	
					TOTAL MARKS= (a+b+c)/3	

Rubric #R6: Evaluation by Guide						
Maximum Marks*: 10						
Level of Achievement						
		Excellent (4)	**Good (3)**	**Average (2)**	**Poor (1)**	**Score**

a	**Technical Knowledge and Awareness related to the Project**	Extensive knowledge and awareness related to the project	Fair knowledge and awareness related to the project	Lacks sufficient knowledge and Awareness	Poor knowledge and no awareness related to project	
Level of Achievement						
		Excellent (6)	**Good (5)**	**Average (3)**	**Poor (1)**	**Score**
b	**Regularity and Attendance**	Reports to the guide regularly and consistent in work	Reports to the guide very often but not very consistent	Reports to the guide but lacks Consistency	Irregular and inconsistent in work	
						TOTAL MARKS= a+b

20INMCA332	OPEN SOURCE PLATFORMS LAB	CATEGORY	L	T	P	CREDIT
		GENERAL	0	1	4	1

Preamble: This course aims to give a basic understanding of open source platforms to the students, along with various technologies in practice.

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

CO 1	Have a good understanding of Open Source Community and Develop open source Software Projects using Python
CO 2	Participate in developing Open Source Projects using Python
CO 3	Have an understanding of intellectual property rights, open source licensing, and the implications of using open source tools in developing web-enabled software like Word Press and Drupal
CO 4	Develop Shell Programs for system administration
CO 5	Have an understanding of open source software tools GitHub

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	2	1	1				3	2	3	3
CO 2	2	3	3	2	2				1	1	1	1
CO 3	1	3	3	2	2							
CO 4	1	2	3	1	2						1	2
CO 5	3	3	3	1	3				1	1	3	1

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	-	-	-
Understand(K2)	-	-	-
Apply(K3)	10	10	10
Analyze(K4)	10	10	10
Evaluate(K5)	10	10	10
Create(K6)	20	20	20

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern:

Attendance	: 8 marks
Continuous Assessment Test(2numbers)	: 30 marks
Assignment/Quiz/Courseproject	: 12marks

End Semester Examination Pattern:
Lab exam will be conducted by an external examiner.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Develop a python program to illustrate the use of variables, data types, operators and expressions(K6)
2. Develop a python program to illustrate the use of Control Structures(K6)
3. Develop a python program to demonstrate String manipulation(K3)

Course Outcome 2 (CO2):

1. Design, Develop and implement a menu driven program in python to illustrate the Functions(K6)
2. Design, Develop and implement program to illustrate the use of built in input- output functions in python(K6)
3. Design, Develop and implement a menu driven program in python to illustrate file and its operations(K6)
4. Design and develop python program to Passing Information using GET method(K6)
5. Design and develop python program to Passing Information using POST method(K6)

Course Outcome 3(CO3):

1. Design, Develop and implement a website in Drupal/ WordPress and Customize it. (K6)

Course Outcome 4 (CO4):

1. Develop Shell Programs for system administration

Course Outcome 5 (CO5):

1. Illustrate the use of Git by pushing the changes in local repository to remote repository(K4)
2. Illustrate the use of Git by pulling the changes in local repository to remote repository(K4)
3. Illustrate the use of Git by merging branches(K6)
4. Use GIT and gain knowledge in using version control(K5)

Syllabus

Python Variables, Strings, Data types – List, tuple, Dictionary, set, Operators, Expressions, Control Structures

Python Functions,Python Input–Output, Python Files, CGI Programming- Passing Information using GET method, CGI Programming-Passing Information using POST method,GUI Programming Basics

–Tkniter Label, Message, Text and Button

Designing a Site, customizing a Site, Content Management, Adding Features to Site – **Wordpress/ Drupal**

Administration Level

Introduction to Shell scripting – Experiment with shell scripts mainly for administrative tasks like user creation in bulk, changing file permissions recursively, creating files in bulk, deleting folders and sub folders etc...

1. Commands
1. echo,read
2. more,less
3. man
4. chmod,chown
5. cd, mkdir, pwd, ls,find
6. cat, mv, cp,rm
7. wc, cut,paste
8. head, tail, grep,expr
9. Redirections &Piping
10. useradd, usermod, userdel,passwd
11. tar

2. Scripting

1. Environment variables
2. If statement
3. For statement
4. While statement

3. Remote access
1. ssh, scp, ssh-keygen, ssh-copy-id

4. Scheduling Using cron and at

Using Git for version Control, creating a Local repository, adding files to the Staging area, committing changes, creating a Remote repository, connecting Local repository with Remote Repository, pushing the changes to the Remote repository, pulling the changes from the Remote repository, organizing your Repository with Branches, working in a team – Branches and Merging.

Reference Books

1. Dr. Jeeva Jose, "Taming Python by Programming", KhannaPublishing
2. Jon Loeliger, "Version Control with Git", O'Reilly mediaInc.
3. Matt Glaman, "Drupal 8 Cookbook", PackTPublishing
4. B. M. Harwani, Unix and Shell programming", Oxford UniversityPress(2013)

Web Resources

1. https://www.hostinger.in/tutorials/wordpress/
2. https://www.hostinger.in/tutorials/drupal
3. https://docs.python.org/2/tutorial/
4. https://documentation.libreoffice.org/en/english-documentation/
5. https://docs.github.com/en

MOOC

1. https://www.coursera.org/learn/interactive-python-1#pricing
2. https://developers.google.com/edu/python/
3. https://www.edx.org/course/introduction-to-computer-science-and-programming-using-python
4. http://www.learnpython.org/
5. https://www.wp101.com/course/wordpress101/

List of Lab Experiments

1. Design, Develop and implement python program to illustrate the use of variables, data types, operators and expressions
2. Write a python function moderate Days that is given a dictionary containing daily temperatureforeachdayoftheweek,andreturnsthelistofthedaysinwhichtheaverage temperature was between 70 &79degrees.
3. Design, Develop and implement python program to illustrate the use of Control Structures
4. Design, Develop and implement python program to demonstrate Stringmanipulation
5. Design, Develop and implement a menu driven program in python to illustrate the Functions
6. Design, Develop and implement program to illustrate the use of built in input- output functions in python
7. Design, Develop and implement a menu driven program in python to illustrate file and its operations
8. Design, Develop and implement a website in Drupal/ WordPress and Customize it.
9. Develop Shell Programs for system administration
10. Illustrate the use of Git by pushing the changes in local repository to remote repository
11. Illustrate the use of Git by pulling the changes in local repository to remote repository
12. Illustrate the use of Git by merging branches

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	**7 hrs.**
1.1	Python Variables	1
1.2	Strings	1
1.3	Data types – List, tuple, Dictionary, set	2
1.4	Operators	1
1.5	Expressions	1
1.6	Control Structures	1
2	**Module 2**	**10 hrs.**
2.1	Python Functions	2
2.2	Python Input – Output	1
2.3	Python Files	2
2.4	CGI Programming - Passing Information using GET method	2
2.5	CGI Programming - Passing Information using POST method	1
2.6	GUI Programming Basics –Tkniter Label, Message, Text and Button	2
3	**Module 3**	**8 hrs.**
3.1	Designing a Site	2
3.2	Customizing a Site	2
3.3	Content Management	2
3.4	Adding Features to Site	2
4	**Module 4**	**12 hrs.**
4.1	Experiment with shell scripts mainly for administrative tasks like user creation in	2
4.2	Experiment with shell scripts mainly for administrative tasks like changing file	2
4.3	Experiment with shell scripts mainly for administrative tasks like creating files in	2
4.4	Experiment with shell scripts mainly for administrative tasks like deleting folders	2
4.5	Experiment with shell scripts for Remote access	2
4.6	Experiment with shell scripts for Scheduling Using cron and at	2
5	**Module 5**	**11 hrs.**
5.1	Using Git for version Control	2
5.2	creating a Local repository, adding files to the Staging area, committing changes	1
5.3	creating a Remote repository, connecting Local repository with Remote	2
5.4	pushing the changes to the Remote repository	1
5.5	pulling the changes from the Remote repository	1
5.6	organizing your Repository with Branches	2
5.7	Working in a team – Branches And merging.	2

20INMCA334	VISUAL PROGRAMMING LAB	CATEGORY	L	T	P	CREDIT
		GENERAL	0	0	4	1

Preamble: The syllabus is prepared with the view of preparing the MCA Graduates capable of writing visual basic programs to create software interface and codes in an easy way to use a graphical environment.

Prerequisite: 20INMCA105 Introduction to Programming, 20INMCA303 User Interface Design

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

CO 1	Understand and explain the concepts of GUI and various VB editions
CO 2	Analyse and evaluate the use of various datatypes, also, practice decision structures and loop structures for determining different operations and to perform repetitive tasks
CO 3	Analyse and implement arrays, procedures and functions
CO 4	Construct and debug Visual Basic applications using various controls
CO 5	Construct and Deploy menu applications

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1					3	2					
CO 2		2										
CO 3			2	2					2			2
CO 4					2			1				
CO 5					3					1	1	

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)			
Understand(K2)			
Apply(K3)	10	10	10
Analyse(K4)	10	10	10
Evaluate(K5)	10	10	10
Create(K6)	20	20	20

Mark distribution

Total Marks	**CIE**	**ESE**	**ESE Duration**
100	50	50	3 hours

Continuous Internal Evaluation Pattern

Attendance : 08 Marks
Continuous Assessment Test(2numbers) : 30 Marks
Assignment/Quiz/Courseproject : 12 Marks

End Semester Examination Pattern

Lab exam will be conducted by an internal examiner.

Course Level Assessment

Course Outcome 1 (C01):

1. Design and develop a windows form familiarizing form and windows properties, toolbox controls etc. (K6))

Course Outcome 2 (C02):

1. Design, Develop and implement program to apply and analyse the use of variables, datatypes, operators (K3,K4)
2. Design, Develop and implement program to illustrate the use of decision statements, loop statements(K6)

Course Outcome 3 (C03):

1. Design, Develop and implement program to illustrate the use of functions and procedures (K6)

Course Outcome 4 (C04):

1. Design, Develop and implement program to illustrate the various windows controls (K6)

Course Outcome 5 (C05):

1. Develop and implement program to evaluate the use of menus (K5)

Syllabus

Event driven programming, How to start with a project, Introduction of various windows, Variables, Data Types, Arrays, Constants, Control Statements, Procedures, Subroutines, Controls, Menus.

Reference Books

1. C.Komalavalli,SanjibKSahu,“Essentialsof.NetProgrammingTheoryandApplication”,Ane Books Pvt. Ltd,2016.
2. Clayton E. Crooks, “Learning Visual Basic.NET Through Applications”, First Edition, Hingham, Mass: Charles River Media,C2003.
3. Shirish Chavan, “Visual Basic .NET”, First Edition, Pearson Educations,2004.
4. Steven Holzner, “Visual Basic .NET Programming. Black Book”, New Edition, Dreamtech Press,2005.

Web Resources

1. http://www.nptelvideos.com/visualbasic_net/visualbasicnet_video_tutorials.php

2. http://www.slideshare.net/somgaj/visual-programming-lab

3. http://www.sourcecodesolutions.in/2010/09/cs1255-visual-programming-lab.html

List of Lab Experiments

1. Sort an array in ascending order.

2. Sort an array in descending order.

3. Search an item in array and print its position.

4. Compute simple interest.(i=prt)

5. Accept 10 values to an array and count no: of evenno's.

6. Accept 10 values to an array and find their average.

7. Find largest of 2no's using function.

8. Accept N values as input, find the max value and count its occurrence.

9. Design a form for employee salary calculation. (Basic salary, ta-5%, da- 6%, grosspay)

10. Place 3 checkboxes to select age (under 15, under 25, above 25) as a group.

    When button is clicked, selection should be prompted.

    When 3rd option is selected, 2nd group should be displayed.

    When radio button in that group is pressed, button should be disabled.

11. Write a function to convert Celsius to Fahrenheit ((c *1.8)+32)

12. Design a student mark entry form to find total, percentage and display grade.

13. Find square and cube of a number entered (selection using radio button)

14. Illustrate add, count, delete, sort, clear operations in a list box.

15. Ask the user to enter a number. It then asks them whether they want to enter another. If they do it will ask the man other and add it to the previous number, it will keep doing this until they say they do not want to enter any more numbers. Finally output the total. (Whileloop).

16. Create an online quiz with 5 questions. Each question should carry 4 options. Place a timer to set time.

17.Create a college Admission registration form, Fields are Name of Applicant ,DOB,Address,Gender(Radio Button),Father Name, Occupation of Father, Mother

Name,Ph no,email id, Hobbies(Check Box),Course completed(combo box). Print the inputs from Form1 into Form2 in a neat format.

18. Create a list box and enter values into it. When you select values in the list box and click on the add button,the selected data should be displayed in another list box.When you select the data in the list box and click on the delete button, the data should be removed from the list box.

19. Write a VB program to perform all arithmetic operations

20. Write a program to find the largest of 3 numbers

21. Write a VB Program to find the sum of n numbers

22. Write a VB program to calculate the grade of a student m1,m2,m3 be the marks of 3 subjects. Average=m1+m2+m3/3. If average between 90 and 100, print A+, 80 and 90 print A and soon.

23. Create an MDIform

24. Create a menu application.

Course Contents and Lecture Schedule

No.	**Topic**	**No. of Hours**
1	**Module 1**	**4 hrs.**
1.1	Event driven programming: Concept of GUI, Various VB- Editions,	2
1.2	How to start with a project, Introduction of various windows: Properties of Windows, Project Windows, Toolbox Windows, Menu bar, Windows.	2
2	**Module 2**	**8 hrs.**
2.1	Variables and constants: data types, declaration, Operators	2
2.2	Program flow-Decision statements–if... Then, if... Then... else, select...case	3
2.3	Loop statements–while… end while, do. .loop, for…next, for…each... next.	3
3	**Module 3**	**12 hrs.**
3.1	Single dimensional, Multidimensional arrays.	4
3.2	Control Structures	4
3.3	Procedures and functions	4
4	**Module 4**	**12 hrs.**
4.1	Windows programming: Creating windows Forms, windows controls -Button, Check box, Combo box, Label, List box, Radio Button, Text box.	5
4.2	Events – Click, close, Deactivate, Load, Mouse move, Mouse down, and Mouse Up.	7
5	**Module 5**	**12 hrs.**
5.1	Creating menus, menu items	3
5.2	modifying the existing menu, assigning and removing shortcut keys	4
5.3	creating a simple menu application	5

INT MCA SEMESTER VII

INT MCA SEMESTER VII

INT MCA SEMESTER VII	
Course No	**Course**
20INMCA401	M- Commerce
20INMCA403	Java Programming
20INMCA405	Advanced Web programming
20INMCA407	Advanced Software Engineering
20INMCA409	Distributed Computing
20INMCA431	Java Programming - Lab
20INMCA433	Advanced Web programming Lab
20INMCANC1	Entrepreneurship & Innovations in Technology

20INMCA401	M- COMMERCE	CATEGORY	L	T	P	CREDIT
		General	3	1	0	4

Preamble: The purpose of this course is to make students familiar with various aspects of Mobile Commerce for performing business transactions through mobile handheld devices.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to

CO 1	Ability to understand and explain Mobile Commerce concepts.
CO 2	Understand the Mobile Commerce Technology
CO 3	Familiarize the Key Players and products of Mobile Commerce
CO 4	Access the mobile payment systems.
CO 5	Discuss the security and privacy issues in Mobile Commerce.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2		2				1		1			
CO 2	3	2	2									1
CO 3	2	3	2	3	1							
CO 4	2	2	2	2	1	1						
CO 5	1	2	3	2		1						

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	

Remember(K1)	10	10	10
Understand(K2)	10	10	15
Apply(K3)	15	15	15
Analyse(K4)	15	15	15
Evaluate(K5)			
Create(K6)			

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 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):

Que 1. Describe Wireless Communication Technology (K1)

Que 2. Explain Mobile portals (K2)

Que 3. Summarize Mobile Commerce Business Models (K4)

Course Outcome 2 (CO2):

Que 1. Differentiate 4G and 5G systems (K2)

Que 2. Illustrate Mobile Communication Standards (K3)

Que 3. Outline Communication Systems (K4)

Course Outcome 3 (CO3):

Que 1. Show different types of Mobile Devices (K3)

Que 2. Evaluate challenges of Mobile Banking (K4)

Que 3. Design Mobile Banking Business Models. (K4)

Course Outcome 4 (CO4):

Que 1. Outline privacy and security issues of Mobile Tickets (K4)

Que 2. Analyse challenges of Mobile Computing (K4)

Que 3. Summarize different types of Mobile Payments (K4)

Course Outcome 5 (CO5):

Que 1. Explain Fraud Detection in M Commerce (K2)

Que 2. Outline Mobile Security Mechanism (K4)

Que 3. Describe legal aspects of mobile devices (K2)

SYLLABUS

Module 1

Introduction to Mobile Commerce- Wireless Communication Technology, Scope, Principles of Mobile Commerce, Benefits, Limitations, Mobile Commerce Framework, Mobile Commerce Business Models, Mobile Banking and Payments, E-Commerce vs M- Commerce, Mobile commerce services - Types, Mobile portals, Mobile Commerce applications - Applications of Mobile Commerce in industry, Mobile Application Development

Module 2

Mobile Commerce Technology: Wireless and Mobile Communication - Communication Systems, Wireless Communication, Satellite Communication, Mobile Communication Systems. Digital Cellular Technology - Cellular Networks, Mobile Phone Cellular Network, Mobile Access Technology - Mobile Communication Standards-Evolution, 4G and 5G systems - 4G Systems, IMT Advanced Standards, 4G features, 4G technologies, LTE -Advanced, 4G Objectives and Goals, 5G systems.

Module 3

Mobile Devices and Banking: Types of Mobile Devices, Mobile Service Providers: Mobile Network Operators, Mobile Commerce Service Providers. Mobile Banking: Mobile Banking Business Models, Mobile Banking Technologies, Mobile Banking Services, Advantages of Mobile Banking, Challenges of Mobile Banking, Applications.

Module 4

Tickets on Mobile and Mobile Payment: Mobile Ticketing, Applications of Mobile Tickets, Advantages of Mobile Tickets, Privacy and Security Issues, Mobile Ticketing Apps**,** Mobile Ticket Providers, Mobile Payment: Characteristics of Mobile Payment Systems, Mobile Payment Models, Types of Mobile Payments, Security Issues, Mobile Payment Service Providers.

Mobile Computing: Nomadic or Ubiquitous Computing, Applications of Mobile Computing, Challenges of Mobile Computing, Mobile Computing Software Platforms, Business Applications Of Mobile Computing.

Module 5

Security and Privacy Issues, Legal Aspects: Mobile Security Concepts, Mobile Security Mechanism, Mobile Network Security, Mobile Information Security, Mobile Device Security, Legal Aspects: Mobile Device Related Laws

Future of Mobile Commerce: Future of Mobile Commerce, Mobile Commerce and Consumer Acceptance, Growth of Mobile Value Added Services, Mobile Fraud Detection, Future Issues.

Text Books

1. Karabi Bandyopadhyay, Mobile Commerce :2013 - PHI Learning Pvt. Ltd.

Reference Books

1. E.Brian Mennecke, J.Troy Strader, "Mobile Commerce: Technology, Theory and Applications", Idea Group Inc., IRM press, 2003.
2. David Taniar, "Mobile Computing: Concepts, Methodologies, Tools, and Applications" Information Science Reference,2009

MOOC

Web Resources

1. https://www.tutorialspoint.com/mobile_marketing/m_commerce.htm
2. https://www.simicart.com/blog/mobile-commerce-guide/

Course Contents and Lecture Schedule

Topic	**No. of lectures**
Module 1	**9 hrs.**
Introduction, Wireless Communication Technology, Scope, Principles of Mobile Commerce, Benefits, Limitations, Mobile Commerce Framework.	2
Mobile Commerce Business Models	1
Mobile Banking and Payments, E-Commerce vs M- Commerce	2
Mobile Commerce Services - Types, Mobile portals	2
Mobile Commerce Applications - Applications of Mobile Commerce in industry, Mobile Application Development	2
Module 2	**9hrs.**
Mobile Commerce Technology, Wireless and Mobile Communication - Communication Systems, Wireless Communication, Satellite Communication, Mobile Communication Systems.	2
Digital Cellular Technology - Cellular Networks, Mobile Phone Cellular Network	2
Mobile Access Technology - Mobile Communication Standards- Evolution, 4G and 5G systems - 4G Systems, IMT Advanced Standards	2
4G features, 4G technologies, LTE -Advanced, 4G Objectives and Goals, 5G systems	3

Module 3	**6 hrs.**
Mobile Device: Types of Mobile Devices, Mobile Service Providers: Mobile Network Operators	2
Mobile Commerce Service Providers. Mobile Banking: Mobile Banking Business Models	1
Mobile Banking Technologies, Mobile Banking Services, Advantages of Mobile Banking	2
Challenges of Mobile Banking, Applications.	1
Module 4	**12 hrs.**
Tickets on Mobile: Mobile Ticketing, Applications of Mobile Tickets, Advantages of Mobile Tickets.	1
Privacy and Security Issues, Mobile Ticketing Apps, Mobile Ticket Providers	2
Mobile Payment: Characteristics of Mobile Payment Systems, Mobile Payment Models	2
Types of Mobile Payments, Security Issues, Mobile Payment Service Providers.	2
Mobile Computing: Nomadic or Ubiquitous Computing, Applications of Mobile Computing	2
Challenges of Mobile Computing, Mobile Computing Software Platforms, Business Applications of Mobile Computing.	3
Module 5	**12 hrs.**

Security and Privacy Issues, Legal Aspects: Mobile Security Concepts, Mobile Security Mechanism	3
Mobile Network Security, Mobile Information Security, Mobile Device Security	2
Legal Aspects: Mobile Device Related Laws	1
Future of Mobile Commerce	1
Mobile Commerce and Consumer Acceptance, Growth of Mobile Value Added Services	3
Mobile Fraud Detection, Future Issues	2

MODEL QUESTION PAPER

Reg No.:_______________		Name:_______________________________________	

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER INTEGRATED M.C.A DEGREE EXAMINATION
MODEL QUESTION PAPER

Course Code: 20INMCA401

Course Name: M- COMMERCE

Max. Marks: 60 | Duration: 3 Hours

PART A

		Answer all questions, each carries3 marks.	Marks
1		Compare E-Commerce vs M-Commerce.	(3)
2		Differentiate 4G and 5G systems	(3)
3		Explain different types of Mobile Devices	(3)
4		Analyse the challenges of Mobile Computing	(3)
5		Describe Mobile Information Security	(3)
6		Explain Mobile portals	(3)
7		Explain Digital Cellular Technology	(3)
8		Describe various Mobile Banking Technologies	(3)
9		List the Characteristics of Mobile Payment Systems	(3)
10		Analyze the growth of Mobile Value Added Services	(3)

PART B

Answer any one question from each module. Each question carries 6 marks.

		Module I	
11		Summarize Mobile Commerce Business Models	(6)
		OR	
12		Explain Mobile Banking and Payments in detail.	(6)
		Module II	
13		Illustrate Mobile Communication Standards	(6)
		OR	
14		Outline Communication Systems	(6)
		Module III	
15		Evaluate the challenges of Mobile Banking	(6)
		OR	
16		Design Mobile Banking Business Models	(6)

Module IV			
17		Outline privacy and security issues of Mobile Tickets	(6)
OR			
18		Summarize different types of Mobile Payments	(6)
Module V			
19		Outline Mobile Security Mechanism	(6)
OR			
20		Outline 1. Mobile Fraud Detection 2. Legal aspects of mobile devices	(6)

20INMCA403	Java Programming	CATEGORY	L	T	P	CREDIT
		General	3	1	0	4

Preamble: The syllabus is prepared with the view of preparing the MCA Graduates capable of writing readable JAVA programs to solve computational problems that they may have to solve in their professional life. The course content is decided to cover the essential object oriented programming fundamentals which can be taught within the given slots in the curriculum.

Prerequisite: 20INMCA105-Introduction to Programming, 20INMCA108-Problem Solving and Structured Programming,20INMCA205-Introduction to Object Oriented Programming

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

CO 1	Understand the concepts of object-oriented programming paradigms and develop skills in these paradigms using Java
CO 2	Apply the concepts of strings, arrays and inheritance
CO 3	Analyse and evaluate the use of interfaces, Create Java application programs using sound OOP practices and proper program structuring
CO 4	Apply and understand JAVA I/O operations and Web applications using Applets.
CO 5	Apply the concepts of Event Handling and provide an exposure to to advanced applications such as TCP and UDP network programming

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	**1**	**1**		**3**	2	**1**		1	1			**3**
CO 2	**2**			**3**	**3**	1	1	3	2	**2**	2	**1**

CO 3	**2**	**2**	**1**	**2**	**3**			2	3	**1**		**1**
CO 4			**3**	**3**	**2**	2	3	2	3	**2**	**2**	**3**
CO 5	**1**		**3**			2	1				**2**	**2**

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	5	5	10
Understand(K2)	5	5	10
Apply(K3)	20	20	20
Analyse(K4)	20	20	20
Evaluate(K5)			
Create(K6)			

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 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. Categorize constructors in Java (K4)

2. Illustrate Java Buzzwords(K3)

3. Design a program to illustrate inner class (K4)

Course Outcome 2 (CO2):

1. Describe one dimensional array with an example (K2)
2. Convince the advantage of 'this' Keyword with proper code sequence(K4)
3. Create a program to illustrate the methodology to resolve the overridden method at run time (K4)

Course Outcome 3(CO3):

1. Outline the Thread Model in Java (K4)
2. Recommend a method to demonstrate the concept of multiple inheritance in java (K4)
3. Generate a program to demonstrate user defined exception in Java(K4)

Course Outcome 4 (CO4):

1. Define the advantages of streams in java (K1)
2. Illustrate Applet skeleton with neat diagram (K4)
3. Compose a java program to read characters (K4)

Course Outcome 5 (CO5):

1. Explain Delegation event model (K2)
2. Compare TCP/IP and Datagram in networking (K4)
3. Develop a program to draw a sphere (K4)

Syllabus

Module 1

Java Basics: The Java Buzzwords, Data types, Variables, Type conversion and casting, **Introducing Classes-** Class Fundamentals**,** Declaring Objects, Constructors, Overloading methods, Recursion, Introducing Access Control (public, private, protected), Introducing nested and inner classes.

Module 2

Arrays and Strings: One dimensional arrays, Multidimensional arrays, Exploring String class and methods, String Buffer.

Inheritance Basics: Member access and Inheritance, Using super and this keyword. Method overriding, Dynamic method dispatch, using abstract classes, Using and final Inheritance

Module 3

Packages - Defining a package, finding packages and class path, Importing packages. **Interface**: Defining an interface, implementing Interface.

Exception Handling: Exception handling Fundamentals, using try and catch, Multiple catch clauses, Nested try statements, Throw, throws and Finally, Java's Built-in exceptions, Creating own exception subclasses.

Multithreaded Programming: Java thread Model, Creating a Threads - Extending thread and Implementing runnable, Creating multiple Threads, synchronizing threads(using synchronized statement and synchronized method)

Module 4

I/O Basics, Streams, Byte Streams, Character Streams, Reading console inputs, Reading characters, Reading Strings

Applets – Applet Basics, Applet Skeleton, Simple Applet display methods, The HTML Applet Tag, passing parameters to applet

Module 5

Event Handling - The Delegation Event Model, Event Classes, Event Listener Interface. Introducing AWT: AWT Classes, Window Fundamentals-Container, Window, Frame, Working with Graphics, Working with Color.

Networking: Networking Basics, client-server, Socket Overview, InetAddress, TCP/IP Client sockets, TCP/IP ServerSockets, Datagrams.

Text Books

1. Herbert Schildt, "The Complete Reference Java 2" , TATA McGRAW-Hill Edition,Fifth Edition,2002.

Reference Books

1. Mahesh P. Matha, " CORE JAVA AComprehensive Study", PHI Learning Private Limited 2011.

2. Balagurusamy E., "Programming JAVA a Primer", 5/e, McGraw Hill, 2014.

MOOC

1. http://www.nptelvideos.com/java/java_video_lectures_tutorials.php

Web Resources

1. https://www.studytonight.com/java/
2. https://www.tutorialspoint.com/java/

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1:Java Basics and Introducing Classes**	**8 hrs.**
1.1	The Java Buzzwords	1
1.2	Data types	1
1.3	Variables	1
1.4	Type conversion and casting	1
1.5	Class Fundamentals , Declaring Objects, Constructors	1
1.6	Overloading methods, Recursion,	1
1.7	Introducing Access Control (public, private, protected)	1
1.8	Introducing nested and inner classes.	1
2	**Module 2 : Arrays,Strings and Inheritance Basics**	**10 hrs.**
2.1	One dimensional arrays	1
2.2	Multidimensional arrays	1
2.3	Exploring String class and methods	1

2.4	String Buffer	1
2.5	Member access and Inheritance, Using super and this keyword.	1
2.6	Method overriding, Dynamic method dispatch	2
2.7	Using abstract classes	1
2.8	Using and final Inheritance	2
3	**Module 3 : Packages,Interface and Exception Handling**	**12 hrs.**
3.1	Defining a package, Finding packages and classpath, Importing packages.	2
3.2	Defining an interface	2
3.3	Implementing Interface.	2
3.4	Exception handling Fundamentals, using try and catch, Multiple catch clauses,	2
3.5	Nested try statements, Throw, throws and Finally	2
3.6	Java's Built-in exceptions, Creating own exception subclasses.	2
4	**Module 4: I/O Basics and Applets**	**8 hrs.**
4.1	Streams, Byte Streams	1
4.2	Character Streams	1
4.3	Reading console inputs, Reading characters	1
4.4	Reading Strings	1
4.5	Applet Basics, Applet Skeleton	1
4.6	Simple Applet display methods	1
4.7	The HTML Applet Tag,	1

4.8	Passing parameters to applet	1
5	**Module 5:Event Handling and Networking**	**10 hrs.**
5.1	The Delegation Event Model,Event Classes, Event Listener Interface	1
5.2	Introducing AWT : AWT Classes	1
5.3	Window fundamentals-Container, Window, Frame	1
5.4	Working with Graphics, Working with Color.	1
5.5	Networking Basics, client-server, Socket Overview	1
5.6	InetAddress	1
5.7	TCP/IP Client sockets, TCP/IP ServerSockets	2
5.8	Datagrams.	2

MODEL QUESTION PAPER

Reg No.:________________		Name:____	

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SEVENTH SEMESTER INTEGRATED M.C.A DEGREE EXAMINATION

MODEL QUESTION PAPER

Course Code: 20INMCA403

Course Name: Java Programming

Max. Marks: 60 | Duration: 3 Hours

PART A

			Marks
		Answer all questions, each carries3 marks.	
1		Illustrate Java Buzzwords with an example	(3)
2		Constructors in Java with example	(3)
3		Define an inner class with example	(3)
4		Describe one dimensional with a class program to find the biggest element	(3)
5		“this” Keyword used in constructors in Java	(3)
6		Illustrate the methodology to resolve the overridden method	(3)
7		Write a note on Thread Model in Java	(3)
8		Implementation of multiple inheritance in java	(3)
9		Compare TCP/IP and Datagram	(3)
10		Develop a program to draw a rectangle	(3)

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

11		.Write Java program to merge two arrays	(6)
		OR	
12		Write a Java program to implement class and inner class	(6)

Module II

13		Define types of Inheritance in Java each with an Example program	(6)
OR			
14		Implement overridden method at run time with the program	(6)
Module III			
15		Write a Java program to implement multiple inheritance in Java	(6)
OR			
16		Different Types of Exceptions in Java with example	(6)
Module IV			
17		Streams in Java with example	(6)
OR			
18		Illustrate Applet skeleton with neat diagram	(6)
Module V			
19		Compare TCP/IP and Datagram in networking	(6)
OR			
20		Develop a program to draw a sphere	(6)

20INMCA405	ADVANCED WEB PROGRAMMING	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: With a dynamic learn-by-doing focus, this course encourages the students to explore the designing of web applications by implementing the relevant and recent techniques.

Prerequisite: 20INMCA210 Internet Concepts and Web Technology, 20INMCA303 User Interface Design

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

CO 1	Understand the latest technologies in the Internet world and Implement server side programming using Advanced PHP and Content Management System.
CO 2	Understand the basic concepts of Object oriented programming in Web Applications.
CO 3	Analyse the concept and develop web applications with AJAX and JavaScript.
CO 4	Demonstrate and develop applications with framework.
CO 5	Deploy the concept of distributed computing and web services.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1			2		3			2				3
CO 2		2	3		2		1			2		
CO 3	3	2	1		2			3				2
CO 4	3	2	2		2							
CO 5	2		2		2			1		2		2

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	5	5	10
Understand(K2)	10	10	15
Apply(K3)	20	20	20
Analyse(K4)	15	15	15
Evaluate(K5)			
Create(K6)			

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 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 and Compare the different versions of PHP. **(K4)**
2. Summarize PHP Three Tier Architecture. **(K4)**

3. Define Content Management System. Discuss the basic concepts with types of content management system. **(K2)**

Course Outcome 2 (CO2):

1. Describe the concepts of Advanced OOPs. **(K2)**
2. Explain Constructors and Destructors in OOPs with suitable examples. **(K2)**
3. Illustrate the concepts of Abstract class and methods. **(K4)**

Course Outcome 3(CO3):

1. Define Ajax. Explain the working of Ajax with proper diagrams. **(K1)**
2. Illustrate the use of JQuery in developing web applications. **(K4)**
3. Describe JQuery Event Methods. **(K2)**

Course Outcome 4 (CO4):

1. Compare different design patterns of MVC architecture. **(K4)**
2. Illustrate the use of JSON in Ajax. **(K4)**
3. Describe MVC and the benefits of MVC Architecture. **(K2)**

Course Outcome 5 (CO5):

1. Describe Web services. Analyse the Basic Operational Model of Web Services. **(K2)**
2. Summarize the Core Web Services Standards. **(K4)**
3. Discuss Simple Object Access Protocol (SOAP) in detail. **(K2)**

SYLLABUS

Module 1

Introduction Advanced PHP: An Introduction to PHP 7: PHP 5.6+ and PHP 7+, PHP Apache and MySQL, Alias Directories, PHP, AJAX, and CSS—Web Applications, PHP Three-Tier Architecture.

Content Management Systems: - What is content, Content Management System, Types of Content Management System.

Module 2

Basic Object Oriented Programming: - Defining a class, creating an object, the $this attribute, creating constructors, Creating Destructors. Advanced OOP: - Inheriting classes, inheriting constructors and Destructors, overriding methods, Access Controls, Using Scope resolution operators, Creating static members. More advanced OOP: - Abstract classes and methods, Interfaces, Namespaces.

Module 3

JQuery: Introduction, finding elements, JQuery methods, objects, Looping, Getting/updating/changing /inserting/adding element content, Getting and setting attribute values, Event methods.

Ajax: Introduction to ajax, How Ajax works, Handling ajax Requests and Responses. Data Formats: XML-Extensible Markup Language.

Module 4

JSON- JavaScript Object Notation, Working with JSON data. Loading HTML, XML, JSON with Ajax. Working with data from other servers: -JSONP. JQuery and Ajax: Requests and Responses. JQuery's Ajax Shorthand Methods, Submitting forms.

Frameworks:-Introduction to MVC, Benefits of MVC, Popular MVC Frameworks, Design Patterns.

Module 5

Distributed Computing: Importance of Distributed Computing, Client-Server Applications. Web Services: Introduction to Web Services, Motivation and Characteristics, Why Use Web Services, Basic Operational Model of Web Services, Core Web Services Standards: - Extensible Markup Language (XML), Simple Object Access Protocol (SOAP), Web Services Definition Language (WSDL). Universal Description, Discovery, and Integration (UDDI).Introduction to REST : REST Principles, Architecture.

Text Books

1. Steve Prettyman "Learn PHP 7", Object-Oriented Modular Programming using HTML5, CSS3, JavaScript, XML, JSON, and MySQL, Apress, Ist edition(2015).

2. Deane Barker "Web Content Management", System, Features and Best Practices, O'Reilly Media, Inc, Ist edition(2016).
3. Larry Ullman, "PHP Advanced and Object- Oriented Programming", Peachpit Press, 3rd edition(2007).
4. JON DUCKETT "JAVASCRIPT & JQUERY", Interactive Front-End Web Development, John Wiley & Sons, Inc. (2014).
5. Chris Pitt "Pro PHP MVC", Apress, Ist edition(2012).
6. Ramesh Nagappan, Robert Skoczylas, Rima Patel Sriganesh "Developing Java Web Services, Architecting and Developing Secure Web Services Using Java" Wiley Publishing Inc.(2003).
7. Ludovic Dewailly "Building a RESTful Web Service with Spring", Packt Publishing.(2015).

Reference Books

1. Matt Stauffer "Laravel: Up & Running",A Framework for Building Modern PHP Apps, O'Reilly Media, (2016).
2. Athman Bouguettaya, Quan Z. Sheng, Florian Daniel, "Web Services Foundations", Springer (2013).
3. Lisa Sabin-Wilson, "WordPress, ALL-IN-ONE", John Wiley & Sons Inc, 4th Edition, (2019).

MOOC

1. https://www.udemy.com/course/learn-advanced-php-programming/
2. https://www.udemy.com/course/ajax-projects-hands-on-ajax-applications/
3. https://www.udemy.com/course/jquery-course/

Web Resources

1. https://www.udemy.com/course/jquery-guide/
2. https://www.udemy.com/course/understanding-mvc-model-view-controller-with-php/

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	**9 hrs.**
1.1	Introduction Advanced PHP: An Introduction to PHP 7: PHP 5.6+ and PHP 7+.	1
1.2	PHP Apache and MySQL, Alias Directories	1
1.3	PHP, AJAX, and CSS—Web Applications	2
1.4	PHP Three-Tier Architecture.	2
1.5	Content Management System: - What is content, Content Management System.	2
1.6	Types of Content Management System.	1
2	**Module 2**	**11 hrs.**
	Basic Object Oriented Programming:- Defining a class, Creating an object.	2
2.1	The $this attribute, Creating constructors, Creating Destructors.	2
2.2	Advanced OOP:- Inheriting classes, Inheriting constructors and Destructors.	2
2.3	Overriding methods, Access Controls, Using Scope resolution operators, Creating static members.	2
2.4	More advanced OOP:- Abstract classes and methods,Interfaces,Namespaces.	3
3	**Module 3**	**9 hrs.**

3.1	JQuery: Introduction, Finding elements, JQuery methods, objects , Looping.	2
3.2	Getting/updating/changing /inserting/adding element content, Getting and setting attribute values.	2
3.3	Event methods.	1
3.4	Ajax: Introduction to ajax, How Ajax works,	1
3.5	Handling ajax Requests and Responses.	2
3.6	Data Formats : XML-Extensible Markup Language.	1
4	**Module 4**	**11 hrs.**
4.1	JSON- JavaScript Object Notation, Working with JSON data.	2
4.2	Loading HTML, XML, JSON with Ajax.	2
4.3	Working with data from other servers: -JSONP.	1
4.4	JQuery and Ajax: Requests and Responses. JQuery's Ajax Shorthand Methods, Submitting forms.	2
4.5	Frameworks:-Introduction to MVC, Benefits of MVC, Popular MVC Frameworks, Design Patterns.	4
5	**Module 5**	**8 hrs.**
5.1	Distributed Computing: Importance of Distributed Computing, Client-Server Applications.	2

5.2	Web Services: Introduction to Web Services, Motivation and Characteristics, Why Use Web Services.	1
5.3	Basic Operational Model of Web Services,Core Web Services Standards:- Extensible Markup Language (XML).	1
5.4	Simple Object Access Protocol (SOAP), Web Services Definition Language (WSDL).Universal Description, Discovery, and Integration (UDDI).	2
5.5	Introduction to REST : REST Principles, Architecture.	2

MODEL QUESTION PAPER

Reg No.:________________		Name:____	

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER INTEGRATED M.C.A DEGREE EXAMINATION
MODEL QUESTION PAPER

Course Code: 20INMCA405

Course Name: ADVANCED WEB PROGRAMMING

Max. Marks: 60		Duration: 3 Hours

PART A

		Answer all questions, each carries3 marks.	Marks
1		Write the benefits of CSS.	(3)
2		Explain use of scope resolution operator.	(3)
3		Explain different Event Methods in JQuery.	(3)
4		Explain different JQuery's Ajax Shorthand Methods.	(3)
5		Differentiate SOAP and REST.	(3)
6		Explain inheritance with example.	(3)
7		Explain PHP Apache and MySQL.	(3)
8		Describe Universal Description, Discovery, and Integration (UDDI).	(3)
9		Describe XML with example.	(3)
10		List and explain popular MVC Frameworks.	(3)

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

11		Describe PHP Three Tier Architecture.	(6)
		OR	
12		Define Content Management System. Discuss the basic concepts with types of content management system.	(6)

Module II

13		Explain Constructors and Destructors in OOPs with suitable examples for each.	(6)
		OR	
14		Illustrate the concepts of Abstract class and methods with examples of each.	(6)

Module III

15		Illustrate the use of JQuery in developing web applications with example.	(6)
		OR	

16		Define Ajax. Explain the working of Ajax with proper diagrams.	(6)
		Module IV	
17		Describe MVC and the benefits of MVC Architecture.	(6)
		OR	
18		Explain the use of JSON in Ajax with example.	(6)
		Module V	
19		Describe Web services. Analyse the Basic Operational Model of Web Services.	(6)
		OR	
20		Discuss Simple Object Access Protocol (SOAP) in detail.	(6)

20INMCA407	ADVANCED SOFTWARE ENGINEERING	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course explores the software industry practices around continuous integration and continuous development. The course introduces the tools and techniques for continuous development of applications in the software industry today and is supposed to make students Industry-ready**.**

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

CO 1	Analyse the principles and practices involved in a continuous development/continuous integration environment in DevOps.
CO 2	Understand and use the git version control system.
CO 3	Analyse the stages of deployment pipeline that leads to the deployment of an application
CO 4	Examine the working of automated testing tools for functional and nonfunctional requirements
CO 5	Understand the practices involved in deploying and releasing applications.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1			2		3		1	3	2	1	3	1
CO 2			2		3		1	3	2	1	3	1
CO 3			2		3		1	3	2	1	3	1
CO 4			2		3		1	3	2	1	3	1
CO 5			2		3		1	3	2	1	3	1

Assessment Pattern

Bloom's Category	Continuous Assessment Tests	End Semester Examination

	1	2	
Remember(K1)	5	5	5
Understand(K2)	15	15	20
Apply(K3)	15	15	20
Analyse(K4)	15	15	15
Evaluate(K5)			
Create(K6)			

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. Explain the principles of software delivery. (K2)
2. Examine the practices involved in a Continuous Integration environment. (K3)

Course Outcome 2 (CO2):

1. Explain the workflow of git. (K2)
2. Analyse the working of branches in git. (K4)

Course Outcome 3(CO3):

1. Demonstrate the working of a basic deployment pipeline. (K3)
2. Explain the commit stage principles and practices. (K2)

Course Outcome 4 (CO4):

1. Analyse the layers in the automated acceptance test. (K4)
2. Explain the features of an automated capacity test. (K2)

Course Outcome 5 (CO5):

1. Differentiate Blue green deployment and Canary releasing. (K2)
2. Examine the needs of the operations team in a DevOps environment. (K3)

SYLLABUS

Module 1

Overview of DevOps Life Cycle (a quick look through the stages of DevOps life cycle), Principles of Software Delivery. Software Configuration Management: Using version control, Managing dependencies, Managing software configuration, Managing build and deployment environments. Continuous Integration: Prerequisites for continuous integration, Essential practices.

Note: Set up Ansible and analyse the working of Ansible for software configuration management.

Module 2

Using Git for version Control – Leveraging Github.com repositories for projects/Assignments – Getting Started with Git – Working with Git- Organizing Your Repository with Branches and Tags – Working in a team – Branches and Merging – Git History - Fixing Commits

Note: Clone an open source project using Git and perform all core version control operations.

Module 3

Deployment Pipeline-A basic Deployment pipeline, Different stages of Deployment pipeline, Deployment pipeline practices, an overview of build tools, Scripting for Deployment stages-Principles and practices of build and deployment scripting, Commit stage-Commit stage principles and practices, The result of Commit stage, Commit test suite principles and practices.

Note: Set up Jenkin Continuous Integration System and analyse the working of Jenkin by frequently committing changes into the Git version control system.

Module 4

Automated Testing-Automated acceptance testing, Layers in acceptance test, Implementing acceptance tests, The acceptance test stage, Acceptance test performance.

Testing nonfunctional requirements-Managing Nonfunctional requirements, Analyzing Non functional requirements, Measuring capacity, The capacity testing environment, Automating capacity testing, Capacity testing via the user interface.

Note: Install the test automation tool Selenium and analyse the working of Selenium

Install the Cucumber testing tool that supports behaviour driven development and analyse the working of Cucumber.

Module 5

Deploying and Releasing Applications-Creating a Release strategy -The Release Plan, Releasing products, Deploying and promoting your applications, Rolling Back Deployments and Zero-Downtime Releases-Rolling Back by Redeploying the Previous Good Version, Blue-Green Deployments Canary Releasing, Managing Infrastructure and Environments-Understanding the needs of the Operations team, Monitoring infrastructure and applications.

Note: Install the DevOps monitoring tool Opsgenie and analyse the working of Opsgenie.

Text Books

1. Jez Humble, David Farley, "Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation", Addison-Wesley Professional, 2010

2. Travis Swicegood, "Pragmatic Guide to Git", Pragmatic Bookshelf, 2010

Reference Books

1. Ben Straub, Scott Chacon, *Pro Git*, 2nd Edition, Apress.
2. Jennifer Davis & Katherine Daniels, Effective DevOps Building a Culture of Collaboration, Affinity, and Tooling at Scale, O'Reilly Media, Inc, First Edition,2016
3. Gene Kim, Jez Humble, Patrick Debois, John Willis," The DevOps Handbook How to create world-class agility, reliability and security in technology organizations", IT Revolution press, First Edition, 2016

MOOC Courses

1. https://www.coursera.org/learn/version-control-with-git
2. https://www.coursera.org/learn/continuous-integration

Web Resources

1. https://guides.github.com/introduction/git-handbook/
2. https://www.tutorialspoint.com/jenkins/index.htm
3. https://www.tutorialspoint.com/ansible/index.htm

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	**9 hrs.**
1.1	Overview of DevOps Life	1
1.2	Principles of Software Delivery	1
1.3	Software Configuration Management: Using version control	1
1.4	Managing dependencies, Managing software configuration	1
1.5	Managing build and deployment environments.	1
1.6	Continuous Integration: Prerequisites for continuous integration	1
1.7	Essential practices.	1
1.8	**Set up Ansible and analyse the working of Ansible for software configuration management.**	2
2	**Module 2**	**10 hrs.**
2.1	Using Git for version Control – Leveraging Github.com repositories for projects/Assignments	1
2.2	Getting Started with Git – Working with Git	1
2.3	Organizing Your Repository with Branches and Tags	3
2.4	Working in a team – Branches and Merging	3

2.5	Git History - Fixing Commits	2
	Note: Above topics under module 2 should be demonstrated by working with git commands.	
3	**Module 3**	**10 hrs.**
3.1	Deployment Pipeline-A basic Deployment pipeline, Different stages of Deployment pipeline	2
3.2	Deployment pipeline practices	1
3.3	An overview of build tools	1
3.4	Scripting for Deployment stages-Principles and practices of build and deployment scripting	1
3.5	Commit stage-Commit stage principles and practices,	1
3.6	The result of Commit stage	1
3.7	Commit test suite principles and practices.	1
3.8	Set up Jenkin Continuous Integration System and analyse the working of Jenkin by frequently committing changes into the Git version control system.	2
4	**Module 4**	**10 hrs.**
4.1	Automated Testing-Automated acceptance testing, Layers in acceptance test	2
4.2	Implementing acceptance tests, The acceptance test stage	2
4.3	Acceptance test performance.	1
4.4	Testing nonfunctional requirements-Managing Nonfunctional requirements, Analyzing Non functional requirements	1
4.5	The capacity testing environment, Automating capacity testing	1

4.6	Capacity testing via the user interface.	1
4.7	Install the test automation tool Selenium and analyse the working of Selenium	1
4.8	Install the Cucumber testing tool that support behaviour driven development and analyse the working of Cucumber.	1
5	**Module 5**	**9 hrs.**
5.1	Deploying and Releasing Applications-Creating a Release strategy -The Release Plan, Releasing products	2
5.2	Deploying and promoting your applications	1
5.3	Rolling Back Deployments and Zero-Downtime Releases-Rolling Back by Redeploying the Previous Good Version, Blue-Green Deployments Canary Releasing	2
5.4	Managing Infrastructure and Environments-Understanding the needs of the Operations team, Monitoring infrastructure and applications	2
5.5	Install the DevOps monitoring tool Opsgenie and analyse the working of Opsgenie.	2

MODEL QUESTION PAPER

Reg No.:________________		Name:____	

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SEVENTH SEMESTER INTEGRATED M.C.A DEGREE EXAMINATION

MODEL QUESTION PAPER

Course Code: 20INMCA407

Course Name: ADVANCED SOFTWARE ENGINEERING

Max. Marks: 60 | Duration: 3 Hours

PART A

		Answer all questions, each carries3 marks.	Marks
1		What are the phases of DevOps life cycle?	(3)
2		Examine the role of version control system in software configuration management.	(3)
3		Differentiate between centralized version control system and distributed version control system.	(3)
4		Compare git fetch and git pull	(3)
5		Write a note on build tools.	(3)
6		List out the principles and practices for build and deployment scripting.	(3)
7		Why is automated acceptance testing essential?	(3)
8		Write a note on acceptance test stage.	(3)
9		What are the factors to be considered while creating the first version release strategy?	(3)
10		Explain Zero-Downtime release.	(3)

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

11		Examine the principles of software delivery.	(6)
		OR	
12		What is Continuous Integration? What are the essential practices required for Continuous Integration?	(6)

Module II

13		Explain the core operations in Git.	(6)

OR			
14		Explain the working of branches and tags in git.	(6)
Module III			
15		Examine the stages of deployment pipeline with the help of a neat diagram.	(6)
OR			
16		Examine the commit stage principles and practices.	(6)
Module IV			
17		Explain the layers in automated acceptance test.	(6)
OR			
18		Explain acceptance test performance in detail.	(6)
Module V			
19		Summarize the steps involved in promoting and deploying applications.	(6)
OR			
20		Compare blue-green deployment and canary release.	(6)

20INMCA409	Distributed Computing	CATEGORY	L	T	P	CREDIT
		General	3	1	0	4

Preamble: This course provides a solid theoretical foundation that furnishes the student with insight into the more sophisticated distributed computing systems and understand large data processing facilities that provides significant computing capabilities.

Prerequisite: 20INMCA206 Operating Systems

Course Outcomes: After the completion of the course, the student will be able to

CO 1	Recognize distributed systems architecture.
CO 2	Distinguish between various communication models in distributed systems
CO 3	Examine on various consistency models
CO 4	Examine different cloud models and services
CO 5	Understand and analyse different virtualisation mechanisms

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO 1		2		1			2					
CO 2				1					2			1
CO 3	1	1	1	2		1				1		
CO 4					2			2			2	
CO 5		1			2					1		

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10	10	10
Understand(K2)	15	15	15
Apply(K3)	10	10	15
Analyse(K4)	15	15	20
Evaluate(K5)			
Create(K6)			

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 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):

Que 1. List out the goals of a distributed computing system (K1)

Que 2. Describe code migration in detail. (K2)

Que 3. Summarize on various types of distributed computing system. (K4)

Course Outcome 2 (CO2)

Que 1. Explain one election algorithm in detail (K2)

Que 2. With necessary diagrams, explain RPC (K2)

Que 3. Explain one mutual exclusion algorithm in detail (K2)

Course Outcome 3 (CO3):

Que 1. Describe various consistency models (K2)

Que 2. Explain process resilience. (K2)

Que 3. Explain reliable client-server communication (K2)

Course Outcome 4 (CO4):

Que 1. With a proper diagram, explain NIST cloud computing reference architecture. (K2)

Que 2. Differentiate b/w public and private cloud (K2)

Que 3. Summarize on various cloud models. (K4)

Course Outcome 5 (CO5):

Que 1. Assess the various implementation levels of virtualization (K4)

Que 2. Explain layered cloud architecture development (K2)

Que 3. Summarize on virtualization of CPU, Memory and I/O Devices. (K4)

Syllabus

Module 1

Introduction to distributed systems – definition, goals, types (Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems (Home Systems)). **Processes** – Virtualisation, Clients, Servers (General Design Issues, General Organization, Distributed Servers), Code Migration (Approaches to Code Migration, Migration and Local Resources)

Module 2

Communication – RPC (Basic RPC Operation-Conventional Procedure Call, Client and Server Stubs, Parameter Passing-Passing Value Parameters, Asynchronous RPC).

Synchronization – Clock synchronization (Physical Clocks, Global Positioning System), Election Algorithms (Bully Algorithm, Ring Algorithm), Mutual Exclusion (Centralized Algorithm, Distributed Algorithm, Token Ring Algorithm)

Module 3

Consistency and replication – Data centric consistency, client centric consistency. **Fault Tolerance** – introduction, process resilience, reliable client-server communication, reliable group communication (Basic Reliable-Multicasting Schemes, Atomic Multicast-Virtual Synchrony).

Module 4

Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. **Cloud Models and Services** – Cloud models (IaaS, PaaS, and SaaS) – Public vs Private Cloud

Module 5

Virtual machines and Virtualisation of clusters and data centres: Implementation Levels of Virtualization, Virtualization Structures /Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices.

Architectural Design of Compute and Storage Clouds: Layered Cloud Architecture Development – Architectural Design Challenges.

Reference Books

1. Distributed Systems – Principles and Paradigm, Tanenbaum& Van Steen, 2nd Edition, PHI Publications
2. "Cloud Computing: Implementation, Management, and Security" John W.Rittinghouse and James F.Ransome, CRC Press, 2010.
3. "Cloud Computing, A Practical Approach" Toby Velte, Anthony Velte, Robert Elsenpeter, TMH, 2009.
4. "Cloud Computing – insights into New-Era Infrastructure", Kumar Saurabh, Wiley India, 2011.
5. "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Morgan Kaufmann Publishers, 2012.

MOOC Courses

1. https://www.coursera.org/learn/cloud-computing?specialization=cloud-computing
2. https://www.coursera.org/learn/cloud-computing-2?specialization=cloud-computing

Web Resources

1. https://www.tutorialspoint.com/Distributed-Systems

2.http://archive.mu.ac.in/myweb_test/MCA%20study%20material/M.C.A.(Sem%20-%20V)%20Distributed%20Computing.pdf

Course Contents and Lecture Schedule

Topic	**No. of lectures**
Module 1	**10 hrs.**
Definition	1
Goals	1
Types	2
Virtualisation	1
Clients	1
Servers	2
Code Migration	2
Module 2	**8 hrs.**
RPC	2
Clock synchronization	2
Election Algorithms	2
Mutual Exclusion	2

Module 3	**10 hrs.**
Data centric consistency	1
Client centric consistency	1
Fault Tolerance – introduction	2
Process resilience	2
Reliable client-server communication	2
Reliable group communication	2
Module 4	**11 hrs.**
Technologies for Network-Based System	2
System Models for Distributed and Cloud Computing	3
NIST Cloud Computing Reference Architecture	3
Cloud Models and Services	3
Module 5	**9 hrs.**
Implementation Levels of Virtualization	1
Virtualization Structures /Tools and Mechanisms	2
Virtualization of CPU, Memory and I/O Devices	2
Layered Cloud Architecture Development	2
Architectural Design Challenges	2

MODEL QUESTION PAPER

Reg No.:________________			Name:________________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER INTEGRATED M.C.A DEGREE EXAMINATION
MODEL QUESTION PAPER

Course Code: 20INMCA409

Course Name: DISTRIBUTED COMPUTING

Max. Marks: 60		Duration: 3 Hours

PART A

		Answer all questions, each carries3 marks.	Marks
1		List out various types of distributed systems	(3)
2		Illustrate various goals of distributed systems	(3)
3		Explain any mutual exclusion algorithm	(3)
4		Summarize on RPC	(3)
5		Distinguish between consistency and replication	(3)
6		Describe on process resilience	(3)
7		Distinguish between IaaS and PaaS	(3)
8		Summarize on various cloud models	(3)
9		Summarize on CPU virtualization	(3)
10		Summarize on I/O devices virtualization	(3)

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

11		Summarize on Distributed Information Systems	(6)
		OR	
12		Define and explain code migration	(6)

Module II

13		Explain one election algorithm in detail	(6)
		OR	
14		With necessary diagrams, explain RPC	(6)

Module III

15		Describe various consistency models	(6)
		OR	
16		Explain reliable client-server communication	(6)

Module IV

17		With a proper diagram, explain NIST cloud computing reference architecture	(6)

OR			
18		Summarize on various cloud models	(6)
Module V			
19		Summarize on virtualization of CPU, Memory and I/O Devices	(6)
OR			
20		Explain layered cloud architecture development	(6)

20INMCA431	Java Programming - Lab	CATEGORY	L	T	P	CREDIT
		General	0	1	3	1

Preamble: The syllabus is prepared with the view of preparing the MCA Graduates capable of writing Java programs to solve computational problems that they may have to solve in their professional life. The students can explore various programming constructs and data structures for the basic problem solving in Java language. The course content is decided to cover the essential programming fundamentals.

Prerequisite: 20INMCA132: Problem Solving and Structured Programming Lab, 20INMCA233: Basic Object Oriented Programming Lab

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

CO 1	Understand the concepts of object-oriented programming paradigms and develop skills in Java.
CO 2	Apply the concepts of constructors and destructors.
CO 3	Implement various Inheritance concepts.
CO 4	Analyse and evaluate the use of interfaces, Exception Handling, and Multithreaded Programming.
CO 5	Apply and understand JAVA I/O operations, Applets, and Event Handling concept.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	**1**	**1**		**3**	2	**1**		1	1			**3**

CO 2	**2**			**3**	**3**	1	1	3	2	**2**	2	**1**
CO 3	**2**	**2**	**1**	**2**	**3**			2	3	**1**		**1**
CO 4			**3**	**3**	**2**	2	3	2	3	**2**	**2**	**3**
CO 5	**1**		**3**			2	1				**2**	**2**

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	**2**	
Remember(K1)	10	10	10
Understand(K2)	10	10	10
Apply(K3)	10	10	10
Analyse(K4)	20	20	20
Evaluate(K5)			
Create(K6)			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern

Attendance : 08 Marks
Continuous Assessment Test (2 numbers) : 30 Marks
Assignment/Quiz/Course project : 12 Marks

End Semester Examination Pattern

Lab exam will be conducted by an internal examiner.

Course Outcome 1 (C01):

1. Create a program to check whether the given number is prime or not using class. (K4).
2. Create a program to prepare a Student Record using class and object to, computing total marks and displaying the results.(K4)

Course Outcome 2 (C02):

1. Create a program to demonstrate a copy constructor (K4).

Course Outcome 3 (C03):

1. Create a program to demonstrate single and multilevel Inheritance (K4).
2. Recommend a method to demonstrate the concept of multiple inheritance in java (K4)

Course Outcome 4 (C04):

1. Create a program to demonstrate Interface (K4)
2. Generate a program to demonstrate user defined exception in Java(K4)

Course Outcome 5 (C05):

1. Develop a program to draw a rectangle (K4)

Syllabus

Classes: Class Fundamentals, Declaring Objects, Constructors, Introducing Access Control (public, private, protected)

Inheritance : Member access and Inheritance, Using super and this keyword. Method overriding, Dynamic method dispatch, Using abstract classes, Using and final Inheritance

Packages: Defining a package, Importing packages.

Interface: Defining an interface, implementing Interface.

Multithreaded Programming: Creating a Threads - Extending thread and Implementing runnable, Creating multiple Threads

I/O: Byte Streams, Character Streams, Reading console inputs, Reading characters, Reading Strings

Applets: Applet, passing parameters to applet

Event Handling: Event Listener Interface. AWT Classes, Working with Graphics, Working with Color.

Networking: TCP/IP Client sockets, TCP/IP Server Sockets, Datagrams.

Reference Books

1. Herbert Schildt, "The Complete Reference Java 2" , TATA McGRAW-Hill Edition,Fifth Edition,2002.
2. Mahesh P. Matha, "CORE JAVA AComprehensive Study", PHI Learning Private Limited 2011.
3. Balagurusamy E., "Programming JAVA a Primer", 5/e, McGraw Hill, 2014.

Web Resources

1. https://www.studytonight.com/java/
2. https://www.tutorialspoint.com/java/

List of Lab Experiments

1 Write a Java program that takes three numbers as input to calculate and print the average of the numbers. Create a class Average, the methods are

a. void getInput(Use Scanner class to accept Input)

b. void add()

c. double average()

create a class AverageDemo and create objects of Average class and call the above methods.

2. Write a Java program to print the area and perimeter of a Rectangle. Also implement the concept of this Keyword.Create a class Rectangle, the methods are

   a. double areaRect(double x,double y) (area=w*l)

   b. double periRect(double x,double y) (perimeter=2*(l+w))

   create a class RectangleDemo and create objects of class Rectangle and call the above methods. (Use Scanner class to accept Input)

3. Create a java program to implement constructor Overloading
4. Create a java program that displays area of different fingers (Rectangle,Square,Triangle) using method overloading. Methods are
   a. Void area(int,int)
   b. Void area(int)
   c. Void area(double,double)
5. Create a java program to perform Matrix addition
6. WAP to create a package for Book details giving BookName,AuthorName,Price and year_of_publishing.Implement this package for the creation and use of another class Library
7. Create a java program to implement multiple inheritance using Interface
8. Develop a program to demonstrate Arithmetic Exception
9. Develop a program to demonstrate try with multiple catch statements
10. Create a Program to throw a user defined exception if the product of two integers is greater than 50
11. Create an applet Program to demonstrate the life cycle of applet
12. Create a program to embed image in applet
13. Create a program to embed sound in an applet
14. Create an applet program to draw an Indian flag
15. Create a java Program to implement client and server communication using TCP
16. Create a java Program to implement client and server communication using UDP

Course Contents and Lecture Schedule

Topic	**No. of Hours**
Classes: Class Fundamentals , Declaring Objects, Constructors, Introducing Access Control (public, private, protected)	9

Inheritance: Member access and Inheritance, Using super and this keyword. Method overriding, Dynamic method dispatch, Using abstract classes, Using and final Inheritance	7
Packages :Defining a package, Importing packages.	7
Interface: Defining an interface, implementing Interface.	5
Multithreaded Programming: Creating a Threads - Extending thread and Implementing runnable ,Creating multiple Threads	5
I/O: Byte Streams, Character Streams, Reading console inputs, Reading characters, Reading Strings	5
Applets: Applet, passing parameters to applet	5
Event Handling: Event Listener Interface. AWT Classes, Working with Graphics, Working with Color. **Networking** TCP/IP Client sockets, TCP/IP Server Sockets, Datagrams.	5

20INMCA433	ADVANCED WEB PROGRAMMING LAB	CATEGORY	L	T	P	CREDIT
		GENERAL	0	1	3	1

Preamble: With a dynamic learn-by-doing focus, this laboratory course encourages the students to explore the designing of web applications by implementing the relevant and recent techniques. This course challenges the students to exercise their creativity in both programming and designing.

Prerequisite: 20INMCA232 Scripting Lab, **20INMCA333** User Interface Design Lab.

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

CO 1	Design and implement dynamic websites with a good aesthetic sense of designing and latest technical know-how's.
CO 2	Develop solutions to complex problems using appropriate methods & technologies.
CO 3	Describe different Web Extensions and Web Services.
CO 4	Develop Web Applications with CMS.
CO 5	Build Dynamic web site using server side scripting languages/ Frameworks.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1			2		3			2				3
CO 2		2	3		2		1			2		
CO 3	3	2	1		2			3				2
CO 4	3	2	2		2							
CO 5	2		2		2			1		2		2

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10	10	10
Understand(K2)	10	10	10
Apply(K3)	10	10	10
Analyse(K4)	20	20	20
Evaluate(K5)			
Create(K6)			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern

Attendance : 08 Marks

Continuous Assessment Test (2 numbers) : 30 Marks

Assignment/Quiz/Course project : 12 Marks

End Semester Examination Pattern

Lab exam will be conducted by an Internal Examiner.

Course Level Assessment

Course Outcome 1 (C01)

1. Create Dynamic web pages containing forms with the help of HTML, CSS and JavaScript. **(K4)**
2. Design your Biodata Webpage using PHP 7. **(K4)**
3. Create a Job Application website with suitable pages with the help of PHP 7 and MySQL**.** **(K4)**

Course Outcome 2 (C02):

1. Redesign the above job application website by creating PHP 7 with OOP concepts. **(K4)**
2. Create a view page for the job profile using constructors. **(K4)**
3. Implement inheritance by creating class for experience, education qualification from class personal information. **(K4)**

Course Outcome 3 (C03):

1. Create a user validation web application for the above job application, where the user submits the login name and password to the server. The name and password are checked against the data already available in Database and if the data matches, a Successful login page is returned. Otherwise a failure message is shown to the user. **(K4)**
2. Implement validation using JQuery for the job application website. **(K3)**
3. Design an employer site to show options like ‘Shortlist’, ‘Waiting list’, ‘Discard’. Implement these actions using AJAX. **(K4)**

Course Outcome 4 (C04):

1. Generate JSON data in order to communicate between employer form and registration data stored in the database. **(K4)**
2. Create your personal blog using CMS. **(K4)**

Course Outcome 5 (C05):

1. Create a MVC application having login, registration and profile. **(K4)**
2. Design a MVC application for the Job application website having employer functionalities such as job application management. **(K4)**
3. Modify the application with applicant functionalities such as job searching, applying for a job and check status. **(K4)**
4. Microproject [Design a MVC web application, may include Payment Gateway Integration and Web services **(K4).**

SYLLABUS

Module 1

Client side scripting and Validation: - HTML, CSS, JavaScript, Basic PHP 7 programs - Database Connectivity

Module 2

Basic Object Oriented Programming: - Defining a class, creating an object, the $this attribute, creating constructors, Creating Destructors.

Advanced OOP: - Inheriting classes, inheriting constructors and Destructors, overriding methods, Access Controls, Using Scope resolution operators, Creating static members.

More advanced OOP: - Abstract classes and methods, Interfaces, Namespaces.

Module 3

JQuery: Introduction, finding elements, JQuery methods, objects, Looping, Getting/updating/changing /inserting/adding element content, Getting and setting attribute values, Event methods.

Ajax: Introduction to ajax, How Ajax works, Handling ajax Requests and Responses. Data Formats: XML-Extensible Markup Language.

Module 4

JSON- JavaScript Object Notation, Working with JSON data. Loading HTML, XML, JSON with Ajax. Working with data from other servers: -JSONP. JQuery and Ajax: Requests and Responses. JQuery's Ajax Shorthand Methods, Submitting forms.

Content Management System(CMS): Basic architecture & configuration, design and develop an application with CMS.

Module 5

Framework: MVC architecture, Configuration, Design, DB Integration, Web Hosting, Payment Gateways.

Micro Project with Framework.

Reference Books

1. Steve Prettyman "Learn PHP 7", Object-Oriented Modular Programming using HTML5, CSS3, JavaScript, XML, JSON, and MySQL, Apress, Ist edition(2015).

2. Deane Barker “Web Content Management”, System, Features and Best Practices, O'Reilly Media, Inc, Ist edition(2016).
3. Larry Ullman, “PHP Advanced and Object- Oriented Programming”, Peachpit Press, 3rd edition(2007).
4. JON DUCKETT “JAVASCRIPT & JQUERY”, Interactive Front-End Web Development, John Wiley & Sons, Inc. (2014).
5. Chris Pitt “Pro PHP MVC”, Apress, Ist edition(2012).
6. Ramesh Nagappan, Robert Skoczylas, Rima Patel Sriganesh “Developing Java Web Services, Architecting and Developing Secure Web Services Using Java” Wiley Publishing Inc.(2003).
7. Ludovic Dewailly “Building a RESTful Web Service with Spring”, Packt Publishing.(2015).

Web Resources

1. https://www.udemy.com/course/jquery-guide/
2. https://www.udemy.com/course/understanding-mvc-model-view-controller-with-php/

List of Lab Experiments

1. Create Dynamic web pages containing forms with the help of HTML, CSS and JavaScript.
2. Design your Biodata Webpage using PHP 7.
3. Create a Job Application website with suitable pages with the help of PHP 7 and MySQL.
4. Redesign the above job application website by creating PHP 7 with OOP concepts.
5. Create a view page for the job profile using constructors.
6. Implement inheritance by creating class for experience, education qualification from class personal information.
7. Create a user validation web application for the above job application, where the user submits the login name and password to the server. The name and password are checked against the data already available in Database and if the data matches, a Successful login page is returned. Otherwise a failure message is shown to the user.
8. Implement validation using JQuery for the job application website.

9. Design an employer site to show options like ‘Shortlist’, ‘Waiting list’, ‘Discard’. Implement these actions using AJAX.
10. Generate JSON data in order to communicate between employer form and registration data stored in the database.
11. Create your personal blog using CMS.
12. Create a MVC application having login, registration and profile.
13. Design a MVC application for the Job application website having employer functionalities such as job application management.
14. Extend the application with applicant functionalities such as job searching, applying for a job and check status.
15. **Microproject:** [Design a MVC web application, may include Payment Gateway Integration and Web services].

Course Contents and Lecture Schedule

No.	Topic	No. of Hours
1	**Module 1**	**7 hrs.**
1.1	Client side scripting and Validation : HTML, CSS, JavaScript	3
1.2	Basic PHP 7 programs - Database Connectivity.	4
2	**Module 2**	**11 hrs.**
2.1	Basic Object Oriented Programming :Defining a class, creating an object, the $this attribute, creating constructors, Creating Destructors.	3
2.2	Advanced OOP: Inheriting classes, inheriting constructors and Destructors, overriding methods, Access Controls, Using Scope resolution operators, Creating static members.	4
2.3	More advanced OOP : Abstract classes and methods, Interfaces, Namespaces.	4
3	**Module 3**	**9 hrs.**

3.1	JQuery : Introduction, finding elements, JQuery methods, objects, Looping, Getting/updating/changing /inserting/adding element content, Getting and setting attribute values, Event methods.	4
3.2	Ajax: Ajax: Introduction to ajax, How Ajax works, Handling ajax Requests and Responses. Data Formats: XML-Extensible Markup Language.	5
4	**Module 4**	**9 hrs.**
4.1	JSON : JavaScript Object Notation, Working with JSON data. Loading HTML, XML, JSON with Ajax. Working with data from other servers: -JSONP. JQuery and Ajax: Requests and Responses. JQuery's Ajax Shorthand Methods, Submitting forms.	4
4.2	Content Management System(CMS) : Content Management System(CMS): Basic architecture & configuration, design and develop an application with CMS.	5
5	**Module 5**	**12 hrs.**
5.1	Framework :MVC architecture, Configuration, Design, DB Integration, Web Hosting, Payment Gateways.	7
5.2	Micro Project with Framework	5

Note: *This laboratory is to be conducted with a suitable framework. The colleges can choose the required platform. Some of the suggested environments for the framework are Laravel, CodeIgniter, or any other PHP framework depending on availability, and for CMS platforms are WordPress, Joomla etc:*

INT MCA SEMESTER VIII

INT MCA SEMESTER VIII	
Course No	**Course**
20INMCA402	Advanced Database Management Systems
20INMCA404	Advanced Computer Networks
20INMCA406	Research Methodology
20INMCA4--	Elective 1
20INMCA4--	Elective 2
20INMCA432	Advanced DBMS Lab
20INMCA434	Networking & System Administration Lab
20INMCANC2	Industrial Readiness Training

20INMCA402	ADVANCED DATABASE MANAGEMENT SYSTEMS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course provides the basic concepts and terminology related to relational and non-relational database management systems. The concept of advanced DBMS techniques and new generation databases like MongoDB, HBase and Cassandra are also introduced. This course serves as a prerequisite for many advanced courses in Data Science and Machine Learning areas.

Prerequisite: Basic knowledge in Database Management Systems.

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

CO 1	Understand the fundamentals of relational database systems including: data models, database architectures.
CO 2	Analyze and apply the different normalization techniques.
CO 3	Assess the basic issues of transaction processing and concurrency control.
CO 4	Understand the roles that databases play in organizations and familiarize with basic database storage, file organization, database accessing techniques.
CO 5	Understand the basics of query processing, object-oriented, distributed databases.
CO 6	Analyze non-relational database systems and structures and XML.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1				1			1					

CO 2	3	3	3	2			2	2			2	2
CO 3	1	2	2	2		2					2	2
CO 4					1		1					
CO 5	1			1								
CO 6	1											

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	5	5	5
Understand(K2)	10	10	10
Apply(K3)	10	10	15
Analyse(K4)	5	5	5
Evaluate(K5)	10	10	15
Create(K6)	10	10	10

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 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. Examine why databases are important. (K3)
2. Describe the basic features of the relational data model and discuss their importance to the end user and the designer. (K2)
3. Analyze the graphic depiction of relationships among the entities and examine how these depictions help in the database design process. (K4)

Course Outcome 2 (CO2):

1. Evaluate and design good table structures to control data redundancies and anomalies. (K6)

Course Outcome 3(CO3):

1. Explain the database transaction and its properties. (K2)
2. Describe concurrency control and analyze the role it plays in maintaining the database integrity. (K4)
3. Assess the common algorithms for concurrency control. (K5)
4. Define deadlock and discuss the strategies for managing deadlocks. (K2)
5. Examine how database recovery management is used to maintain database integrity. (K3)

Course Outcome 4 (CO4):

1. Discuss the various disk-organization techniques. (K2)
2. Describe the various data structures that allow fast access to data. (K2)
3. Analyze and examine the different indexing techniques. (K4)

Course Outcome 5 (CO5):

1. Describe the basics of query processing and evaluate the query processing cost. (K5)

2. Analyze the concept of object oriented databases and distributed databases. (K4)

Course Outcome 6 (CO6):

1. Explain the concept of XML. (K2)
2. Describe the various NoSQL databases. (K2)

Syllabus

Module I: Relational Databases

Introduction - Purpose of Database System – Database System Applications - View of data: Data Abstraction, Instances and Schemas, Data Models – Database Architecture - Database Users and Administrators: Database Users and Interfaces, DBA – Introduction to the Relational Model: Structure of Relational Database, database Schema, Keys, Relational Query language – The Relational Algebra: Fundamental Operations, Formal definition of the relational algebra, additional relational algebra operations

Module II: Database Design

Database Tables and Normalization – The Need for Normalization – The Normalization Process: Inference Rules for Functional Dependencies (proof not needed) - Minimal set of Functional Dependencies - Conversion to First Normal Form, Conversion to Second Normal Form, Conversion to Third Normal Form - Improving the Design - Surrogate Key Considerations - Higher Level Normal Forms: Boyce/Codd Normal Form, Fourth Normal Form, Join dependencies and Fifth Normal Form – Normalization and Database Design.

Module III: Transaction Management and Concurrency Control

Transaction: Evaluating Transaction Results, Transaction Properties, Transaction Management with SQL, The Transaction Log – Concurrency Control: Lost Updates, Uncommitted Data, Inconsistent Retrievals, The Scheduler – Concurrency Control with Locking Methods: Lock Granularity, Lock Types, Two Phase Locking to Ensure Serializability, Deadlocks – Concurrency Control with Timestamping Methods: Wait/Die and Wait/Wound Schemes – Concurrency Control with Optimistic Methods - Database Recovery Management: Transaction Recovery.

Module IV: Data Storage and Querying

RAID – File Organization – Organization of Records in Files – Indexing and Hashing: Basic concept, Ordered Indices, B+ tree Index Files: Structure of a B+-Tree (structure only, algorithms not needed) - B tree index files – Static Hashing – Dynamic Hashing – Query Processing: Overview - Selection Operation.

Module V: System Architecture, Object Oriented Databases, XML and NoSQL

Distributed Databases: Homogeneous and Heterogeneous Databases, Distributed Data Storage,

Distributed Transactions - Object Based Databases: Overview, Complex Data types, Structured types and inheritance in SQL, Table Inheritance, Array and Multiset types in SQL, Object identity and reference types in SQL - XML: DTD and XML Schema, XML presentation, XML Applications - Next Generation Databases: Distributed Relational Databases - Nonrelational Distributed Databases - MongoDB Sharding and Replication - Hbase - Cassandra - CAP Theorem.

Text Books

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan," Database System Concepts", McGraw Hill Education, 6th Edition, 2011.
2. Ramez Elmasri, Shamkant B.Navathe, " Fundamentals of Database Systems ", Pearson Education, 6th Edition, 2010.
3. Guy Harrison, "Next Generation Databases: NoSQL, NewSQL, and Big Data", Apress, 1st Edition, 14 December 2015.
4. Rob, Peter and Carlos Coronel, "Database Principles: Fundamentals of Design, Implementation and Management", 9th Edition, 2011.

Reference Books

1. Ashutosh Kumar Dubay, "Database Management Concepts", S.K. Kataria & Sons, 1st Edition (2012).
2. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", McGraw Hill, 3rd Edition (2014).
3. Thomas M Connolly and Carolyn E Begg, "Database systems- A Practical Approach to Design, Implementation and Management", Pearson Education, 4th Edition (2014).

Web Resources

1. Introduction to Databases (nptel) https://nptel.ac.in/courses/106/106/106106220/
2. Database Design https://nptel.ac.in/courses/106/106/106106093/
3. Introduction to Database Systems and Design https://nptel.ac.in/courses/106/106/106106095/
4. Fundamentals of Database Systems https://nptel.ac.in/courses/106/104/106104135/#
5. Database Management Essentials (Coursera) https://www.coursera.org/learn/database-management
6. Database Systems Concepts & Design https://www.udacity.com/course/database-systems-concepts-design--ud150

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	***Module I: Relational Databases***	**8 hours**
1.1	Introduction - Purpose of Database System - Database System Applications	1 hr
1.2	View of data: Data Abstraction, Instances and Schemas, Data Models	1 hr
1.3	Database Architecture	1 hr
1.4	Database Users and Administrators: Database Users and Interfaces, DBA	1 hr
1.5	Introduction to the Relational Model: Structure of Relational Database, database Schema, Keys, Relational Query language	2 hr
1.6	The Relational Algebra: Fundamental Operations, Formal definition of the relational algebra, additional relational algebra operations	2 hr
2	***Module II: Database Design***	**9 hours**
2.1	Database Tables and Normalization - The Need for Normalization	1 hr

2.2	The Normalization Process: Inference Rules for Functional Dependencies (proof not needed) - Minimal set of Functional Dependencies - Conversion to First Normal Form, Conversion to Second Normal Form	2 hr
2.3	Conversion to Third Normal Form	1 hr
2.4	Improving the Design - Surrogate Key Considerations	1 hr
2.5	Higher Level Normal Forms: Boyce/Codd Normal Form	1 hr
2.6	Fourth Normal Form	1 hr
2.7	Join dependencies and Fifth Normal Form	1 hr
2.8	Normalization and Database Design	1 hr
3	***Module III: Transaction Management and Concurrency Control***	**9 hours**
3.1	Transaction: Evaluating Transaction Results, Transaction Properties	1 hr
3.2	Transaction Management with SQL, The Transaction Log	1 hr
3.3	Concurrency Control: Lost Updates, Uncommitted Data, Inconsistent Retrievals, The Scheduler	2 hr
3.4	Concurrency Control with Locking Methods: Lock Granularity	1 hr
3.5	Lock Types, Two Phase Locking to Ensure Serializability	1 hr
3.6	Deadlocks	1 hr
3.7	Concurrency Control with Timestamping Methods: Wait/Die and Wait/Wound Schemes, Concurrency Control with Optimistic Methods, Database Recovery Management: Transaction Recovery	2 hr
4	***Module IV: Data Storage and Querying***	**10 hours**
4.1	RAID	1 hr

4.2	File Organization	1 hr
4.3	Organization of Records in Files	1 hr
4.4	Indexing and Hashing: Basic concept, Ordered Indices	1 hr
4.5	B+ tree Index Files: Structure of a B+-Tree, B tree Index Files	2 hr
4.6	Static Hashing, Dynamic Hashing	2 hr
4.7	Query Processing: Overview, Selection Operation	2 hr
5	***Module V: System Architecture, Object Oriented Databases, XML and NoSQL***	**12 hours**
5.1	Distributed Databases: Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions	1 hr
5.2	Object Based Databases: Overview, Complex Data types	1 hr
5.3	Structured types and inheritance in SQL	1 hr
5.4	Table Inheritance	1 hr
5.5	Array and Multiset types in SQL	1 hr
5.6	Object identity and reference types in SQL	1 hr
5.7	XML: DTD and XML Schema	1 hr
5.8	XML presentation, XML Applications	1 hr

5.9	Next Generation Databases: Distributed Relational Databases - CAP Theorem	1 hr
5.10	Nonrelational Databases – MongoDB Sharding and Replication	1 hr
5.11	Hbase	1 hr
5.12	Cassandra	1 hr

MODEL QUESTION PAPER

Reg No.:_______________		Name:_______________________________________	

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

EIGHTH SEMESTER INTEGRATED M.C.A DEGREE EXAMINATION

MODEL QUESTION PAPER

Course Code: 20INMCA402

Course Name: ADVANCED DATABASE MANAGEMENT SYSTEMS

Max. Marks: 60 | Duration: 3 Hours

PART A

		Answer all questions, each carries3 marks.	Marks
1		What is the purpose of Database System?	(3)
2		Differentiate between instances and schemas of database.	(3)
3		What is Data Normalization and why is it Important?	(3)
4		What do you meant by Join dependencies?	(3)
5		Write a note on transaction properties.	(3)
6		What are the strategies for managing deadlocks?	(3)
7		Explain the various disk-organization techniques.	(3)
8		Differentiate between Static Hashing and Dynamic Hashing	(3)
9		Write a note on Array and Multiset types in SQL	(3)
10		Compare DTD and XML Schema.	(3)

PART B

Answer any one question from each module. Each question carries 6 marks.

		Module I	
11		Explain the Database architecture in detail.	(6)
		OR	
12		Describe the fundamental operations in Relational algebra.	(6)
		Module II	
13		Examine the Inference Rules for Functional Dependencies.	(6)
		OR	
14		Examine the conversion to third normal form with the help of examples.	(6)
		Module III	
15		Explain the Concurrency Control with Locking Methods.	(6)
		OR	
16		Examine how database recovery management is used to maintain database integrity.	(6)

Module IV			
17		Analyze the RAID – File Organization.	(6)
OR			
18		Analyze the structure of a B+ Tree.	(6)
Module V			
19		Explain the concept of object oriented databases and distributed databases.	(6)
OR			
20		Explain MongoDB Sharding and Replication.	(6)

20INMCA404	Advanced Computer Networks	CATEGORY	L	T	P	CREDIT
		General	3	1	0	4

Preamble: The syllabus is prepared with the view of equipping the MCA Graduates in the domain of internetworking applications and throughout the networking terminologies. The course content is decided to cover the essentials explored with respect to various protocols within the TCP/IP protocol stack. An introduction to the Python Network programming language is included in this to motivate students for the hands on experiment.

Prerequisite: 20INMCA210 Internet Concepts and Web Technology.

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

CO 1	Analyse the terminology and concepts of the OSI reference model and the TCP-IP reference model
CO 2	Analyse basic taxonomy and terminology of the computer networking area
CO 3	Assess advanced networking concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks.
CO 4	Evaluate various related technical, administrative and social aspects of specific computer network protocols related to error detection and control.
CO 5	Expertise in some specific areas of networking such as the design of networking applications using Python.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1				1	2	1	1		2	2
CO 2	2	1			2				2		1	2
CO 3	2	1	1	1	1	2	2	2	2	1	1	2
CO 4	2	3	2	1	2		1	1	2			1

CO 5	3	3	2	3	2	1	1	1	2	1	1	1

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	9	9	12
Understand (K2)	9	9	18
Apply(K3)	18	18	18
Analyse(K4)	14	14	12
Evaluate(K5)			
Create(K6)			

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 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. Describe IP model(K2)
2. Describe how FTP works (K2)
3. Discuss the working of DNS(K2)

Course Outcome 2 (CO2):

1. Explain how multiplexing and demultiplexing is performed (K2)
2. Discuss connection-oriented transport using TCP (K2)
3. Discuss connection less transport using UDP (K2)
4. Compare Go Back N with Selective Repeat (K5)

Course Outcome 3(CO3):

1. Discuss the principles of routing (K2)
2. Illustrate virtual circuits and datagrams (K4)
3. Evaluate Link state with Distance Vector routing algorithms. (K5).
4. Compare IPV4 with IPV6 (K5)
5. Discuss TCP congestion control (K2)

Course Outcome 4 (CO4):

1. Demonstrate error detection methods discussed in link layer (K3)
2. Discuss multiple access protocols (K2)
3. Justify IEEE802.11 in operation (K5)

Course Outcome 5 (CO5):

1. Design a Python program for echo server (K6)
2. Design a Python program for chat application using TCP(K6)
3. Design a Python program for chat application using UDP(K6)

Syllabus

Module 1

Introduction: Basic communications model - Protocol layers and service models - Basic definitions - OSI model - Internet protocols.

Application Layer: Network application architecture, Web, HTTP, FTP, SMTP, POP3, and DNS

Module 2

Transport Layer Protocols: Introduction to transport layer, Multiplexing and demultiplexing, Principles of Reliable data transfer - Stop-and-wait and Go-back- N design and evaluation, Connection oriented transport TCP, Connection less transport UDP, Principles of congestion control - efficiency and fairness

Module 3

Network Layer Protocols: Virtual circuits and datagrams, Principles of routing, internet protocol Ipv4 and Ipv6, Routing algorithms: Link-state and distance vector routing, Routing on the internet RIP, OSPF and BGP, Multicast routing

Congestion control and resource allocation: Queuing disciplines, TCP congestion control, congestion avoidance mechanisms, quality of service.

Module 4

Link layer and Physical Layer: Introduction to link layer - Error detection (parity, checksum, and CRC), Multiple access protocols (collision and token based), IEEE 802.3, Ethernet, wireless (802.11), Bluetooth, cellular networks, Switching and bridging.

Module 5

Network programming with Python: Network Programming and Python, IP and DNS, Programming with sockets: Working with TCP sockets, Working with UDP sockets, Client and Server Applications, Echo server

Text Books

1. James Kurose, Keith W. Ross, “Computer Networking: A Top-Down Approach”, Pearson, 6th Edition.

2. Dr M O Faruque Sarkar, Sam Washington, “ Learning Python Network Programming “, PACKT publishing open source, Birmingham

Reference Books

1. Behrouz A Forouzan, Firouz Mosharraf, “Computer Networks: A top down Approach”, McGraw Hill Education, 1st Edition (2011).

2. Kevin R. Fall, W. Richard Stevens, “TCP/IP Illustrated, Volume 1 -The Protocols”, Pearson Education, 2nd Edition (2014).

3. Larry Peterson, Bruce Davie, “Computer Networks, A systems Approach”, Morgan

Kaufmann Publishers, 5th Edition (2011).
4. William Stallings, “Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud”, Pearson Education, 1st Edition (2016).
5. Computer Networks: a Systems Approach, Fifth Edition: Bruce S. Davie and Larry L. Peterson

MOOC

1. https://lagunita.stanford.edu/courses/Engineering/Networking-SP/SelfPaced/info
2. https://www.mooc-list.com/tags/computer-networking
3. https://www.edx.org/course/computer-networks-and-the-internet

Web Resources

1. https://www.sciencedirect.com/topics/computer-science/network-resource
2. https://www.cs.vu.nl/~ast/CN5/
3. https://teachcomputerscience.com/computer-networks/
4. https://www.edx.org/learn/computer-networking

Course Contents and Lecture Schedule

Topic	No. of lectures
Module 1	**10 hrs.**
Introduction: Basic communications model - Protocol layers and service models - Basic definitions - OSI model - Internet protocols	4
Application Layer: Network application architecture, Web, HTTP, FTP, SMTP, POP3, and DNS, Peer-to-peer file sharing networks.	6
Module 2	**12 hrs**
Transport Layer Protocols: Introduction to transport layer, Multiplexing and demultiplexing, Principles of Reliable data transfer - Stop-and-wait and Go-back- N design and evaluation	7

Connection oriented transport TCP, Connection less transport UDP, Principles of congestion control - efficiency and fairness	5
Module 3	**10 hrs**
Network Layer Protocols: Virtual circuits and datagrams, Principles of routing, internet protocol Ipv4 and Ipv6, Routing algorithms: Link-state and distance vector routing, Routing on the internet RIP, OSPF and BGP, Multicast routing	6
Congestion control and resource allocation: Queuing disciplines, TCP congestion control, congestion avoidance mechanisms, quality of service	4
Module 4	**8 hrs**
Link layer and Physical Layer: Introduction to link layer - Error detection (parity, checksum, and CRC)	4
Multiple access protocols (collision and token based), IEEE 802.3 Ethernet, wireless (802.11), Bluetooth, cellular networks, Switching and bridging.	4
Module 5	**8 hr**
Network programming with Python: Network Programming and Python, IP and DNS	4
Programming with sockets: Working with TCP sockets, Working with UDP sockets, Client and Server Applications, Echo server.	4

Reg No.:_______________		Name:______________________________________	

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

EIGHTH SEMESTER INTEGRATED M.C.A DEGREE EXAMINATION

MODEL QUESTION PAPER

Course Code: 20INMCA404

Course Name: ADVANCED COMPUTER NETWORKS

Max. Marks: 60	Duration: 3 Hours

PART A

	Answer all questions, each carries3 marks.	Marks
1	Describe basic communication model with the help of an example.	(3)
2	Describe how FTP woks.	(3)
3	Discuss connection-oriented transport using TCP	(3)
4	Illustrate how multiplexing demultiplexing is performed	(3)
5	Illustrate virtual circuits and datagrams	(3)
6	Discuss TCP congestion control	(3)
7	Justify IEEE802.11 in operation	(3)
8	Illustrate the differences between switches and bridges.	(3)
9	Design a Python program for echo server	(3)
10	Write a program in python to identify the IP Address.	(3)

PART B

Answer any one question from each module. Each question carries 6 marks.

	Module I	
11	Illustrate OSI model in detail.	(6)
	OR	
12	Illustrate network application architecture in detail.	(6)
	Module II	
13	Illustrate Go Back N, Selective Repeat protocols.	(6)
	OR	
14	Discuss the principles of routing	(6)
	Module III	
15	Evaluate Link state with Distance Vector routing algorithms.	(6)
	OR	
16	Compare IPV4 with IPV6	(6)
	Module IV	
17	Demonstrate error detection methods discussed in link layer	(6)

OR			
18		Discuss multiple access protocols.	(6)
Module V			
19		Design a Python program for chat application using TCP(K6)	(6)
OR			
20		Design a Python program for chat application using UDP(K6)	(6)

20INMCA406	**Research Methodology**	**CATEGORY**	**L**	**T**	**P**	**CREDIT**
		GENERAL	**3**	**1**	**0**	**4**

Preamble: This course is designed for students to begin research projects which are at the core of MCA course. It aims to give students the tools to identify the research problem, collecting relevant data pertaining to the problem, methodology of carrying out the research and analysis of the result and writing papers.

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

CO 1	Understand the fundamentals concepts of Research Methodology.
CO 2	Apply the basic aspects of Research Methodology to formulate a research problem and its plan..
CO 3	Deploy numerical/quantitative techniques for data analysis.
CO 4	Understand good technical writing.
CO 5	Understand the research ethics and publication ethics.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO 1				1								
CO 2		3		2								3
CO 3		2		2								
CO 4		1										2
CO 5		1		2		3						2

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	8	8	9
Understand(K2)	12	12	18
Apply(K3)	20	20	18

Analyse(K4)	10	10	15
Evaluate(K5)			
Create(K6)			

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 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. Illustrate criteria for good research. (K3)

2. Compare types of research. (K5)

3. Outline the necessity of defining a problem. (K4)

Course Outcome 2 (CO2):

1. Compare and contrast the types of sampling. (K5)

2. Summarize the features of good research design. (K5)

3. Demonstrate the guidelines for constructing questionnaires. (K3)

Course Outcome 3(CO3):

1. Describe some problems in the preparation process. (K2)

2. Categorize the limitations of the tests of hypothesis. (K4)

3. Define critical value. (K1)

Course Outcome 4 (CO4):

1. Categorize types of reports. (K4)

2. Recommend the precautions for writing research reports. (K5)

3. Describe the significance of report writing. (K2)

Course Outcome 5 (CO5):

1. Define ethical values. (K1)

2. Illustrate the forms of Publication. (K3)

3. Summarize ethical justification. (K2)

SYLLABUS

Module 1

Research Methodology - Meaning of research, Objectives of research, Types of Research, Research Approaches, Research Methods versus methodology, Research and scientific method, Research process, Criteria of good research.

Defining research problems - What is a research problem, Selecting the problem, Necessity of defining the problem, Technique involved in defining a problem.

Module 2

Research Design - Meaning of research design, Need for research design, Features of good design, Important concepts relating to research design.

Design of sample surveys - Sample design, Sampling and non-sampling errors, Types of sampling design.

Data Collection - Experiments and Surveys, Collection of primary data, Difference between questionnaire and schedule, Guidelines for constructing questionnaire or schedule, Some other methods of data collection, Collection of secondary data, Selection of appropriate method for data collection.

Module 3

Data preparation - Data preparation process, Some problems in preparation process, Type of analysis.

Testing of Hypothesis - Basic concepts~~,~~ Testing the hypothesis, Test statistic and critical region, Critical value and decision rule, Procedure for hypothesis testing, Hypothesis testing for mean, Hypothesis testing for proportion, Hypothesis testing for variance, Limitations of the tests of hypothesis.

Assignment - for data collection and analysis

Module 4

Report Writing - Significance of report writing, Different steps in report writing, Layout of the research report, Types of reports, Mechanics of writing a research report, Precautions for writing research reports.

Module 5

Research Ethics - Ethics, Values, Reason; Value and Value Judgements, Ethics and Ethical Justification, Interests and Consequences.

Doing Research - Understanding rights and responsibilities, Defining options, Selecting the Topic, Misconduct.

Publishing - Identifying stakeholders, Understanding rights and responsibilities, Defining options, Writing, Forms of Publication, Authorship, Peer Review.

Text Books

1. C R Kothari, Gaurav Garg, "Research Methodology - Methods and Techniques" New Age Publishers, Third Edition, 2014
2. Caroline Whitbeck, "Ethics in Engineering Practice and Research" Cambridge University Press, Second Edition, 2012
3. Henriikka Mustajoki, Arto Mustajoki, "A New Approach to Research Ethics", Taylor and Francis Group, First Edition, 2017

Reference Books

1. R Panneerselvam, "Research Methodology", PHI, Second Edition, 2014
2. G C Ramamurthy, "Research Methodology", Dreamtech Press, 2015

MOOC

1. https://www.udemy.com/course/research-methods/
2. https://www.udemy.com/course/research-methodology-complete/
3. https://www.udemy.com/course/introduction-to-research-methodology/

Web Resources

1. https://nptel.ac.in/courses/127/105/109105115/
2. https://nptel.ac.in/courses/107/108/107108011/
3. https://nptel.ac.in/courses/109/103/109103153/

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	**10 hrs.**
	Research Methodology - Meaning of research, Objectives of research, Types of Research, Research Approaches, Research Methods versus methodology, Research and scientific method, Research process, Criteria of good research.	5
	Defining research problems - What is a research problem, Selecting the problem, Necessity of defining the problem, Technique involved in defining a problem.	5
2	**Module 2**	**10 hrs.**
	Research Design - Meaning of research design, Need for research design, Features of good design, Important concepts relating to research design.	2
	Design of sample surveys - Sample design, Sampling and non-sampling errors, Types of sampling design.	3
	Data Collection - Experiments and Surveys, Collection of primary data, Difference between questionnaire and schedule, Guidelines for constructing questionnaire or schedule, Some other methods of data collection, Collection of secondary data, Selection of appropriate method for data collection.	5
3	**Module 3**	**12 hrs.**
	Data preparation - Data preparation process, Some problems in preparation	2

	process, Type of analysis.	
	Testing of Hypothesis - Basic concepts, Testing the hypothesis, Test statistic and critical region, Critical value and decision rule, Procedure for hypothesis testing, Hypothesis testing for mean, Hypothesis testing for proportion, Hypothesis testing for variance, Limitations of the tests of hypothesis.	10
4	**Module 4**	**6 hrs.**
	Report Writing - Significance of report writing, Different steps in report writing, Layout of the research report, Types of reports, Mechanics of writing a research report, Precautions for writing research reports.	6
5	**Module 5**	**10 hrs.**
	Research Ethics - Ethics, Values, Reason; Value and Value Judgements, Ethics and Ethical Justification, Interests and Consequences.	3
	Doing Research - Understanding rights and responsibilities, Defining options, Selecting the Topic, Misconduct.	3
	Publishing - Identifying stakeholders, Understanding rights and responsibilities, Defining options, Writing, Forms of Publication, Authorship, Peer Review.	4

MODEL QUESTION PAPER

Reg No.:________________		Name:____	

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

EIGHTH SEMESTER INTEGRATED M.C.A DEGREE EXAMINATION

MODEL QUESTION PAPER

Course Code: 20INMCA406

Course Name: Research Methodology

Max. Marks: 60 | Duration: 3 Hours

PART A

		Answer all questions, each carries3 marks.	Marks
1		Write the criteria of good research.	(3)
2		Explain the technique involved in defining a problem.	(3)
3		Differentiate between sampling and non-sampling errors.	(3)
4		Difference between questionnaire and schedule.	(3)
5		Explain some problems in preparation process.	(3)
6		Write the limitations of the tests of hypothesis.	(3)
7		Write about the types of reports.	(3)
8		Explain the layout of the research report.	(3)
9		Explain the different forms of publication.	(3)
10		Write about the consequences of misconduct in research.	(3)

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

11		Explain the types of research and different research approaches.	(6)
		OR	
12		What is a research problem? How to select a problem for research? What is the necessity of defining the problem?	(6)
		Module II	
13		Demonstrate the guidelines for constructing questionnaires.	(6)
		OR	
14		Compare and contrast the types of sampling.	(6)
		Module III	
15		Explain data preparation and analysis process.	(6)
		OR	

16		Explain the following test statistic and critical region, critical value and decision rule.	(6)
Module IV			
17		Describe the significance of efficient report writing.	(6)
OR			
18		Recommend the precautions required for writing research reports.	(6)
Module V			
19		Summarize the ethical justification.	(6)
OR			
20		Explain the steps of doing research.	(6)

20INMCA432	Advanced DBMS Lab	CATEGORY	L	T	P	CREDIT
		GENERAL	0	1	3	1

Preamble: This course is to provide understanding on relational and non-relational database systems and its design. The course covers SQL, PL/SQL and NoSQL programs which are essential for the development and deployment of web based applications. Also this course serves as a prerequisite for many advanced courses in Data Science areas.

Prerequisite: Basic knowledge in Database Management Systems

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

CO 1	Design and build a simple relational database system and demonstrate competence with the fundamentals tasks involved with modelling, designing and implementing a database.
CO 2	Apply PL/SQL for processing databases.
CO 3	Understand the basics of relational and non-relational (NoSQL) databases and the configuration of NoSQL Databases.
CO 4	Apply CRUD operations and retrieve data in a NoSQL environment.
CO 5	Understand the basic storage architecture of distributed file systems.
CO 6	Design and deployment of NoSQL databases with real time requirements.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	3	2	2					1	1	
CO 2	2	2	2		1							

CO 3	2	2	2	2						1	1	
CO 4	2	2	3	1	2		1			1	1	1
CO 5	3	2	2				1				1	1
CO 6	2	2	3	1	1			1		1	1	2

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	15	15	18
Understand(K2)	15	15	18
Apply(K3)	10	10	12
Analyse(K4)	10	10	12
Evaluate(K5)			
Create(K6)			

Mark distribution

Total Marks	**CIE**	**ESE**	**ESE Duration**
100	50	50	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

Lab exam will be conducted by an internal examiner.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Creation of a database using DDL commands including integrity constraints. (K6)
2. Create an application to apply Data Manipulation Language (DML) commands to modify the database. (K6)
3. Apply DCL and TCL commands to impose restrictions on databases. (K3)
4. Create an application to retrieve data from databases using select, views. (K6)
5. Create an application to use joins for query optimization. (K6)

Course Outcome 2 (CO2):

1. Construct PL/SQL code for sample databases. (K6)

Course Outcome 3(CO3):

1. Compare relational and non-relational databases. (K5)
2. Understand the installation and configuration of NoSQL Databases. (K2)

Course Outcome 4 (CO4):

1. Build sample collections/documents to perform query operations. (K6)

Course Outcome 5 (CO5):

1. Build sample collections/documents to perform the shell commands like replica set, indexing etc. (K6)

Course Outcome 6 (CO6):

1. Develop sample applications using any of the front end tools and NoSQL. (K6)
2. Design and usage of concerned Online/Cloud Storage Management Systems like MongoDB Atlas, Cassandra DataStax etc. (K6)
3. Design and Deployment of NoSQL in Cloud: Google Bigtable/ Amazon DynamoDB/ Azure Cosmos DB. (K6)

Syllabus

1. An overview of relational database design using MySQL/ MariaDB/ PostgreSQL etc. (Apply the following basic queries on an Employee/ Student database etc.)
    a. DDL Commands
    b. DML Commands
    c. Imposing restrictions on database (DCL & TCL Commands)
    d. Accessing database (SELECT, Filtering using WHERE, HAVING, GROUP BY, ORDER BY Clauses, Subquery and View)
    e. Optimizing databases (Join, Aggregate & Set operations, Other operators like arithmetic, logical, special etc.)
2. PL/SQL Programs (Trigger, Cursor, Stored Procedures and Functions)
3. Introduction to NoSQL Databases.
    a. Installation and configuration of any one of the NoSQL databases - MongoDB/ Cassandra/ HBase/ CouchDB/ Amazon DynamoDB/ Redis/ Neo4j etc.
4. Designing Databases using NoSQL
5. Query Processing
    a. Performing CRUD operations
    b. Retrieving Data from a NoSQL database
    c. Usage of aggregate functions, regular expressions etc.
6. NoSQL Administration
    a. Security, Monitoring & Backup
    b. Create Users and Roles
7. NoSQL shell commands
    a. Perform Sharding, Replication (Master-Slave/ Master-Less/ Peer-to-Peer Architectures), Clustering, Partitioning, Indexing (Corresponding to the selected NoSQL Database)

8. Deployment
    a. Local Deployment
        i. NoSQL and Front-End: PHP/Java/Python (MongoDB/ Cassandra etc.)
    b. Cloud Deployment
        i. NoSQL and Cloud: Amazon DynamoDB/ Google Bigtable/ Azure Cosmos DB
        ii. Familiarization of Atlas/ DataStax corresponding to the selected NoSQL Database
9. ***Micro project:*** *Students can be given a group micro project, so that they learn to work in a team environment.*

Text Books

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan," Database System Concepts", McGraw Hill Education, 6th Edition (2011).
2. Guy Harrison, "Next Generation Databases: NoSQL, NewSQL, and Big Data", Apress, 1st Edition (14 December 2015).

Reference Books

1. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", McGraw Hill, 3rd Edition (2014).
2. HBase: "The Definitive Guide", Lars George O'Reilly Media; August 2011, ISBN: 9781449315771.
3. Shashank Tiwari. Professional NoSQL. John Wiley and Sons. ISBN: 978-0-470- 94224-6.
4. MongoDB Administrator's Guide, Cyrus Dasadia, October 2017, Packet Publishing ISBN: 9781787126480.
5. Cassandra: The Definitive Guide Distributed Data at Web Scale, 1st Edition, Eben Hewitt, Jeff Carpenter, O'Reilly Media; November 2010.

Web Resources

1. Database Management System https://nptel.ac.in/courses/106/105/106105175/

2. Databases: SQL
   https://www.edx.org/course/databas
   es-5-sql
3. Introduction to MongoDB
   https://www.coursera.org/learn/introduction-
   mongodb
4. Apache Cassandra
   https://www.edureka.co/ca
   ssandra
5. NoSQL systems
   https://www.coursera.org/learn/nosql-
   databases
6. https://hbase.apache.org/
7. https://couchdb.apache.org/
8. https://aws.amazon.com/dynamodb/

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**An overview of relational database design using MySQL/ MariaDB/ PostgreSQL etc. (Apply the following basic queries on an Employee/ Student database etc.)**	**6 hrs**
1.1	DDL Commands, DML Commands, Imposing restrictions on database (DCL & TCL Commands)	3
1.2	Accessing database (SELECT, Filtering using WHERE, HAVING, GROUP BY, ORDER BY Clauses, Subquery and View) Optimizing databases (Join, Aggregate & Set operations, Other operators like arithmetic, logical, special etc.)	3
2	**PL/SQL Programs**	**4 hrs**
2.1	Trigger, Cursor, Stored Procedures and Functions	4

3	**Introduction to NoSQL Databases**	**2 hrs**
3.1	Installation and configuration of any one of the NoSQL databases - MongoDB/ Cassandra/ HBase/ CouchDB/ Amazon DynamoDB/ Redis/ Neo4j etc.	2
4	**Designing Databases using NoSQL**	**2 hrs**
5	**Query Processing**	**8 hrs**
5.1	Performing CRUD operations Retrieving Data from a NoSQL database Usage of aggregate functions, regular expressions etc.	8

6	**NoSQL Administration**	**2 hrs**
6.1	Security, Monitoring & Backup Create Users and Roles	2
7	**NoSQL shell commands**	**6 hrs**
7.1	Perform Sharding, Replication (Master-Slave/ Master-Less/ Peer-to-Peer Architectures), Clustering, Partitioning, Indexing (Corresponding to the selected NoSQL Database)	6
8	**Deployment**	**10 hrs**
8.1	Local Deployment: NoSQL and Front-End: PHP/Java/Python (MongoDB/ Cassandra etc.)	4
8.2	Cloud Deployment: NoSQL and Cloud: Amazon DynamoDB/ Google Bigtable/ Azure Cosmos DB	8
8.3	Familiarization of Atlas/ DataStax corresponding to the selected NoSQL Database	4
9	**Micro project**	**8 hrs**

20INMCA434	Networking & System Administration lab	CATEGORY	L	T	P	CREDIT
		GENERAL	0	0	3	1

Preamble: The syllabus is prepared for equipping MCA Graduates to design, troubleshoot, model and evaluate computer networks. The students can explore through network simulation programs and thereby evaluate their design approaches and expected network performance outcome. The students can achieve a thorough understanding on network program execution using Python language, best suited for Network Administration under various operating systems.

Prerequisite: 20INMCA404 Advanced Computer Networks

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

CO1	Design a computer network and configured by relevant protocols
CO2	Design socket programming for client server interaction
CO3	Create a simple Pyro Server, XML-RPC server and to know how to connect to SSH server and remotely execute a command.
CO4	Experiment an MD5 checksum on files and in removal of duplicate files.
CO5	Experiment with SNMP network discovery and their relationships, their inter-dependencies.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	2	1	3	2	2	2	2	2	1	3
CO2	2	2	3	3	3			1	2	2		2
CO3	3	3	3	2	3					2		
CO4	3	3	3	3	3					1	2	1
CO5	3	3	3	1	2			2		1	2	1

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10	10	15
Understand(K2)	10	10	15
Apply(K3)	15	15	15
Analyse(K4)	15	15	15
Evaluate(K5)			
Create(K6)			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern

Attendance : 08 Marks

Continuous Assessment Test (2 numbers) : 30 Marks

Assignment/Quiz/Course project : 12 Marks

End Semester Examination Pattern

Lab exam will be conducted by internal examiner.

Course Level Assessment

Course Outcome 1 (CO1):

1. Explore basic network commands (K1)
2. Demonstrate a network using Distance vector routing protocol (K3)

Course Outcome 2 (CO2):

1. Design a client server application program in Python using UDP(K6)
2. Design a client server application program in Python for two – way chat using TCP (K6)

Course Outcome 3 (CO3):

1. Demonstrate TCP port checker in Python(K3).
2. Demonstrate socket-based web server checker(K3).

Course Outcome 4 (CO4):

1. Convince through the use of MD5 checksum on files (K5)

Course Outcome 5 (CO5):

1. Demonstrate procedure for data center discovery(K3)
2. Apply methods for net-SNMP and configuring SNMP agents on Linux server(K3)

Reference Books

1. Python for Unix and Linux System Administration by Noah Gift, Jeremy M. Jones

Web Resources

1.http://docs.linuxtone.org/ebooks/Python/OReilly.Python.for.Unix.and.Linux.System.Administration.Sep.2008.pdf

2. http://index-of.co.uk/Python/Pro%20Python%20System%20Administration%20-%20Sileika%20-%20Apress.pdf

3. https://buildmedia.readthedocs.org/media/pdf/python-for-system-administrators/latest/python-for-system-administrators.pdf

List of Lab Experiments

1. Execute basic network commands ipconfig, ping, traceroute, nslookup etc.
2. Apply command pathping.
3. Design a network topology using packet tracer software.
4. Design a network using Distance vector routing protocol.
5. Design a network using Link State routing protocol
6. Write a program for implementing an echo server in Python.
7. Write a client server application program in Python using UDP.
8. Write a client server application program in Python for two – way chat using TCP.
9. Implement TCP port checker in Python.
10. Implement socket-based web server checker.
11. Implement httplib-based web server checker.

12. Implement a simple Pyro server.
13. Implement using shutil module to copy a data tree.
14. Evaluate MD5 checksum on a directory tree to find duplicates.
15. Implement basic Net-SNMP session module.
16. Write SNMP configuration file to display ‘Hello World’.

Course Contents and Lecture Schedule

No.	Topic	No. of Hours
1	**Module 1**	**12 Hrs.**
1.1	Study of Networking- a. Study of network devices in detail b. Study of network IP c. Connect the computers in local area network d. Study of basic network command and Network configuration commands. e. Configure a Network topology using packet tracer software. f. Configure a network using Distance vector routing protocol. g. Configure a network using Link state routing protocol.	12
2	**Module 2**	**8 Hrs.**
2.1	System Administration using Python programming a. Socket b. TCP Client-server communication program using socket c. UDP Client-server communication program using socket. d. Echo server implementation.	8
3	**Module 3**	**8 Hrs.**
3.1	a. TCP port checker b. Socket based web server checker	2
3.2	a. Httplib-based web server checker	2
3.3	a. Simple XML-RPC server	4

	b. Simple Pyro server c. Connecting to an SSH server and remotely executing a command.	
4	**Module 4**	**12 Hrs.**
4.1	a. Using the shutil module to copy a data tree b. Moving a data tree with shutil.	4
4.2	a. Performing an MD5 checksum on files. b. Performing an MD5 checksum on a directory tree to find duplicates	6
4.3	a. Using IPython and Net-SNMP with Python bindings b. Basic Net-SNMP session module	2
5	**Module 5**	**8 Hrs.**
5.1	a. Basic data center discovery b. SNMP configuration file with Hello World	8

Electives-1

20INMCA462	APPLIED STATISTICS	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: This course introduces the concepts and application of probability distribution, Correlation, Regression and testing of hypothesis. The topics treated in this course have applications in Computer Science.

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

CO 1	Apply the concept of discrete probability distributions in determining the parameters of the distribution and hence to solve different problems
CO 2	Apply the concept of continuous probability distribution in solving different problems
CO 3	Apply the principles of correlation and regression in practical problems.
CO 4	Develop confidence intervals for various problems.
CO 5	Test the given hypothesis on the basis of known criteria.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3										
CO 2	3	3										
CO 3	3	3										
CO 4	3	3										
CO 5	3	3										

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember (K1)	10	10	10
Understand (K2)	20	20	20
Apply (K3)	20	20	30
Analyse (K4)			
Evaluate (K5)			
Create (K6)			

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 of 2 sub-divisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. With the usual notation find p for the binomial random variable X, if n = 6 and 9 p[x =4] = p[x =2] (K3)
2. Define Poisson distribution. Derive its Mean. (K1)
3. A die is tossed twice. Getting 'a number greater than 4' is considered as success. Find the mean and variance of the probability distribution of the number of success. (K3)

Course Outcome 2 (CO2)

1. Define distribution function of a continuous random variable. Also state its important properties. (K1)
2. Derive the mean and variance of a continuous uniform distribution. (K4)
3. In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. (K3)

Course Outcome 3(CO3):

1. State the principle of least squares. (K1)
2. Fit a parabola by the method of least squares, to the following data. (K3)

x:	1	2	3	4	5
y:	5	12	26	60	97

3. Compute the correlation coefficient from the following data. (K3)

x:	77	54	27	52	14	35	90	25	96	60
y:	35	58	60	40	50	40	35	56	34	42

Course Outcome 4 (CO4):

1. Differentiate parameter and statistic. (K1)
2. A random sample of 700 units from a large consignment showed that 200 were damaged. Find i) 95% and ii) 99% confidence limits for proportion of damaged limits in the consignment. (K3)

3. Explain different types of sampling. (K2)

Course Outcome 5 (CO5):

1. State Type I and Type II error. (K1)
2. Explain the different steps in testing of hypothesis. (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 men in this city are smokers? (K5)

Model Question Paper

Reg. No.______________ Name: _________________

APJ Abdul Kalam Kerala Technological University

First Semester MCA Degree Examination

Course Code: 20MCA462

Course Name: Applied Statistics

Time: 3 hours Max. Marks: 60

Part A

*Answer **all** questions, each carries **3 marks.***

1. Define Poisson distribution. Derive its mean.
2. Find the binomial distribution for which mean is 5 and variance $\frac{15}{4}$.
3. Define standard normal distribution. Write its mean and variance.
4. Define mean of exponential distribution.
5. State the principle of least squares.
6. Define marginal probability function.
7. Define confidence interval.
8. Differentiate between parameter and static.
9. State Type I and Type II error.
10. Define critical region and level of significance.

Part B

*Answer **one** full question from each module, each carries **6 marks**.*

Module - 1

11. Seven coins are tossed and number of heads is noted. The experiment is repeated 128 times and the following distribution is obtained. Fit a Binomial distribution to the following data

No. of heads	0	1	2	3	4	5	6	7
Frequencies	7	6	19	35	30	23	7	1

or

12. If the probability that an individual suffers a bad reaction from an injection is 0.001. find the probability that out of 2000 individuals is (i) At least 2 (ii) At most 3 (iii) None will suffer from a bad reaction.

Module – 2

13. A continuous random variable has pdf $f(x) = \{c(1-x^2),\ \ 0 < x < 1 \quad 0,\quad elsewhere$

(i) Find c (ii) Find mean and variance

or

14. In a normal distribution 7% of the items are under 35 and 89% are under 63. What are the mean and SD of the distribution?

Module – 3

15. Calculate the correlation coefficient from the following data

X	78	89	97	69	59	79	68	57
Y	125	137	156	112	107	138	123	108

or

16. The joint probability mass function of X and Y are given by

$$f(x, y) = c(x + 2y); where\ x = 0, 1, 2; y = 0, 1, 2, 3$$

Find (i) c (ii) the marginal probability mass function.

Module – 4

17. Explain different types of sampling.

or

18. A random sample of 700 units from a large consignment showed that 200 were damaged. Find (i) 90% and (ii) 95% confidence limit for proportion of damaged limits in the consignment.

Module – 5

19. Explain the different steps in testing of hypothesis.

or

20. Intelligence test of two groups give the following results

	Mean	SD	Number
Girls	84	10	121
Boys	81	12	81

Is the difference in mean scores significant?

Syllabus

Module 1

Introduction – Random Experiment, Random Variables, Discrete Random Variables, Probability Distributions and Probability Mass Functions, Mean and Variance of a Discrete Random Variable, Discrete Uniform Distribution - Mean and Variance, Binomial Distribution - Mean and Variance, Geometric Distribution - Mean and Variance, Poisson Distribution - Mean and Variance

Module 2

Continuous Random Variables, Probability Density Functions, Mean and Variance of a Continuous Random Variable, Continuous Uniform Distribution- Mean and Variance, Normal Distribution-Mean and Variance (Proof not required), Standard Normal Distribution, Exponential Distribution.

Module 3

Curve fitting – Principle of least squares – fitting a straight line – fitting a parabola – linear correlation and regression – Karl's Pearson's Coefficient of Correlation.
Joint and marginal probability distribution - Conditional probability distribution - independent random variable (discrete case only).

Module 4

Sampling distribution – Introduction to sampling – random sampling – sampling distribution – standard error – estimation – interval estimates and confidence interval – estimation of population mean and proportions (small and large samples).

Module 5

Testing of hypothesis – introduction – basic concepts – Hypothesis concerning a mean – equality of means – Hypothesis concerning one proportion – difference of two proportions.

Text Books

1. Veerarajan T, "***Probability and Random Process***", 3rd Edition, Tata McGraw-Hill(2002)
2. Gupta S.C and Kapoor V .K, "***Fundamentals of Mathematical Statistics***", Sultan Chand and Sons (2014).

Reference Books

1. David S. Moore and George P. McCabe, "***Introduction to practice of statistics***", W.H. Freeman & Company, 5th Edition (2005).
2. G. Jay Kerns, "***Introduction to Probability and Statistics Using R***", Chapman & Hall (2010)
3. Douglas C. Montgomery and George C. Runger, "***Applied Statistics and Probability for Engineers***", Wiley India, 5th Edition (2012).

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
4. Statistics Online Computational Resource
http://www.socr.ucla.edu/

Course Contents and Lecture Schedule

Topic	No. of lectures
Module 1	**9 hrs**
Introduction – Random Experiment, Random Variables, Discrete Random Variables, Probability Distributions and Probability Mass Functions, Mean and Variance of a Discrete Random Variable	3
Discrete Uniform Distribution - Mean and Variance	1
Binomial Distribution - Mean and Variance	2

Geometric Distribution - Mean and Variance, Poisson Distribution - Mean and Variance	3
Module 2	**9 hrs**
Continuous Random Variables, Probability Density Functions, Mean and Variance of a Continuous Random Variable	3
Continuous Uniform Distribution, Mean and Variance	2
Normal Distribution, Mean and Variance (Proof not required), Standard Normal Distribution	3
Exponential Distribution	1
Module 3	**9 hrs**
Curve fitting – Principle of least squares – fitting a straight line – fitting a parabola	3
Linear correlation and regression – Karl's Pearson's Coefficient of Correlation	2
Joint and marginal probability distribution	2
Conditional probability distribution - independent random variable (discrete case only)	2
Module 4	**9 hrs**
Sampling distribution – Introduction to sampling – random sampling.	3
Sampling distribution – standard error	2
Estimation – interval estimates and confidence interval – estimation of population mean and proportions (small and large samples)	4
Module 5	**9 hrs**
Testing of hypothesis – introduction – basic concepts	3
Hypothesis concerning a mean – equality of means	3
Hypothesis concerning one proportion – difference of two proportions	3

20INMCA464	ORGANIZATIONAL BEHAVIOUR	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: This course is designed primarily for students who are being exposed to Organizational Behaviour for the first time. Primary aim of this course is to help students to understand organizational culture and its dynamics and to acquire skills to take rational decisions in groups or organizations.

Prerequisite: Nil

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

CO 1	Identify managers' challenges and opportunities in applying OB concepts.
CO 2	Analyse various characteristics of individual behaviour and its impact on organizational performance.
CO 3	Acquire knowledge about the complexities associated with management of individual behaviour in the organization.
CO 4	Understand group behaviour and develop inter-personal skills and group dynamics.
CO 5	Understand organizational structures and analyze the behavioral implications of different organizational designs.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	1			2		2	2		1	1
CO 2	2	2				1	2	3	3		3	1
CO 3	2	2				1	2	3	3		3	1
CO 4	2	2				1		3	3		3	
CO 5	2	2	1			2		2	2		1	

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember (K1)	30%	30%	30%
Understand (K2)	30%	30%	30%
Apply (K3)			
Analyse (K4)	30%	30%	30%
Evaluate (K5)	10%	10%	10%
Create (K6)			

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/Seminar/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 of 2 sub-divisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Describe the importance of inter-personal skills in workplace.
2. Analyse the challenges and opportunities for managers in using OB concepts.
3. "The workplace discriminations undermine organisational performance", Justify.

Course Outcome 2 (CO2):

1. Identify major job attitude and job satisfaction parameters.
2. How to apply concepts about emotions and moods to specific OB issues.
3. Differentiate between person fit for the job and person fit for the organisation.

Course Outcome 3(CO3):

1. What is learning and what are the theories of learning?
2. How do individual differences and organisational constraints influence decision making?
3. Identify how employee involvement measures motivate employees.

Course Outcome 4 (CO4):

1. Differentiate group and team.
2. Relate the contemporary theories of leadership to earlier foundational theories.
3. What are three types of conflicts and the three loci of conflict?

Course Outcome 5 (CO5):

1. What are the functional and dysfunctional effects of organisational culture?
2. What are your suggestions to overcome resistance to change in an organization?
3. Identify the potential environmental, organisational and personal sources of stress at work.

Model Question paper

Reg No.:________________		Name:_______________________________________ _

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER M.C.A.DEGREE EXAMINATION, MODEL QUESTION PAPER

20INMCA464 – Organisational Behaviour

Max. Marks: 60 | Duration: 3 Hours

PART A

	Answer all questions, each carries 3 marks.	Marks
1	Define organisational behaviour. What is the objective of learning this subject in this programme?	3
2	What is workforce diversity? How to manage diversity?	3
3	State and explain the foundations of individual behaviour.	3
4	Differentiate ‘Classical conditioning’ and ‘Operant conditioning’ behavioural theories.	3
5	Describe how an understanding of attitudes is useful for the study of organisational behaviour.	3
6	What is job design? Describe different approaches to job design.	3
7	What is a team? Can groups become team? Defend your answer.	3
8	What is the difference between transformational leadership, transactional leadership and charismatic leadership?	3
9	What is creativity? How creativity can be enhanced in organisations?	3
10	What is Organisational Development? Why is it undertaken by organisations?	3

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

11	State your views on the following statement: “People influence organizations and organizations influence people”.	6
	OR	
12	Why have career management and talent management become important these days? Justify your points.	6

Module II

13	What is personality? What are its determinants? As per your opinion, which of them are more important in shaping personality.	6
	OR	
14	From your own experience, provide three examples of perceptual errors. Discuss the outcomes of each instance.	6

		Module III	
15		Compare and contrast Maslow's need hierarchy theory with Herzberg's two-factory of motivation.	6
		OR	
16		What is the relationship between stress and personality? What aspects of personality might tend to increase or decrease stress?	6
		Module IV	
17		Why groupthink is to be avoided? How might a manager attempt to ensure that groupthink does not occur in his / her group?	6
		OR	
18		What are the potential problems with upward and downward communications? How can managers alleviate these problems?	6
		Module V	
19		What are the obstacles to change organisational culture? How can change be brought about?	6
		OR	
20		What are the forces leading to change in organisations? Using Lewin's theory justify why the change is resisted.	6
		****	

Syllabus

Module 1

Nature of Organisational Behaviour: What are Organisations? – Why do Organisations Exist? – Nature of Organisational Behaviour – Foundations of OB – Contemporary OB – Scope of Organisational Behaviour – Contextual Perspectives of OB – Evolution of OB – OB Model

Management and Managers: Functions of Management – Manager's Roles – Types of Managers –Evolution of Management Theory – Contemporary Trends in Management Thinking

Challenges in OB: Managing Inclusivity / Diversity – Career Management – Talent Management – Globalisation

Module 2

Foundations of Individual Behaviour: Personal Factors – Environmental Factors – Organisational Systems and Resources – Models of Individual Behaviour

Intelligence: Nature of Intelligence – Types of Intelligence – Model, Theories, Measurement of Intelligence – Factors Influencing Intelligence

Personality: Nature of Personality – The Shaping of Personality – Determinants of Personality – Personality Structure – OB Related Personality Traits

Perception and Attribution: Perception: Meaning and Definition – Factors Influencing Perception – Perceptual Process – Perception and OB

Learning: Explicit and Tacit Knowledge – How Learning Occurs? – Principles of Learning – Learning and OB

Module 3

Attitudes and Values: Nature of Attitudes – Components of Attitudes – Formation of Attitudes – Functions of Attitudes – Changing Attitudes – Work-related Attitudes – Values

Motivation: Nature of Motivation – Importance of Motivation – Motivational Challenges – Theories on Motivation

Applied Motivational Practices: Rewards – Job Design – Behaviour Modification – Empowerment –Problem Employees – Quality of Work Life – Employee Engagement

Work Stress: Work Stress Model – Burnout – Stress Management – Stress and Performance

Module 4

Group Dynamics: Nature of Groups – Types of Groups – Group Development – Usefulness & Pitfalls of Groups – Determinants of Group Behaviour – Group Structuring – Group Decision Making

Team Dynamics: Teams vs. Groups – Benefits from Teams – Types of Teams – Implementing Teams in Organisations – Team Properties – Effective Teamwork

Workplace Behaviour: Nature of Conflict – Changing Views of Conflict – Functional and Dysfunctional Conflict – The Process of Conflict – Levels of Conflict – Conflict Resolution – Conflict Management Styles - Managerial Implications – Negotiation and Conflict Resolution

Leadership: Nature of Leadership – Leadership and Management – Importance of Leadership – Formal and Informal Leadership – Leadership Styles and Their Implications – Theories of Leadership – Contemporary Issues on Leadership – Leadership Development

Communication: Interpersonal Communication – Organisational Communication – Communication Networks – Communication Roles – Informal Communication – Communication Media – Information Technologies – Managerial Implications

Module 5

Organisations: Nature of Organisations – Organisational Structure – Key Factors of Organisational Structure – Types of Organisational Structures – Organisations for Future – Informal Organisations – Managerial Implications

Organisational Culture: Cultural Dimensions – How is Culture Created? – Sustaining Culture – Effects of Culture – Changing Organisational Culture – Creativity in Organisations – Innovation in Organisations

Organisational Change and Development: Nature of Change – Levels of Change – Types of Change – Forces for Change in Organisations – Resistance to Change – Force Field Theory of Change - The Change Process – Organisational Development – Managerial Implications

Text Books

1. K Aswathappa, ***Organizational Behaviour***, Himalaya Publishing House, 2018.
2. Robbins, Stephen, Timothy, A & Sanghi, S. "***Organizational Behavior***",13th Edn, Pearson Education. 2009.

Reference Books

1. Mc Shane & Von Glinow, "***Organizational Behavior***", Mc Graw Hill Publications, New Delhi, 2008
2. ***Understanding Organizational Behaviour*** by Udai Pareek, Oxford University Press (Third Edition)
3. ***Behaviour in Organizations*** by Jerald Greenberg and Robert A. Baron, PHI learning private Ltd, New Delhi (Ninth Edition).
4. Laurie J. Mullins, ***Management and Organisational Behaviour***, Oxford Publishers, New Delhi, 2007.
5. ***ORGB*** by Nelson, Quick and Khandelwal, Cengage Learning New Delhi (second edition).

Course Contents and Lecture Schedule

Topic	No. of lectures (49 Hrs)
Module 1	**9 Hrs**
Nature of Organisational Behaviour	3
Management and Managers	3
Challenges in OB	3
Module 2	**10 Hrs**
Foundations of Individual Behaviour	2
Intelligence	2
Personality	2
Perception and Attribution	2
Learning	2
Module 3	**9 Hrs**
Attitudes and Values	2
Motivation	2
Applied Motivational Practices	3

Work Stress	2
Module 4	**12 Hrs**
Group Dynamics	2
Team Dynamics	2
Workplace Behaviour	3
Leadership	3
Communication	2
Module 5	**9 Hrs**
Organisations	3
Organisational Culture	3
Organisational Change and Development	3

20INMCA466	FUNCTIONAL PROGRAMMING	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: This course introduces a functional programming approach in problem solving. Salient features of functional programming like recursion, pattern matching, higher order functions are discussed.
Lists and their features, new types such as Recursive types, Enumerated types, Composite and Abstract types along with their applications are being discussed with high importance.
Haskell is introduced to give a practical flavour to the course.
Prerequisite: Knowledge of Discrete mathematics.
Course Outcomes: After the completion of the course the student will be able to:

CO 1	Understand the principles of functional programming (Module 1)
CO 2	Write purely functional programs, using recursion, pattern matching, and higher- order functions ((Module 2)
CO 3	Design immutable data structures like lists. (Module 3)
CO 4	Understand generic types for functional programs (Module 4)
CO 5	Write programs using Haskell (Module 5)

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	2			2			2			
CO 2	2	2	2			2			2			
CO 3	2	2	2			2			2			
CO 4	2	2	2			2			2			
CO 5	2	2	2		2	2	2		2			2

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember	10	10	10
Understand	20	20	20
Apply	20	20	30
Analyse			
Evaluate			
Create			

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 carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum of 2 sub-divisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Design a recursive function to add two numbers.
2. Design a tail recursive function to find the nth Fibonacci number.
3. Explain the basic differences between imperative style programming and functional style programming.
4. Analyse each of the following lambda expressions to clarify its structure. If the expression is a function, identify the bound variable and the body expression, and then analyse the body expression. If the expression is an application, identify the function and argument expressions, and then analyse the function and argument expressions:

   i) λa.(a λb.(b a))

   ii) λx.λy.λz.((z x) (z y))

   iii) (λf.λg.(λh.(g h) f) λp.λq.p)

   iv) λfee.λfi.λfo.λfum.(fum (fo (fi fee))

   v) (λp.(λq.p λx.(x p)) λi.λj.(j i))

Course Outcome 2 (CO2)

1. Explain with the help of examples the various forms of function definitions.
2. Explain functional composition with the help of examples.
3. Deduce the type of the following expression:

   (.) f g x = f (g x) where. -> Functional Composition.

Course Outcome 3(CO3):

1. Predict the output of the following along with detailed explanation on how did you arrive at the answer:
    A. [(a,b) | a <- [1 . . 8] ; even a; b <- [a + 3. . 4] ; odd b]
    B. ["Party" | k <- [1 .. 5]]
    C. [' * ' | i <- [1 .. 3] ; j <- [1, 2]]

2. Explain any three list operations along with function definitions and examples.

Note: Questions can be asked to solve problems using list comprehensions, to prove properties on list operations and functions on natural numbers using Mathematical Induction.

Course Outcome 4 (CO4):

1. Define Natural numbers as a Recursive Type and explain how this definition enumerates all-Natural numbers.

2. Find the equivalent decimal representation of this value:

    Succ (Succ (Succ (Succ (Succ (Succ Zero)))))

3. Define Fibonacci numbers using Pattern matching. Natural numbers should be represented as a Recursive type.

Note: Questions can be asked to prove properties on Binary Trees and Binary Search Trees using Structural Induction (Variant of Mathematical Induction).

Course Outcome 5 (CO5):

1. Duplicate only even numbers among the elements of a list using a Haskell function and explain. You need to do this in two ways; 1. Recursion 2. List Comprehension

    Example: λ> dupli [1, 2, 3] ANS: [2,2]

Model question Paper

Duration: 3 Hours **PART A** **Total : 60 Marks**

1. Design a recursive function to add two numbers.
2. Can Arrays be used as a data structure in functional programming? Explain with reasons.
3. Explain functional composition with the help of an example.
4. Deduce the type of the following expression:

    (.) f g x = f (g x) where . -> Functional Composition.
5. Predict the output of the following along with detailed explanation on how did you arrive at the answer:

a. [(a, b) | a <- [1 . . 8] ; even a; b <- [a + 3. . 4] ; odd b]
b. ["Party" | k <- [1 .. 5]]
c. [' * ' | i <- [1 .. 3] ; j <- [1, 2]]

6. Define the function “take”. For example, take does the following:

   Prelude> take 2 [1,2,3,4] [1,2].

7. Find the equivalent decimal representation of this value:

   Succ (Succ (Succ (Succ (Succ (Succ Zero)))))

8. Explain composite types with the help of an example.
9. Define a Haskell function to find the factorial of a given number.
10. Define a Haskell function to reverse the elements of a list.

(3 x 10 = 30 Marks)

PART B

11. Explain commonly used data types in functional programming along with their properties.

OR

12. Write Recursive definitions along with an explanation for the below Arithmetic operations. Illustrate the recursive flow with the help of a diagram.

    1. add x y   2. mult x y   3. div x y

13. Explain the following along with suitable examples:

    1. Currying in Functional Programming. 2. Strict and Non strict functions.

OR

14. Explain the following along with suitable examples:

    1. Guards and Pattern matching.2. Inverse functions.

15. Given below the definition of a function funcky

```
funcky:: Int ->Int

funcky n

|n == 0 = 0

|otherwise = 1 + funcky ( n−1)
```

Predict the output of f for all n >= 0? Prove your answer.

OR

16. Explain any three list operations along with function definitions and examples.

17. Explain Recursive Data Types with the help of an example.

OR

18. Give the type definition of a binary tree along with explanation of two functions on binary trees.

19. Duplicate only even numbers among the elements of a list using a Haskell function and explain. You need to do this in two ways; 1. Recursion 2. List Comprehension

    Example : λ> dupli [1, 2, 3] ANS: [2,2]

OR

20. Define a queue data type in Haskell and any two operations on it with examples.

(6 x 5 = 30 Marks)

SYLLABUS

Module I:

Review of recursion -Tail recursion -recursive program design- Functional Programming: Introduction, λ calculus, λ expressions, Identity function, Self-application function, Function application function, Notation for naming functions and application reduction, Functions from functions, Argument selection and argument pairing functions, Free and bound variables, Name clashes and α conversion, Simplification through eta reduction, Conditions, Booleans and Integers, Recursion and Arithmetic, Expressions and values, Basic Data Types, Names and values in programming- Data structures in functional languages - Names and values in imperative and functional languages- Execution order in imperative and functional languages- Repetition in imperative and functional languages- Functions as values.

(Note: Recursion is a very important technique in functional programming, hence high importance needs to be given to make students understand the essentials of recursive thinking and program design, Basic Lambda (λ) calculus needs to be taught.)

Module II:

Functions: Functions and definitions, Functional composition, Operators, Inverse functions, Strict and non-strict functions, Type Inference.

(Note: Basic ways of defining functions, how to infer the types of variables and function needs to be taught.)

Module III:

Lists: List notation, List comprehensions, Operations on lists, Map and filter, List patterns, Recursion and Induction: Over natural numbers, Over lists. Operations on lists

(Note: Mathematical Induction based Proofs needs to be taught from the reference text book.)

Module IV:

New Types: Enumerated types, Composite types, Recursive types, Abstract types, Trees: Binary trees, Binary search trees

(Note : Various definitions of properties of these new types, their property proofs etc needs to be taught)

Module V:

Programming with Haskell: Introduction to Haskell, defining functions: guards, pattern matching and recursion, Lists, strings and tuples, Types and polymorphism, Higher order functions on lists: map, filter, list comprehension, User defined data types: lists, queues, trees

(Note: Students need to be taught how to program using Haskell in this module)

Text Books

1. Richard S. Bird, Philip Wadler, "Introduction to Functional Programming", Prentice Hall , 1988 (Module 1,2,3,4)
2. Greg Michaelson, "An introduction to functional programming through lambda calculus", Dover Publications, 2011 (Module 1)
3. Miran Lipovača, "Learn You a Haskell for Great Good!: A Beginner's Guide", No Starch Press, 1st Edition (15 March 2011) (Module 5)

Reference Books and Sites

1. Simon Peyton Jones , "The Implementation of Functional Languages" , Prentice Hall.
2. Benjamin C. Pierce, " Types and Programming Languages", MIT Press, 2002
3. https://www.haskell.org/
4. http://learnyouahaskell.com

Course Contents and Lecture Schedule

No	Topic/Module	No. of Lectures
1	Review of recursion -Tail recursion -recursive program design-Functional Programming: Introduction, λ calculus, λ expressions, Identity function, Self application function, Function application function, Notation for naming functions and application reduction, Functions from functions, Argument selection and argument pairing functions, Free and bound variables, Name clashes and α conversion, Simplification through eta reduction, Conditions, Booleans and Integers, Recursion and Arithmetic, Expressions and values, Basic Data Types, Names and values in programming-Data structures in functional languages - Names and values in imperative and functional languages- Execution order in imperative and functional languages- Repetition in imperative and functional languages- Functions as values.	10
2	Functions: Functions and definitions, Functional composition, Operators, Inverse functions, Strict and non-strict functions, Type Inference.	8
3	Lists: List notation, List comprehensions, Operations on lists, Map and filter, List patterns, Recursion and Induction: Over natural numbers, Over lists. Operations on lists	10
4	New Types: Enumerated types, Composite types, Recursive types, Abstract types, Trees: Binary trees, Binary search trees	10
5	Programming with Haskell: Introduction to Haskell, Defining functions: guards, pattern matching and recursion, Lists, strings and tuples, Types and polymorphism, Higher order functions on lists: map, filter, list comprehension, User defined data types: lists, queues, trees	10

20INMCA468	VIRTUALISATION AND CONTAINERS	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble:

A graduate course in Computer Applications should give due exposure to the recent developments. Since virtualization and containers are the technologies that drive the majority of the day-to-day applications and industry, this course is designed to build upon the knowledge acquired at the undergraduate/graduate level on Operating Systems and familiarise students with virtualization and container technologies.

Prerequisite: Knowledge of Operating Systems

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

CO 1	Understand the basics of virtualization technology, architecture, limitations and applications.
CO 2	Apply Networking Principles to setup virtual machines (VMs) and connect to the network
CO 3	Understand the basics of VM life cycle, VM migrations, VM scheduling and load balancing
CO 4	Understand Container fundamentals including how to configure and set up a container
CO 5	Understand the basics of security, troubleshooting and monitoring aspects in container technology
CO 6	Apply the knowledge in Virtualization and docker to setup VMs and dockers.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1										
CO 2	3	2	1	1			1					
CO 3	2	1					1					
CO 4	2	1					1					
CO 5	2	1					1					
CO 6	3	2	1	1			1					

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	10
Understand	20	20	20
Apply	20	20	30
Analyse			
Evaluate			
Create			

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 carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum of 2 sub-divisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

(a) Explain the need and applications of virtualization.
(b) Describe the hypervisor architecture.
(c) Mention tools and technologies used in virtualization.

Course Outcome 2 (CO2)

(a) Describe IP addressing
(b) Explain the concept of paging and virtual memory

Course Outcome 3(CO3):

(a) Describe the VM life cycle.
(b) Explain VM provisioning, VM scheduling and load balancing
(c) Write in detail the KVM architecture and commands

Course Outcome 4 (CO4):

(a) Discuss the container fundamentals and different container technologies.
(b) Explain the container orchestration and clustering.

Course Outcome 5 (CO5):

(a) Discuss the concepts of security and isolation in containers.
(b) Explain troubleshooting, monitoring and alerting in containers.

Course Outcome 6 (CO6):

(a) Explain how to configure and set up virtual machines.
(b) Describe configuration and setting up of containers.

Model Question paper

Reg No.:________________ Name:______________________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.C.A DEGREE EXAMINATION, MODEL QUESTION PAPER

20MCA468 VIRTULAISATION AND CONTAINERS

Max. Marks: 60 Duration: 3 Hours

PART A

	Answer all questions, each carries 3 marks.	Marks
1	Explain different types of hypervisors.	(3)
2	What are the types of virtualization?	(3)
3	Explain the difference between private IP and Public IP.	(3)
4	What is virtual memory?	(3)
5	Explain any three commands in KVM and their uses.	(3)
6	What do you mean by virtual machine migration?	(3)
7	Write a short note on the container creation process.	(3)
8	Explain virtual networking in containers.	(3)
9	How are the running containers controlled	(3)
10	Explain troubleshooting in container technologies.	(3)

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

11	Briefly explain the hypervisor architecture.	(6)
	OR	
12	Explain difference between virtualization and virtual computing.	(6)

Module II

13	Briefly explain the different modes in networking can be set up in virtual machines.	(6)
	OR	
14	Explain how paging is important in the context of virtualization.	(6)

Module III

15	Briefly explain the VM life cycle.	(6)
	OR	
16	Describe any VM scheduling algorithm.	(6)

Module IV

17	Explain the Docker commands ‘run’,’build’ and ’exec’ with important options?	(6)
	OR	

18		Compare virtual machines and containers	(6)
Module V			
19		Explain the importance of security and isolation in Docker.	(6)
OR			
20		Explain the business context of containers	(6)

Syllabus

Module 1 *(10 Hours)*: Physical and virtual machines, Traditional and virtual computing, Understanding virtualization, Need and Applications of virtualization, Limitations, Simulations and Emulations, Challenges in Virtualized environment, tools and technologies in virtualized environments. Types of Hypervisors, Hypervisor architecture

Module 2 *(8 Hours)*: IP addressing - Private address, Public address, virtual LAN, Memory addressing, Paging, Memory mapping, virtual memory, complexities and solutions of memory virtualization

Module 3 *(14 Hours)***:** VM lifecycle, Process and system level VMs, VM configurations, VM migrations, Migration types and process, VM provisioning, Scaling, VM scheduling, Load balancing: Significance, Types and Algorithms. Case study : KVM, KVM architecture, KVM commands

Module 4 *(10 Hours)***:** Container fundamentals, Containers versus virtual machines, Different container technologies, Configuring a container engine, Container virtual networking, Container orchestration and clustering, Images and containers. Case study : Docker

Module 5 *(6 Hours)***:** Working with remote repositories, Security and isolation, Troubleshooting, Monitoring and alerting, Controlling running containers, Containers in a business context

References

1. Chris Wolf , Erick M. Halter, ***Virtualization: From the Desktop to the Enterprise***, APress 2005.

2. Kumar Reddy, Victor Moreno, ***Network virtualization***, Cisco Press, July, 2006.

3. James E. Smith, Ravi Nair, ***Virtual Machines: Versatile Platforms for Systems and Processes***,

Elsevier/Morgan Kaufmann, 2005

4 Matthew Portnoy, ***Virtualization Essentials***, Wiley; Second edition (2016)

5. Sean P. Kane, Karl Matthias, ***Docker: Up & Running - Shipping Reliable Containers in Production***, Second Edition, O'Reilly

Web References

1. https://www.linux-kvm.org/page/Main_Page
2. https://docs.docker.com/get-started/

Course Contents and Lecture Schedule

No	Topic	No. of Lecture Hours
1	**Introduction**	
1.1	Physical and virtual machines	1
1.2	Traditional and virtual computing	1
1.3	Understanding virtualization	1
1.4	Need, Applications and Limitations of virtualization	2
1.5	Simulations and Emulations	1
1.6	Challenges in Virtualized environment	1
1.7	Tools and technologies in virtualized environments	1
1.8	Types of Hypervisors	1
1.9	Hypervisor architecture	1
2	**Network Virtualization**	
2.1	IP addressing	1
2.2	Private address and Public Addresses	1
2.3	Virtual LAN	1
2.4	Memory addressing	1
2.5	Paging	1
2.6	Memory mapping	1
2.7	Virtual memory	1
2.8	Complexities and solutions of memory virtualization	1

No	Topic	No. of Lecture Hours
3	**Virtual Machine**	
3.1	VM lifecycle	1
3.2	Process and system level VMs	1
3.3	VM configurations	1
3.4	VM migrations	1
3.5	Migration types and process	1
3.6	VM provisioning	1
3.7	Scaling, VM scheduling	2
3.8	Load balancing: Significance	1
3.9	Types and Algorithms	1
3.10	Case study : KVM	1
3.11	KVM architecture	1
3.12	KVM commands	2
4	**Containers**	
4.1	Container fundamentals	1
4.2	Containers versus virtual machines	1
4.3	Different container technologies	1
4.4	Configuring a container engine	1

4.5	Container virtual networking	1
4.6	Container orchestration and clustering	1
4.7	Images and containers	1
4.8	Case study : Docker	3
5	**Security and Management**	
5.1	Working with remote repositories	1
5.2	Security and isolation	1
5.3	Troubleshooting	1
5.4	Monitoring and alerting	1
5.5	Controlling running containers	1
5.6	Containers in a business context	1

20INMCA472	ADVANCED OPERATING SYSTEMS	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: This course intends to provide insight into Advanced Operating Systems. Detailed discussion on various concepts like process synchronization, mutual exclusion, resource sharing, concurrency control and security are discussed at algorithm level. Various kinds of advanced operating systems like Distributed Systems, Multiprocessor systems, and Database Systems are included to the level possible within the scope of a single course. More detailed treatment can be done through seminars, assignments and talks by eminent external experts.

Prerequisite: Basic concepts of desktop computer operating systems.

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

CO 1	Identify synchronization problems in operating systems and issues in distributed systems.
CO 2	Explain classification of mutual exclusion algorithms and security violations.
CO 3	Explain the design of distributed shared memory and issues in load distribution.
CO 4	Explain design issues and synchronization in multiprocessor systems.
CO 5	Explain synchronization and concurrency control in database systems.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2			2				1			
CO 2	2	1							1			
CO 3	2	1							1			
CO 4	2	1							1			
CO 5	2	2			1		1		1			

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10		10
Understand	20	20	20
Apply	20	20	20
Analyse		10	10
Evaluate			
Create			

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 carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum of 2 sub-divisions and carry 6 marks

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain synchronization using semaphore.
2. Classify Advanced operating systems.
3. Illustrate limitation of Lamports clocks.

Course Outcome 2 (CO2)

1. Explain some of the algorithms for mutual exclusion.
2. Explain potential security violations.
3. Compare the Lamport's algorithm and Rickart-Agarwala algorithm.

Course Outcome 3(CO3):

1. Explain major design issues and building mechanisms in Distributed file systems.
2. Explain important algorithms for implementing DSM.
3. Explain issues in load distribution.

Course Outcome 4 (CO4):

1. Explain system architecture of Multiprocessor systems.
2. Explain design issues in Database Multiprocessor Systems.
3. Explain how virtualization is implemented.

Course Outcome 5 (CO5):

1. Explain Lock based algorithms for concurrency control in Database Systems.
2. Illustrate Timestamp based algorithms for concurrency control in Database Systems.
3. Explain design issues in Database Systems.

Model Question paper

Part A

1. Categorize various advanced operating systems.
2. Illustrate synchronization using semaphore.
3. Explain potential security violations.
4. Explain requirements of mutual exclusion.
5. What is the difference between load balancing and load sharing?
6. Which are the major components of a load distributing algorithm?
7. Explain the interconnection network in multiprocessors?
8. Explain the structure of Multiprocessor of Operating Systems.
9. Explain what is meant by serializability.
10. What is meant by Log equivalence? (3 x 10 = 30 Marks)

Part B

Module 1

11. Identify any six issues that are common with Distributed systems. [6 Marks]

OR

12. Write a note on the following:
    a. mutex [3 marks]
    b. semaphore [3 marks]

Module 2

13. Write short notes on
    a. Rickart-Agarwala Algorithm [3 Marks]
    b. Lamport's algorithm. [3 Marks]

OR

14. Explain any six Design Principles for Secure Systems. [6 Marks]

Module 3

15. Identify major design issues in Distributed File systems.

[6 Marks]

OR

16. Write any two algorithms for implementing DSM

[6 Marks]

Module 4

17. Explain Multiprocessor System Architectures and Interconnection Networks.

[6 Marks]

OR

18. Discuss the synchronization of processes in Multiprocessors.

[6 Marks]

Module 5

19. Explain the basic Synchronization Primitives for Concurrency Control in Database systems.

[6 Marks]

OR

20. Write and explain an optimistic algorithm for concurrency control in database systems.

[6 Marks]

Syllabus

Module	Contents	Hours
I	**Overview**: Functions of Operating System –Design Approaches –Types of Advanced Operating Systems. **Synchronization Mechanisms**: Concept of Processes and Threads –The Critical Section Problem – Other Synchronization Problems:– Monitor –Serializer – Path Expressions. **Distributed Operating Systems**:- Issues in Distributed Operating System – Communication Networks And Primitives –Lamport's Logical clocks – Causal Ordering of Messages.	10
II	**Distributed Mutual Exclusion**:- Classification - Requirements – Measuring Performance – Lamport's Algorithm – Rickart-Agarwala Algorithm – Suzuki-Kasami's Broadcast Algorithm. **Security:** Potential Security Violations – Design Principles for Secure Systems –The Access Matrix Model and Implementation- The Access Control list Method.	10
III	**Distributed Resource Management**: Mechanisms for building Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory – Issues in Load Distributing – Components of Load Distributing Algorithm – Sender-Initiated Algorithm – Receiver- Initiated Algorithm.	10
IV	**Multiprocessor Operating Systems**: Basic Multiprocessor System Architectures – Interconnection Networks – Structures – Design Issues – Threads – Process Synchronization – Processor Scheduling – Memory Management – Virtualization – Types of Hypervisors – Paravirtualization – Memory Virtualization – I/O Virtualization.	8
V	**Database Systems**: Problem of Concurrency Control – Serializability – Basic Synchronization Primitives for Concurrency Control – Lock-Based Algorithms – Time-Stamp Based Algorithms – Optimistic Algorithms.	10

Textbooks:

1. Mukesh Singhal and Niranjan G. Shivaratri, "***Advanced Concepts in Operating Systems*** – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.
2. Andrew S. Tanenbaum, "***Modern Operating Systems***", 3rd Edition, Prentice Hall, 2012.

Reference Books:

1. Pradeep K Sinha, "***Distributed Operating Systems: Concepts and Design***", Prentice Hall of India, 2007.
2. George Coulouris, Jean Dollimore,Tim Kindberg, Gordon Blair, ***"Distributed Systems, Concepts and Design"***, 5th Edtn, Pearson, 2019
3. https://www.classcentral.com/course/udacity-advanced-operating-systems-1016
4. https://www.my-mooc.com/en/mooc/advanced-operating-systems--ud189/

Course Contents and Lecture Schedule

No	**Topic**	**No. of Lectures**
1	**Introduction**	
1.1	**Overview**: Functions of Operating System –Design Approaches – Types of Advanced Operating Systems.	2
1.2	**Synchronization Mechanisms**: Concept of Processes and Threads – The Critical Section Problem – Other Synchronization Problems:– Monitor –Serializer – Path Expressions.	3
1.3	**Distributed Operating Systems**:- Issues in Distributed Operating System – Communication Networks And Primitives –Lamport's Logical clocks – Causal Ordering of Messages	4
2		
2.1	**Distributed Mutual Exclusion**:- Classification - Requirements – Measuring Performance – Lamport's Algorithm –	2
2.2	. Rickart-Agarwala Algorithm – Suzuki- Kasami's Broadcast Algorithm.	3
2.3	**Security:** Potential Security Violations – Design Principles for Secure Systems –The Access Matrix Model and Implementation- The Access Control list Method	4
3		
3.1	**Distributed Resource Management**: Mechanisms for building Distributed File Systems – Design Issues.	3
3.2	**Distributed Shared Memory** – Algorithms for Implementing Distributed Shared memory	3
3.3	**Load Distribution**: Issues in Load Distributing – Components of Load Distributing Algorithm – Sender- Initiated Algorithm – Receiver-Initiated Algorithm.	3
4		
4.1	**Multiprocessor Operating Systems**: Basic Multiprocessor System Architectures – Interconnection Networks – Structures	3
4.2	Design Issues – Threads – Process Synchronization - Processor Scheduling – Memory Management	3
4.3	Virtualization – Types of Hypervisors – Paravirtualization – Memory Virtualization – I/O Virtualization.	2
5		

5.1	**Database Systems**: Problem of Concurrency Control – Serializability – Basic Synchronization Primitives for Concurrency Control – Lock-Based Algorithms	5
5.2	Time-Stamp Based Algorithms	3
5.3	Optimistic Algorithms	2

Electives-2

20INMCA482	BUSINESS MANAGEMENT	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: Primary aim of this course is to understand basic principles of management and accounting. In our day-to-day life, managers will have to manage numerous resources in the present-day complex business environments. 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 idea on book keeping and accounting is also required for managers for taking decisions.

Prerequisite: NIL

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

CO 1	Understand management as a process.
CO 2	Critically analyse and evaluate management theories and practices
CO 3	Perform planning and organising for an organisation
CO 4	Do staffing and related human resource development function
CO 5	Take proper decisions to get competitive advantage
CO 6	Understand basic concepts in book keeping and accounting.

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

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO 1	3							2				
CO 2		3										
CO 3			3									3
CO 4											3	
CO 5					3	2						
CO 6	3							3				

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember	10	10	20
Understand	20	20	20

Apply	20	20	20
Analyse			
Evaluate			
Create			

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 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 of 2 sub-divisions and carry 6 marks.

Course Level Assessment Sample Questions

Course Outcome CO1:

Describe various functions of management.

Course Outcome CO2 :

Explain different theories of management thought.

Course Outcome CO3:

Illustrate different steps in planning.

Course Outcome CO4:

Describe different types of training methods for employees in an organisation.

Course Outcome CO5:

Explain the decision process in an organisation with case example.

Course Outcome CO6:

Explain the procedure of preparation of balance sheet with a simple example.

Model Question Paper

			Total Pages:
Reg No.:_______________		Name:______________________________________ _	

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SECOND SEMESTER M.C.A. DEGREE EXAMINATION

Course Code: 20MCA482

Course Name: BUSINESS MANAGEMENT

Max. Marks: 60

PART A

		Answer all questions, each carries3 marks.	Marks
1		Define management. What are the levels of management?	(3)
2		Distinguish between efficiency and effectiveness in management.	(3)
3		Explain system approach in management.	(3)
4		Illustrate different types of plans.	(3)
5		Explain matrix form of organisation.	(3)
6		What is meant by job analysis?	(3)
7		Explain bench marking.	(3)
8		What is product life cycle?	(3)
9		Explain the rules of debit and credit.	(3)
10		Explain the advantages of accounting software.	(3)

PART B

Answer six questions, one full question from each module and carries 6 marks.

		Module I	
11		What are the different roles that managers play in an organisation?	(6)
		OR	
12		Explain the major contributions of FW Taylor to scientific management.	(6)
		Module II	
13		Explain various steps involved in planning with a case example.	(6)
		OR	
14		Explain any 3 types of organisation structures.	(6)
		Module III	
15		Explain various steps involved in selection of employees for an organisation.	(6)

OR			
16		Describe different types of training methods for employees in an organisation.	(6)
Module IV			
17		Illustrate the decision process in an industry by giving different steps involved in it.	(6)
OR			
18		Explain the marketing mix elements with a case example.	(6)
Module V			
19		What is a Journal? Explain the rules of journalising	(6)
OR			
20		What are final accounts? Explain the procedure of preparing balance sheet with a simple example.	(6)

Syllabus

Module I

Introduction to Management: Basic Managerial Concepts, Levels of management, Managerial Skills, Managerial role. Management functions- Planning, Organising, Staffing, leading 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: Nature and importance of planning, types of plans - Steps in planning, Levels of planning - The Planning Process - MBO definition and process, SWOT Analysis, its 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 related HRD Functions: meaning, nature, staffing process, Job analysis and manpower planning, job description and job specification, Recruitment & selection, selection process, Tests and interviews. Training and development - concept and methods, Performance appraisal- concept and methods.

Module IV

Managerial Decision Making and controlling: Decision making –types of decisions, decision making process, Decision Making Tools, Importance of controlling, Techniques of controlling-Break Even Analysis, Budgetary Control - Benchmarking –importance and limitations of benchmarking, Six Sigma importance, limitations and process of six sigma, Total Quality Management- Introduction to marketing management-Marketing mix- product life cycle

Module V

Book- Keeping and Accountancy -Elements of Double Entry -Book- Keeping - rules for journalizing -Ledger accounts –Cash book- – Trial Balance- Method of Balancing accounts-the journal proper (simple problems). Final accounts: Preparation of trading and profit and loss Account- Balance sheet (with simple problems) - Introduction to Accounting packages (Description only)

References

1. L M Prasad, "*Principles of Management*", Sultan Chand & Sons, 8th Edition (2010)
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. R N Gupta, "*Principles of Management*", S. Chand & Company Ltd., (2010)
6. Tripathi, "*Principles of Management*", McGraw Hill Education, 5th Edition (2012)
7. *Double Entry book Keeping* – Batliboi
8. *A Systematic approach to Accounting*: Dr K.G. Chandrasekharan Nair

Suggested MOOCs

1. Management Functions http://nptel.ac.in/courses/122108038/
2. Leadership http://nptel.ac.in/courses/110105033/33

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
1	Introduction to Management: Basic Management concepts	2
1.1	Levels of management, Managerial Skills	2
1.2	Management roles	1
1.3	Management functions	2
1.4	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	3
2	Planning: Nature and importance of planning, types of plans - Steps in planning, Levels of planning - The Planning Process	2
2.1	MBO definition and process, SWOT Analysis, importance.	2
2.2	Organising: Nature of organizing, -span of control in management, factors affecting span of control- authority and responsibility.	2
2.3	Organisation structure - Formal and informal, Types of organization structure line, line and staff, functional, divisional, project, matrix, virtual form of organisations	2
3	Staffing and related HRD Functions: meaning, nature, staffing process.	2
3.1	Job analysis and manpower planning, job description and job specification	2
3.2	Recruitment & selection, selection process, Tests and interviews. Training and development - concept and methods	3
3.3	Performance appraisal - concept and methods.	2
4	Managerial Decision Making and controlling: Decision making –types of decisions, decision making process, Decision Making Tools.	2
4.1	Importance of controlling, Techniques of controlling- Break Even Analysis, Budgetary Control	2
4.2	Benchmarking –importance and limitations of benchmarking	2
4.3	Six Sigma: importance, limitations and process of six sigma,	2
4.4	Total Quality Management-	2

4.5	Introduction to marketing management-Marketing mix- product life cycle	2
5	Book Keeping and Accountancy -Elements of Double Entry -Book- Keeping	2
5.1	Rules for journalizing -Ledger accounts –Cash book-	3
5.2	Trial Balance- Method of Balancing accounts- (simple problems). Final accounts: Preparation of trading and profit and loss Account- Balance sheet (with simple problems)	3
5.3	Introduction to Accounting packages.	2

20INMCA484	EMBEDDED SYSTEMS	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: This course introduces students to the basic concepts of Embedded Systems. It helps the students to understand the various techniques involved in embedded system design and development.

Prerequisite:

- 20MCA103 Digital Fundamentals & Computer Architecture.
- 20MCA107 Advanced Software Engineering.
- Basic knowledge of the subjects Operating Systems and System Software.

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

CO 1	Understand the basic concepts of Embedded Systems and its Applications.
CO 2	Demonstrate the role of each component in a typical embedded system.
CO 3	Learn about the co-design approach for embedded hardware and firmware development.
CO 4	Understand the concepts involved in Embedded System design and development Process.
CO 5	Learn about techniques used in the Integration and testing of Embedded Hardware and Firmware.
CO 6	Understand the basic concepts of RTOS based Embedded System design.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2											
CO 2	3	3										
CO 3	3	3			3							
CO 4			3	2								
CO 5		3										
CO 6		3										

Assessment Pattern

Bloom's Category	Continuous Assessment Tests	End Semester Examination

	1	2	
Remember (K1)	10	10	10
Understand (K2)	20	20	20
Apply (K3)	20	20	30
Analyse (K4)			
Evaluate (K5)			
Create (K6)			

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 of 2 sub-divisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Define Embedded System.
2. Illustrate the major applications of Embedded System.
3. List out the classifications of Embedded System.

Course Outcome 2 (CO2):

1. Illustrate the components of an embedded System with the help of relevant diagram.
2. Explain the processor Embedded into a System.

Course Outcome 3 (CO3):

1. Describe the Fundamental Issues in Hardware Software Co-Design.
2. Explain UML with the help of an example.

Course Outcome 4 (CO4):

1. Describe any three Digital Electronic Components used in the embedded Hardware development.
2. Explain about Embedded Firmware Design Approaches.

Course Outcome 5 (CO5):

1. Explain any one technique used for the Integration of Hardware and Firmware.
2. List out the techniques used for the Testing of Embedded Systems.

Course Outcome 6(CO6):

1. Define RTOS.
2. Describe How you will Choose an RTOS.

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY **Model Question Paper**			
Course Code: 20INMCA484			
Course Name: Embedded Systems			
Max. Marks: 60			Duration: 3 Hours
PART A			
	Answer all questions, each carries 3 marks.		Marks
1		Define embedded computing system. Write two functionalities of an embedded system.	(3)
2		What are the building blocks and devices of hardware in an embedded system?	(3)
3		Describe the Design Process in Embedded System.	(3)
4		Explain Formalism of System Design.	(3)
5		Illustrate Data Flow Graph Model with the help of relevant diagram.	(3)
6		Define State Machine Model with the help of suitable example.	(3)
7		Describe the Analog Electronic Components in Embedded Hardware Design.	(3)

8		Illustrate the Super Loop Based firmware development approach.	(3)
9		How will you Test Embedded Systems?	(3)
10		Define Real Time Operating System.	(3)
		PART B	
		Answer any one question from each module. Each question carries 6 marks.	
		Module I	
11		Differentiate Embedded system and General Computing System.	(6)
		OR	
12		Explain the Classification of Embedded systems.	(6)
		Module II	
13		Explain in detail the Design Challenges in Embedded System Design.	(6)
		OR	
14		Explain the Hardware-Software Co-Design in an Embedded System.	(6)
		Module III	
15		With the help of suitable diagrams, explain UML Building Blocks.	(6)
		OR	
16		Describe the Fundamental Issues in Hardware Software Co-Design.	(6)
		Module IV	
17		Explain any three Digital Electronic Components in Embedded systems with the help of suitable diagrams.	(6)
		OR	
18		Explain Embedded Firmware Development Languages.	(6)

Module V			
19		Explain in detail the commonly used techniques for the Integration of Hardware and Firmware.	(6)
OR			
20		A lot of factors need to be analysed carefully before making a decision of choosing an RTOS. Justify.	(6)
****			

Syllabus

Module 1

Introduction to Embedded Systems: Embedded system, Embedded system Vs General Computing System, Processor Embedded into a System, Embedded Hardware units and devices in a system, Embedded Software in a System, Introduction to embedded system design, Classification of Embedded systems, Skills Required for an embedded system Designer, Examples of the Embedded Systems. Major Application Areas of Embedded Systems, Purpose of Embedded Systems.

Module 2

Embedded System Design and development Process: Embedded System-On-Chip (SoC) and Use of VLSI Circuit Design Technology, Build Process for embedded systems, Design Process in Embedded System, Design Challenges in Embedded System Design, Hardware-Software Co-Design in an Embedded System, Formalism of System Design.

Module 3

Hardware Software Co-Design and Program Modelling: – Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design - Data Flow Graph Model, Control Data Flow Graph, State Machine Model, Sequential Program Model, Concurrent / Communicating Process Model, Object oriented model, UML.

Module 4

Design and Development of Embedded Product:

Embedded Hardware Design and Development: - Analog Electronic Components, Digital Electronic Components, VLSI and Integrated Circuit Design.

Embedded Firmware Design and Development: - Embedded Firmware Design Approaches, Embedded Firmware Development Languages.

Module 5

Integration and Testing of Embedded Hardware and Firmware: - Integration of Hardware and Firmware, Testing Embedded Systems.

RTOS based Embedded System Design: - Basic operating system services, Introduction to Real Time Operating System(RTOS), RTOS Task-Scheduling models, How to Choose an RTOS.

Text Books

1. Raj Kamal, Embedded Systems: Architecture, Programming and Design, Third Edition, McGraw Hill Education (India), 2014.
2. Shibu K.V., Introduction to Embedded Systems, McGraw Hill Education (India), 2009.

Reference Books

1. J Staunstrup and Wayne Wolf, Hardware / Software Co-Design: Principles and Practice, Prentice Hall.
2. Jean J. Labrose, Micro C/OS II: The Real Time Kernel, 2e, CRC Press, 2002.
3. Steave Heath, Embedded System Design, Second Edition, Elsevier.
4. Wayne Wolf , Computers as Components-Principles of Embedded Computer System Design, Morgan Kaufmann publishers, Third edition, 2012.

Web Resources

1. https://nptel.ac.in/courses/108/102/108102045/
2. https://www.coursera.org/learn/embedded-software-hardware.
3. https://www.edx.org/course/embedded-systems-shape-the-world-multi-threaded-in.

Course Contents and Lecture Schedule

Topic	**No. of lectures**
Module 1	**9 hrs.**
Introduction to Embedded Systems: Embedded system, Embedded system Vs General Computing System, Processor Embedded into a System.	2
Embedded Hardware units and devices in a system, Embedded Software in a System, Introduction to embedded system design, classification of Embedded	

systems, Skills Required for an embedded system Designer, Examples of the Embedded Systems.	5
Major Application Areas of Embedded Systems, Purpose of Embedded Systems.	2
Module 2	**10 hrs**
Embedded System Design and development Process: Embedded System-On-Chip (SoC) and Use of VLSI Circuit Design Technology, Build Process for embedded systems.	4
Design Process in Embedded System, Design Challenges in Embedded System Design.	3
Hardware-Software Co-Design in an Embedded System, Formalism of System Design.	3
Module 3	**9 hrs**
Hardware Software Co-Design and Program Modelling: – Fundamental Issues in Hardware Software Co-Design.	2
Computational Models in Embedded Design - Data Flow Graph Model, Control Data Flow Graph, State Machine Model, Sequential Program Model, Concurrent / communicating Process Model, Object oriented model, UML.	7
Module 4	**10 hrs**
Design and Development of Embedded Product: **Embedded Hardware Design and Development:** - Analog Electronic Components, Digital Electronic Components, VLSI and Integrated Circuit Design.	5
Embedded Firmware Design and Development: - Embedded Firmware Design Approaches, Embedded Firmware Development Languages.	5
Module 5	**10 hrs**
Integration and Testing of Embedded Hardware and Firmware: - Integration of Hardware and Firmware, Testing Embedded Systems.	6
RTOS based Embedded System Design: - Basic operating system services, Introduction to Real Time Operating System (RTOS), RTOS Task-Scheduling models, How to Choose an RTOS.	4

20INMCA486	COMPUTER GRAPHICS	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: This course intends to provide an overview of the foundations of Computer Graphics rendering. Special emphasis is laid on concepts like Ray Tracing that have already become industry standards for graphics rendering with modern GPUs. Other fundamentals such as colorimetry and radiometry are also introduced in the subject. Although the course is expected to be treated theoretically for evaluation purposes, practical sessions and talks by external experts from the graphics processing industry may be desirable.

Prerequisite:

Fundamentals of computer hardware, Linear Algebra

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

CO 1	Apply foundational knowledge in computer graphics to work with Graphics APIs.
CO 2	Explain various shape drawing algorithms and transformations.
CO 3	Explain viewing concepts and follow the workflow in computer graphics pipeline.
CO 4	Explain different shading, texture mapping and data structures used in computer graphics.
CO 5	Apply concepts in Raytracing to better understand and design computer graphics models.
CO 6	Apply concepts in colorimetry and radiometry to work with images.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3											
CO 2	3	2	2		3							
CO 3	3											
CO 4	3											
CO 5	3				1		1					
CO 6	3											

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	10
Understand	20	20	20
Apply	20	20	30
Analyse			
Evaluate			
Create			

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 of 2 sub-divisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain the workflow in the computer graphics pipeline.
2. How does alpha composition affect image appearance?
3. Explain Eigenvectors and Eigenvalues?

Course Outcome 2 (CO2)

1. Explain some of the pitfalls of Bresenham line drawing algorithm.
2. Explain Affine transformation and its purpose.
3. Compare the mid-point and Bresenham circle drawing algorithms.

Course Outcome 3(CO3):

1. Explain how anti-aliasing affects the image quality.
2. Explain projective transformation.
3. Explain Field of View.

Course Outcome 4 (CO4):

1. Explain some of the benefits of using Triangle meshes.
2. How is Phong shading different from Artistic Shading?
3. How is texture mapping for rasterized image performed.

Course Outcome 5 (CO5):

1. Explain what makes Ray Tracing a highly system intensive rendering process.
2. How can transparency be achieved using ray tracing.
3. Explain the techniques used in Ray Tracing for shadows.

Course Outcome 6 (CO6):

1. Explain Tonal Reproduction.
2. Write a short note on particle tracing for Lambertian scenes.
3. How can rough and smooth surfaces be modeled?

Model Question paper

Part A

1. Explain the concept and idea behind pixels.
2. Write three major applications of computer graphics.
3. Explain the term antialiasing.
4. Demonstrate how the DDA Line drawing algorithm works with a simple example of your own.
5. What is the purpose of tiling multidimensional arrays.
6. Explain the meaning and purpose of graphics APIs.
7. Explain the concept of ray tracing.
8. Explain the basic concept behind ray-object intersection and how it is established.
9. Explain what is meant by color space and give examples.
10. What is meant by a High Dynamic Range image? [3x10 =30 Marks]

Part B

Module 1

11. Explain the process of converting an analog image to a digital image. [6 Marks]

OR

12. Write a note on the following
    a. RGB Color Space [3 marks]
    b. Matrix Diagonalisation [3 marks]

Module 2

13. Write short notes on
    a. Projective Transformation [3 Marks]
    b. Perspective Projection [3 Marks]

OR

14. Explain a typical Graphics Pipeline. [6 Marks]

Module 3

15. Compare the various graphics APIs citing their advantages and disadvantages.

OR [6 Marks]

16. Explain the various specialized data structures used in computer graphics

[6 Marks]

Module 4

17. Explain how shading and shadowing are achieved using Ray Tracing.

OR [6 Marks]

18. Explain the geometry for graphics hardware.

[6 Marks]

Module 5

19. Explain the methods for Nighttone mapping.

[6 Marks]

OR

20. Explain how accurate direct lighting can be achieved.

[6 Marks]

Syllabus

Module	Contents	Hours
I	**Introduction to computer graphics**: Major Areas and Major Applications, Preliminary discussion on Graphics Pipeline, Numerical Issues, Efficiency and Coding Graphics Programs. **Raster Images**: Raster Devices, Images, Pixels, RGB Color and Alpha Composition. **Fundamentals of Signal Processing** for Images and Sampling Theory(Theoretical understanding only). **Mathematical Foundations of Computer Graphics**: Review of Trigonometry and Geometry, Theoretical foundations of Linear Algebra – Vectors and Matrices, Eigen Values and Eigen Vectors, Matrix Diagonalization(Theoretical understanding only).	9
II	**Fundamentals of shape drawing**:- Line drawing - DDA and Bresenham Algorithms, Circle drawing: Mid Point and Bresenham. **Transformations(2D, 3D)**:, Translation and Affine Transformations, Inverse of Transformation Matrices, Coordinate transformations. **Viewing**: Viewing Transformations, Projective Transformation, Perspective Projection, Field of View **Graphics Pipeline**: Rasterization, Operations, Antialiasing, Culling primitives for efficiency.	10
III	**Surface shading**: Diffuse Shading, Phong Shading, Artistic Shading. **Texture Mapping**: 2D and 3D Mapping, Texture Mapping for Rasterized Triangles, Bump Textures, Displacement Mapping, Shadow Maps. **Data Structures for Graphics**: Triangle Meshes, Scene Graphs, Spatial Data Structures, BSP Tree for visibility, Tiling Multidimensional Arrays.	10

	Graphics APIs: Intuitive understanding of role of Graphics APIs such as OpenGL, Direct3D(DirectX), Vulkan etc. – No programming required	
IV	**Ray Tracing**: Basic Ray Tracing Algorithms, Perspective, Computing Viewing Rays, Ray-Object Intersection, Shading, Shadows, Ideal Specular Reflection, Ray Tracing Program, Transparency and Refraction, Instancing, Constructive Solid Geometry, Distribution Ray Tracing. **Using Graphics Hardware**: Introduction, Geometry for Hardware, Processing Geometry using Pixels.	8
V	**Light**: Radiometry, Transport Equation, Photometry; **Colors**: Colorimetry, Color Spaces, Chromatic Adaption, Color Appearance; **Tonal Reproduction**: Classification, Dynamic Range, Image Formation, Frequency based Operators, Gradient Domain Operators, Gradient Domain Operators, Spatial Operators, Division, Sigmoids, Night Tone mapping. **Global Illumination**: Particle tracing for Lambertian scenes, Path Tracing, Accurate Direct Lighting. Reflection Models: Real World Materials, Implementing Reflection Models, Specular Reflection models, Smooth layered Model, Rough Layered Model.	10

Textbooks:

1. Peter Shirley, Steve Marschner: ***"Fundamentals of Computer Graphics"***, 4th Edtn. AK Peters, 2015. – All Modules.

2. Donald Hearn and M. Pauline Baker, ***"Computer Graphics"***, 2nd Edtn. PHI, 1996. – Module 2(Fundamentals of Shape Drawing).

Reference Books:

1. Matt Pharr and Greg Humphreys, ***"Physically Based Rendering: From Theory to Implementation"***, 2nd Edtn, Morgan Kaufmann,2010;

2. Gilbert Strang, ***"Introduction to Linear Algebra"***, 4th Edtn, Wellesley-Cambridge Press, 2009

3. William Stallings, ***"Data and Computer Communications"***, 10th Edtn, Pearson, 2013.

4. Vulkan Documentation, https://www.khronos.org/vulkan/

5. OpenGL Documentation, https://www.khronos.org/opengl/

6. Nvidia Developer, ***"Nvidia Ray Tracing Documentation"***, Nvidia Documentation, https://raytracing-docs.nvidia.com/. – Module 3 and 4, Topics on Ray Tracing.

Course Contents and Lecture Schedule

No.	**Topic**	No. of Lectures
1	**Introduction**	
1.1	**Introduction to computer graphics**: Major Areas and Major Applications, Preliminary discussion on Graphics Pipeline, Numerical Issues, Efficiency and Coding Graphics Programs.	2
1.2	**Raster Images**: Raster Devices, Images, Pixels, RGB Color and Alpha Composition.	3
1.3	**Fundamentals of Signal Processing** for Images and Sampling Theory(Theoretical understanding only). **Mathematical Foundations of Computer Graphics**: Review of Trigonometry and Geometry, Theoretical foundations of Linear Algebra – Vectors and Matrices, Eigen Values and Eigen Vectors, Matrix Diagonalization(Theoretical understanding only).	4
2	**Shape Drawing, transformations and Viewing**	
2.1	**Fundamentals of shape drawing**:- Line drawing - DDA and Bresenham Algorithms, Circle drawing: Mid Point and Bresenham.	2
2.2	**Transformations(2D, 3D)**:, Translation and Affine Transformations, Inverse of Transformation Matrices, Coordinate transformations.	2
2.3	**Viewing**: Viewing Transformations, Projective Transformation, Perspective Projection, Field of View	3
2.4	**Graphics Pipeline**: Rasterization, Operations, Antialiasing, Culling primitives for efficiency.	2
3	**Shading**	

3.1	**Surface shading**: Diffuse Shading, Phong Shading, Artistic Shading.	3
3.2	**Texture Mapping**: 2D and 3D Mapping, Texture Mapping for Rasterized Triangles, Bump Textures, Displacement Mapping, Shadow Maps.	3
3.3	**Data Structures for Graphics**: Triangle Meshes, Scene Graphs, Spatial Data Structures, BSP Tree for visibility, Tiling Multidimensional Arrays.	4
4	**Ray Tracing, Graphics Hardware and APIs**	
4.1	**Ray Tracing**: Basic Ray Tracing Algorithms, Perspective, Computing Viewing Rays, Ray-Object Intersection, Shading, Shadows, Ideal Specular Reflection, Ray Tracing Program, Transparency and Refraction, Instancing, Constructive Solid Geometry, Distribution Ray Tracing.	3
4.2	**Using Graphics Hardware**: Introduction, Geometry for Hardware, Processing Geometry using Pixels.	3
4.3	**Graphics APIs**: Intuitive understanding of role of Graphics APIs such as OpenGL, Direct3D (DirectX), Vulkan etc. – No programming required	2
5	**Radiometry, colorimetry and tones**	
5.1	**Light**: Radiometry, Transport Equation, Photometry; **Global Illumination**: Particle tracing for Lambertian scenes, Path Tracing, Accurate Direct Lighting Reflection Models: Real World Materials, Implementing Reflection Models, Specular Reflection models, Smooth layered Model, Rough Layered Model.	5
5.2	**Colors**: Colorimetry, Color Spaces, Chromatic Adaption, Color Appearance;	3
5.3	**Tonal Reproduction**: Classification, Dynamic Range, Image Formation, Frequency based Operators, Gradient Domain Operators, Gradient Domain Operators, Spatial Operators, Division, Sigmoids, Night Tone mapping.	3

20INMCA488	ARTIFICIAL INTELLIGENCE	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: This course introduces the techniques of Artificial Intelligence and analyzes various methods of solving problems using it. The concept of expert system architecture & fuzzy operations are introduced. This course serves as a prerequisite for many advanced courses in Data Science areas.

Prerequisite: Mathematical Foundations for Computing, Advanced Data structures

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

CO 1	Apply the steps needed to provide a formal specification for solving the problem.
CO 2	Apply and analyse the different types of control and heuristic search methods to solve problems
CO 3	Understand various Game theory problems & Knowledge structures
CO 4	Formulate knowledge representation and examine resolution in predicate and propositional logic
CO 5	Apply feasible planning and learning techniques to solve non-trial problems
CO 6	Analyse expert systems & fuzzy operations to solve real life problems.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3							2			
CO 2	3	3							2			
CO 3	3	3							2			
CO 4	3	3							2			
CO 5	3	3							2			
CO 6	3	3	3				3		2		2	2

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10	10	10
Understand(K2)	20	20	20
Apply(K3)	20	20	30
Analyse(K4)			
Evaluate(K5)			
Create(K6)			

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. Describe the areas of Artificial intelligence. (K1)

2. List the problem formulations & production characteristics. (K1 & K2)

3. Solve the various problems such as 8 puzzle, Crypt arithmetic, etc. (K3)

Course Outcome 2 (CO2):

1. Describe search strategies in solving problems. (K1 & K2)

2. List the disadvantages of hill climbing algorithm (K1& K2)

3. Illustrate A* algorithm for the graph (K3)

Course Outcome 3 (CO3):

1. Demonstrate two player Zero sum game (K3)

2. List and explain the knowledge representation methods in AI. (K1&K2)

3. Explain how alpha-beta algorithm works in pruning of branches with an example. (K3)

Course Outcome 4 (CO4):

1. Translate the following sentence to predicate logic (K3)

a) 'All pompeians were Roman'

b)'All Romans were either loyal to Caesar or hated him'.

2. Explain the algorithm to convert WFF to clause. (K1 & K2)

3. Describe the resolution graph in predicate and propositional logic. (K1 & K2)

Course Outcome 5 (CO5):

1. Differentiate between Goal stack and Hierarchical planning in AI. (K1 & K2)

2. Discuss about neural net learning(K1 & K2)

3. List out the steps in genetic learning. (K1 & K2)

Course Outcome 6 (CO6):

1. Specify the components in expert system. (K1 & K2)

2. Solve various fuzzy operations (K3)

3. List out and explain various tools and languages in AI. (K1 & K2)

Model question paper

Part A

1. List the applications areas in AI.
2. Solve the following cryptarithmetic problem

```
  SEND +
  MORE
 MONEY
```

3. Explain iterative deepening search.
4. List the disadvantages of hill climbing.
5. Solve a simple two player Zero sum game.
6. Explain about conceptual dependency.
7. Explain inference rules in FOPL.
8. List components of a planning system.
9. Give a short note on role of an expert system.
10. List various fuzzy operations.

(10X3=30 marks)

Part B

11. Consider a water jug problem. You are given two jugs: a 4 gallon and a 3 gallon. Neither has any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into 4-gallon jug? State the production rule for the water jug problem (6)

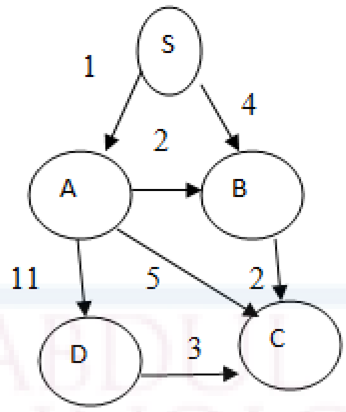
OR

12. Solve missionaries and cannibals problem. (6)

13. Explain blind search strategies in detail. (6)

OR

14. Explain A* Algorithm for the given graph. (6)



Heuristic Value:

S	6
A	2
B	3
C	0
D	5

15. List and explain the knowledge representation methods in AI. (6)

OR

16. Explain how alpha-beta algorithm works in pruning of branches with an example. (6)

17. Explain the algorithm to convert WFF to clause with an example. (6)

OR

18. Explain Neural net and Genetic learning methods in AI. (6)

19. Illustrate architecture of an expert system and mention its features. (6)

OR

20. Solve the following using various Fuzzy set operations (6)

A= {0.1/1,0.3/2,0.45/3}

B={0.15/1,0.34/2}

(5X6=30 Marks)

SYLLABUS

Module 1

Introduction to AI and Production Systems:- AI-Problem formulation, Problem Definition -Production systems, Problem characteristics, Production system characteristics, Example AI Problems (8 Puzzle problem, Missionary Cannibals Problem, Crypt arithmetic Problems, block world Problem)

Module 2

Search Strategies: - Blind search strategies -Depth First Search, Breadth First Search, Best First Search, Iterative Deepening Search, Heuristic Search strategies- Admissible Heuristics and examples - Simple Hill Climbing and Steepest Ascending Hill Climbing, Simulated Annealing , A* algorithm.

Module 3

Game playing : Two Player Zero Sum Games, Modelling Two Player Zero Sum Games as search problems, Min-Max Algorithm, Optimizing Min Max Algorithm using $\alpha - \beta$ cut off, *Knowledge Representation Structures*: Frames, Sematic Networks and Conceptual Dependencies.

Module 4

Knowledge representation using Logic: - First Order Predicate Logic (FOPL), Well Formed Formula(WFF) in FOPL, Inference rules for FOPL, The Clause Form and conversion of WFFs to Clause Form, Resolution- Refutation. *Planning*:- Overview, components of a planning system, Goal stack planning, Hierarchical planning, *Learning*:-Forms of learning, neural net learning & genetic learning.

Module 5

Expert systems:–Architecture of expert systems, Roles of expert systems, Languages and tools – Typical expert system examples. *Fuzzy Logic:* - Fuzzy Variables ,Fuzzy Sets and Fuzzy Set Operations, Typical Examples using Fuzzy Sets.

Text Books

1. Kevin Night and Elaine Rich, "***Artificial Intelligence (SIE)***", McGrawHill-2008.
2. Stuart Russel and Peter Norvig "***AI – A Modern Approach***", 2nd Edition, Pearson Education2007.

Reference Books

1. Peter Jackson, "***Introduction to Expert Systems***", 3rd Edition, Pearson Education, 2007.
2. Dan W. Patterson, "***Introduction to AI and ES***", Pearson Education, 2007.

Course Contents and Lecture Schedule

No	**Topic**	**No. of Lectures**
1	***Module I: Introduction to AI***	***9 hrs***
1.1	AI-Problem formulation, Problem Definition -Production systems	
1.2	Production system characteristics	
1.3	AI Problems	
2	***Module II: Search Strategies***	***9 hrs***
2.1	Blind search strategies	
2.2	Heuristics search strategies	
2.3	Simple Hill Climbing and Steepest Ascending Hill Climbing,	
2.4	Simulated anneling	
2.5	A* algorithm	
3	***Module III: Game playing***	***9 hrs***
3.1	Zero sum game	
3.2	Minimax algorithm	
3.3	Alpha beta pruning	
3.4	Knowledge representation structure	
4	***Module IV: Knowledge representation using Logic***	***12 hrs***
4.1	First Order Predicate Logic (FOPL)	

4.2	Well Formed Formula(WFF) in FOPL, Inference rules for FOPL	
4.3	The Clause Form and conversion of WFFs to Clause Form	
4.4	Resolution	
4.5	Planning	
4.6	Learning	
5	***Module V: APPLICATIONS***	***6 hrs***
5.1	Expert system Architecture	
5.2	Fuzzy logic operations	
5.3	Languages and tools	

20INMCA492	IPR AND CYBER LAWS	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: This course intends to provide insight into Intellectual Property Rights and Cyber Laws. It includes detailed discussion on various intellectual property rights, procedures to apply for copyrights & patents, legalities of intellectual property to avoid plagiarism and other IPR related crimes. Effectiveness of cyber-laws and other countermeasures against cybercrime and cyber warfare are discussed in detail. Various kinds of Intellectual Property issues in cyberspace and the evolution and development of the law in this regard are included to the level possible within the scope of a single course. More detailed treatment can be done through seminars, assignments and talks by eminent external experts including industry professionals.

Prerequisite: General awareness on internet essentials, web technologies and e-commerce.

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

CO 1	Explain the fundamentals of IPR and patents.
CO 2	Apply intellectual property related tools such as trademark and copyright to real problems.
CO 3	Discuss Industrial designs, trade secret and geographic Indications.
CO 4	Describe laws governing cyberspace and analyse the role of Internet Governance in framing policies for Internet security.
CO 5	Discuss different types of cybercrimes and penalties under IT Act.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	1		1						
CO 2	3	3	2	1		1						
CO 3	3	2	1	1								
CO 4	2	2	1			1						
CO 5	2	2	1	1		1						

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	10	10	10
Understand	20	30	25
Apply	20	10	25
Analyse			
Evaluate			

Create			

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 carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum of 2 sub-divisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Discuss the need for protection of intellectual property.
2. Explain TRIPS Agreement.
3. Illustrate types of patent applications.

Course Outcome 2 (CO2)

1. Explain Trademark Infringement and Protection of trademarks.
2. Explain the rights conferred by copyright, registration and ownerships of copyrights.
3. Discuss software copyright.

Course Outcome 3(CO3):

1. Discuss the need for protection of design and explain Design Act, 2000.
2. Explain basic concepts of Geographic Indications such as filing, granting and Protection of geographic indications.
3. Describe the procedure of discovering and protecting of trade secret.

Course Outcome 4 (CO4):

1. Explain the need for cyber laws.
2. Discuss protection of copyright on cyberspace.
3. Explain ISP in cyberspace.

Course Outcome 5 (CO5):

1. Explain different amendments on IT Act 2000.
2. Discuss Terrorism on cyberspace.
3. Explain offences of misrepresentation.

Model Question paper

Part A

1. Categorize various patent applications.
2. Explain the criteria for categorizing an invention as patentable or non-patentable.
3. What are the requirements for filing trademarks?
4. Explain copyright and the rights conferred by copyrights.
5. Explain the term geographical indications by giving suitable examples.
6. What is meant by design under the Design Act, 2000?
7. Describe the risks associated with cyber space.
8. What is meant by the term cyber laws.
9. Explain cyber stalking and phishing.
10. Define the term hacking and explain its essentials. [3 x 10 =30 Marks]

Part B

Module 1

11. Describe the procedure for registration of patents. [6 Marks]

OR

12. Write short notes on

c. Intellectual property and the need for its protection. [3 marks]

d. Importance and features of WIPO. [3 marks]

Module 2

13. Explain the methods for transferring copyrights. [6 Marks]

OR

14. Describe software copyright and how can software be classified according to copyrights. [6 Marks]

Module 3

15. What is industrial design? Describe the salient features of Design act, 2000. [6 Marks]

OR

16. How are the trade secrets dealt with under the Indian law? Discuss.

[6 Marks]

Module 4

17. Explain the essential requirements of cybersquatting.

[6 Marks]

OR

18. Discuss about cyber space and the protection of copyrights on cyberspace.

[6 Marks]

Module 5

19. Explain the objectives and features of Information Technology Act 2000.

[6 Marks]

OR

20. What do you mean by cybercrimes? Discuss the nature and types of cybercrimes.

[6 Marks]

Syllabus

Module	Contents	Hours
I	Fundamentals of IPR- Introduction – Intellectual property – Need for protection of intellectual property – WIPO – Intellectual property rights and development – Rationale of protection – TRIPS Agreement - **Patents: –** Introduction – Patentable and Non-patentable Invention – Types of patent applications – Guidelines for registration of patent – patent filing – grant of patent – types of patent documents.	10
II	**Trademarks**– Introduction – Guidelines for registration-Requirements for filing trademarks – Trademark Infringement – Protection of trademarks – **Copyright –** Introduction – Rights conferred by copyright – registration – ownerships – terms – transfer of copyrights – copyright infringement – databases and copyright- **Software Copyright**–Introduction – Need of software copyright –classification of software according to copyright – software auditing –copyright notice – transfer of copyright.	10
III	**Industrial Designs**– Introduction – Need for protection of design – requirements for registration of designs – Design Act, 2000 – Duration of registration of design – application procedure – **Geographic Indications** –Introduction – Filing – **Granting** – Protection of geographic indications**.** **Trade Secret –** definition – discovering and protecting of trade secret.	10
IV	**Cyber law** - Need for cyber laws - Historical perspective - cyberspace - deception by squatting in cyberspace - protection of copyright on cyberspace - infringement of copyright on cyberspace - linking, hyper linking and framing - ISP in cyberspace - cyberspace and protection of patents in India.	8
V	**Information Technology Act and Punishments**- Introduction to IT Act 2000- Amendments on IT Act - Violation of the right of privacy in cyberspace/internet-punishment for violation of privacy, breach of confidentiality and privacy under IT act-Terrorism on cyberspace Overview of cybercrimes-offences by intermediaries-offences related to protected system- offences of misrepresentation-	10

	punishment for Abetment and Attempt to commit offences under the IT act.	

Textbooks:

1. Dr. R. Radhakrishnan and Dr. S. Balasubramanian, "**Intellectual Property Rights: Text and Cases**", Excel Books
2. Harish Chander, "**Cyber Law and IT Protection**", PHI Learning Pvt. Ltd.

Reference Books:

5. D. Bainbridge, "Introduction to Computer Law", Pearson Education
6. Rohas Nagpal, "Cyber Crime & Corporate Liability", CCH, 2008
7. https://www.udemy.com/course/cyber-security-law/
8. https://www.coursera.org/specializations/introduction-intellectual-property

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
1	**Introduction**	
1.1	**Fundamentals of IPR-** Introduction – Intellectual property – Need for protection of intellectual property	2
1.2	WIPO – Intellectual property rights and development – Rationale of protection – TRIPS Agreement	3
1.3	**Patents:** – Introduction – Patentable and Non-patentable Invention – Types of patent applications – Guidelines for registration of patent – patent filing – grant of patent – types of patent documents	5
2		
2.1	**Trademarks**– Introduction – Guidelines for registration – Requirements for filing trademarks – Trademark Infringement – Protection of trademarks	3

2.2	**Copyright –** Introduction – Rights conferred by copyright – registration – ownerships – terms – transfer of copyrights – copyright infringement – databases and copyright	3
2.3	**Software Copyright**– Introduction – Need of software copyright – classification of software according to copyright – software auditing – copyright notice – transfer of copyright.	4
3		
3.1	**Industrial Designs**– Introduction – Need for protection of design – requirements for registration of designs – Design Act, 2000 – Duration of registration of design – application procedure	4
3.2	**Geographic Indications** – Introduction – Filing **Granting** – Protection of geographic indications**.**	4
3.3	**Trade Secret –** definition – discovering and protecting of trade secret.	2
4		
4.1	**Cyber law** - Need for cyber laws - Historical perspective - cyberspace - deception by squatting in cyberspace.	3
4.2	Protection of copyright on cyberspace - infringement of copyright on cyberspace - linking, hyper linking and framing -	3
4.3	ISP in cyberspace - cyberspace and protection of patents in India.	2
5		
5.1	**Information Technology Act and Punishments**- Introduction to IT Act 2000- Amendments on IT Act	2
5.2	Violation of the right of privacy in cyberspace/internet-punishment for violation of privacy, breach of confidentiality and privacy under IT act- Terrorism on cyberspace overview of cybercrimes	4
5.3	Offences by intermediaries- offences related to protected system- offences of misrepresentation-punishment for Abetment and Attempt to commit offences under the IT Act.	4

INT MCA SEMESTER IX

INT MCA SEMESTER IX

INT MCA SEMESTER IX	
Course No	**Course**
20INMCA501	Data Science & Machine Learning
20INMCA503	Mobile Computing
20INMCA5--	Elective 3
20INMCA5--	Elective 4
20INMCA509	Mini Project 2
20INMCA531	Data Science Lab
20INMCA533	Mobile Application Development Lab
20INMCANC3	Domain Expertise Workshops

20INMCA501	**Data Science & Machine Learning**	**CATEGORY**	**L**	**T**	**P**	**CREDIT**
		General	**3**	**1**	**0**	**4**

Preamble: This course helps the students to learn, understand, and practice the basic concepts and techniques of data science and Machine Learning. The students will be able to develop skills for implementing data science concepts and machine learning algorithms for solving practical problems.

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

CO 1	Explore the fundamental concepts of data science
CO 2	Understand data analysis techniques for applications handling large data
CO 3	Understand the basic concepts and techniques of Machine Learning.
CO 4	Develop skills for using machine learning algorithms for solving practical problems.
CO 5	Recognize machine learning problems and apply suitable algorithms.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO 1	3	2	3	2		3				3	3	3
CO 2	3	2	3	3	2					3		3
CO 3	3	2	3	2	3	1				2		3
CO 4	3	2	3	2	3	1				2		3
CO 5	3	2	3	2	3	1				2		3

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	12	12	15
Understand(K2)	14	14	15
Apply(K3)	12	12	15
Analyse(K4)	12	12	15
Evaluate(K5)			
Create(K6)			

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. Classify the different types of data handled in big data processing? (K4)
2. Explain the steps involved in data science process. (K1)

Course Outcome 2 (CO2):

1. Summarise the concepts of Cleansing, integrating, and transforming data. (K5)
2. Illustrate Exploratory data analysis with suitable example (K4)

Course Outcome 3(CO3):

1. Explain the steps of machine learning with the help of diagram (K1)
2. Illustrate KNN Algorithm with an example. (K3)

Course Outcome 4 (CO4):

1. Compare Simple linear regression and Multiple linear regression. (K5)
2. Describe Neural Network Models with the help of relevant diagrams. (K2)

Course Outcome 5 (CO5):

1. Explain How Confusion matrix is used for Evaluating Model Performance. (K2)
2. Describe how model performance is improved with ensemble learning? (K1)

Syllabus

Module 1

Introduction to Data Science - Benefits and uses of data science and big data-Facets of data-The data science process-The big data ecosystem and data science- introduction to hadoop.

Module 2

The data science process: Overview of the data science process - Defining research goals and creating a project charter - Retrieving data -Cleansing, integrating, and transforming data-Exploratory data analysis-Build the models - Presenting findings and building applications on top of them.

Module 3

Introduction to Machine Learning - How do machines learn - Selecting the right features, understanding data: - numeric variables – mean, median, mode, Measuring spread. Review of distributions: Uniform and normal. Categorical variables.

Lazy Learning - Classification Using k-Nearest Neighbor(KNN) algorithm. Measuring similarity. Choice of k. Probabilistic Learning - Naive Bays' classifier. Review of probability - Joint probability, Conditional probability and Bay's theorem, Naive Bayes algorithm.

Module 4

Classification Using Decision Trees and Rules: Divide and conquer strategy. Decision tree algorithm.

Regression Methods: Simple linear regression - Ordinary least squares estimation Correlations - Multiple linear regression.

Neural Networks: Biological motivation - Perceptron - Activation functions - Network Models. Introduction to deep learning.

Module 5

Evaluating Model Performance**:** Precision and recall, Confusion matrix, Cross validation Bootstrap sampling.

Improving Model Performance: Improving model performance with ensemble learning, Bagging and Boosting. Introduction to random forest.

Text Books

1.”Introducing Data Science Big Data, Machine Learning, and More, Using Python Tools ”Davy Cielen Arno D. B. Meysman Mohamed Ali, MANNING Publications

2. “ BIG DATA and Analytics”, Seema Acharya, Subhashini Chellappan,WILEY india pvt Ltd.

3.Brett Lantz, “Machine Learning with R”, Packt Publishing, 2nd Edition.

4. Tom M. Michell, “Machine Learning”, Mcgraw Hill

Reference Books

1. Ethem Alpaydin, “Introduction to Machine Learning”, PHI Learning

2. “Data Science and Big Data Analytics Discovering, Analyzing, Visualizing and Presenting Data” EMC Education Services

MOOC

1. https://www.coursera.org/learn/machine-learning
2. https://www.coursera.org/specializations/jhu-data-science

Web Resources

1. https://nptel.ac.in/courses/106/105/106105152/
2. https://onlinecourses.nptel.ac.in/noc20_cs80/preview
3. https://www.udacity.com/course/intro-to-data-science--ud359

Course Contents and Lecture Schedule

Topic	**No. of lectures**
Module 1	**8 hrs.**
Introduction to Data Science - Benefits and uses of data science and big data-Facets of data	2
The data science process.	2
The big data ecosystem and data science.	2

Introduction to hadoop.	2
Module 2	**10 hrs**
The data science process: Overview of the data science process - Defining research goals and creating a project charter	2
Retrieving data -Cleansing, integrating, and transforming data	3
Exploratory data analysis.	2
Build the models - Presenting findings and building applications on top of them.	3
Module 3	**12 hrs**
Introduction to Machine Learning - How do machines learn - Selecting the right features, understanding data: - numeric variables – mean, median, mode, Measuring spread. Review of distributions: Uniform and normal. Categorical variables.	4
Lazy Learning - Classification Using k-Nearest Neighbor(KNN) algorithm. Measuring similarity. Choice of k.	3
Probabilistic Learning - Naive Bays' classifier. Review of probability - Joint probability, Conditional probability and Bay's theorem, Naive Bayes algorithm.	5
Module 4	**10 hrs**
Classification Using Decision Trees and Rules - Divide and conquer strategy. Decision tree algorithm.	3
Regression Methods - Simple linear regression - Ordinary least squares estimation Correlations - Multiple linear regression.	4
Neural Networks: Biological motivation - Perceptron - Activation functions - Network Models. Introduction to deep learning.	3
Module 5	**8 hrs**
Evaluating Model Performance: Precision and recall, Confusion matrix, Cross validation, Bootstrap sampling.	4

Improving Model Performance: Improving model performance with ensemble learning, Bagging and Boosting. Introduction to random forest.	4

MODEL QUESTION PAPER

Reg No.:________________		Name:____	

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
NINTH SEMESTER INTEGRATED M.C.A DEGREE EXAMINATION
MODEL QUESTION PAPER

Course Code: 20INMCA501

Course Name: Data Science & Machine Learning

Max. Marks: 60		Duration: 3 Hours

PART A

		Answer all questions, each carries3 marks.	Marks
1		Summarise the characteristics of big data	(3)
2		Compare structured and unstructured data give example	(3)
3		List any two strategies used to handle missing data.	(3)
4		Illustrate any one method to handle outlier values	(3)
5		Differentiate between training set and test set.	(3)
6		Define supervised learning give an example	(3)
7		Summarise the concepts of perceptron	(3)
8		Explain Information gain with suitable example	(3)
9		Explain precision and recall	(3)
10		differentiate between bagging and boosting methods	(3)

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

11		With a suitable diagram explain data science process in detail	(6)
		OR	
12		Describe the components of hadoop ecco system	(6)

Module II

13		Illustrate Exploratory data analysis with suitable example	(6)
		OR	
14		Explain Data pre-processing steps involved in Data Science.	(6)

Module III

15		Explain how classification is done using Naive Bays' classifier with suitable example	(6)
OR			
16		Illustrate KNN Algorithm with an example.	(6)
Module IV			
17		Compare the mathematical models and assumptions of Simple linear regression model and multiple linear regression model	(6)
OR			
18		Describe Neural Network Models with the help of relevant diagrams.	(6)
Module V			
19		With a suitable example Illustrate how Confusion matrix is used for Evaluating Model Performance.	(6)
OR			
20		Describe how to improve model performance using ensemble learning?	(6)

20INMCA503	Mobile Computing	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble:

The course begins with an overview of mobile computing and Android programming fundamentals. This course helps students to develop skills and confidence in Android programming and make them understand about the entire Android Apps development cycle, as well as it would also enable the students to independently create new Android applications.

Prerequisite:

20INMCA305 Introduction to RDBMS and SQL

20INMCA403 Java Programming

20INMCA404 Advanced Computer Networks

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

CO 1	Understand the basic concepts of mobile computing.
CO 2	Explore the concepts and working of various mobile networks.
CO 3	Learn various mobile OS concepts and understand the key technological principles, protocols, and methods for delivering and maintaining mobile applications.
CO 4	Learn Android development environments for better application development
CO 5	Develop and apply current standard-compliant scripting/programming techniques for the successful deployment of mobile applications targeting a variety of platforms.

Mapping of course outcomes with program outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO 1	3					1	1					
CO 2	3					1	1					
CO 3	3	2	2				1					

CO 4			3	2	3	2	2					2
CO 5		1	3	2	3	2	2			2		3

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	15	15	15
Understand(K2)	15	15	15
Apply(K3)	10	10	15
Analyse(K4)	10	10	15
Evaluate(K5)			
Create(K6)			

Mark distribution

Total Marks	**CIE**	**ESE**	**ESE Duration**
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 08 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 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. Describe the protocol stack of Bluetooth. (K2)
2. Discuss the architecture of mobile telecommunication systems with a schematic diagram. (K2)
3. Explain the different components used in wireless networks. (K2)

Course Outcome 2 (CO2):

1. Differentiate between mobile computing and wireless networking. (K2)
2. Is 3G cellular wireless technology superior to 2G technology? Justify your answer. (K5)
3. Illustrate the similarities and dissimilarities between GSM network and UMTS network. (K4)

Course Outcome 3(CO3):

1. Explain the special features that an operating system for a mobile device needs to support compared to the traditional OS. (K2)
2. Compare the features provided by the following mobile OS: Android, Symbian, Windows Phone7. (K5)
3. Illustrate Android software stack structure with a neat diagram. (K4)

Course Outcome 4 (CO4):

1. Describe the protocol stack of Android with a neat diagram. (K1)
2. Compare JVM and DVM. (K5)
3. Explain any 3 layouts in android. (K2)

Course Outcome 5 (CO5):

1. Write the difference between Implicit and explicit intent. (K5)
2. Illustrate the Activity life cycle with diagram. (K4)
3. Explain how to store and retrieve data in SQLite database with example. (K2)

Syllabus

Module 1

Basics of Communication Technologies - Mobile handsets, wireless communications and server applications, Components of a wireless Communication System, Architecture of a Mobile Telecommunication System, Wireless Networking Standards, Wireless Local Area Networks (WLANs), Bluetooth Technology.

Module 2

Introduction to Mobile Computing and Wireless Networking- Mobile Computing vs. Wireless Networking, Mobile Computing Applications, Characteristics of Mobile Computing, Structure of Mobile Computing Application, Cellular Mobile Communication, Global System for Mobile Communication (GSM) – Services, Architecture and Security, General Packet Radio Service (GPRS) -Services, Architecture, Universal Mobile Telecommunications system.

Module 3

Operating Systems for Mobile Computing- OS Responsibilities in mobile devices, A Few Basic Concepts, Special Constraints and Requirements of Mobile OS , Survey of Commercial Mobile OS, A Comparative study of Mobile OS.

Mobile Applications Development and Protocols - Mobile devices as Web Clients, HDML, WAP, J2ME, Android Application Development.

Module 4

Configuration of Android Environment-: Android SDK, Android Development Tools, Android Virtual Devices, Emulators, Dalvik Virtual Machine, Difference between JVM and DVM.

Android User Interface: Linear Layout, Absolute Layout, Frame Layout, Relative Layout, Table Layout.

Designing Your User Interface with Views: Text View, Button, ImageButton, Edit Text, CheckBox, ToggleButton, RadioButton and RadioGroup, Progress Bar, AutocompleteTextView, Spinner, ListView, Image View.

Module 5

Activity: Introduction, Intent, Intent-filter, Activity Life cycle, Broadcast Life cycle, Service.

SQLite Database in Android: SQLite Database, Creation and Connection of the database, Extracting value from a Cursors.

Text Books

1. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing “, Second Edition, PHI (2017)
2. Prasanna Kumar Dixit, “Android”, Vikas Publishing, First Edition(2014).

Reference Books

1. Ashoke K Talukder, Hasan Admed, Roopa R Yavagal, “Mobile Computing Technology, Applications and Service Creation”, McGraw Hill
2. Joseph Annuzzi, Jr, Lauren Darcey Shane Conder, “Introduction to Android Application Development Android Essentials”, Fifth Edition, 2016.
3. Dawn Griffiths & David Griffiths, “Head First Android Development”, Shroff Publishers, First Edition(2015)

MOOC

1. https://nptel.ac.in/courses/106/106/106106147/
2. https://www.udemy.com/course/complete-android-n-developer-course/

Web Resources

1. https://developer.android.com/index.html
2. https://rb.gy/taqlyh
3. https://www.mpirical.com/technology/4g-lte-lte-advanced-training

Course Contents and Lecture Schedule

Topic	No. of lectures
Module 1	**09 hrs.**
Basics of Communication Technologies - Mobile handsets, wireless communications and server applications.	1
Components of a wireless Communication System	1
Architecture of a Mobile Telecommunication System	2

Wireless Networking Standards	1
Wireless Local Area Networks (WLANs)	2
Bluetooth Technology	2
Module 2	**09 hrs**
Introduction to Mobile Computing and Wireless Networking- Mobile Computing vs. Wireless Networking, Mobile Computing Applications, Characteristics of Mobile Computing	2
Structure of Mobile Computing Application Cellular Mobile Communication.	2
Global System for Mobile Communication (GSM) – Services, Architecture and Security	2
General Packet Radio Service (GPRS) -Services, Architecture	2
Universal Mobile Telecommunications system.	1
Module 3	**09 hrs**
Operating Systems for Mobile Computing- OS Responsibilities in mobile devices, A Few Basic Concepts	2
Special Constraints and Requirements of Mobile OS	1
Survey of Commercial Mobile OS, A Comparative study of Mobile OS.	2
Mobile Applications Development and Protocols - Mobile devices as Web Clients	1
HDML, WAP.	1
J2ME	1
Android Application Development	1
Module 4	**10 hrs**
Configuration of Android Environment-: Android SDK	1
Android Development Tools, Android Virtual Devices, Emulators	2

Dalvik Virtual Machine, Difference between JVM and DVM.	1
Android User Interface: Linear Layout, Absolute Layout, Frame Layout, Relative Layout, Table Layout.	3
Designing Your User Interface with Views: Text View, Button, ImageButton, Edit Text, CheckBox, ToggleButton, RadioButton and RadioGroup, Progress Bar, AutocompleteTextView, Spinner, ListView, Image View.	3
Module 5	**11 hrs**
Activity: Introduction	1
Intent, Intent-filter	1
Activity Life cycle	1
Broadcast Life cycle	1
Service.	1
SQLite Database in Android: SQLite Database	2
Creation and Connection of the database	2
Extracting value from a Cursors.	2

MODEL QUESTION PAPER

Reg No.:_______________		Name:_________________________________	

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

NINTH SEMESTER INTEGRATED M.C.A DEGREE EXAMINATION

MODEL QUESTION PAPER

20INMCA503

MOBILE COMPUTING

Max. Marks: 60		Duration: 3 Hours

PART A

	Answer all questions, each carries3 marks.	Marks
1	Explain the different components used in wireless networks	(3)
2	Write a note on Wireless Local Area Networks	(3)
3	Differentiate between mobile computing and wireless networking.	(3)
4	Compare any three important features of 3G and 4G.	(3)
5	What are the important features of Windows mobile OS?	(3)

6		Explain the special features that an operating system for a mobile device needs to support compared to the traditional OS.	(3)
7		Explain any two layouts in android.	(3)
8		Explain SDK.	(3)
9		Write the differences between Implicit and explicit intent	(3)
10		Compare Activity and Services in Android.	(3)
		PART B	
		Answer any one question from each module. Each question carries 6 marks.	
		Module I	
11		Describe the protocol stack of Bluetooth.	(6)
		OR	
12		Discuss the architecture of mobile telecommunication systems with a schematic diagram. (K2)	(6)
		Module II	
13		Illustrate the similarities and dissimilarities between GSM network and GPRS network.	(6)

OR			
14		Is 3G cellular wireless technology superior to 2G technology? Justify your answer	(6)
Module III			
15		Illustrate Android software stack structure with a neat diagram.	(6)
OR			
16		Compare the features provided by the following mobile OS: Android, Symbian, Windows Phone7.	(6)
Module IV			
17		Describe the protocol stack of Android with a neat diagram.	(6)
OR			
18		Compare JVM and DVM.	(6)
Module V			
19		Illustrate the Activity life cycle with a diagram.	(6)
OR			
20		Explain how to store and retrieve data in SQLite database with examples.	(6)

20INMCA509	MINI PROJECT 2	CATEGORY	L	T	P	CREDIT
		GENERAL	0	0	4	2

Preamble:

The mini project is designed to develop practical ability and knowledge about tools/techniques in order to solve the actual problems related to the industry, academic institutions or similar areas.

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

CO 1	Identify the requirements for the real-world problems.
CO 2	Demonstrate an ability to work in teams and manage the conduct of the research study
CO 3	Conduct a survey of several available literatures in the preferred field of study.
CO 4	Perform analysis on the reviewed literatures and derive conclusions
CO 5	Report and present the findings of the study conducted in the preferred domain
CO 6	Inculcate innovative thinking and thereby prepare students for the main project.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2		3	3	2		3	3			3	2
CO 2	2		3	3	2		3	3			3	2
CO 3	2		3	3	2		3	3			3	2
CO 4	2		3	3	2		3	3			3	2
CO 5	2		3	3	2		3	3			3	2

Syllabus

Students can take up any application level/system level experimental design / implementation tasks of relatively minor intensity of research and scope as compared to the major-project.

They will carry out literature surveys in a selected area, prepare a review paper and a working prototype of a computational system.

At the end of each phase, presentation and demonstration of the project should be conducted, which will be evaluated by a panel of examiners. A detailed project report duly approved by the guide in the prescribed format should be submitted by the student for final evaluation.

Publishing the work in Conference Proceedings/ Journals with National/ International status with the consent of the guide will carry an additional weightage in the review process.

Internal Continuous Assessment (100 marks)

10% (10) - Project Synopsis / Proposal Evaluation

20% (20) - 1st Interim Project Evaluation (Literature Review)

20% (20) - 2nd Interim Project Evaluation (Implementation & Analysis using any Software Tool)

50% (50) - End Semester Internal Project & Project Report Evaluation and Evaluation by Guide

20INMCA531	Data Science Lab	CATEGORY	L	T	P	CREDIT
		General	0	1	3	1

Preamble: This course helps the students to gain practical experience in programming tools for data sciences and big data tools. This lab is designed to introduce implementation of practical machine learning algorithms.

Prerequisite: 20INMCA105Introduction to Programming, 20INMCA234 Statistics Lab

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

CO 1	Practice the concepts of Data collection and wrangling.
CO 2	Apply EDA techniques for data pre-processing
CO 3	Integrate data visualisation in big-data analytics
CO 4	Apply mathematical and statistical functions for practising data science
CO 5	Apply Basic Machine Learning Algorithms

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	3	2		3				3	3	3
CO 2	3	2	3	3	2					3		3
CO 3	3	2	3	2	3	1				2		3
CO 4	3	2	3	2	3	1				2		3
CO 5	3	2	3	2	3	1				2		3

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests**		**End Semester Examination**
	1	**2**	
Remember(K1)	15	15	15
Understand(K2)	15	15	15
Apply(K3)	10	10	15
Analyse(K4)	10	10	15
Evaluate(K5)			
Create(K6)			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	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 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. How to import *.csv formatted data (k3)
2. How to merge two csv files with a common column but uneven lengths (K3)

Course Outcome 2 (CO2):

1. Illustrate the process of Removing duplicates from a given dataset. (K3)
2. Demonstrate the process of Encoding Categorical variables in a given dataset (K3)

Course Outcome 3(CO3):

1. Compare the relationship between the two variables using Scatterplot. (K5)
2. import some categorical data and create a histogram using appropriate methods (K6)

Course Outcome 4 (CO4):

1. Demonstrate the aggregation operations on data. (K4)

2. Demonstrate Array manipulation operations on the given dataset. (K4)

Course Outcome 5 (CO5):

1. Illustrate the working of KNN Algorithm with an Example. (K4)
2. Build & Implement the Regression algorithm in order to fit data points. Select an appropriate data set for your experiment and draw the corresponding graphs (K6)

SYLLABUS

Data collection and wrangling, Exploratory Data Analysis(EDA), Data Visualization Mathematical functions, machine learning Algorithms

Reference Books

1. Seema Acharya, Suhashini Chellappan, " Big Data Analytics", WILEY publishers,New Delhi, 2015

2. Chandrakant Naikodi, "Managing Big Data", Vikas Publishing, 2015

3. Thomas Erl ,"Big Data Fundamentals Concepts, Drivers and Techniques", Pearson Education First Edition,2016

4. Jeeva Jose & P.SojanLal, "Introduction to Computing and Problem Solving with PYTHON", Khanna Publishers, New Delhi, 2016

Web Resources

1. https://nptel.ac.in/courses/106/106/106106212/
2. https://nptel.ac.in/courses/110/107/110107129/
3. https://www.scipy.org, http://www.numpy.org, https://matplotlib.org
4. https://towardsdatascience.com/introduction-to-data-visualization-in-python-89a54c97fbed.
5. https://www.udemy.com/course/data-science-and-machine-learning-with-python-hands-on/

List of Lab Experiments

1. Program to read and write data files

2. Merge/concatenate two data frames
3. Program to sort the data
4. Program to do data filtration (to create a subset of available data)
5. Program to perform aggregation operations on data.
6. Program for quantifying missing values per column, filling & dropping duplicate values
7. Program to demonstrate encoding categorical values
8. Plot a line chart using an array
9. Generate a histogram for the blue, green and red values of a colour image
10. Compare two data series using bar chart
11. Demonstrate heatmaps using a suitable data set
12. Program to visualize the relationship between the two variables using Scatterplot.
13. Illustrate the working of KNN Algorithm with an Example.
14. Build & Implement the Regression algorithm in order to fit data points. Select an appropriate data set for your experiment and draw the corresponding graphs.

Course Contents and Lecture Schedule

No	Topic	No. Of Hours
1	**Module 1**	**8**
1.1	Data collection and wrangling: Working with Text and CSV files: -Reading input files, writing to files.	4
1.2	Merging Data: - Concatenating multiple CSV files, Joining Data Based on a Matching Column.	4
2	**Module II**	**10**
2.1	Exploratory Data Analysis(EDA): Handle Missing value – Removing duplicates	4

2.2	Outlier Treatment – Normalizing and Scaling(Numerical Variables) – Encoding Categorical variables(Dummy Variables) Bivariate Analysis	6
3	**Module III**	**6**
	Data Visualization: Importing Datasets, Scatter Plot, Line Chart-histogram-Bar Chart- Box plots- Heat maps- faceting - pair plot.	
4	**Module IV**	**12**
4.1	Practicing data science: Mathematical functions- statistical functions-string functions	5
4.2	Array, 2D Array, N- Dimensional Arrays.	7
5	**Module V**	**12**
5.1	Practice Machine Learning Algorithms: Data Loading for ML Projects, Understanding Data with Statistics,	5
5.2	Preparing Data,Data Feature Selection. Linear Regression,KNN Algorithm, Decision Tree.	7

1. ***Note :*** *This laboratory is to be conducted with a suitable data science software. The colleges can choose the required software. Some of the suggested environments are R, Python, Hadoop or any other data science tools depending on availability.*

20INMCA533	MOBILE APPLICATION DEVELOPMENT LAB	CATEGORY	L	T	P	CREDIT
		GENERAL	0	1	3	1

Preamble: The students can learn the basics of Android platform and to implement rich Android applications for the Android mobile platform. Students will be able to build, compile, execute, and debug mobile applications. This course is designed to quickly get you up to speed with writing apps for Android devices.

Prerequisite:

20INMCA431 Java Programming Lab, 20INMCA331 RDBMS Lab, 20INMCA233 Basic Object Oriented Programming Lab, 20INMCA503 Mobile Computing.

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

CO 1	Understand UI Design: Widgets and Layouts, UI Events, Event Listeners
CO 2	Learn Android components, Activities, Services, Broadcast Receivers and Intents
CO 3	Debug Android applications using different tools and plugins
CO 4	Design and build a functional Android application
CO 5	Implement SQLite Database and content providers.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2		2							
CO 2	3	2	2		1		1	1				
CO 3	3				2							
CO 4	3	2		2	2	2	2	2				3
CO 5	3	2			2	2	2	3	2	1	2	3

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember(K1)	10	10	15
Understand(K2)	10	10	15

Apply(K3)	10	10	15
Analyse(K4)	20	20	15
Evaluate(K5)			
Create(K6)			

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	50	50	3 hours

Continuous Internal Evaluation Pattern

Attendance : 08 Marks
Continuous Assessment Test (2 numbers) : 30 Marks
Assignment/Quiz/Course project : 12 Marks

End Semester Examination Pattern

Lab exam will be conducted by an internal examiner.

Course Level Assessment

Course Outcome 1 (C01):

1. Develop a simple calculator application. (K6)
2. Develop a simple application to implement built-in widgets and components. (K6)

Course Outcome 2 (C02):

1. Develop a simple application to demonstrate the activity life cycle (K6)
2. Create an application to connect activities using intents. (K6)

Course Outcome 3 (C03):

1. Develop an application that draws basic graphical primitives on the screen. (K6)
2. Develop an application to make calls to your friends contact number. (K6)

Course Outcome 4 (C04):

1. Develop an application to load an Image in ImageView. (K6)
2. Create an android application for to-do list(K6)

Course Outcome 5 (C05):

1. Create quiz application with SQLite database. (K6)
2. Create an SQLite application to generate mark list. (K6)

SYLLABUS

- Application Structure: AndroidManifest.xml, User-permission, Resources and R.java, Assets, Layouts and Drawable Resources, Activities.
- Emulator-Android Virtual Device: Launching emulator, Editing emulator settings
- Basic UI design: Form widgets, Text Fields, Layouts.
- UI Components: Views and notifications Components for communication
- UI design: Time and Date, Images and media, Toast.
- Activities, Services
- Working with preferences
- Menu: Option menu , Context menu
- Intents: Explicit Intents and Implicit intents.
- Intent Filters.
- SQLite: SQLite Open Helper, SQLite Database, Cursor, Reading and updating values.
- Introduction to Flutter.
- ***Micro Project*** *– Students should be able to create a real time application.*

Reference Books

1. Ian Lake and Reto Meier, “Professional Android”,Fourth Edition(2018)

2. Ian F. Darwin, “Android Cookbook”, O'Reilly Media, 2nd Edition(2017)
3. Joseph Annuzzi, Jr, Lauren Darcey Shane Conder, “Introduction to Android Application Development Android Essentials”, Fifth Edition(2016).
4. Dawn Griffiths & David Griffiths, “Head First Android Development”, Shroff Publishers, First Edition(2015)

Web Resources

1. https://developer.android.com/index.html
2. https://google.github.io/styleguide/javaguide.html
3. https://github.com/JStumpp/awesome-android
4. https://www.sitepoint.com/10-essential-material-design-resources-and-tutorials/

List of Lab Experiments

3. Program to Design User Login form
4. Program to Display message in Edit text on button press
5. Program to Check the given number in the Edit Text, is prime or not
6. Program to demonstrate Toast.
7. Program to add two numbers and display the result.
8. Program to perform simple calculator using Linear Layout
9. Program to Load an Image in ImageView
10. Program to move an Image from one ImageView to another ImageView on button press
11. Create a simple list view to list our former presidents
12. Develop an application that draws basic graphical primitives on the screen.
13. Create a Custom List view that contains list of students with their name, place and photo
14. Create an application to make calls to your friends contact number.
15. Create the Application to play the Audio and Video clips
16. Create Application by Using Building Menus and Storing Data.
17. Design the Application for Menus and Action Bar.
18. Create simple reminder app.
19. Program to Select an item from the list and display in Label

20. Program to perform all arithmetic operations with Menu
21. Program to Demonstrate Implicit and Explicit Intent
22. Create Student Details App to read roll no, name and 3 marks, calculate total and store in DB
23. Create a login form with username and password and check successful login.
24. Read details of N employees (EID, Ename, Basic Pay) calculate HRA,DA,TA, PF and Net Salary finally store in DB(HRA=50%of BP, DA=20% of BP, TA=100,PF=2%of BP, NS=BP+HRA+DA+TA-PF)
25. Create a menu (Store, Display) to store and retrieve data of students marks from the DB

Course Contents and Lecture Schedule

No.	Topic	No. of Hours
1	**Module 1**	**6 hrs.**
1.1	Application Structure: AndroidManifest.xml, User-permission, Resources and R.java.	2
1.2	Assets, Layouts and Drawable Resources, Activities.	2
1.3	Emulator-Android Virtual Device: Launching emulator, Editing emulator settings	2
2	**Module 2**	**10 hrs.**
2.1	Basic UI design: Form widgets, Text Fields, Layouts.	6
2.2	UI Components: Views and notifications Components for communication	4
3	**Module 3**	**12 hrs.**
3.1	UI design: Time and Date, Images and media, Toast.	4
3.2	Activities and Services	6
3.3	Working with preferences	2
4	**Module 4**	**10 hrs.**
4.1	Menu: Option menu , Context menu	3
4.2	Intents: Explicit Intents and Implicit intents.	4
4.3	Intent Filters.	3
5	**Module 5**	**10 hrs.**
5.1	SQLite: SQLite Open Helper, SQLite Database, Cursor, Reading and updating values.	6
5.2	Introduction to Flutter.	4

Elective – 3

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
20INMCA561	OPERATIONS RESEARCH	ELECTIVE	3	1	0	4

Preamble: This course introduces the concepts of linear programming problems. The topics treated in this course have applications in real life problems.

Prerequisite: Nil

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

CO No.	Course Outcome (CO)	Bloom's Category Level
CO 1	Solve different types of Linear Programming Problems.	Level 3: Apply
CO 2	Apply the concept of linear programming problems in real life.	Level 3: Apply
CO 3	Solve different decision-making problems using optimization techniques.	Level 3: Apply
CO 4	Use PERT and CPM to analyse project network management.	Level 3: Apply
CO 5	Identify suitable queuing model and solve queuing problems.	Level 3: Apply

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	1	-	-	-	2	-	-	-	-	-
CO 2	3	3	3	-	-	-	2	-	-	-	-	-
CO 3	3	3	3	-	-	-	2	-	-	-	-	-
CO 4	3	3	1	1	-	-	2	2	-	-	-	-
CO 5	3	3	3	-	-	-	2	-	-	-	-	-

3/2/1: High/Medium/Low

Assessment Pattern

Bloom's Category Levels	Continuous Assessment Tests		End Semester Examination
	1	2	
Level 1: Remember	10	10	10
Level 2: Understand	20	20	20
Level 3: Apply	20	20	30
Level 4: Analyse			
Level 5: Evaluate			
Level 6: Create			

Mark Distribution

Total Marks	Continuous Internal Evaluation (CIE)	End Semester Examination (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 contain 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

Sample Course Level Assessment Questions

Course Outcome 1 (CO 1):

1. Define slack variable, surplus variable and optimal basic feasible solution.
2. Obtain all basic feasible solution of the set of equations:

   a) $2x_1 + 3x_2 + 4x_3 + x_4 = 2$

   b) $x_1 + x_2 + 7x_3 + x_4 = 4$
3. Solve by Big M method

   Maximise $Z = 6x_1 - 3x_2 + 2x_3$

   Subject to $2x_1 + x_2 + x_3 \leq 16$

   $3x_1 + 2x_2 + x_3 \leq 18$

$$x_1 - 2x_2 \geq 8$$
$$x_1,\ x_2,\ x_3 \geq 0$$

Course Outcome 2 (CO 2):

1. Construct the dual of

$$\begin{aligned} &\text{Maximise} \quad Z = 3x_1 + 17x_2 + 9x_3 \\ &\text{Subject to} \quad x_1 - x_2 + x_3 \geq 3 \\ &\qquad -3x_1 + 2x_2 \leq 1 \\ &\qquad x_1,\ x_2,\ x_3 \geq 0 \end{aligned}$$

2. Prove that the dual of the dual is the primal
3. Solve using the principle of duality

$$\begin{aligned} &\text{Minimise} \quad Z = 3x_1 + 5x_2 \\ &\text{Subject to} \quad 2x_1 + 8x_2 \geq 40 \\ &\qquad 3x_1 + 4x_2 \geq 50 \\ &\qquad x_1,\ x_2 \geq 0 \end{aligned}$$

Course Outcome 3 (CO 3):

1. Explain North West Corner method
2. Solve the following transportation problem

	1	2	3	Supply
1	2	7	4	5
2	3	3	1	8
3	5	4	7	7
4	1	6	2	14
Demand	7	9	18	34

3. Solve the assignment problem

	I	II	III	IV
A	16	10	14	11
B	14	11	15	15
C	15	15	13	12
D	13	12	14	15

Course Outcome 4 (CO 4):

1. Explain critical path analysis.

2. A project consists of series of tasks labelled A, B, …, H, I with the following relationships (W < X, Y means X and Y cannot start until W is completed; X, Y < W means W cannot start until both X and Y are completed). With this notation construct the network diagram having the following constraints:

   A < D, E; B, D < F; C < G; B, G< H; F, G < I.

   Find also the minimum time of completion of the project, when the time (in days) of completion of each task is as follows:

Task :	A	B	C	D	E	F	G	H	I
Time :	23	8	20	16	24	18	19	4	10

3. A project consists of eight activities with the following relevant information.

Activity	Immediate predecessor	Estimated duration (days)		
		Optimistic	Most likely	Pessimistic
A	--	1	1	7
B	--	1	4	7
C	--	2	2	8
D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D, E	3	6	15
H	F, G	1	2	3

(i) Draw the PERT network and find out the expected project completion time.
(ii) What duration will have 95% confidence for project completion?
(iii) If the average duration for activity F increases to 14 days, what will be its effects on the expected project completion time which will have 95% confidence?

(For standard normal Z = 1.645, area under the standard normal curve from 0 to Z is 0.45)

Course Outcome 5 (CO 5):

1. Explain Birth-death process.
2. In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time distribution is also exponential with an average 36 minutes. Calculate the following:

i. The mean queue size (line length), and
ii. The probability that the queue size exceeds 10.
iii. If the input of trains increases to an average 33 per day, what will be the change in (i) and (ii)?

3. At a railway station, only one train is handled at a time. The railway yard is sufficient only for two trains to wait while other is given signal to leave the station. Trains arrive at the station at an average rate of 6 per hour and the railway station can handle them on an average of 12 per hour. Assuming Poisson arrivals and exponential service distribution, find the steady-state probabilities for the various number of trains in the system. also find the average waiting time of a new train coming into the yard

Model Question Paper

Course Code: 20INMCA561

Course name: Operations Research

Max. Marks: 60 Duration: 3hrs

Part A

Answer all questions, each carries 3 marks (10×3 = 30)

1. Write down the basic structure of a linear programming problem in the mathematical form.
2. Define slack and surplus variables in LPP.
3. State the fundamental theorem of duality.
4. Write the dual of the following

$$Max\ Z = x_1 - x_2 + 3x_3$$
$$subject\ to\ x_1 + x_2 + x_3 \leq 10$$
$$2x_1 - x_3 \leq 2$$
$$2x_1 - 2x_2 + 3x_3 \leq 6$$
$$x_1, x_2, x_3 \geq 0$$

5. Obtain the IBFS using north west corner method

	D_1	D_2	D_3	D_4	Supply
O_1	2	4	3	6	20
O_2	7	3	8	2	10

O_3	2	2	9	11	15
Demand	15	15	8	7	

6. Describe the Matrix Minima method.
7. What is queue discipline?
8. Explain single serve Poisson queuing model with infinite capacity.
9. Activities P, Q and R instantly follow activity M, and their current starting times are 12, 19 and 10. So, what is the latest finishing time for activity M?
10. What is the difference between PERT and CPM.

Part B

Answer all questions, each carries 6 marks (5×6 = 30)

11. Solve the following problem by Simplex method

$$Max\ Z = 5x_1 + 3x_2$$
$$subject\ to\ 4x_1 - x_2 \leq 10$$
$$2x_1 + 2x_2 \leq 50$$
$$x_1, x_2 \geq 0$$

or

12. Solve by Big-M method

$$Max\ Z = 6x_1 - 3x_2 + 2x_3$$
$$subject\ to\ 2x_1 + x_2 + x_3 \leq 16$$
$$3x_1 + 2x_2 + x_3 \leq 18$$
$$x_2 - 2x_3 \geq 8$$
$$x_1, x_2, x_3 \geq 0$$

13. Prove that the dual of a dual is the primal.

or

14. Solve the following by using the dual principle

$$Max\ Z = 40x_1 + 35x_2$$
$$subject\ to\ 2x_1 + 3x_2 \leq 60$$
$$4x_1 + 3x_2 \leq 96$$

$x_1, x_2 \geq 0$

15. Solve the following Assignment problem

	I	II	III	IV
A	2	3	4	5
B	4	5	6	7
C	7	8	9	8
D	3	5	8	9

or

16. Solve the following transportation problem

	D_1	D_2	D_3	D_4	Supply
O_1	5	2	4	3	22
O_2	4	5	1	6	15
O_3	4	6	7	5	8
Demand	7	12	17	9	

17. Explain critical path analysis.

or

18. A project consists of eight activities with the following relevant information.

Activity	Immediate predecessor	Estimated duration (days)		
		Optimistic	Most likely	Pessimistic
A	--	1	1	7
B	--	1	4	7
C	--	2	2	8

D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D, E	3	6	15
H	F, G	1	2	3

(iv) Draw the PERT network and find out the expected project completion time.

(v) What duration will have 95% confidence for project completion?

(vi) If the average duration for activity F increases to 14 days, what will be its effects on the expected project completion time which will have 95% confidence?

(For standard normal Z = 1.645, area under the standard normal curve from 0 to Z is 0.45)

19. Explain birth-death process.

or

20. At a railway station, only one train is handled at a time. The railway yard is sufficient only for two trains to wait while other is given signal to leave the station. Trains arrive at the station at an average rate of 6 per hour and the railway station can handle them on an average of 12 per hour. Assuming Poisson arrivals and exponential service distribution, find the steady-state probabilities for the various number of trains in the system. also find the average waiting time of a new train coming into the yard

Syllabus

Module 1:
Linear programming problem- Slack and surplus variable- Standard form- Solution of Linear programming problem- Basic solution- Basic feasible solution- Degenerate- and Non-degenerate solutions- Optimal solution- Solution by simplex method- Artificial variables- Big- M method.
Module 2:
Duality in Linear Programming Problem- Statement of duality theorem- Statement of complementary slackness theorem. The primal- Duality solutions using simplex method- Revised simplex method
Module 3:

Transportation problem- Solution of Transportation problem- Finding an initial basic feasible solution- North West Corner method- Matrix minima method- Vogel's Approximation method- Test for Optimality- Modi method- Unbalanced Transportation problem- Maximisation in Transportation problem. Assignment problem- Optimal solution- Hungarian method of assignment- Maximization in assignment problem.
Module 4:
Network analysis- Project scheduling- Construction of project networks- Critical path method (CPM)- Identification of critical path using CPM- Estimation of Floats- Total float- Independent float- Project Evaluation and Review Technique (PERT) - Computation of expected completion times by PERT.
Module 5:
Queuing theory- Elements of Queuing System- Kendall's notation- Operating characteristics- Poisson process- Exponential distribution- Mean and variance- Birth and Death process. Queuing models based on Poisson process- Single server models with finite and infinite capacity- Multi server model with finite and infinite capacity.

Note:

- Programming Assignments using Python and appropriate Case Studies may be given at the end of each module.

- Linear Programming Problems in module 1 and module 2 and Transportation problems in module 3 can be solved using Python library PuLP. Using Numpy, PERT/CPM problems in module 4 can be solved.

Text Book

1. KantiSwarup, P.K. Gupta and Man Mohan, Operation Research, Sultan Chand (2010)

Reference Books

1. Hamdy A Taha, Operations Research- an introduction, Eighth Edition, Prentice Hall of India.
2. Ravindran, Philips and Solberg, Wiley, Operation Research, Second edition (2007)

Web References

1. https://pypi.org/project/PuLP/
2. https://numpy.org/

Course Contents and Lecture Schedule

Sl. No.	Topic	No. of Lectures
1	**Module 1**	**9 Hours**
1.1	Linear programming problem- Slack and surplus variable- Standard form	1
1.2	Solution of Linear programming problem- Basic solution- Basic feasible solution- Degenerate- and Non-degenerate solutions- Optimal solution	2
1.3	Solution by simplex method	3
1.4	Artificial variables- Big- M method	3
2	**Module 2**	**9 Hours**
2.1	Duality in Linear Programming Problem	1
2.2	Statement of duality theorem- Statement of complementary slackness theorem	2
2.3	The primal- Duality solutions using simplex method	3
2.4	Revised simplex method	3
3	**Module 3**	**9 Hours**
3.1	Transportation problem- Solution of Transportation problem- Finding an initial basic feasible solution- North West Corner method	2
3.2	Matrix minima method- Vogel's Approximation method	1
3.3	Test for Optimality- Modi method- Unbalanced Transportation problem- Maximisation in Transportation problem	3
3.4	Assignment problem- Optimal solution- Hungarian method of assignment- Maximization in assignment problem	3
4	**Module 4**	**9 Hours**
4.1	Network analysis- Project scheduling- Construction of project networks	1
4.2	Critical path method (CPM)- Identification of critical path using CPM	2
4.3	Estimation of Floats- Total float- Independent float	3
4.4	Project Evaluation and Review Technique (PERT)- Computation of expected completion times by PERT	3
5	**Module 5**	**9 Hours**

5.1	Queuing theory- Elements of Queuing System- Kendall's notation- Operating characteristics- Poisson process	1
5.2	Exponential distribution- Mean and variance- Birth and Death process	2
5.3	Queuing models based on Poisson process	3
5.4	Single server models with finite and infinite capacity- Multi server model with finite and infinite capacity	3

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
20INMCA563	CYBER SECURITY & CRYPTOGRAPHY	ELECTIVE	3	1	0	4

Preamble: This course is designed to provide theoretical concepts used in cryptography and to introduce the students to various cryptographic algorithms and techniques used for implementing data security and protection. This course also discusses common web application security vulnerabilities.

Prerequisite: Student is expected to have studied mathematics courses that cover Elementary Number Theory, Finite Field, Discrete Logarithm and Euclidean Algorithm.

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

CO No.	Course Outcome (CO)	Bloom's Category Level
CO 1	Explain various types of security attacks, security mechanisms, security services and classical encryption techniques.	Level 2: Understand
CO 2	Make use of Symmetric and Asymmetric encryption techniques to solve cryptographic problems.	Level 3: Apply
CO 3	Describe the concepts of message authentication codes, hash functions and digital signing techniques for ensuring secure transactions.	Level 2: Understand
CO 4	Discuss security services in Application, Transport and Network layers.	Level 2: Understand
CO 5	Explain common web application security vulnerabilities and various prevention mechanisms.	Level 2: Understand

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1	1				1					
CO 2	2	2	2	1			1					
CO 3	2	1	1				1					
CO 4	2	1	1			2	1					
CO 5	2	1	1			2	1					

3/2/1: High/Medium/Low

Assessment Pattern

Bloom's Category Levels	Continuous Assessment Tests		End Semester Examination
	1	2	
Level 1: Remember	15	15	20
Level 2: Understand	35	35	40
Level 3: Apply			
Level 4: Analyse			
Level 5: Evaluate			
Level 6: Create			

Mark distribution

Total Marks	Continuous Internal Evaluation (CIE)	End Semester Examination (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 carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have a maximum of 2 sub-divisions and carry 6 marks.

Sample Course Level Assessment Questions

Course Outcome 1 (CO 1):

1. Briefly explain each component of OSI security architecture.
2. Compare Substitution and Transposition techniques in cryptography.
3. Explain how steganography is used in cryptography.

Course Outcome 2 (CO 2):

1. Explain block cipher modes of operation.

2. Compare DES and AES

3. Perform encryption and decryption using RSA Algorithm with parameters: P=17, q = 11, e = 7, M = 88.

Course Outcome 3 (CO 3):

1. Compare the features of HMAC and CMAC algorithms.

2. Explain important steps in DSS.

3. Describe the terms (a) birthday attack (b) hashcash (c) blind signature

Course Outcome 4 (CO 4):

1. Explain any one protocol used in E-mail for security.

2. Explain how security is provided in Network Layer using IPsec.

3. Describe the process of securing electronic transactions.

Course Outcome 5 (CO 5):

1. Discuss any four Application Security Risks.

2. Which are the different forms of XSS and how to prevent these?

3. Explain the attack scenario of any four web application security vulnerabilities.

Model Question Paper

Course Code: 20INMCA563

Course Name: CYBER SECURITY & CRYPTOGRAPHY

Max. Marks :60 **Duration: 3 Hrs**

Part A

Answer all questions.

Each question carries 3 marks (10 x 3 = 30 Marks)

.

1. Compare phishing and ransomware attacks.
2. What is OSI security architecture?
3. List out the advantages and disadvantages of Output Feed Back mode.

4. Explain round functions used in DES.
5. Explain important steps in DSS.
6. Describe the terms (a) birthday attack (b) hashcash (c) blind signature.
7. Describe security association of IPSec.
8. Explain about S/MIME.
9. How can we prevent Injection attack?
10. What is XXE? How to prevent it?

(10 x 3=30 marks)

Part B

Answer all questions. Each question carries 6 marks. (5 * 6 = 30 Marks)

11. Explain Network security model with the help of a neat diagram (6)

OR

12. Describe the working of Playfair cipher and Hill cipher. (6)

13. Apply Diffie-Hellman key exchange algorithm to compute the shared private key using the values P = 23, g = 9, a= 4, b= 3. Explain the steps in detail. (6)

OR

14. Perform encryption and decryption using RSA Algorithm with parameters: P=17, q = 11, e = 7, M = 88. Explain the steps in detail. (6)

15. Compare HMAC and CMAC protocol with suitable diagrams. (6)

OR

16. Compare various signature schemes with suitable diagrams. (6)

17. Explain PGP cryptographic functions with diagram. (6)

OR

18. Explain Secure Electronic Transaction Protocol. (6)

19. Briefly explain any four Application Security Risks. (6)

OR

20. Explain the attack scenarios of any four web application security vulnerabilities. (6)

(5 x 6=30 Marks)

Syllabus

Module 1: (7 Hours)
Introduction to Cryptography, OSI security architecture: Security Services, Mechanisms and attacks- Phishing, Ransomware, DoS attack. Network security model. Classical Encryption techniques - Symmetric cipher model, substitution techniques, transposition techniques. Steganography.
Module 2: (10 Hours)
Conventional Symmetric Key Encryption: Block ciphers and Stream Ciphers, Block Cipher Design Principles, Modes of operation, Data Encryption Standard, Advanced Encryption Standard (AES), Multiple Encryption, Triple DES. **Public key cryptography:** Principles of public key cryptosystems-The RSA algorithm-Key management – Diffie Hellman Key exchange - Elliptic curve arithmetic - Elliptic curve cryptography.
Module 3: (10 Hours)
Hash Functions and MAC: Properties of hash functions, birthday attack, hashcash, Message Authentication Code Algorithms, MAC protocols: HMAC, CMAC. **Digital Signatures:** Classification of signature schemes: RSA signature, Digital Signature Standard, Overview of ElGamal and Schnorr schemes, One time signature schemes, Attacks on Digital Signatures, Blind Signatures.
Module 4: (10 Hours)
Introduction to Cyber Security: Email Security: Security Services for email, Attacks possible through email, Establishing keys privacy, authentication of the source, Message Integrity, Non-repudiation, Pretty Good Privacy, S/MIME. **IP Security:** Overview of IPSec, IPv4 and IPv6, Authentication Header, Encapsulation Security Payload (ESP), Internet Key Exchange. **Transport Level Security:** SSL/TLS Basic Protocol, computing the keys, client authentication, PKI as deployed by SSL, Attacks fixed in v3, Exportability, Encoding, Secure Electronic Transaction (SET).
Module 5: (8 Hours)

Common web application security vulnerabilities: Injection flaws, Broken authentication, Sensitive data exposure, XML External Entities (XXE), Broken access control, Security misconfiguration, Cross-Site Scripting (XSS), Insecure deserialization, Using components with known vulnerabilities, Insufficient logging & monitoring. Example attack scenarios of each of the vulnerabilities listed; how to prevent them

Text Book

1. William Stallings, "Cryptography and Network Security," 6th Edition, Pearson Education, March (2013).
2. Behrouz A. Forouzan, "Introduction to Cryptography and Network Security", Tata McGraw-Hill Publishing 2nd Edition (2011).

Reference Books

1. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.
2. Manuel Mogollon, "Cryptography and Security Services – Mechanisms and Applications", Cybertech Publishing, 2008
3. William R. Cheswick, Steven M. Bellovin, Aviel D. Rubin, "Firewalls and Internet Security" Addison- Wesley, 2003

Web References

1. http://www.hashcash.org/hashcash.pdf [Reference for hashcash]
2. https://owasp.org/www-pdf-archive/OWASP_Top_10-2017_%28en%29.pdf. [Reference for Module 5]
3. https://www.coursera.org/learn/crypto
4. https://www.coursera.org/learn/crypto2

Course Contents and Lecture Schedule

Sl. No.	Topic	No. of Lectures
1	**Introduction to Cryptography**	**7 Hours**
1.1	What is cryptography, Related Terms, Need of cryptosystems	1
1.2	OSI security architecture: Security Services, Mechanisms	1
1.3	Security attacks- Phishing, Ransomware, DoS attack.	1
1.4	Network security model	1
1.5	Classical Encryption techniques, Symmetric cipher model	1
1.6	Substitution techniques	1

1.7	Transposition techniques, Steganography	1
2	**Conventional Symmetric and Public Key Encryption**	**10 Hours**
2.1	Block ciphers and Stream Ciphers, Block Cipher Design Principles	1
2.2	Modes of operation	1
2.3	Data Encryption Standard	1
2.4	Advanced Encryption Standard (AES)	1
2.5	Multiple Encryption, Triple DES	1
2.6	Public key cryptography: Principles of public key cryptosystems	1
2.7	The RSA algorithm	1
2.8	Key management	1
2.9	Diffie Hellman Key exchange	1
2.10	Elliptic curve arithmetic - Elliptic curve cryptography.	1
3	**Hash Functions and MAC**	**10 Hours**
3.1	Properties of hash functions, birthday attack	1
3.2	Hashcash, Message Authentication Code Algorithms	1
3.3	MAC protocols: HMAC, CMAC	1
3.4	Digital Signatures: Classification of signature schemes	1
3.5	RSA signature	1
3.6	Digital Signature Standard	1
3.7	Overview of ElGamal and Schnorr schemes	1
3.8	One time signature schemes	1
3.9	Attacks on Digital Signatures	1
3.10	Blind Signatures	1
4	**Introduction to Cyber Security**	**10 Hours**
4.1	Email Security: Security Services for email, Attacks possible through email	1
4.2	Establishing keys privacy, authentication of the source, Message Integrity, Non-repudiation	1
4.3	Pretty Good Privacy, S/MIME	1
4.4	IP Security: Overview of IPSec	1

4.5	IPv4 and IPv6, Authentication Header	1
4.6	Encapsulation Security Payload (ESP), Internet Key Exchange	1
4.7	Transport Level Security: SSL/TLS Basic Protocol	1
4.8	computing the keys, client authentication, PKI as deployed by SSL	1
4.9	Attacks fixed in v3, Exportability, Encoding	1
4.10	Secure Electronic Transaction (SET)	1
5	**Common web application security vulnerabilities**	**8 Hours**
5.1	Common web application security vulnerabilities	1
5.2	Injection flaws, Broken authentication	1
5.3	Sensitive data exposure, XML External Entities (XXE)	1
5.4	Broken access control, Security misconfiguration	1
5.5	Cross-Site Scripting (XSS), Insecure deserialization	1
5.6	Using components with known vulnerabilities, Insufficient logging & monitoring.	1
5.7	Example attack scenarios of each of the vulnerabilities listed	1
5.8	How to prevent each of the vulnerabilities.	1

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
20INMCA565	**Cloud Computing**	**ELECTIVE**	**3**	**1**	**0**	**4**

Preamble: The syllabus is prepared with a view to equip the students to learn basic concepts in cloud computing - compute, storage, networking. They should gain basic understanding of orchestration, HA and failover.

Prerequisite: Awareness in Virtualisation and Containers is desirable.

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

CO No.	Course Outcome (CO)	Bloom's Category Level
CO 1	Understand the basic concepts in cloud computing and OpenStack logical architecture	Level 2: Understand
CO 2	Discuss OpenStack cloud controller and common services	Level 3: Apply
CO 3	Compare different OpenStack compute service components and storage types	Level 2: Understand
CO 4	Describe the OpenStack Networking- Connection types and networking services	Level 2: Understand
CO 5	Discuss orchestration, HA and failover in OpenStack	Level 2: Understand

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2				3		2					1
CO 2	2				3		2					1
CO 3	2				3		2					1
CO 4	2				3		2					1
CO 5	2				3		2					1

3/2/1: High/Medium/Low

Assessment Pattern

Bloom's Category Levels	Continuous Assessment Tests		End Semester Examination
	1	2	
Level 1: Remember	10	10	10
Level 2: Understand	20	20	20
Level 3: Apply	20	20	30
Level 4: Analyse			
Level 5: Evaluate			
Level 6: Create			

Mark distribution

Total Marks	Continuous Internal Evaluation (CIE)	End Semester Examination (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 carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have a maximum 2 subdivisions and carry 6 marks.

Sample Course Level Assessment Questions

Course Outcome 1 (CO 1):

1. List and explain various components of Nova compute service.
2. Explain the neutron architecture?
3. Briefly describe keystone identity management.

Course Outcome 2 (CO 2):

1. Explain the telemetry services in OpenStack.
2. Explain the steps involved in bringing up a working OpenStack Ansible on the deployment host.
3. Explain the steps in network configuration

Course Outcome 3 (CO 3):

1. Explain briefly swift architecture
2. Briefly explain how data is handled in the cluster by swift
3. What is meant by CPU over commitment?

Course Outcome 4 (CO 4):

1. Explain steps in associating a floating IP to a virtual machine.
2. Briefly explain the steps in creating a virtual network with two subnets
3. Briefly explain Linux bridge-based connectivity?

Course Outcome 5 (CO 5):

1. Briefly explain the major components in heat?
2. Explain the different metrics that can be measured in a highly available infrastructure?
3. Explain the need for Service level agreement.

Model Question Paper

Course Code: 20INMCA565

Course Name: Cloud Computing

Max. Marks :60 **Duration: 3 Hrs**

Part A

Answer all questions. Each question carries 3 marks (10 * 3 = 30 Marks)

1. What are the different components in OpenStack logical architecture?
2. Differentiate between private cloud and public cloud.
3. Explain asymmetric clustering and symmetric clustering.
4. List out the functionalities handled by the cloud controller.
5. Briefly explain docker containers.
6. Compare object storage with NAS/SAN based storage.
7. Describe the steps in connecting two networks using a virtual router.
8. Write a short note on firewall as a service
9. List the HA levels in OpenStack.
10. Explain the purpose of HA proxy.

Part B

Answer all questions. Each question carries 6 marks. (5 * 6 = 30 Marks)

11	List and explain the different components in OpenStack Architecture.	6
	OR	
12	a. Explain the provisioning of VM in OpenStack using a diagram	4
	b. Describe the best practices used in Physical mode design	2
13	Explain the keystone architecture	6
	OR	
14	Explain the steps involved in running OpenStack playbooks	6
15	Explain in detail the multiple services involved in launching an instance	6
	OR	
16	Explain the steps in deploying swift service	6
17	Explain the architecture of neutron in detail	6
	OR	
18	Explain the categorization of neutron virtual networks in detail	6
19	Explain stacking in OpenStack	6
	OR	
20	Explain in detail steps involved in setting a database with high availability	6

Syllabus

Module 1: Overview of OpenStack (7 Hours)
Introduction to cloud computing, private cloud, public cloud, hybrid cloud architecture. Cloud Services - Infrastructure as a Service, Platform as a Service, Storage as a Service. Designing OpenStack Cloud Architectural Consideration - OpenStack - The new data centre paradigm - OpenStack logical architecture - Nova - Compute Service-Neutron - Networking services - Gathering the pieces and building a picture - A sample architecture setup.
Module 2: OpenStack cluster - Controller and common services (6 Hours)
OpenStack Cluster – The Cloud Controller and Common Services- Asymmetric clustering, Symmetric clustering, The cloud controller - The keystone service. The nova-conductor service, The nova-scheduler service, The API services, Image management, The network service, The horizon dashboard, The telemetry services.

Module 3: OpenStack compute and Storage (12 Hours)
OpenStack Compute -The compute service components - Deciding on the hypervisor - OpenStack Magnum Project - Segregating the compute cloud - Overcommitment considerations - Storing instances' alternatives - Understanding instance booting - Planning for service recovery. OpenStack Storage - Block, Object, and File Share - Understanding the storage types - Ephemeral Storage - Persistent storage - A spotlight on Swift - Deploying Swift service - Using block storage service: Cinder.
Module 4: OpenStack Networking (10 Hours)
The architecture of Neutron - Implementing virtual networks - Connecting virtual networks with routers - Implementing network security in OpenStack. OpenStack Networking - The architecture of Neutron - Implementing virtual networks - VLAN, Tunnel based, Virtual Switches, The ML2 Plugin. Neutron Subnets - Connecting virtual networks with routers - Configuring the routing service - connecting networks using a virtual router, connecting to the external world, connectivity from the external world, associating a floating IP - Implementing network security in OpenStack
Module 5: OpenStack Orchestration, HA and failover (10 Hours)
Orchestration in OpenStack - Heat and its Components, stacking in OpenStack, OpenStack Orchestration with Terraform. OpenStack HA and failover: Scope of HA in OpenStack, HA in the database, HA in the Queue, Implementing HA on RabbitMQ.

Text Book

1. Omar Khedher, Chandan Datta Chowdhury, Mastering OpenStack, 2nd Edition, Packt Publishing, 2017

Reference Books

1. Tom Fifield, Diane Fleming, Anne Gentle,Lorin Hochstein, Jonathan Proulx, Everett Toews, and Joe Topjian,OpenStack Operations Guide, O'REILY,1/e, 2014.
2. Uchit Vyas, Applied OpenStack Design Patterns, Apress, 1/e, 2016.
3. V. K. Cody Bumgardner, OpenStack in action, Manning, 2016.
4. Amar Kapadia, Sreedhar Varma, Kris Rajana, Implementing Cloud Storage with OpenStack Swift, Packt Publishing, 2014.
5. https://docs.openstack.org/wallaby/?_ga=2.231002015.1428061357.1620834394-1139122985.1620834394

Course Contents and Lecture Schedule

Sl. No.	Topic	No. of Lectures

1	**Overview of OpenStack**	**7 Hours**
1.1	Introduction to cloud computing, private cloud, public cloud, hybrid cloud architecture.	1
1.2	Cloud Services - Infrastructure as a Service, Platform as a Service, Storage as a Service	1
1.3	Designing OpenStack Cloud Architectural Consideration - OpenStack - The new data center paradigm -OpenStack logical architecture	1
1.4	Nova - Compute service	1
1.5	Neutron - Networking services	1
1.6	Gathering the pieces and building a picture	1
1.7	A sample architecture setup	1
2	**OpenStack cluster - Controller and common services**	**6 Hours**
2.1	OpenStack Cluster – The Cloud Controller and Common Services-Asymmetric clustering, Symmetric clustering	1
2.2	The cloud controller - The keystone service	2
2.3	The nova-conductor service, The nova-scheduler service, The API services, Image management.	1
2.4	The network service, The horizon dashboard, The telemetry services	2
3	**OpenStack compute and Storage**	**12 Hours**
3.1	The compute service components-Deciding on the hypervisor-OpenStack Magnum project	1
3.2	Segregating the compute cloud	1
3.3	Overcommitment considerations	1
3.4	Storing instances' alternatives	1
3.5	Understanding instance booting	1
3.6	Planning for service recovery	1
3.7	OpenStack Storage - Block, Object, and File Share-Understanding the storage types	1
3.8	A spotlight on swift	2
3.9	Deploying swift service	1
3.10	Using Block Storage Service Cinder	2
4	**OpenStack Networking**	**10 Hours**
4.1	The architecture of Neutron	1
4.2	Implementing virtual networks - VLAN, Tunnel based	1

4.3	Virtual Switches, The ML2 Plugin	1
4.4	Neutron Subnets	2
4.5	Connecting virtual networks with routers - Configuring the routing service	1
4.6	Connecting networks using a virtual router, Connecting to the external world	1
4.7	Connectivity from the external world, Associating a floating IP	1
4.8	Implementing network security in OpenStack	2
5	**OpenStack Orchestration, HA and Failover**	**10 Hours**
5.1	Orchestration in OpenStack, Heat and its Components	1
5.2	Stacking in OpenStack	2
5.3	OpenStack Orchestration with Terraform	2
5.4	Scope of HA in OpenStack	2
5.5	HA in the database	1
5.6	HA in the Queue, Implementing HA on RabbitMQ	2

Suggested Assignments

1) Create VMs in your physical machine using OpenStack to set up the following services: Moodle, MySQL Server, Samba. Design the desired configuration of the physical machine to handle the requirements of the entire college.
2) Set up storage services for storing external files for Moodle.
3) Set up firewall rules for samba, MySQL server, allow the connection to MySQL server only to Moodle VM.
4) Set up recovery plans for the above services
5) Convert the MySQL server to HA MySQL server.
6) Setup a load balancer for the Moodle server.

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
20INMCA567	CYBER FORENSICS	ELECTIVE	3	1	0	4

Preamble: This course helps the learner to understand the fundamentals of cyber forensics. Student will learn common approaches, practices and techniques used for collecting and preserving digital evidences in this course.

Prerequisite: Basic knowledge in operating systems & computer networks.

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

CO No.	Course Outcome (CO)	Bloom's Category Level
CO 1	Explain a computer crime and the concept of rules or policy violations.	Level 2: Understand
CO 2	Gather evidences and preserve the collected evidence with the required knowledge on various storage format choices.	Level 3: Apply
CO 3	Describe digital storage and file systems and extract data using Autopsy.	Level 3: Apply
CO 4	Explain mobile device forensics and practice data acquisition procedures for network forensics using Wireshark.	Level 3: Apply
CO 5	Prepare forensics reports both using tools and manually and explain ethics and code for expert witness.	Level 2: Understand

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1		1		2	1		2			
CO 2	2	1		1	2		1					
CO 3	2	1		1	2		1					
CO 4	2	1		1	2		1					
CO 5	2	1		1	2	3	1		1			

3/2/1: High/Medium/Low

Assessment Pattern

Bloom's Category Levels	Continuous Assessment Tests		End Semester Examination
	1	2	
Level 1: Remember	15	15	20
Level 2: Understand	35	35	40
Level 3: Apply			
Level 4: Analyse			
Level 5: Evaluate			
Level 6: Create			

Mark distribution

Total Marks	Continuous Internal Evaluation (CIE)	End Semester Examination (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 carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have a maximum of 2 sub-divisions and carry 6 marks.

Sample Course Level Assessment Questions

Course Outcome 1 (CO 1):

1. How to perform industrial espionage investigation?
2. Explain the various steps involved in cyber forensics investigation.
3. Identify real-time scenarios that is considered as company policy violation.

Course Outcome 2 (CO 2):

1. What are the advantages of proprietary evidence format over row format?
2. Differentiate static acquisitions from live acquisitions.

3. How to ensure the integrity of collected digital evidence? List the techniques employed to validate the collected evidence.

Course Outcome 3 (CO 3):

1. Describe the various activities involved while starting a windows operating system.
2. Explain the various file system organization used in windows operating system.
3. What is the importance of windows registry analysis in forensic investigation?
4. How to ensure the integrity of collected evidences?
5. Differentiate the forensics procedure in Linux and MacOS.

Course Outcome 4 (CO 4):

1. Explain the mobile forensics procedure in detail.
2. Illustrate the use of Wireshark packet analyser.
3. How the forensics acquisition method in mobile differs from that in computer system?

Course Outcome 5 (CO 5):

1. How to write an investigation report that can sustain in court of law?
2. Discuss how Autopsy tool is used to generate forensics report.
3. Address the difficulties that occurred while preparing an Expert Testimony.

Model Question Paper
Course Code: 20INMCA567

Course Name: Cyber Forensics

Max. Marks :60 Duration: 3 Hrs

Part A
Answer all questions.
Each question carries 3 marks (10 x 3 = 30 Marks)

1. Categorize the formats used to store the collected digital evidences.

2. What do you mean by a computer crime? Which activities are considered as company policy violations?
3. Enumerate the features of Resilient File System.
4. Write down the operations involved in boot sequence.
5. Differentiate between soft link and hard link.
6. Which are the data acquisition tools available in Linux that is forensically sound?
7. List the features of Wireshark tool.
8. List different types of mobile forensic acquisition procedures.
9. State the guidelines for writing a report which is admissible in a court of law.
10. What are the different types of forensics reports?

(10 x 3=30 marks)

Part B

Answer all questions. Each question carries 6 marks. (5 * 6 = 30 Marks)

11. What is evidence bag? Describe standard operating procedures for securing evidence before transporting it to forensic lab. (6)

OR

12. How the retention policy of evidence related to evidence storage mediums? (6)

13. Explain the importance of Windows Registry in forensics analysis. (6)

OR

14. What is a solid-state storage device? Discuss the usage of Microsoft BitLocker tool. (6)

15. Explain the file structures of Linux and MacOS. (6)

OR

16. Define write blocker? Explain the use of Sleuth Kit tool. (6)

17. Explain the standard operating procedures used for mobile forensics. (6)

OR

18. Discuss the standard operating procedures used for network forensics. (6)

19. List and explain the steps involved in generating forensics report using Autopsy tool. (6)

OR

20. What are the responsibilities of a Computer Forensic Investigator? (6)

(5 x 6=30 Marks)

Syllabus

Module 1: (8 Hours)
Overview of computer crime, Overview of company policy violation, Preparing a case - Planning an investigation, Securing evidence. Industrial espionage investigation. Conducting an investigation: Gathering evidence, Bit-stream copy of evidence. Storage formats for storing collected digital evidence - Raw format, Proprietary formats, Advanced Forensic Format (AFF). Acquisition tools and methods. Digital evidence validation methods and tools. Storing Digital evidence- Evidence Retention. Familiarizing Autopsy for Windows - a free forensics tool.
Module 2: (10 Hours)
Understanding Digital data and storage systems: Understanding boot sequence, Understanding Disk Drives - Solid-state Storage Devices (SSDs). Microsoft File Systems - Disk partitions, Understanding FAT, Understanding NTFS, MFT - file attributes, file data, NTFS compressed files, NTFS encrypted file system, Deleting NTFS file system, ReFS. Whole disk encryption, Microsoft BitLocker. Understanding Windows Registry. Microsoft Windows startup tasks. *A practical assignment may be given in encrypting a partition of your computer hard disk drive/ encrypting USB flash drive to avoid firm-level attack.*
Module 3: (10 Hours)
Linux file structures - File structures in Ext4, Hard links and Symbolic links. Macintosh (MacOS) file structures - Forensic procedures in MacOS. Setting up Sleuth Kit and Autopsy - Examining a case with Sleuth Kit and Autopsy, Importance of Write-blocker.

Acquiring data with a Linux boot CD - Preparing a target drive for data acquisition, Using dd and dcfldd commands.

Validating data acquisitions - Linux validation methods, Windows validation methods.

Following practical assignments may be given:

i. *Recover deleted files from pen drive*
ii. *Extract camera information from recovered images*
iii. *Extract deleted internet browsing history*
iv. *Recover deleted files from unallocated space using Autopsy*

Module 4: (10 Hours)

Understanding Mobile Device forensics - Mobile phone basics, Understanding Mobile phone hardware.

Acquisition procedures for Mobile devices, Mobile Forensic equipment, SIM card readers, Mobile phone Forensics tools and methods.

Network Forensics - The Need for Established Procedures, Securing a Network, Developing Procedures for Network Forensics, Wireshark packet analyser.

Practical assignments may be given:

i. *Identify students who use college lab facility to browse shopping websites*
ii. *Identify the hacking attempt on a closed port using ping sweep*
iii. *Using Wireshark retrieve the username and password of users who browse less secure website with Wi- Fi connection*

Module 5: (7 Hours)

Understand the importance of Forensics Reports, Types of reports, Guidelines for writing reports, Layout and presentation of reports, Generating reports with Autopsy.

Ethics and codes for Expert Witness - Forensics Examiner’s role in testifying, Considerations in disqualification, Determining admissibility of evidence. Ethical difficulties in Expert Testimony, Ethical responsibilities.

Text Book

1. Bill Nelson, Amelia Phillips, Christopher Steuart, “Guide to Computer Forensics and Investigations”, Cengage Learning, 6th Edition.

Reference Books

1. Marjie T. Britz, “Computer Forensics and Cyber Crime”, Pearson Third Edition 2013.
2. Marie - Helen Maras “Computer Forensics: Cybercriminals, Laws, and Evidence”, Jones & Bartlett Learning, Second Edition 2015.

Web References

1. https://www.wireshark.org/download/docs/user-guide.pdf (Reference for Wireshark)
2. http://www.open.edu/openlearn/futurelearn/cyber-security

Course Contents and Lecture Schedule

Sl. No.	Topic	No. of Lectures
1	**Module 1**	**8 Hours**
1.1	An overview of computer crimes and company policy violations	1
1.2	Preparing a case - Planning an investigation, Securing evidence. Industrial espionage investigation	1
1.3	Conducting an investigation: Gathering evidence, Bit-stream copy of evidence	1
1.4	Storage formats for storing collected digital evidence - Raw format, Proprietary formats, Advanced Forensic Format (AFF)	1
1.5	Acquisition tools and methods	1
1.6	Digital evidence validation methods and tools	1
1.7	Storing Digital evidence -Evidence Retention	1
1.8	Familiarizing Autopsy for Windows - a free forensics tool	1
2	**Module 2**	**10 Hours**
2.1	Understanding Digital data and storage systems, Understanding boot sequence	1
2.2	Understanding Disk Drives	1
2.3	Solid-state Storage Devices (SSDs)	1
2.4	Microsoft File Systems - Disk partitions	1
2.5	Understanding FAT	1
2.6	Understanding NTFS, MFT - file attributes, file data	1
2.7	NTFS compressed files, NTFS encrypted file system	1
2.8	Deleting NTFS file system, ReFS	1

2.9	Whole disk encryption, Microsoft BitLocker	1
2.10	Understanding Windows Registry, Microsoft Windows startup tasks	1
3	**Module 3**	**10 Hours**
3.1	Linux file structures - File structures in Ext4	1
3.2	Hard links and Symbolic links	1
3.3	Macintosh (MacOS) file structures - Forensic procedures in MacOS	1
3.4	Setting up Sleuth Kit and Autopsy - Examining a case with Sleuth Kit and Autopsy	1
3.5	Importance of Write-blocker	1
3.6	Acquiring data with a Linux boot CD	1
3.7	Preparing a target drive for data acquisition	1
3.8	Using dd and dcfldd commands	1
3.9	Validating data acquisitions - Linux validation methods	1
3.10	Windows validation methods	1
4	**Module 4**	**10 Hours**
4.1	Understanding Mobile Device forensics - Mobile phone basics	1
4.2	Understanding Mobile phone hardware	1
4.3	Acquisition procedures for Mobile devices	1
4.4	Mobile Forensic equipment	1
4.5	SIM card readers	1
4.6	Mobile phone Forensics tools and methods	1
4.7	Network Forensics - The Need for Established Procedures	1
4.8	Securing a Network	1
4.9	Developing Procedures for Network Forensics	1
4.10	Wireshark packet analyser	1
5	**Module 5**	**7 Hours**
5.1	Understand the importance of Forensics Reports, Types of reports	1
5.2	Guidelines for writing reports, Layout and presentation of reports	1
5.3	Generating reports with Autopsy	1
5.4	Ethics and codes for Expert Witness - Forensics Examiner’s role in testifying	1

5.5	Considerations in disqualification, Determining admissibility of evidence	1
5.6	Ethical difficulties in Expert Testimony	1
5.7	Ethical responsibilities	1

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
20INMCA569	COMPILER DESIGN	ELECTIVE	3	1	0	4

Preamble: The objective of this course is to explore the principles, algorithms and data structures involved in the design of compilers. It includes lexical analysis, parsing techniques, generating grammars, intermediate code generation, code optimization and code generation phases.
Prerequisite: Nil

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

CO No.	Course Outcome (CO)	Bloom's Category Level
CO 1	Explain different phases of compiler and perform lexical analysis using the concepts of regular expressions and finite automata.	Level 2: Understand
CO 2	Develop top down and bottom-up parsers to perform syntax analysis using context free grammar.	Level 3: Apply
CO 3	Explain syntax directed translation schemes and type checking for a given grammar.	Level 2: Understand
CO 4	Distinguish different intermediate code representations and generate intermediate code for statements in high level languages.	Level 2: Understand
CO 5	Describe various code optimization techniques and generate machine dependent code.	Level 2: Understand

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2		-	-	-	2	-	-	-	-	-
CO 2	2	2	2	-	-	-	2	-	-	-	-	-
CO 3	2	2		-	-	-	2	-	-	-	-	-
CO 4	2	1		-	-	-	2	-	-	-	-	-
CO 5	2	3		-	-	-	2	-	-	-	-	-

3/2/1: High/Medium/Low

Assessment Pattern

Bloom's Category Levels	Continuous Assessment Tests		End Semester Examination
	1	2	
Level 1: Remember	15	15	20
Level 2: Understand	25	35	30
Level 3: Apply	10		10
Level 4: Analyse			
Level 5: Evaluate			
Level 6: Create			

Mark distribution

Total Marks	Continuous Internal Evaluation (CIE)	End Semester Examination (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 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 carries 6 marks.

Sample Course Level Assessment Questions

Course Outcome 1 (CO 1):

1. Explain how the regular expressions and finite automata are used for specification and recognition of tokens.
2. State the role of lexical analyser. Identify the lexemes and their corresponding tokens in the following statement: printf (“Simple Interest=%f\n”, si);
3. Draw the DFA for the regular expression (a | b) * (abb | a+ b).
4. Trace the output after each phase of the compiler for the assignment statement:
   a = b + c * 10, if variables given are of float type.

Course Outcome 2 (CO 2):

1. Find the LR (0) items for the grammar
   S->SS | a| €.
2. Show the steps involved in recursive descent parsing with backtracking for the string cad with the given grammar: S -> cAd, A -> ab | a
3. Construct the predictive parsing table for the following grammar:
   S -> (L) | a
   L -> L,S | S

Course Outcome 3 (CO 3):

1. Write the S-attributed SDD of a simple desk calculator and show annotated parse tree for the expression (3+4) *(5+6).
2. Explain bottom- up evaluation of S- attributed definitions.
3. Explain the specification of a simple type checker

Course Outcome 4 (CO 4):

1. Draw DAG for the expression (a/10 + (b -10)) *(a/10 + (b-10)). Also write the sequence of instructions used for the DAG construction.
2. Write the three-address code sequence for the statement x=y*z + y*-z. Also give its triple representation.
3. Write syntax directed definitions to construct syntax tree and three address code for assignment statements.

Course Outcome 5 (CO 5):

1. Using code generation algorithm generate code sequence for the expression x = (a – b) + (a + c).
2. With suitable example of a basic block, explain the code-improving transformations of a basic block.
3. Explain common sub expression elimination with an example.

Model Question Paper
Course Code: 20INMCA569

Course Name: COMPILER DESIGN

Max. Marks :60 **Duration: 3 Hrs**

Part A

Answer all questions. Each question carries 3 marks (10 * 3 = 30 Marks)

1	State the role of lexical analyzer. Identify the lexemes and their corresponding tokens in the following statement: printf ("Simple Interest=%f\n", si);	(3)
2	Draw the transition diagram for the regular definition, relop → < | <= | = | <> | >= | >	(3)
3	Find the FIRST and FOLLOW of the non-terminals in the grammar S-> aABe A-> Abc|b B-> d	(3)
4	Demonstrate the identification of handles in operator precedence parsing?	(3)
5	What is a Syntax Directed Definition? Show an example.	(3)
6	Distinguish between synthesized and inherited attributes.	(3)
7	Write the three-address code sequence for the statement x=y*z + y*-z. Also give its triple representation.	(3)
8	Discuss about the getreg() function in code generator algorithm	(3)
9	Identify any two issues in the design of a Code Generator.	(3)
10	Explain common sub expression elimination with an example.	(3)

Part B

Answer all questions. Each question carries 6 marks. (5 * 6 = 30 Marks)

11	Explain the working of different phases of a compiler. Illustrate with a source language statement.	(6)

OR

12	Explain how the regular expressions and finite state automata are used for the specification and recognition of tokens?	(6)

13 Construct LALR parse table for the grammar (6)
S->C
C->cC|d

OR

14 Design a recursive descent parser for the grammar (6)
E->E + T | T
T->T*F | F
F->(E) | id

15 Differentiate between S-attributed and L-attributed definitions with suitable examples (6)

OR

16 Write the Syntax Directed Definition for a simple type declaration and draw the annotated parse tree for the declaration float a, b, c. (6)

17 Explain the following and show an example for each. (6)
i). Three-address code iii). Triples
ii). Quadruples iv). Indirect triples

OR

18 Write Syntax Directed Definition to produce three-address code for Boolean expressions and obtain the three-address code for the statement given below: (6)

```
while a < b do
        if c < d then
              x = y + z
          else
              x = y – z
```

19 Explain different code optimization techniques available in local and global optimizations? (6)

OR

20 Write the code generation algorithm. Using this algorithm generate code sequence for the expression x = (a – b) + (a + c). (6)

Syllabus

Module 1 (8 Hours)
Introduction to compilers: Analysis of the source program, Phases of a compiler, Grouping of phases Lexical analysis: role of lexical analyser, input buffering, specification of tokens, recognition of tokens, Deterministic and Non-Deterministic Finite automata, Regular expression to NFA and DFA
Module 2 (12 Hours)
Syntax analysis: Role of parser, Context free grammars Top down parsing: Recursive Descent parsing, Predictive parsing, LL(1) Grammars. Bottom-up parsing: Shift Reduce Parsing, Operator Precedence Parsing (concepts only), LR parsing – Constructing SLR parsing tables, Constructing Canonical LR parsing tables and Constructing LALR parsing tables.
Module 3 (8 Hours)
Syntax directed translation: Syntax directed definitions, Bottom-up evaluation of S-attributed definitions, L- attributed definitions, Top-down translation, Bottom-up evaluation of inherited attributes. Type Checking: Type systems, Specification of a simple type checker.
Module 4 (7 Hours)
Intermediate code generation: Graphical representations, Three address code - Quadruples - triples - Indirect triples, Assignment Statements, Boolean Expressions, Control flow statements
Module 5 (10 Hours)
Code Optimization: Principal sources of optimization, Optimization of Basic blocks, Global data flow analysis. Code generation: Issues in the design of a code generator, The target machine, Basic blocks and flow graphs, A simple code generator, Peephole optimization.

Note : Programming assignments using lexical analyser generator, using parser generator.

Text Books

1. Alfred V.Aho , Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers – Principles, Techniques and Tools, Addison Wesley, 2nd Edition,2006.

Reference Books

1. V Raghavan- Principles of Compiler Design – Tata McGraw Hill, 2nd edition,2011
2. Jean Paul Tremblay and Sorenson., The Theory and Practice of Compiler Writing ,McGraw Hill,2nd Edition,2006
3. Nandini Prasad, Principles of compiler design, Elsevier, 2nd Edition,2012
4. Kenneth C. Louden, Compiler Construction-Principles and Practice, 2nd Edition, Cengage, 2010.
5. Keith Cooper and Linda Torczon, Engineering a Compiler, 2nd Edition, Elsevier, 2011

Course Contents and Lecture Schedule

Sl. No.	Topic	No. of Lectures
1	**Lexical Analysis**	
1.1	Lexical Analysis: Analysis of the source program	1
1.2	Phases of a compiler, Grouping of phases	1
1.3	Lexical analysis: role of lexical analyser, input Buffering	1
1.4	specification of tokens, recognition of tokens	1
1.5	Deterministic and Non-Deterministic Finite automata	2
1.6	Regular expression to NFA and DFA	2
2	**Syntax Analysis**	
2.1	Syntax analysis: Role of parser, Context free grammars	1
2.2	Top-down parsing: Recursive Descent parsing	2
2.3	Predictive parsing, LL(1) Grammars	2
2.4	Bottom-up parsing: Shift Reduce Parsing	1
2.5	Operator Precedence Parsing	1
2.6	LR parsing – Constructing SLR parsing tables	2

2.7	Constructing Canonical LR parsing tables	2
2.8	Constructing LALR parsing tables.	1
3	**Syntax directed translation and Type Checking**	
3.1	Syntax directed translation: Syntax directed definitions	1
3.2	Bottom- up evaluation of S attributed definitions, L- attributed definitions	2
3.3	Top-down translation, Bottom-up evaluation of inherited attributes.	2
3.4	Type Checking: Type systems	1
3.5	Specification of a simple type checker.	2
4	**Intermediate code generation**	
4.1	Intermediate code generation: Graphical representations	2
4.2	Three address code-quadruples -triples-Indirect triples	2
4.3	Assignment Statements, Boolean Expressions, Control flow statements	2
4.4	Control flow statements	1
5	**Code Optimization and Code Generation**	
5.1	Code Optimization: Principal sources of optimization	2
5.2	Optimization of Basic blocks,	1
5.3	Global data flow analysis	2
5.4	Code generation: Issues in the design of a code generator.	2
5.5	The target machine, Basic blocks and Flow graphs	2
5.6	Peephole optimization	1

Elective IV

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
20INMCA581	INTERNET OF THINGS	ELECTIVE	3	1	0	4

Preamble: This course intends to provide insight into new innovations that will build novel type of interactions among things and humans, and enables the realization of smart cities, infrastructures, and services for enhancing the quality of life and utilization of resources. An overview of IOT and its related concepts, different IOT architectures and their components, emerging paradigms such as Fog computing, Platforms and solutions supporting development and deployment of IOT applications, message passing mechanisms such as RPC, REST, and CoAP, data and knowledge management, data confidentiality, data integrity, and operation control issues faced by IOT are included in the course.

Prerequisite: Basic concepts of Information Technology and Internet.
Course Outcomes: After completion of the course the student will be able to

CO No:	Course Outcome (CO)	Blooms Category Level
CO 1	Describe the main concepts and features of the IOT paradigm.	Level 2: Understand
CO 2	Discuss Fog computing, TinyOS - nesC and programming frameworks for IOT	Level 2: Understand
CO 3	Describe the data management techniques applied to the IOT environment.	Level 2 Understand
CO 4	Explain security, and privacy in IOT environments	Level 2 Understand
CO 5	Discuss key enablers and solutions to enable practical IoT systems	Level 2 Understand

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3						2					
CO 2	3	1					2					
CO 3	3	1					2					
CO 4	3	1					2					
CO 5	3	1	1				2					

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	20	20	20
Understand	30	30	40
Apply			
Analyse			
Evaluate			
Create			

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 contain 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 a maximum of 2 subdivisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Compare SOA-based architecture and API-oriented architecture.
2. Neatly sketch the open IOT architecture for IOT/CLOUD convergence.
3. List and explain the applications of device/cloud collaboration.

Course Outcome 2 (CO2)

1. What are the advantages associated with Fog computing?
2. Comment on the four broad requirements that motivate the design of TinyOS.
3. Summarize the communication paradigms and technologies used in resource-constrained environments.

Course Outcome 3(CO3):

1. Explain stream and stream processing in IOT.
2. Write and explain the algorithm for distributed anomaly detection by clustering ellipsoids.
3. Discuss the general architecture of a stream-processing system in IOT.

Course Outcome 4 (CO4):

1. Give an overview on the security requirements of IOT.
2. How can you nullify the impact of fault in high-availability cluster?
3. Explain the BCK with pre-shared keys for TinyTO.

Course Outcome 5 (CO5):

1. Give an overview on the Wired Gateway Interfaces.
2. List the features to select the gateway hardware.
3. List the steps to prepare Raspberry Pi for the execution.

Model Question Paper

Course Code: 20INMCA581

Course Name: INTERNET OF THINGS

Max. Marks :60 **Duration: 3 Hrs**

Part A

Answer all questions. Each question carries 3 marks (10 * 3 = 30 Marks)

1. What do you mean by computation offloading?
2. Explain the framework that enables collaboration between smart mobile devices and cloud.
3. Outline the major challenges faced in the Fog paradigm.
4. Explain Polyglot Programming.
5. Which are the challenges faced by stream-processing systems?
6. Explain anomaly detection and categorize anomalies in the data.
7. List the different ways that an IOT gateway can extend connectivity to nodes.
8. Write the advantages of obfuscation and diversification techniques.
9. Explain Inter-Integrated Circuit (I^2C) or Two Wire Interface (TWI).
10. Write a short note on Zigbee.

Part B

Answer all questions. Each question carries 6 marks. (5 * 6 = 30 Marks)

11. Explain the taxonomy of Resource Management in IOT. (6 Marks)

OR

12. Draw and explain the state diagram of the open IOT services life cycle. (6 Marks)

13. a. Comment on the four broad requirements that motivate the design of TinyOS (3 Marks)

    b. Describe the design decisions for nesC. (3 Marks)

OR

14. List the features in coordination languages - Linda, eLinda, Orc, and Jolie (6 Marks)

15. Compare Stream Management System (DSMS) and Complex Event Processing (CEP). (6 Marks)

OR

16. Describe hyper ellipsoidal model for anomaly detection. (6 Marks)

17. Describe the error detection techniques which are applicable in the context of an IOT. (6 Marks)

OR

18. Explain the Station-to-Station protocol (STS) and the two main shortcomings of STS. (6 Marks)

19. Discuss the sensors required to build the environmental-sensing IoT gateway device for weather monitoring. (6 Marks)

OR

20. List and explain the six steps for the development of a sensor project. (6 Marks)

Syllabus

Module 1 (9 Hours)
Overview of Internet of Things: Open-source semantic web infrastructure for managing IOT resources in the Cloud - Device/Cloud Collaboration framework for intelligence applications.
Module 2 (11 Hours)
Introduction to Fog Computing: principles, architectures, and applications. TinyOS – NesC, Programming frameworks for Internet of Things
Module 3 (8 Hours)

Stream processing in IoT: foundations, state-of-the-art, and future directions - A framework for distributed data analysis for IoT
Module 4 (9 Hours)
Security and privacy in the Internet of Things- Internet of Things - robustness and reliability. TinyTO: two-way authentication for constrained devices in the Internet of Things - Obfuscation and diversification for securing the Internet of Things
Module 5 (8 Hours)
Creating a simple sensor project - Preparing Raspberry Pi – Interfacing the hardware - Internal representation of sensor values- Persisting data - Creating the actuator project - Creating a controller.

More detailed knowledge may be acquired through seminars, assignments and talks by eminent external experts and also by implementing a micro project.

Any one of the following or similar micro projects may be given as part of the course.
1. Smart Gas Leakage Detector
2. Night Patrol at home

Text Books

1. RajkumarBuyya; Amir VahidDastjerdi , "Internet of Things", Morgan Kaufmann, 2016

Reference Books

1. Peter Waher, "Learning Internet of Things", Packt Publishing, 2015
2. S. SitharamaIyengar; Nandan Parameswaran; Vir V. Phoha; N. Balakrishnan; Chuka Okoye, "Fundamentals of Sensor Network Programming: Applications and Technology", Wiley, December 14, 2010
3. Robert Stackowiak, Art Licht, VenuMantha, Louis Nagode, "Big Data and The Internet of Things: Enterprise Information Architecture for A New Age", Apress, 2015

Web Resources

1. https://www.coursera.org/specializations/internet-of-things
2. http://web.mit.edu/professional/digital-programs/courses/IoT

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Introduction**	
1.1	Internet of things- definition, evolution. Applications -Smart home applications, Health care, Elder care, Traffic surveillance.	1
	SOA -Based Architecture, API oriented Architecture, Resource Management.	1
	Computational Offloading, Identification and Resource/Service Discovery, IOT Data Management and Analytics, IOT and the CLOUD	1
1.2	Open IOT architecture for IOT/Cloud convergence, Sensor middleware, Cloud computing infrastructure, Directory service, Global Scheduler, Local Scheduler component, Service delivery and utility manager	1
	Workflow of open IOT platform, Scheduling process and IOT Services lifecycle, State diagram of the Open IOT Services lifecycle within the scheduler module	1
	Scheduling and resource management, Resource optimization schemes, Caching technique	1
	Service creation flowchart, Comparison of cost - with cache server and public cloud data-score	1
1.3	Runtime adaptation engine, Device/cloud collaboration framework	1
	applications of device/cloud collaboration, Semantic QA cache	1
2	**Programming frameworks**	
2.1	Introduction to Fog Computing: principles, architectures, and Applications	1
	Motivating scenario for Fog Computing, Advantages of Fog Computing, Reference architecture of Fog Computing	1
	Software-Defined Resource management layer, Services of Software-Defined Resource management layer, Applications of Fog Computing.	1
2.2	History of TinyOS, Implementation, Requirements motivating the design of TinyOS, Component Model, Interfaces. TinyOS computational concepts	1

	Overview of TinyOS Execution Model, Concurrency, TinyOS Theory of Execution: Events & Tasks, TinyOS Architecture. TinyOS-Programming Model.	1
2.3	nesC design, Component Implementation, Design Decisions for nesC, Module Components, Configuration Components	1
	Whole-Program Analysis, Detecting Race Conditions, Dealing with Race Conditions, Issues for nesC.	1
2.4	Overview of Embedded Programming Languages- nesC, Keil C, Dynamic C, B#, Message Passing in Devices-Remote Procedure Call (RPC), Lightweight RPC (LRPC)	1
	Representational state transfer (REST), Computational REST (CREST), Constrained Application Protocol(CoAP), Comparison of HTTP and CoAP, Advantages of CoAP	1
	Coordination Languages- Orchestration, Choreography, Linda and eLinda, Orc, Features of Orc, Java Orchestration Language Interpreter Engine (Jolie), Polyglot Programming, Inverse pyramid for Polyglot Programming.	1
	Features of programming frameworks for IOT, IOT programming approaches, Existing IOT frameworks	1
3	**Data management techniques**	
3.1	Stream, Stream Processing, Data Stream Management System (DSMS)	1
	Complex Event Processing (CEP), differences between two use-cases of Stream Processing: DSMS and CEP	1
	The characteristics of stream data in IOT, general architecture of a stream-processing system in IOT	1
	Continuous logic processing system, challenges in stream-processing systems.	1
3.2	Anomaly detection, problem statement and definitions	1
	Hyper ellipsoidal anomaly detection	1
	Distributed anomaly detection	1
	Clustering ellipsoids, incremental local modeling	1
4	**Security and privacy**	

4.1	IOT security threats, IOT security requirements, security frameworks for IOT, IOT security overview, IOT gateways and security, IOT routing attacks	1
	Security frameworks for IOT - Lightweight cryptography, asymmetric LWC algorithms, privacy in IOT networks	1
4.2	IOT characteristics and reliability issues, reliability challenges	1
	Addressing reliability, security aspects and solutions	1
4.3	TinyTO: Two-way authentication for constrained devices in the Internet of Things	1
	TinyTO protocol	1
	BCK with pre-shared keys for TinyTO, handshake implementation	1
4.4	IOT network stack and access protocols**,** Obfuscation and diversification techniques	1
	Enhancing the security in IOT using obfuscation and diversification techniques, motivations and limitations, different use-case scenarios on software diversification and obfuscation.	1
5		
5.1	Three key components to an IOT architecture, Sensor to gateway communication - wired gateway interfaces, wireless gateway interfaces	1
	Sensors - sensors required to build the environmental-sensing IOT gateway device for weather monitoring	1
	Gateway, Gateway hardware, Gateway software	1
	Data transmission - advanced message queuing protocol, backend processing, to CLOUD or not to cloud	1
5.2	Creating a simple sensor project - Preparing Raspberry Pi – Clayster libraries	1
	Hardware, Interfacing the hardware - Internal representation of sensor values- Persisting data	1
	External representation of sensor values, Exporting sensor data	1
	Creating the actuator project – Hardware, Interfacing the hardware, Creating a controller	1

20INMCA583	DEEP LEARNING	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: This course intends to provide insight into deep learning. This topic is currently a much sought-after skill and is under active research. Students have to refer appropriate research papers and multiple books to get in-depth knowledge about the topics. Instructors may give suitable programming assignments to augment the material covered in the classroom.

Prerequisite: Basic concepts of linear algebra, probability and optimization.

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

CO No.	Course Outcome (CO)	Bloom's Category Level
CO 1	Explain the basic concepts of deep learning.	Level 2: Understand
CO 2	Design neural networks using TensorFlow	Level 3: Apply
CO 3	Solve real world problems with CNN.	Level 3: Apply
CO 4	Solve real world problems with RNN.	Level 3: Apply
CO 5	Describe the concepts of GAN.	Level 2: Understand

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2										
CO 2	3	3	3		3		3					
CO 3	3	3	3		3		3					
CO 4	3	3	3		3		3					
CO 5	2	3			2		2					

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember	15	15	10

Understand	25	25	30
Apply	10	10	20
Analyze			
Evaluate			
Create			

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 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. Describe the model of a biological neuron.
2. Explain Perceptron learning algorithm.
3. Explain the role of batch normalization in training a neural network.

Course Outcome 2 (CO2)

1. Draw and demonstrate the VGG-16 architecture.
2. Sketch the AlexNet architecture and explain its functionalities.

Course Outcome 3(CO3):

1. Design a convolutional neural network which can classify MNIST handwritten data.

Course Outcome 4 (CO4):

1. You are given an image data set with 10 classes. Describe how you will use deep learning to build a classifier.
2. Design a system to generate deep fakes from an image.

Course Outcome 5 (CO5):

1. Describe auto encoders and how they help in dimensionality reduction.
2. Explain how GANS work.

Model Question Paper

Course Code: 20INMCA583

Course Name: DEEP LEARNING

Max. Marks :60 **Duration: 3 Hrs**

Part A

Answer all questions. Each question carries 3 marks (10 * 3 = 30 Marks)

1. Describe sigmoid activation functions.
2. Write the gradient descent algorithm.
3. Explain with an example how graphs are stored and represented in TensorFlow.
4. Discuss how graph representation can accelerate computing models.
5. Describe the VGG 16 architecture.
6. What is max pooling in the context of CNN?
7. Explain ReLU.
8. Explain the problem of vanishing gradients.
9. Write a note on auto encoders.
10. Explain the idea behind cross entropy.

Part B

Answer one full question from each module, each carries 6 marks.

11. (a) Describe the model of a biological neuron. 3 marks

(b) Explain perceptron learning algorithm. 3 marks

OR

12. With a suitable example explain how backpropagation works 6marks

13. Explain the role of batch normalization in training a neural network and

describe how to find out overfitting from training and validation curves 6 marks

OR

14. Explain the ideas of Rank, Shape and Type with an example in the context of a Tensor Data Structure 6 marks

15. With a suitable numerical example illustrate convolution operation. 6 marks

OR

16. Explain the architecture of AlexNet. 6 marks

17. Explain the idea of Truncated backpropagation through time. 6 marks

OR

18. Describe how LSTM works. 6 marks

19. Distinguish between generative and discriminative models 6 marks

OR

20. Explain how a GAN is trained. 6 marks

Syllabus

Module I (8 Hours)
Review of Neural Networks: Model of a biological neuron, McCulloch Pitts Neuron, Activation Functions, Perceptron, Perceptron Learning Algorithm and Convergence, Multilayer Perceptron, Back propagation, Learning XOR, Sigmoid Neurons, Gradient Descent, Feed forward Neural Networks.
Module II (10 Hours)
Training Neural Networks: Initialization, dropout, batch normalization and dropout, overfitting, underfitting, training and validation curves. Data Visualization: Feature and weight visualization, tSNE. Introduction to TensorFlow: graphs, nodes, Tensor data structures - rank, shape, type, Building neural networks with TensorFlow, Introduction to Keras.
Module III (10 Hours)
Convolutional Neural Networks: Convolution operation, Convolutional layers in neural network, pooling, fully connected layers.

Case study: Architecture of Lenet, Alexnet and VGG 16
Module IV (8 Hours)
Recurrent Neural Networks: Back propagation, vanishing gradients, exploding gradients, truncated backpropagation through time, Gated Recurrent Units (GRUs), Long Short-Term Memory (LSTM) cells, solving the vanishing gradient problem with LSTMs.
Module V (9 Hours)
Autoencoders, variational autoencoders. Generative Adversarial Networks (GAN): Discriminative and generative models, GAN discriminator, GAN generator, upsampling, GAN Training, GAN challenges, loss functions, cross entropy, minimax loss, Wasserstein loss.

Programming assignments using TensorFlow maybe given at the end of each module to get hands on experience.

Textbooks.

1. Generative Deep Learning: David Foster, OReily, (2019)
2. Deep Learning, Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT press (2016)
3. Hands on Machine Learning with Scikit Learn and TensorFlow, Aurélien Géron (2019)
4. Deep Learning Illustrated, Jon Krohn, Grant Beyleveld, Aglae Bassens, Pearson, First Edition (2020)
5. Online book Dive Deep into Machine Learning at https://d2l.ai/

References

Module 1

a. https://www.cse.iitm.ac.in/~miteshk/CS6910/Slides/Lecture2.pdf
b. https://www.cse.iitm.ac.in/~miteshk/CS6910/Slides/Lecture3.pdf

Module 2

a. http://neuralnetworksanddeeplearning.com
b. Hands on Machine Learning with Scikit Learn and TensorFlow, Aurélien Géron
c. Probabilistic Machine Learning: An Introduction, Kevin Murphy
d. https://www.researchgate.net/publication/228339739_Viualizing_data_using_t-SNE

Module 3

a. https://www.cse.iitm.ac.in/~miteshk/CS7015/Slides/Teaching/pdf/Lecture11.pdf
b. Convolutional neural networks for visual computing (Chapter 4), Ragav Venkatesan and Baoxin Li CRC press

Module 4

a. On the difficulty of training RNNs: https://arxiv.org/pdf/1211.5063.pdf

b. LSTM: A Search Space Odyssey: https://arxiv.org/abs/1503.04069
c. Understanding Deriving and Extending the LSTM: https://r2rt.com/written-memories-understanding-deriving-and-extending-the-lstm.html
d. Understanding LSTM Networks: http://colah.github.io/posts/2015-08-Understanding-LSTMs/
e. https://www.cse.iitm.ac.in/~miteshk/CS7015/Slides/Teaching/pdf/Lecture14.pdf
f. https://www.cse.iitm.ac.in/~miteshk/CS7015/Slides/Teaching/pdf/Lecture15.pdf

Module 5

a. GANs in Action: Deep Learning with Generative Adversarial Network Jakub Langgr, Vladimir Bok
b. Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play David Foster
c. https://developers.google.com/machine-learning/gan

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1**	**8 Hours**
1.1	Review of Neural Networks: Model of a biological neuron	1
1.2	McCulloch Pitts Neuron, Activation functions	1
1.3	Perceptron, Perceptron Learning Algorithm	1
1.4	Convergence, Multilayer Perceptron	1
1.5	Back propagation	1
1.6	Learning XOR, Sigmoid Neurons	1
1.7	Gradient Descent, Feed forward Neural Networks	2
2	**Module 2**	**10 Hours**
2.1	Training Neural Networks	1
2.2	Initialization, Dropout	1
2.3	Batch normalization and drop out	1
2.4	Over fitting, under fitting, training and validation curves, data visualization, feature and weight visualization, tSNE	2
2.5	Introduction to TensorFlow, graphs, nodes, Tensor Data Structures - rank, shape, type	2
2.6	Building neural networks with tensor flow	2
2.7	Introduction to Keras	1

3	**Module 3**	**10 Hours**
3.1	Convolutional neural networks	1
3.2	Convolution operation	2
3.3	Back propagation in multilayer neural networks	1
3.4	Convolutional layers in neural network, pooling	2
3.5	Fully connected layers	2
3.6	Case study: Architecture of Lenet, Alexnet and VGG 16	2
4	**Module 4**	**8 Hours**
4.1	Recurrent neural networks	1
4.2	Back propagation: vanishing gradients, exploding gradients	1
4.3	Truncated Backpropagation Through Time	1
4.4	LSTM	1
4.5	Gated Recurrent Units (GRUs)	1
4.6	Long Short-Term Memory (LSTM) Cells	1
4.7	Solving the vanishing gradient problem with LSTMs	2
5	**Module 5**	**9 Hours**
5.1	Autoencoders, Variational autoencoders	2
5.2	Generative Adversarial Networks (GAN)	1
5.3	Discriminative and generative models	2
5.4	GAN Discriminator, GAN Generator, upsampling,	1
5.5	GAN Training	1
5.6	GAN challenges, Loss functions, cross entropy, minimax loss, Wasserstein loss	2

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
20INMCA585	DIGITAL IMAGE PROCESSING	ELECTIVE	3	1	0	4

Preamble: This course introduces the techniques of simulating human vision into computer vision based on feature extraction to develop applications in different areas. The concept of enhancement, transforms, smoothing, restoration, compression, morphological image analysis, classification & segmentation in two-dimensional space are introduced. This course serves as a prerequisite for many advanced courses in computer vision areas.

Prerequisite: Nil

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

CO No.	Course Outcome (CO)	Bloom's Category Level
CO 1	Discuss the fundamental concepts of digital image processing, image formation and representation of images.	Level 2: Understand
CO 2	Summarise image enhancement methods in the spatial domain.	Level 2: Understand
CO 3	Explain image transforms and image smoothing & sharpening using various kinds of filters in frequency domain.	Level 2: Understand
CO 4	Describe various methods in image restoration and compression.	Level 2: Understand
CO 5	Discuss morphological basics and image segmentation methods.	Level 2: Understand

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2					2					
CO 2	2	2					2					
CO 3	2	2					2					
CO 4	2	2					2					
CO 5	2	2					2					

3/2/1: High/Medium/Low

Assessment Pattern

Bloom's Category Levels	Continuous Assessment Tests		End Semester Examination
	1	2	
Level 1: Remember	15	15	20
Level 2: Understand	35	35	40
Level 3: Apply			
Level 4: Analyse			
Level 5: Evaluate			
Level 6: Create			

Mark distribution

Total Marks	Continuous Internal Evaluation (CIE)	End Semester Examination (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 carries 3 marks. Part B contains 2 questions from each module of which student should answer any one. Each question can have a maximum of 2 sub-divisions and carry 6 marks.

Sample Course Level Assessment Questions

Course Outcome 1 (CO 1):

1. List out various components of an Image Processing System.
2. Define Electromagnetic Spectrum.
3. Illustrate the image formation in the eye. Calculate the size of the retinal image of a tree, if the observer is looking at a tree 20 m high at a distance of 100.

Course Outcome 2 (CO 2):

4. Describe the basic relationships and distance measures between pixels in a digital image.
5. List and explain steps in Histogram Processing.

6. List and explain various Intensity transformation functions used in grey scale images.

7. Explain the process of Unsharp masking?

Course Outcome 3 (CO 3):

1. Explain the properties of Unitary transform.
2. Compare and contrast 1D-DFT and 2D-DFT.
3. Design a basic Laplacian filter using first order and second order derivatives.
4. Describe various image smoothing techniques using frequency domain filters.

Course Outcome 4 (CO 4):

1. Explain image noise models and list out different noise probability density functions used in image processing applications.
2. Describe Wiener filtering technique.
3. Draw the functional block diagram of image compression system. List various types of redundancy in compression?

Course Outcome 5 (CO 5):

1. Differentiate erosion and dilation in morphological processing.
2. Compare Global thresholding and Otsu's method.
3. Explain how does Hough transform works.

Model Question Paper

Course Code: 20INMCA585

Course Name: Digital Image Processing

Max. Marks :60 **Duration: 3 Hrs**

Part A

Answer all questions.

Each question carries 3 marks (10 x 3 = 30 Marks)

.

1. Describe the elements of visual perception.
2. Define Toeplitz & Circulant matrices
3. Explain histogram equalization in detail.
4. Differentiate linear spatial filter and non-linear spatial filter.
5. Explain the properties of 2D DFT.
6. List the steps involved in frequency domain filtering.

7. Write note on Point Spread Function.
8. List the components of a compression system.
9. Compare opening and closing in morphological processing of images.
10. Explain the merits and demerits of edge thresholding in segmentation.

(10 x 3=30 marks)

Part B

Answer all questions. Each question carries 6 marks. (5 * 6 = 30 Marks)

11. Explain fundamental steps in Digital Image Processing. (6)

OR

12. Differentiate sampling and quantization in image processing. (6)

13. Explain basic grey level transformation in spatial domain. (6)

OR

14. Compare Unsharp masking and High-boost filtering in Spatial filtering (6)

15. Explain Discrete Cosine Transform and its properties. (6)

OR

16. Explain the working of Homomorphic filtering with an example. (6)

17. Explain image restoration process in detail. (6)

OR

18. Differentiate lossy and lossless image compression methods (6)

19. Compare erosion and dilation in Morphological image analysis (6)

OR

20. Explain canny edge detector in detail (6)

(5 x 6=30 Marks)

Syllabus

Module 1: Overview of Digital Image Processing (9 Hours)
Digital Image Processing: Basic concepts, Difference between image processing and computer vision, Components of an image processing system. Image processing applications. Mathematical preliminaries: Basic Vector and Matrix operations, Toeplitz, Circulant, Unitary & Orthogonal matrices. Elements of Visual Perception: Structure of the human eye and image formation, Brightness adaptation and discrimination. Types of Images: Binary, Gray scale and Color Images. Image Sampling and Quantization: Digital image as a 2D array, Spatial and Intensity resolution, 2D-sampling theorem. RGB and HSI color models.
Module 2: Concept of Image enhancement & Spatial filtering (10 Hours)
Concept of Image enhancement, Basic grey level transformation functions: Image negative, Log transformation, Power-law transformation, Piecewise linear transformations. Histogram of an Image, Histogram equalization with illustration. Fundamentals of Spatial Filtering: Mechanics of Spatial filtering, 2D correlation and convolution. Smoothing spatial filters: Linear and Nonlinear types. Sharpening spatial filters: Laplacian operator, Unsharp masking and High-boost filtering, Gradient based operators for image sharpening.
Module 3: Image Transform & Filtering in frequency domain (8 Hours)
Image Transform-representation of an image in frequency domain, Unitary transformation of an Image-transform pair equations in matrix form, Properties of unitary transforms. 1D-DFT, 2D-DFT of an image- Properties of 2D-DFT. DCT and its properties, Filtering an Image in the Frequency Domain– Steps of frequency domain filtering. Basic concept and illustration of frequency domain image smoothing and sharpening.
Module 4: Image Restoration & Compression (8 Hours)
Image Restoration: Concept of Image restoration, A Model of the Image Degradation/Restoration Process, Image Noise Models, Point Spread Function, Restoration using Inverse filtering, Wiener filtering. Image compression: Need for compression, redundancy, classification of image compression schemes, A general image compression system, Huffman coding, Transform based compression, JPEG standard, Digital image watermarking-basic concept.
Module 5: Basics of morphological image processing & image segmentation (10 Hours)

Morphological image processing basics: erosion and dilation, opening and closing, Hit or Miss transformation. Image segmentation: Fundamentals, Point detection, Line detection, Basic steps of edge detection, Hough transform, Edge detectors - Marr-Hildreth edge detector & Canny edge detector. Thresholding: Basics of intensity thresholding, Global thresholding and Otsu's method. Region-based segmentation: Region growing, Region Splitting and Merging.

Text Books

1. Rafael C., Gonzalez & Woods R.E., "Digital Image Processing", Pearson Education.
2. Jain A.K, "Fundamentals of Digital Image Processing", Prentice Hall, Eaglewood Cliffs, NJ.

Reference Books

1.Schalkoff R. J., "Digital Image Processing and Computer Vision", John Wiley 5. Pratt W.K., "Digital Image Processing", John Wiley

2.Al Bovick , "Handbook of Image and Video Processing" , Academic Press, 2000

Course Contents and Lecture Schedule

Sl. No.	Topic	No. of Lectures
1	**Overview of Data Image Processing**	**9 Hours**
1.1	Basic concepts of digital image processing, Image processing application	2
1.2	Mathematical preliminaries: Basic Vector and Matrix operations	1
1.3	Toeplitz, Circulant, Unitary & Orthogonal matrices	1
1.4	Elements of Visual Perception, Structure of human eye	1
1.5	Brightness adaptation and discrimination, Types of Images	1
1.6	Sampling and Quantization	1
1.7	Spatial and Intensity resolution, 2D-sampling theorem.	1
1.8	RGB and HSI color models.	1
2	**Concept of Image enhancement & Spatial filtering**	**10 Hours**
2.1	Concepts of Image enhancement, Basic grey level transformation functions: Image negative, Log transformation, Power-law transformation, Piecewise linear transformations.	2
2.2	Histogram of an Image, Histogram equalization with illustration	1

2.3	Fundamentals of Spatial Filtering: Mechanics of Spatial filtering	1
2.4	2D correlation and convolution	1
2.5	Smoothing spatial filters: Linear and Nonlinear types	1
2.6	Sharpening spatial filters: Laplacian operator	1
2.7	Unsharp masking	1
2.8	High-boost filtering	1
2.9	Gradient based operators for image sharpening	1
3	**Image Transform & Filtering in frequency domain**	**8 Hours**
3.1	Image Transform-representation of an image in the transform domain.	1
3.2	Unitary transformation of an Image, Properties of unitary transforms	1
3.3	1D-DFT	1
3.4	2D-DFT and its properties	1
3.5	DCT and its properties	1
3.6	Filtering an Image in the Frequency Domain– Steps of frequency domain filtering	1
3.7	Image smoothing using frequency domain filters – Ideal Lowpass Filters, Butterworth Lowpass filter & Gaussian Lowpass filter.	1
3.8	Image sharpening using frequency domain filters – Ideal Highpass Filters, Butterworth Highpass filter & Gaussian Highpass filter.	1
4	**Image Restoration & Image compression**	**8 Hours**
4.1	Image Restoration: Concept of Image restoration	1
4.2	A Model of the Image Degradation/Restoration Process	1
4.3	Image Noise Models	1
4.4	Point Spread Function	1
4.5	Restoration using Inverse filtering, Wiener filtering	1
4.6	Image compression: Need for compression, redundancy, classification of image compression schemes	1
4.7	A general image compression system Huffman coding, Transform based compression.	1
4.8	JPEG standard, Digital image watermarking-basic concept.	1
5	**Basics of morphological image processing & image segmentation**	**10 Hours**
5.1	Morphological image processing basics: erosion and dilation, opening and closing, Hit or Miss transformation.	1

5.2	Image segmentation: Fundamentals, Point detection, Line detection	1
5.3	Basic steps of edge detection - Hough transform	2
5.4	Edge detectors: Marr-Hildreth edge detector	1
5.5	Canny edge detector	1
5.6	Thresholding: Basics of intensity thresholding.	1
5.7	Global thresholding	1
5.8	Otsu's method	1
5.9	Region-based segmentation: Region growing, Region Splitting and Merging.	1

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
20INMCA587	**BIOINFORMATICS**	**ELECTIVE**	**3**	**1**	**0**	**4**

Preamble: This course helps to understand the concepts of computational biology and bioinformatics. The students will learn Database tools and their uses, various algorithms for biological sequence analysis, Genomics and Gene Recognition, Protein structure and to use various visualization techniques, data mining & machine learning in bioinformatics.

Prerequisite: Nil

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

CO No.	Course Outcome (CO)	Bloom's Category Level
CO 1	Explain the fundamentals of Computational Biology and Bioinformatics.	Level 2: Understand
CO 2	Classify various biological databases.	Level 2: Understand
CO 3	Use suitable algorithm for Biological Sequence Analysis and make use of database search tools.	Level 3: Apply
CO 4	Discuss Gene structure and expression of Prokaryotic and Eukaryotes.	Level 2: Understand
CO 5	Apply data mining & machine learning methods to analyse and visualize biological data.	Level 3: Apply

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	1				1					
CO 2	3	3	1				2					
CO 3	3	3	2				2					
CO 4	3	2	1				1					
CO 5	3	3	2		2		2					

3/2/1: High/Medium/Low

Assessment Pattern

Bloom's Category Levels	Continuous Assessment Tests		End Semester Examination
	1	2	
Level 1: Remember	10	10	10
Level 2: Understand	30	30	30
Level 3: Apply	10	10	20
Level 4: Analyse			
Level 5: Evaluate			
Level 6: Create			

Mark distribution

Total Marks	Continuous Internal Evaluation (CIE)	End Semester Examination (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 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 a maximum 2 subdivisions and carry 6 marks.

Sample Course Level Assessment Questions

Course Outcome 1 (CO 1):

1. Explain the concept of DNA
2. Explain the concept of RNA.
3. Illustrate the concept of translation and transcription.
4. Discuss Gnome project and its impact on bioinformatics

Course Outcome 2 (CO 2):

1. Explain the features of biological databases?
2. Discuss primary sequence databases and secondary sequence databases.
3. Classify the two important classification schemes of structure classification databases.
4. Retrieve the sequence from primary / secondary databases.

5. Use of BLAST for comparing sequences.

Course Outcome 3 (CO 3):

1. Explain the importance of scoring matrices in sequence alignment.
2. Explain the different algorithms used for sequence alignment .
3. Illustrate Local and global alignment Algorithm for the sequence CGTGAATTCAT (sequence#1 or A) GACTTAC (sequence #2 or B)
4. Compute the best alignment of these two sequences: ACTGATTCA ACGCATCA Using -2 as a gap penalty, -3 as a mismatch penalty, and 2 as the score for a match.

Course Outcome 4 (CO 4):

1. Explain the Prokaryotic gene structure
2. Explain the Eukaryotic gene structure
3. Demonstrate the usage of Open Reading Frame with an example
    a. 5′-ATCTAAAATGGGTGCC-3′
4. Explain the working principle of microarray

Course Outcome 5 (CO 5):

1. Differentiate between the different protein molecular structure visualizations.
2. Use Web-based Map Viewer program, RasMol, PyMol data visualization techniques in bioinformatics .
3. Use PubMed to search for a particular pattern to specify the importance of mining the biomedical literature for data on functions to complement the sequence and structure data mined from nucleotide and protein databases.
4. Compare any three machine learning technologies and their applicability to data mining methods.

Model Question Paper

Course Code: 20INMCA587

Course Name: BIOINFORMATICS

Max.Marks :60 Duration: 3 Hrs

Part A

Answer all questions. Each question carries 3 marks (10 * 3 = 30 Marks)

1. Write short note on “ how genome carries hereditary data from organisms.”
2. What is antisense RNA?
3. Write a short note on primary database.
4. Write note on : (a) SCOP (b) CATH.
5. How many times faster is to find the best alignment for the sequences “RQQEPURSTC” and “QQESGPVRST” using N_W algorithm compared to assessing each possible alignment one by one?

6. Define raw score, bit score and e-value in BLAST.
7. Write a short note on of process is gene expression in Prokaryotic.
8. Justify the reasons for the high Prokaryotic gene density compared to Eukaryotes.
9. Differentiate between centralized and distributed data mining Infrastructure. Use diagrams if necessary.
10. Explain the significance of Hidden Markov Model in bioinformatics. Draw a sample Markov chain which is the basis of HMM, also mention how HMM is different from Markov chain.

Part B

Answer all questions. Each question carries 6 marks. (5 * 6 = 30 Marks)

11	What is the Central dogma of Molecular biology? How can Molecular biology be considered as an information science?	6
	OR	
12	With a neat diagram describe the structural and functional differences between DNA and RNA?	6
13	Explain different types of protein databases and its applications in bioinformatics.	6
	OR	
14	Differentiate between Composite protein sequence database and secondary databases .	6
15	Align the following sequence using Needleman and Wunch algorithm for global alignment ATTGC and AGGC with match +1, mismatch -1 and gap penalty -2. What is the score of the optimal global alignment?	6
	OR	
16	Find the best local alignment between ACCTAGG and GGCTCAATCA with +2 for a match, -1 for a mismatch and -2 for a gap using Smith Waterman Algorithm. Explain Prokaryotic Gene structure with neat diagram.	6
17	What is GC content? How it differs in eukaryotic and prokaryotic genomes.	6
	OR	
18	Describe with the help of a diagram the generation of cDNAs. Mention its use and also write notes on ESTs.	6
19	Illustrate with the help of a neat diagram the pattern recognition and the label discovery process.	6
	OR	
20	Justify the importance of user interfaces in data visualization. With the support of a representative block diagram explain the structure of a 3D protein visualization tool. Also explain the UI components of the same.	6

Syllabus

Module 1: Computational Biology and Bioinformatics (7 Hours)
Computational Biology: Cell - Central Dogma of Molecular Biology - Structure of DNA, RNA and Protein - Coding and Non-coding RNAs - mRNA, tRNA, miRNA and siRNA. Bioinformatics: Nature & Scope of Bioinformatics, Gnome projects, Importance of bioinformatics, Pattern recognition and prediction.
Module 2: Biological Databases (8 Hours)
Biological Databases, Primary Sequence Databases, Composite protein sequence databases, Secondary Databases, Composite protein pattern databases, Structure classification databases. //Tutorial class may be arranged to the introduction and use of sequence retrieval from the databases.
Module 3: Data Searches and pairwise Alignment (10 Hours)
Dot Plots, Concept of Simple Alignment, Scoring matrices: Introduction to PAM & Blosum, Needleman and Wunsch Algorithm, Global and Local Alignments, Smith Waterman Algorithm, Multiple Sequence Alignment. Familiarize Database search tools: BLAST & FastA //Tutorial class may be arranged to the introduction and use of sequence alignment and BLAST.
Module 4: Genomics and Gene recognition (10 Hours)
Introduction to Gene expression in prokaryotes, Prokaryotic Gene structure, GC content in prokaryotic genomes, Gene Density. Eukaryotic Genomes: Gene structure, GC content in eukaryotic genomes, Gene Expression – Introduction to Microarrays.
Module 5: Data Visualization, Data mining and Machine learning (10 Hours)
Data Visualization - Introduction, Sequence Visualization, Structure Visualization, User Interface, Animation Versus Simulation, General-Purpose Technologies. Data Mining using biological data, Methods, Infrastructure, Pattern recognition and discovery, Genetic Algorithms, Neural networks using biological data, Statistical methods using biological data, Introduction to Hidden Markov Models and Text mining. //Tutorial class may be arranged to introduce and use - RasMol and PyMol .

Text Books

1. Dan. E. Krane and M. L. Raymer, “Fundamental Concepts of Bioinformatics”, Pearson Education, 2003(Module 4)
2. Bryan Bergeron, M.D, “Bioinformatics Computing”, Pearson Education, 2015. (Module 1,5)
3. Attwood T. K. and D. J. Parry-Smith,” Introduction to Bioinformatics”, Pearson Education, 2003 (Module 2,3)

4. Neil C Jones and Pavel A Pevzner, "An Introduction to Bioinformatics Algorithms", MIT Press, 2004

Reference Books

1. Jean-Michel Claverie and Cedric Notredame, "Bioinformatics For Dummies" , 2nd Edition,Wiley Publishing
2. David W Mount, "Bioinformatics- Sequence and Genome Analysis " , 2/e, Cold Spring Harbor
3. Laboratory Press, New York.
4. "Bioinformatics for Dummies" J. Claverie & C. Notredame ,Wiley India..

Web Reference

1. https://nptel.ac.in/courses/102/106/102106065/

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Computational Biology and Bioinformatics**	**(7 Hours)**
1.1	Cell - Central Dogma of Molecular Biology, Structure of DNA	1
1.2	RNA and Protein: Coding and Non-coding RNAs -mRNA	1
1.3	tRNA, miRNA and siRNA	1
1.4	Nature & Scope of Bioinformatics, Gnome projects	1
1.5	Importance of bioinformatics, Pattern recognition and prediction	1
1.6	Folding problem	1
1.7	Sequence analysis, homology and analogy	1
2	**Biological Databases**	**(8 Hours)**
2.1	Primary Sequence databases: Nucleic acid and Protein sequence: PIR, MIPS, SWIS-PROT	1
2.2	Protein sequence: TrEMBL, NRL-3D	1
2.3	Composite protein sequence Databases: NRDB, OWL, MIPSX and SWISS-PROT+TrEMBL	1
2.4	Secondary Databases, Need for Secondary databases	1
2.5	Prosite	1
2.6	Prints	1
2.7	Blocks, Profile, Pfam, Identify	1
2.8	Composite Protein Pattern Database and Structure Classification Databases	1
3	**Data Searches and pairwise Alignment**	**(10 Hours)**
3.1	Dot Plots	1

3.2	Concept of Simple Alignment, GAPS	1
3.3	Scoring matrices	1
3.4	Introduction to PAM	1
3.5	Introduction to Blosum	1
3.6	Needleman and Wunsch Algorithm	1
3.7	Global and Local Alignments: Semiglobal alignment	1
3.8	Smith Waterman Algorithm	1
3.9	Alignment scores and statistical significance of database search , Multiple Sequence Alignment.	1
3.10	Familiarize Database search tools: BLAST & FastA	1
4	**Gene structure and expression of Prokaryotic and Eukaryotes.**	**(10 Hours)**
4.1	Introduction to Gene expression in Prokaryotes	1
4.2	Prokaryotic Gene structure	1
4.3	GC content in prokaryotic genomes	1
4.4	Prokaryotic Genomes -Gene Density	1
4.5	Eukaryotic Genomes	1
4.6	Gene structure , ORF in Prokaryotic	1
4.7	GC content in Eukaryotic Genomes	1
4.8	Gene Expression - cDNAs & ESTs,	1
4.9	Serial Analysis of Gene Expression	1
4.10	Introduction to Microarrays.	1
5	**Data Visualization, Data mining & Machine learning**	**(10 Hours)**
5.1	Data Visualization Introduction	1
5.2	Sequence Visualization- Sequence Map	1
5.3	Structure Visualization- Rendering tools	1
5.4	User Interface - User Interface Components, Alternative Metaphors, Display Architecture	1
5.5	Animation Versus Simulation, General-Purpose Technologies.	1
5.6	Data Mining, Methods, Infrastructure	1
5.7	Pattern recognition and discovery	1
5.8	Genetic Algorithms	1
5.9	Neural networks, Statistical methods	1
5.10	Hidden Markov Models and Text mining	1

20INMCA589	SOCIAL NETWORK ANALYSIS	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: This course intends to provide insight into social network analysis. The objective of this course is to enable students analyse and visualize network data. This course will create an understanding about the semantic web, structure of various social networks and the structure of search engines.

Prerequisite: Basic concepts of graph theory and networks

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

CO No.	Course Outcome (CO)	Bloom's Category Level
CO 1	Explain the basic concepts of semantic web and social network analysis.	Level 2: Understand
CO 2	Describe the ontology-based knowledge representation techniques in social network.	Level 2: Understand
CO 3	Discuss aggregation of social network information and representation of social individuals and social relationships.	Level 2: Understand
CO 4	Describe the structure of the Web and Facebook as a graph and the algorithms for searching and community discovery.	Level 2: Understand
CO 5	Explain the general architecture of a search engine and specifically the Google search engine architecture.	Level 2: Understand

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2					1					
CO 2	2	2					1					
CO 3	2	2					2					
CO 4	2	3		2	2	2	2			2		
CO 5	2	3		2	2		2					

Assessment Pattern

Bloom's Category	Continuous Assessment Tests	End Semester Examination

	1	**2**	
Remember	15	15	20
Understand	35	35	40
Apply			
Analyze			
Evaluate			
Create			

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 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. Explain the development of semantic Web and the emergence of Social Web.
2. Describe the global structure social networks.
3. Discuss in detail about the macro-structure of social networks.
4. "Most network analysis methods work on an abstract, graph-based representation of real-world networks". Justify this statement.

Course Outcome 2 (CO2)

1. Describe the characteristics of Resource Description Framework (RDF).
2. Compare the features of Web Ontology Language (WOL) and Unified Modeling Language (UML).
3. Compare the features of Web Ontology Language (WOL) and Entity Relationship (ER) Model.

Course Outcome 3(CO3):

1. Describe the ontological representation of social individuals.

2. Explain the generic architecture of Semantic Web applications.
3. Discuss how semantic web applications can be built with social network features?

Course Outcome 4 (CO4):

1. Describe Zipf's Law.
2. Write the limitations of HyperANF Algorithm and explain how it can be sorted out using the Iterative Fringe Upper Bound (iFUB) Algorithm.
3. What is meant by Degree Assortativity? What is the use of this measure?
4. "A user who logs in more generally has more friends on Facebook", describe how can we conclude this statement.

Course Outcome 5 (CO5):

1. Draw the architecture of a general search engine and explain how it works.
2. Explain how the HITS Algorithm works to assign ranks to web pages.
3. Compare the HITS Algorithm and the Page Rank Algorithm.

Model Question Paper

Course Code: 20INMCA589

Course Name: SOCIAL NETWORK ANALYSIS

Max. Marks :60 **Duration: 3 Hrs**

Part A

Answer all questions. Each question carries 3 marks (10 * 3 = 30 Marks)

1. What is meant by semantic web?
2. Write notes on personal networks.
3. Define Electronic discussion networks.
4. List out the features of blogs that can be used for social network extraction.
5. Explain how the reasoning with instance equality is done in social network data?
6. What is meant by Evaluating Smushing?
7. Define "Power Law".
8. What is "Spid"? How it is used to differentiate between web-network and social network?
9. What are the basic functions of the storage repository of a search engine?
10. How can we identify web spam pages?

Part B

Answer one full question from each module, each carries 6 marks.

11. List and explain various measures in network analysis. 6 marks

OR

12. Describe the macro-structure of social networks. 6 marks

13. What is meant by ontology-based knowledge representation? Explain its role in the semantic web. 6 marks

OR

14. Compare the features of Web Ontology Language (WOL) and Extensible Markup Language (XML). 6 marks

15. Describe how aggregating and reasoning can be done on social network data. 6 marks

OR

16. Discuss the ontological representation of social relationships. 6 marks

17. Define the following with suitable example:
    a) Rank exponent 2 marks
    b) Hop plot exponent 2 marks
    c) Eigen exponent 2 marks

OR

18. Explain how to generate in-degree and out-degree distributions on the graph of the Web crawl. 6 marks

19. Describe how the web crawler module in a search engine does the page selection and page refresh. 6 marks

OR

20. Draw the architecture of Google search engine and comment on each of its components. 6 marks

Syllabus

Module I (9 Hours)
Introduction to the Semantic Web and Social Networks: The Semantic Web, Limitations of the current Web, The semantic solution, Development of the Semantic Web, The emergence of the social web, Social Network Analysis**,** Development of Social Network Analysis, The global structure of networks, The macro-structure of social networks, Personal networks.
Module II (8 Hours)
Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based networks. **Knowledge Representation on the Semantic Web:** Ontologies and their role in the Semantic Web, Ontology languages for the Semantic Web, The Resource Description Framework (RDF) and RDF Schema, The Web Ontology Language (OWL), Comparison of Ontology languages with the Unified Modelling Language (UML), Comparison to the Entity/Relationship (E/R) model and the Relational model, Comparison to the Extensible Markup Language (XML) and XML Schema.
Module III (8 Hours)
Modelling and aggregating social network data: Network data representation, Ontological representation of social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data, Representing identity, On the notion of equality, Determining equality, Reasoning with instance equality, Evaluating smushing.
Module IV (10 Hours)
Graph Structure of the Web: Breadth First Search (BFS) Algorithm, Strongly Connected Components (SCC) Algorithm, Weakly Connected Components (WCC) Algorithm, In-degree and out- degree distributions, Connected Components, Zipf's Law, Rank Exponent R, Out-Degree Exponent O, Hop Plot Exponent H, Eigen Exponent E. **Graph Structure of Facebook:** Hyper ANF Algorithm, Iterative Fringe Upper Bound (iFUB) Algorithm, Spid, Degree Distribution, Path Length, Component Size, Clustering Coefficient and Degeneracy, Friends-of-Friends, Degree Assortativity, Login Correlation, Effects of Age, Gender and Country of Origin.
Module V (10 Hours)
Link Analysis: Search Engine – Search engine architecture, Crawling, Storage, Indexing, Ranking, HITS Algorithm, Page rank algorithm, Random walk, SALSA

Algorithm, Bayesian Algorithm; Google - Google architecture, Data Structures, Crawling, Searching, Web Spam Pages.

Textbooks.

1. Social Networks and the Semantic Web, Peter Mika, Springer, 2007. (For Modules 1, 2 & 3)
2. Practical Social Network Analysis with Python, Krishna Raj P. M., Ankith Mohan, K. G. Srinivasa, Springer, 2018. (For Modules 4 & 5)

References

1. Social Network Analysis, John Scott, SAGE Publications, 4th Edition (2017)
2. Social Network Analysis - Interdisciplinary Approaches and Case Studies, Xiaoming Fu, Jar-Der Luo and Margarete Boos, CRC Press (2017)
3. Handbook of Social Network Analysis, John Scott and Peter J. Carrington, SAGE Publications (2011)
4. Social Network Analysis - Methods and Applications, Stanley Wasserman and Katherine Faust, Cambridge University Press (2012)

Web - References

1. https://onlinecourses.nptel.ac.in/noc20_cs78/preview
2. https://www.coursera.org/learn/social-network-analysis
3. https://www.coursera.org/learn/python-social-network-analysis

Course Contents and Lecture Schedule

No	**Topic**	**No. of Lectures**
1	**Module 1**	**9 Hours**
1.1	The Semantic Web, Limitations of the current Web	1
1.2	The semantic solution	1
1.3	Development of the Semantic Web	1
1.4	The emergence of the Social Web	1
1.5	Social Network Analysis	1
1.6	Development of Social Network Analysis	1
1.7	The global structure of networks	1
1.8	The macro-structure of social networks	1
1.9	Personal networks	1
2	**Module 2**	**8 Hours**
2.1	Electronic sources for network analysis, Electronic discussion networks	1
2.2	Blogs and online communities	1

2.3	Web-based networks	1
2.4	Knowledge Representation on the Semantic Web	1
2.5	Ontologies and their role in the Semantic Web	1
2.6	Ontology languages for the Semantic Web, The Resource Description Framework (RDF) and RDF Schema	1
2.7	The Web Ontology Language (OWL), Comparison of Ontology languages with the Unified Modelling Language (UML)	1
2.8	Comparison to the Entity/Relationship (E/R) model and the Relational model, Comparison to the Extensible Markup Language (XML) and XML Schema	1
3	**Module 3**	**8 Hours**
3.1	Modelling and aggregating social network data, Network data representation	1
3.2	Ontological representation of social individuals	1
3.3	Ontological representation of social relationships	1
3.4	Aggregating and reasoning with social network data	1
3.5	Representing identity	1
3.6	Notion of equality, Determining equality	1
3.7	Reasoning with instance equality	1
3.8	Evaluating smushing	1
4	**Module 4**	**10 Hours**
4.1	Graph Structure of the Web	1
4.2	Breadth First Search (BFS) Algorithm	1
4.3	Strongly Connected Components (SCC) Algorithm, Weakly Connected Components (WCC) Algorithm	1
4.4	In-degree and out- degree distributions, Connected Components	1
4.5	Zipf’s Law	1
4.6	Rank Exponent R, Out-Degree Exponent O, Hop Plot Exponent H, Eigen Exponent E	1
4.7	Graph Structure of Facebook: HyperANF Algorithm	1
4.8	Iterative Fringe Upper Bound (iFUB) Algorithm, Spid, Degree Distribution, Path Length	1
4.9	Component Size, Clustering Coefficient and Degeneracy, Friends-of-Friends	1
4.10	Degree Assortativity, Login Correlation, Effects of Age, Gender and Country of Origin	1
5	**Module 5**	**10 Hours**
5.1	Link Analysis: Search Engine – Search engine architecture	1
5.2	Crawling, Storage, Indexing	1

5.3	Ranking, HITS Algorithm	1
5.4	Page rank algorithm	1
5.5	Random walk	1
5.6	SALSA Algorithm	1
5.7	Bayesian Algorithm	1
5.8	Google - Google architecture	1
5.9	Data Structures, Crawling, Searching	1
5.10	Web Spam Pages	1

INT MCA SEMESTER X

INT MCA SEMESTER X	
Course No	**Course**
20INMCA502	Comprehensive Viva
20INMCA504	Seminar
20INMCA506	Main Project

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
20INMCA502	COMPREHENSIVE VIVA	VIVA	-	-	-	6

Preamble: Comprehensive Viva intends to assess the knowledge gained by a student in the core courses of this programme and to make the student aware of his/her knowledge level and where he/she stands after completing this programme. This course will help the student in preparing for comprehensive examinations and improve the confidence in answering questions in objective mode.

Prerequisite: Thorough knowledge in all the courses he/she learned during this programme.

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

CO No.	Course Outcome (CO)	Bloom's Category Level
CO 1	Articulate the concepts in the core courses learned through this programme.	Level 2: Understand
CO 2	Attend technical interviews with confidence.	Level 2: Understand
CO 3	Interpret questions and answer them with clarity.	Level 2: Understand
CO 4	Make use of the concepts learned through this programme in future.	Level 3: Apply

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3		2	2		2		3			
CO 2	3	3	1	2	3	2	3		3			
CO 3	1	2				2	2		3			
CO 4	3	2	3	2	2	3	3		2			

Mark distribution

Total Marks	CIE	ESE
100	-	100

Guidelines:

- Comprehensive viva shall be conducted within the first 20 days of the fourth semester.

- Viva shall be conducted by a panel of examiners consisting of:
    1. Head of the department
    2. A senior faculty in the department
    3. External examiner appointed by the university

- Viva shall be conducted for each student for a minimum of 20 minutes

- Knowledge level of the student shall be assessed on the following topics.

    - 20MCA105 - Advanced Data Structures
    - 20MCA107 - Advanced Software Engineering
    - 20MCA102 - Advanced Database Management Systems
    - 20MCA201 - Data Science & Machine Learning
    - 20MCA203 - Design & Analysis of Algorithms
    - Code snippets in Java or Python to solve simple problems.
    - Technologies used in the project work
    - Recent developments in the field of computer science.

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
20INMCA504	SEMINAR	SEMINAR	-	-	2	2

Preamble: This course intends to enable the students to gain knowledge in any of the technically relevant current topics on Computer Science or Information Technology, and to acquire confidence in presenting the topic and preparing a report.

Prerequisite: Nil

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

CO No.	Course Outcome (CO)	Bloom's Category Level
CO 1	Annotate the ideas presented in technical papers	Level 2: Understand
CO 2	Comprehend a concept by referring different technical documents	Level 2: Understand
CO 3	Prepare technical documents	Level 3: Apply
CO 4	Present a topic before an audience	Level 3: Apply
CO 5	Interact with the audience	Level 2: Understand

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3	1	3	2		3		3	2		2
CO 2	2	3	1	3	2		3		3	2		2
CO 3	2		1	2	3	2	3		3	2		2
CO 4	2	2			3	3			3		2	
CO 5	2	2			3	3			3		2	

Mark distribution

Total Marks	CIE	ESE
50	50	-

Assessment Criteria

Scope and relevance of topic	20%
Quality of presentation slides	10%
Presentation skills	30%
Knowledge in the topic	20%
Report	20%

Marks Division

Evaluation by Faculty Guide	20 Marks
Evaluation by the Faculty Committee	30 Marks
Total	**50 Marks**

Guidelines:

- Students shall conduct detailed study on a technically relevant current topic in Computer Science / Information Technology under the supervision of a Faculty Guide and present it as a seminar at the end of the study.
- The study may be conducted on
    - articles published in reputed journals/conference proceedings
    - recent development in Computer Science / Information Technology
    - recent research and development activity in a research lab
    - latest software tool or framework
- Students shall submit an abstract on identified topic and get prior approval from the Faculty Guide before the study begins.
- The student shall submit a seminar report, based on the study and their findings. The report shall not be a reproduction of original paper or manual.
- The study and its findings shall be presented in the class taking a duration of 15-20 minutes.
- LaTeX or an equivalent tool shall be used for preparing Presentations and Seminar Report.
- Students shall be encouraged to publish their study in journals and due credit shall be given to such students.

- A committee of three senior faculty members shall constituted by the head of the department and the seminar presentation shall be evaluated by that committee.

CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
20INMCA506	MAIN PROJECT	PROJECT	-	-	27	12

Preamble: This project work aims to enable the students to apply the software engineering principles on a real software project, to make the students familiar with the stages of a deployment pipeline and to develop a software product using the latest software development methodology.

Prerequisite: Knowledge in software engineering principles and programming skills.

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

CO No.	Course Outcome (CO)	Bloom's Category Level
CO 1	Identify a real-life project which is useful to society / industry	Level 2: Understand
CO 2	Interact with people to identify the project requirements	Level 3: Apply
CO 3	Apply suitable development methodology for the development of the product / project	Level 3: Apply
CO 4	Analyse and design a software product / project	Level 4: Analyse
CO 5	Test the modules at various stages of project development	Level 5: Evaluate
CO 6	Build and integrate different software modules	Level 6: Create
CO 7	Document and deploy the product / project	Level 3: Apply

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3	3	3	1	2	3	3	3	3	3	3
CO 2	2	3	2	3	2	3	2	1	3	2	3	
CO 3	3	3	3	3	3	1	3	3	1		2	
CO 4	3	3	3	3	3		3	3	1	1	2	
CO 5	3	3	3	3	3		2	3			1	
CO 6	3	3	3	3	3		3	3		2	3	3
CO 7	1	1	3	3	3	2	3	3	2	1	2	

Mark distribution

Total Marks	CIE	ESE
100	70	30

Marks Division

Continuous evaluation by Supervisor, Guide(s) and Scrum Master	30 Marks (Internal)
Evaluation by the Project Assessment Board	40 Marks (Internal)
Evaluation by the External expert	30 Marks (External)
Total	**100 Marks**

Guidelines:

- Students shall identify Real-Life Projects which are relevant and useful to the society or industry.

- The project shall be an individual project and must be done in-house. The student has to spend time in the lab for the project work. Attendance as per MCA regulations is applicable for submitting the project for final evaluation.

- However, in exceptional cases students shall be given permission to work on the project outside the campus and at the industry premises if the organization offering the project belongs to anyone of the following categories.
    - CMM Level 5 Certified Company
    - Publicly listed company in India
    - National Research Institute
    - Central / State Government Department
    - Project funded by the Central / State Government Agency

- In such cases, the student is required to produce a letter from the organisation before starting the project and a committee constituted by the head of the department shall make the decision on permission. Industries and training institutes that offer project work for a fee shall not be permitted.

- Students shall submit project synopsis and get prior approval from the Project (Faculty) Supervisor before the project work begins.

- If there is a customer for the project then he/she will be the Product Owner (External Guide) and a faculty from the department will be the Internal Guide. If there is no such customer then the Internal Guide himself/herself shall act as the Product Owner.

- A faculty / technical staff shall act as the Scrum Master to continuously monitor the project development. Periodic meetings, of less than 15 minutes, at the convenience of the Scrum Master are to be highly encouraged. Ensure such meetings occur once in three days.

- The student shall maintain a Scrum Book (Rough Record) which has to be divided into 4 parts – (i) Product Backlog (ii) Database & UI Design (iii) Testing & Validation and (iv) Details of Versions. Make dated entries in the corresponding part at regular intervals. The corrections and comments from Product Owner and Scrum Master should be clearly indicated with the Date.

- Test Driven Development methodology may be practiced for the project development. BugZilla, BackLog or any such tool may be used for Bug Tracking.

- Git shall be used for Version Control and Git commit history may be verified as part of project evaluation .

- LaTeX or an equivalent tool shall be used for preparing Presentations and Project Report.

- Students shall be encouraged to publish their work in journals and due credit shall be given to such students.

- For the externally done projects, periodic confidential progress report and attendance statement shall be collected from the External Guide and be reviewed by the Project Supervisor.

- Set a sprint as two weeks, ensure biweekly reviews. A review shall not exceed 30 minutes. A demo to the Product Owner (Project Guide) is mandatory in every review.

- Interim evaluations of the project's progress shall be conducted by a Project Assessment Board as part of internal assessment. Two such evaluations are desirable. Scrum reviews shall not be sacrificed for such presentations.

- The Project Assessment Board shall be constituted by the Head of the Department with the following five members.

  Chairman:

  1. Head of the Department

  Members:

2. Project supervisor/s of the student
3. One faculty member from the Department
4. One faculty member from a sister Department
5. An external expert, either from an academic/research institute or Industry. (For the externally done projects, the external guide shall be invited as external expert.)

- At the end of the semester, two evaluations shall be there on the entire project development activities. First an internal evaluation by the Project Assessment Board and second an external evaluation by an External Examiner.

- An External Examiner either from an academic institute or industry shall be appointed by the University for the External Evaluation.

Week	Schedule
(May be scheduled inline with the KTU academic calendar)	
1	Selection of Topic, Submission of project synopsis and getting approval Meeting of Development Team including Scrum Master with Product Owner (Project Guide)
2	Commencement of the Project.
4	First Sprint release and Scrum Review by the Product Owner (Project Guide)
6	Second Sprint release and Scrum Review by the Project Guide First interim evaluation by the Project Assessment Board
8	Third Sprint release and Scrum Review by the Project Guide
10	Fourth Sprint release and Scrum Review by the Project Guide
11	Second interim evaluation by the Project Assessment Board
12	Fifth Sprint release and Scrum Review by the Project Guide
13	Submission of project report, with Scrum Book Final project presentation Evaluation by the Project Assessment Board
14	Final evaluation by the External Examiner.