

SEMESTER – I

20MCA101	MATHEMATICAL FOUNDATIONS FOR COMPUTING	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	

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 graph theory, set theory and statistics.

Prerequisite: A basic course in set theory and statistics.

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

CO 1	Understand mathematical reasoning in order to read, comprehend and construct mathematical arguments
CO 2	Count or enumerate objects and solve counting problems and analyze algorithms
CO 3	Solve problems in almost every conceivable discipline using graph models
CO 4	Solve the linear system of equations and Calculate the eigen values and eigen vectors of matrices.
CO 5	Apply the principles of correlation and regression in practical 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	3	3			3					
CO 2	3	3	3	3			3					
CO 3	3	3	3	3			3					
CO 4	3	3	3	3			3					
CO 5	3	3	3	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 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 equivalence relation with suitable example. (K1)
2. Write Warshall's algorithm. Use to find the transitive closure of the relation
 $\{(1,3), (3,2), (2,4), (3,1), (4,1)\}$ on $(1,2,3,4)$ (K2)
3. Let $f, g: \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = x+1$, $g(x) = 2x^2+3$, find $f \circ g$ and $g \circ f$. Is $f \circ g = g \circ f$? (K3)



Course Outcome 2 (CO2)

1. Solve the linear Diophantine equation $24x+138y = 18$ (K5)
2. Find the GCD (12378,3054) (K3)
3. Solve $a_{n+2}- 4a_{n+1}+3a_n= -200, n \geq 0$ given that $a_0= 3000, a_1=3300$ (K5)

Course Outcome 3(CO3):

1. Define Hamilton cycle and Euler circuit with example. (K1)
2. Show that $K_{3,3}$ is non-planar. Define planar graph. State Kuratowski's theorem. (K4)
3. Prove that a connected graph G is an Euler graph if all vertices of G are of even degree. (K4)

Course Outcome 4 (CO4):

1. Find the rank of the matrix $\begin{bmatrix} 0 & 3 & 4 \\ -3 & 0 & -5 \\ -4 & 5 & 0 \end{bmatrix}$ (K3)
2. Find the Eigen values and Eigen vectors of $\begin{bmatrix} 4 & 2 & -2 \\ 2 & 5 & 0 \\ -2 & 0 & 3 \end{bmatrix}$ (K3)
3. Find out what type of conic sections the quadratic form $Q = 17x_1^2 - 30x_1x_2 + 17x_2^2 = 128$ represents and transform it into principal axes form (K3)

Course Outcome 5 (CO5):

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

Syllabus

Module 1

Sets, Set Operations, Relations, Classification of relations, Equivalence Relations, Closures of Relations, Matrix Representation of Relations, Partial Ordering, n-ary Relations, Functions.



Module 2

Division Algorithm, GCD, Primes, Euclidean Algorithm, Congruences, Properties of Congruences, Solutions of Linear Congruences.

First Order Linear Recurrence Relation, Second Order Linear Homogeneous Recurrence Relations with Constant coefficients, Non Homogeneous Recurrence Relation.

Module 3

Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Directed Graph, Multigraph, Connected graph, Euler circuit and trail, Planar and Non-planar Graphs.

Module 4

Linear system of equations, coefficient matrix, augmented matrix, Gauss elimination method and back substitution, elementary row operations, row equivalent systems, Gauss elimination- three possible cases, Row Echelon form and information from it, Linear independence- rank of a matrix. Solution of linear system, fundamental theorem of non- homogeneous linear system (without proof). Homogeneous linear system (theory only), Matrix eigen value problem- determination of eigen values and eigen vectors, Basis of eigen vectors- diagonalization of matrix- Quadratic form- principle axis theorem (without proof).

Module 5

Bivariate data – Scatter Diagram – Interpretation of the nature and degree of relation using scattered diagram - Curve fitting – Principle of least squares – fitting a straight line – fitting a parabola – linear correlation and regression – Karl's Pearson's Coefficient of Correlation – Spearman's rank correlation coefficient (problems based on the formula).

Text Books

1. David M. Burton, "Elementary Number Theory", McGraw-Hill, 7th Edition (2012).
2. Ralph P Grimaldi, "Discrete and Computational Mathematics: An applied introduction", Pearson Education, 5th Edition, (2007).
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th ed., Wiley.
4. Gupta S.C and Kapoor V .K, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons 11th edition.



Reference Books

1. C. Liu, "Elements of Discrete Mathematics: A Computer Oriented Approach", McGraw-Hill, 4th Edition (2012).
2. Jean-Paul Tremblay, "Discrete Mathematical Structures with applications to Computer science", McGraw-Hill, 1st Edition (2001).
3. Kenneth H. Rosen, "Discrete mathematics and its applications", McGraw-Hill, (7th Edition), (Smartbook available).
4. Marty Lewinter, Jeanine Meyer, "Elementary Number Theory with Programming", Wiley- Blackwell (2015).
5. David S. Moore and George P. McCabe, "Introduction to practice of statistics", W.H. Freeman & Company, 5th Edition (2005).
6. Douglas C. Montgomery and George C. Runger, "Applied Statistics and Probability for Engineers", Wiley India, 5th Edition (2012).
7. Veerarajan T, "Probability and Random Process", 3rd Edition, Tata McGraw-Hill (2002)
8. G. Jay Kerns, "Introduction to Probability and Statistics Using R", Chapman & Hall (2010).
9. B.S Grewal. Higher Engineering Mathematics, Khanna Publishers, New Delhi.

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.
Sets, Set Operations	2
Relations, Classification of relations, Equivalence Relations	2
Closures of Relations, Matrix Representation of Relations, Partial Ordering, n-ary Relations	3
Functions	2



Module 2	9 hrs.
Division Algorithm, GCD, Primes, Euclidean Algorithm	2
Congruences, Properties of Congruences, Solutions of Linear Congruences	2
First Order Linear Recurrence Relation	1
Second Order Linear homogeneous Recurrence Relations with Constant coefficients	2
Non Homogeneous Recurrence Relation	2
Module 3	8 hrs.
Graphs and Graph Models, Graph Terminology and Special Types of Graphs	1
Representing Graphs and Graph Isomorphism, Connectivity	2
Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs	2
Directed Graph, Multigraph, Connected graph	1
Euler circuit and trail, Planar and Non-Planar Graphs	2
Module 4	11 hrs.
Linear system of equations, coefficient matrix, augmented matrix, Gauss elimination method and back substitution, elementary row operations, row equivalent systems	2
Gauss elimination- three possible cases, Row Echelon form and information from it	2
Linear independence- rank of a matrix. Solution of linear system, fundamental theorem of non- homogeneous linear system (without proof). Homogeneous linear system (theory only), fundamental theorem of non- homogeneous linear system (without proof). Homogeneous linear system (theory only)	3
Matrix eigen value problem- determination of eigen values and eigen vectors, Basis of eigen vectors	2
diagonalization of matrix, Quadratic form-principle axis theorem (without proof).	2
Module 5	8 hrs.
Bivariate data – Scatter Diagram – Interpretation of the nature and degree of relation using scattered diagram	2
Curve fitting – Principle of least squares – fitting a straight line – fitting a parabola	2
linear correlation and regression – Karl's Pearson's Coefficient of Correlation	2
Spearman's rank correlation coefficient	2



20MCA103	DIGITAL FUNDAMENTALS & COMPUTER ARCHITECTURE	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble:

The primary aim of this course is to understand the fundamentals behind the digital logic design and gain the experience to design digital circuits and systems. Students should also acquire some understanding and appreciation of a computer system's functional components, their characteristics, performance and interactions. They need to understand the computer architecture in order to make best use of the software tools and computer languages they use to create programs.

Prerequisite: NIL

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

CO 1	Apply the basics of digital electronics to design and realize simple combinational logic circuits
CO 2	Apply the digital electronics principles to design sequential logic circuits.
CO 3	Understand the different design features of computer architecture, Five key components of a computer, processor and memory making technologies, addressing modes & instruction formats.
CO 4	Understand Processor logic design conventions and data path, pipelining and hazards, I/O organization, Interrupts and direct memory access
CO 5	Understand and different types of memories - RAM, ROM, Cache memory, virtual memory etc. Apply the different memory design techniques.
CO 6	Understand the concept of single board computers like Arduino, Raspberry Pi etc. and apply the same in practical 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	3	3	2	1	-	1	-	-	-	-	-	-
CO 2	3	3	2	1	-	1	-	-	-	-	-	-
CO 3	1	1	-	1	-	1	-	-	-	-	-	-
CO 4	1	1	-	-	-	1	-	-	-	-	-	-
CO 5	2	2	1	1	-	1	-	-	-	-	-	-
CO 6	1	1	2	-	2	2	2	2	2	-	2	2



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 2 sub-divisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Minimize the Boolean Expression $f(A,B,C) = \sum m(1,3,5,6,7)$ using K-map.
2. Convert the decimal number $3.257 * 10^4$ into single precision floating point binary representation
3. Express -31 in sign magnitude, 1's complement and 2's complement notations



Course Outcome 2 (CO2)

1. Explain J-K flipflop with its truth table
2. Design an asynchronous decade counter.
3. Describe the working of a Parallel in Serial Out register.

Course Outcome 3 (CO3):

1. Describe the key components of a computer.
2. Define addressing mode. List 5 addressing modes with examples.
3. Differentiate between fixed length encoding and variable length encoding.

Course Outcome 4 (CO4):

1. Define pipeline, describe how pipeline improves the performance of the machine.
2. Explain how interrupts from multiple devices handled?
3. List different types of pipeline hazards with examples.

Course Outcome 5 (CO5):

1. Illustrate different cache mapping techniques with neat diagrams.
2. Discuss about Read Only Memories
3. Design $2M \times 32$ memory module using $512K \times 8$ static memory chips.

Course Outcome 6 (CO6):

No questions for university examination, for internal assessments practical assignment for configuring a PC / arduino or raspberry and programming assignments using HDL like Verilog or VHDL can be given.



Model Question paper

Reg No.:		Name:	_____
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY			
FIRST SEMESTER M.C.A.DEGREE EXAMINATION, MODEL QUESTION PAPER			
Course Code: 20MCA103			
Course Name: DIGITAL FUNDAMENTALS & COMPUTER ARCHITECTURE			
Max. Marks: 60			Duration: 3 Hours
PART A			
<i>Answer all questions, each carries 3 marks.</i>			Mar ks
1	Represent +45,-45 in 1's complement and 2's complement form.		(3)
2	Implement a full adder using 8:1 MUX		(3)
3	How could you convert RS flip flop to D flip flop?		(3)
4	What is meant by modulus of a counter? Realize a mod-8 synchronous counter.		(3)
5	Suppose we have two implementations of the same instruction set architecture. Computer A has a clock cycle time of 250 ps and a CPI of 2.0 for some program, and computer B has a clock cycle time of 500 ps and a CPI of 1.2 for the same program. Which computer is faster for this program and by how much?		(3)
6	Describe about little endian and big endian byte ordering.		(3)
7	Explain 4 stage pipelining with a diagram.		(3)
8	Differentiate between memory mapped I/O and Isolated I/O		(3)
9	What is static RAM ?		(3)
10	Define temporal locality and spatial locality.		(3)
PART B			
<i>Answer any one question from each module. Each question carries 6 marks.</i>			
Module I			
11	Explain about single precision floating point representation with an example		(6)
OR			
12	Minimize the Boolean expression $f(A,B,C,D)=\Sigma m(1,5,6,7,9,15)+d(2,3,11,13)$ using Karnaugh map and realize it using NAND gates.		(6)



Module II		
13	Demonstrate the working of a JK flip flop. How does it eliminate the invalid condition in SR flip flop? List out its applications.	(6)
OR		
14	Design a mod-12 asynchronous counter.	(6)
Module III		
15	Explain the five classic components of a computer with diagram.	(6)
OR		
16	Describe the code sequence of $C=A+B$ in different types of instruction set architecture.	(6)
Module IV		
17	Draw a single datapath representation for memory instructions and R-type instructions	(6)
OR		
18	What is Direct Memory Access? Explain two types of bus arbitration schemes	(6)
Module V		
19	Elaborate the various cache memory mapping techniques with an example for each.	(6)
OR		
20	Explain the internal organization of memory chips and design a 1K*1 memory chip using decoder.	(6)

Syllabus

Module I (11 Hours)

Representation of signed numbers – 1's complement and 2's complement ,Logic gates – AND - OR – NOT - NAND- NOR - XOR , Boolean algebra - Basic laws and theorems , Boolean functions - truth table, Standard forms of Boolean Expressions – Sum of Products and Product of Sums - minimization of Boolean function using Karnaugh map method - Realization using logic gates, Floating point numbers
Combinational Circuits - Half adder - Full Adder- Decoder -Encoder- Multiplexer – Demultiplexer

Module II (10 Hours)

Sequential circuit - Clocking, Flip flops - SR – JK- D -T flip flops, Counters - Synchronous and asynchronous counters - UP/DOWN counters , Registers - Serial in serial out - Serial in parallel out - Parallel in serial out - Parallel in parallel out registers



A practical assignments may be given in configuring a PC / configuring arduino - Implementing simple programs for blinking an LED - Input from an external switch - fading an LED - serial monitor and debugging / installing & configuring Raspberry pi.

Module III (10 Hours)

Computer abstractions and technology - Introduction, Computer architecture -8 Design features, Application program - layers of abstraction, Five key components of a computer, Technologies for building processors and memory, Performance, Instruction set principles – Introduction, Classifying instruction set architectures, Memory addressing, Encoding an instruction set.

Module IV (9 Hours)

The Processor - Introduction, Logic design conventions, Building a datapath, A simple implementation scheme, An overview of pipelining - Pipelined datapath and control - Structural hazards - Data hazards - Control hazards

I/O organization - Accessing I/O devices, interrupts - handling multiple devices, Direct memory access

Programming assignments may be given in any HDL like Verilog or VHDL to create gate level/ Dataflow/Behavioural level models of gates, multiplexers, adders, flip-flops, registers etc. No detailed teaching of HDL is necessary. The students can be given a basic tutorial write up on gate level modelling.

Module V (8 Hours)

The Memory System – basic concepts, semiconductor RAM memories - organization – static and dynamic RAM, Structure of larger memories, semiconductor ROM memories, Speed, Size and cost ,Cache memory – mapping functions – replacement algorithms , Virtual memory – paging and segmentation.

Text Books

1. Floyd, “*Digital Fundamentals*”, Pearson Education, 10th Edition (2011).(Module 1 & 2)
2. J. Hennessy and D. Patterson, “*Computer Organization and Design: The Hardware/Software Interface*”, 5th Edition. (Module 3 & 4)
3. J. Hennessy and D. Patterson, “*Computer Architecture, A quantitative approach*”, 5th Edition. (Module 3)
4. Hamacher, Vranesic & Zaky, “*Computer Organization*” (5th Ed), McGraw Hill. (Module 4 & 5)



References

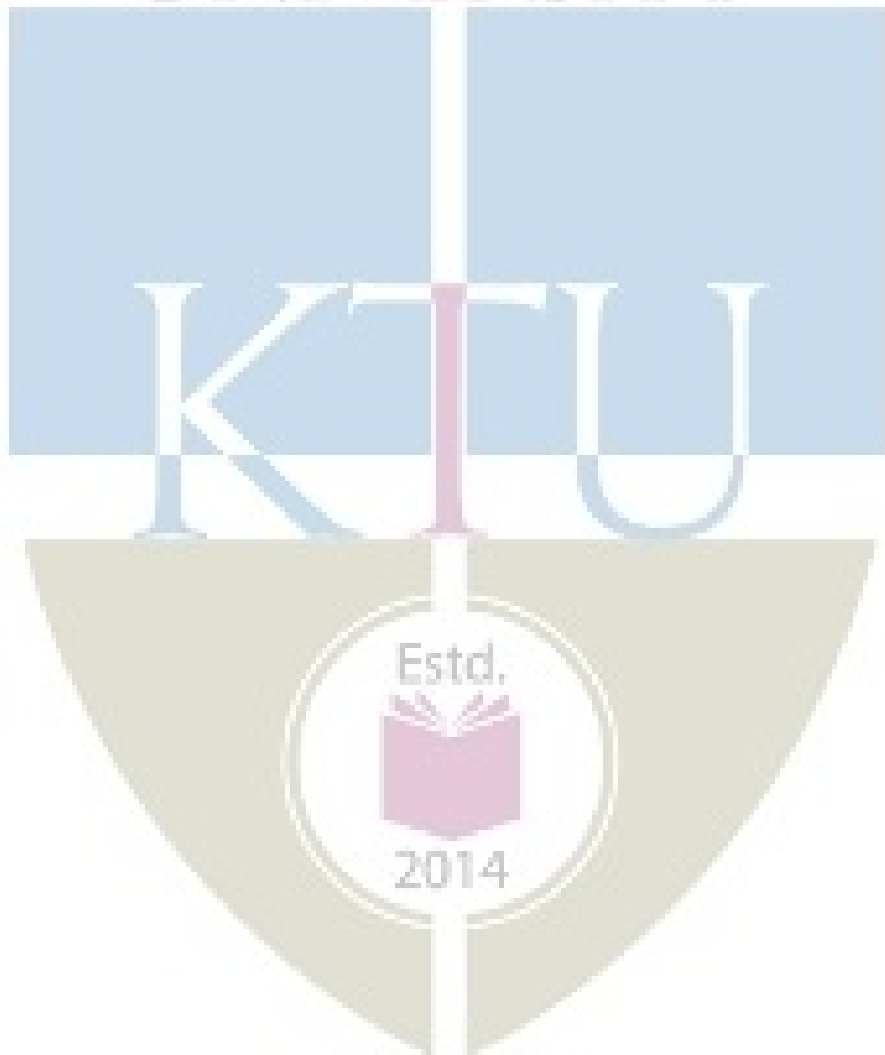
1. William Stallings, “*Computer Organization and Architecture: Designing for Performance*”, Pearson, 9/e, 2013.
2. R.P.Jain, ”*Modern Digital Electronics*”, McGraw Hill.,Fourth Edition,2009
3. Mano, “*Digital Design : With an Introduction to Verilog HDL*”, Pearson Education, 5th Edition (2014)

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
	Module 1	11
1	Representation of signed numbers – 1's complement and 2's complement, Logic gates - AND, OR, NOT, NAND, NOR, XOR	2
1.1	Boolean algebra - Basic laws and theorems, Boolean functions - truth table.	2
1.2	Standard forms of Boolean Expressions – Sum of Products and Product of Sums - minimization of Boolean function using Karnaugh map method - Realization using logic gates.	2
1.3	Floating point numbers	1
1.4	Combinational Circuits - Half adder - Full Adder	2
1.5	Decoder – Encoder - Multiplexers – Demultiplexers	2
	Module 2	10
2.1	Sequential circuit - Clocking, Flip flops -RS – JK- D -T flip flops	3
2.2	Counters - Synchronous and asynchronous counters - UP/DOWN counters.	3
2.3	Registers - Serial in serial out - Serial in parallel out - Parallel in serial out - Parallel in parallel out registers	2
2.4	Introduction to arduino and raspberry pi	2
	Module 3	10
3.1	Computer abstractions and technology - Introduction, Computer architecture	4
3.2	Technologies for building processors and memory, Performance, instruction	4
3.3	Classifying instruction set architectures, Memory addressing, Encoding an	2
	Module 4	9
4.1	The Processor - Introduction, Logic design conventions, Building a datapath, A simple implementation scheme.	3
4.2	An Overview of pipelining - Pipelined datapath and control - Structural hazards - Data hazards - Control hazards	3
4.3	I/O organization - Accessing I/O devices, Interrupts - Handling multiple devices- Direct memory access	3



No	Topic	No. of Lectures
	Module 5	8
5.1	The memory system – basic concepts, semiconductor RAM memories, organization	2
5.2	Static and dynamic RAM, Structure of larger memories, semiconductor ROM memories, Speed, size and cost	2
5.3	Cache memory – mapping functions – replacement algorithms,	2
5.4	Virtual memory – paging and segmentation.	2



20MCA105	ADVANCED DATA STRUCTURES	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: A graduate course in Computer Applications should give due exposure to the recent developments. Since Data structures is a central pillar of any program on Computer Science/ Applications, this course is designed to build upon the knowledge acquired at the undergraduate level and familiarise students with a bunch of modern data structures which are quite useful to solve, in the most effective manner, the modern, real life problems.

Prerequisite: Basic Data Structures

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

CO 1	Remember the Basic Data Structures and understand the Set Data Structure and its implementation.
CO 2	Understand Advanced Tree Structures for the design of efficient algorithms
CO 3	Understand Advanced Heap Structures suitable for solving Computational problems involving Optimisation and analysing these data structures using amortised analysis.
CO 4	Understand Advanced Graph algorithms suitable for solving advanced computational problems
CO 5	Understand the basic operation of Blockchaining along with the data structures used in it and the challenges in Blockchain 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	2		1							
CO 2	2	2	3	2	1		1					
CO 3	2	3	3	2	1		1					
CO 4	3	3	2	1	2		1					
CO 5	3	2	2	2	3		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 2 sub-divisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

- Review the basic data structures such as array, linked list, stack, queue etc.
- Understand the set data structure and its implementation
- Understand the Disjoint set data structure
- Learn the basics of Amortised Analysis and its important types



Course Outcome 2 (CO2)

- (a) Understand Balanced Binary Search Trees and the idea of Rotations
- (b) Understand Red Black Trees and their operations
- (c) Understand B Trees and operations
- (d) Obtain a basic awareness of Splay Trees and Suffix Trees.

Course Outcome 3(CO3):

- (a) Understand the concepts of Mergeable Heaps and their operations.
- (b) Understand the Binomial Heaps and its operations along with their amortised analysis
- (c) Understand the Fibonacci Heaps and its operations along with their amortised analysis

Course Outcome 4 (CO4):

- (a) Understand Graphs traversal techniques and topological sorting using these
- (b) Understand the algorithms for finding the strongly connected components and biconnected components in a graph.
- (c) Understand the Prim's and Kruskal's algorithms and their implementation
- (d) Understand the Dijkstra's Single Source Shortest path algorithm and implementing it using Advanced Heap Structures.

Course Outcome 5 (CO5):

- (a) Understand a basic overview of the Blockchain system architecture.
- (b) Understand the Blockchain Data Structures and Data Types.
- (c) Understand the problems and challenges in Blockchain data.

Model Question paper

Reg No.:	_____	Name:	_____
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY			
FIRST SEMESTER M.C.A.DEGREE EXAMINATION, MODEL QUESTION PAPER			
Course Code: 20MCA105			
Course Name: ADVANCED DATA STRUCTURES			
Max. Marks: 60			Duration: 3 Hours
PART A			



<i>Answer all questions, each carries 3 marks.</i>		Marks
1	What is meant by Hashing ?	(3)
2	How does Amortised Analysis differ from Average Case Analysis?	(3)
3	What is meant by Balanced Binary Search Tree? Give an example for a balanced binary search tree and an unbalanced one.	(3)
4	What is meant by Suffix Tree?	(3)
5	Give a valid Binomial heap with nodes 3,5,7,10,12,15.	(3)
6	Explain how fibonacci heaps are implemented?	(3)
7	What do you mean by Minimum Costs Spanning Tree?	(3)
8	What is meant by Strongly Connected Components? Illustrate with an example	(3)
9	What is meant by Block Chaining?	(3)
10	What is Contract Data ?	(3)
PART B		
<i>Answer any one question from each module. Each question carries 6 marks.</i>		
Module I		
11	How do you perform Amortised Analysis using Accounting method? Illustrate with Multipop Stack example.	(6)
OR		
12	Explain any three Hashing functions.	(6)
Module II		
13	What is meant by Red Black Tree? Explain how insertion is done in a Red Black Tree.	(6)
OR		
14	Give notes on B-Trees and Splay Trees.	(6)
Module III		
15	Explain how the Decrease-Key operation is performed on Binomial Heaps. What is the Amortised Cost of this operation?	(6)
OR		
16	Describe how the Delete-Key operation is performed in a Fibonacci heap? Illustrate with an example.	(6)
Module IV		
17	Explain the Breadth First Search algorithm with a suitable example.	(6)
OR		
18	Explain the Prim's algorithm with an example.	(6)



<i>Module V</i>		
19	Explain the Blockchain architecture in detail.	(6)
<i>OR</i>		
20	Explain the problems to be solved in Blockchain Data Analysis.	(6)

Syllabus

Module 1 [12 hrs]

Review of basic data structures- Array, linked list and its variants, Stack ,Queue and Trees

Set Data Structure:- Representation of sets, Set implementation using bit string.

Hashing :- Simple hash functions, Collision and Collision Resolution techniques

Amortised Analysis - Aggregate, Accounting and Potential Methods (using the examples Multipop Stack and Incrementing Binary Counter only)

Disjoint sets- representations, Union, Find algorithms

Module 2 [10 hrs]

Advanced Tree Structures:- Balanced Binary Search trees, Red-Black trees- Properties of Red Black trees, Rotations, Insertion, Deletion. B-Trees- Basic operations on B-Trees – Insertion and Deletion, Introduction to Splay Trees and Suffix Trees

Module 3 [10 hrs]

Advanced Heap Structures:- Mergeable Heaps and operations on Mergeable Heaps. Binomial Heaps, Binomial Heap operations and Analysis, Fibonacci Heaps, Fibonacci Heap operations and Analysis.

Module 4 [14 hrs]

Advanced Graph Structures : Representation of graphs, Depth First and Breadth First Traversals, Topological Sorting, Strongly connected Components and Biconnected Components Minimum Cost Spanning Tree algorithms- Prim's Algorithm, Kruskal' Algorithm,. Shortest Path Finding algorithms – Dijkstra's single source shortest paths algorithm

Module 5[8 hrs]

Blockchain Data Structure:- Blockchain Architecture, Blockchain Data Structures and Data types, Contract Data, Problems to be solved in Blockchain data analysis



Text Books

1. Cormen T.H., Leiserson C.E, Rivest R.L. and Stein C, *Introduction to Algorithms*, Prentice Hall India, New Delhi, 2004 [Modules 1 to 4]
2. Yang, Xiaojing, Jinshan Liu, and Xiaohe Li. "*Research and Analysis of Blockchain Data.*" *Journal of Physics: Conference Series*. Vol. 1237. No. 2. IOP Publishing, 2019.

Reference Books

1. Kleinberg, Jon, and Eva Tardos. *Algorithm design*. Pearson Education India, 2006.
2. Aho A.V., Hopcroft J.E., and Ullman J.D., *Data Structures and Algorithms*, Pearson Education, New Delhi, 1983.
3. Sahni S., *Data Structures, Algorithms, and Applications in C++*, Mc Graw Hill, Singapore, 1998.

Course Contents and Lecture Schedule

No	Topic	No. of Lecture Hours
1	Review of basic data structures	10Hrs
1.1	Array, Stack and Queue	
1.2	Linked list and its variants	
1.3	Representation of sets, Set implementation using bit string.	
1.4	Hashing – Simple hash functions	
1.5	Collision and Collision Resolution techniques	
1.6	Amortised Analysis	
1.7	Aggregate Method (Multipop Stack and Incrementing Binary Counter)	
1.8	Accounting Method (Multipop Stack and Incrementing Binary Counter)	
1.9	Potential Method (Multipop Stack and Incrementing Binary Counter)	
1.10	Disjoint sets- representations	
1.11	Union, Find algorithms	
2	Advanced Tree Structures	10Hrs
2.1	Balanced Binary Search trees	
2.2	Red-Black trees	
2.3	Properties of Red Black trees	
2.4	Rotations	
2.5	Insertion	



2.6	Deletion	
2.7	B-Trees	
2.8	Insertion and Deletion	
2.9	Splay Trees	
2.10	Suffix Trees	
3	Advanced Heap Structures	8Hrs
3.1	Mergeable Heaps	
3.2	Operations on Mergeable Heaps	
3.3	Binomial Heaps	
3.4	Binomial Heaps operations and Analysis	
3.5	Fibonacci Heaps	
3.6	Fibonacci Heap operations and Analysis.	
4	Advanced Graph Structures	12Hrs
4.1	Representation of graphs	
4.2	Depth First and Breadth First Traversals	
4.3	Topological Sorting	
4.4	Strongly connected Components	
4.5	Biconnected Components	
4.6	Minimum Cost Spanning Tree	
4.7	Prim's Algorithm	
4.8	Kruskal's Algorithm	
4.9	Dijkstra's single source shortest paths algorithm	
5	Blockchain Data Structure	8Hrs
5.1	Blockchain Architecture	
5.2	Blockchain Data Structures	
5.3	Blockchain Data types	
5.4	Contract Data	
5.5	Problems to be solved in Blockchain data analysis	



20MCA107	ADVANCED SOFTWARE ENGINEERING	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble:

Most of the programs on Computer Applications do not give due importance to teach Software Engineering in an Industry perspective. But this course, built upon the tools and techniques prevalent in Industry today, is supposed to make students Industry-ready.

Prerequisite: Programming proficiency in at least one of C, C++, Java, Python or PHP programming languages.

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

CO 1	Get a full view of the Software life cycle
CO 2	Gain a deep knowledge of Software Planning, Analysis and Design and Software Engineering Models
CO 3	Have a great comprehension of Coding Practices, Version Control using ‘git’ and Software Quality
CO 4	Acquire ample grasp of Design Patterns
CO 5	Get deeply familiarised with Software Testing and its automation
CO 6	Start using Agile Methodology
CO 7	Begin to apply CI/CD techniques in Software 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		2	2					3			1	1
CO 2		3	3					3				
CO 3					3				3	2	2	
CO 4			3		3							
CO 5					3					2	3	
CO 6					2			2	2		2	3
CO 7					3			1		2		



Assessment Pattern

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

- Understand the software development as an engineering process and its stages.
- Understand Software development lifecycle (SDLC).
- Understand software engineering models.
- Learn how to prepare software requirements specification, approaches and methodologies to prepare requirement specifications document.



Course Outcome 2 (CO2)

- (a) Understand writing industry-grade software programs, following style guides and coding standards.
- (b) Learn core concepts of software version control system and common operations with Git distributed version control system.
- (c) Understanding software quality concepts with respect to software requirement specifications document, what to conform to at various stages of SDLC.
- (d) Understand what to ensure at various stage of SDLC to ensure quality of developed software system.

Course Outcome 3(CO3):

- (a) Learn Object Oriented Programming concepts comprehensively.
- (b) Learn the concept of Design Patterns, category of patterns, and how to select appropriate design patterns.
- (c) Understand Unit testing concepts and xUnit architecture.
- (d) Learn Unit testing frameworks and writing unit testing for Java and one of PHP or Python.
- (e) Understand the concepts Continuous Integration and Continuous Delivery (CI/CD).

Course Outcome 4 (CO4):

- (a) Knowledge of Git distributed version control system to use in a product environment.
- (b) Knowledge of OOP paradigm and software Design Patterns to design the software system.
- (c) Knowledge of unit testing frameworks such as Junit, unittest, phpdbg for wiring units tests in a software production environment.
- (d) Knowledge of software testing CI/CD practices.

Course Outcome 5 (CO5):

- (a) Understand software testing concepts and principles.
- (b) Learn common approaches to ensure software quality through testing.
- (c) In-depth understanding of various types of testing methodologies.



- (d) Learn about testing automation and understand commonly used test automation types.
- (e) Learn to use Robot framework.

Course Outcome 6 (CO5):

- (a) Understand the concepts of Agile methodology.
- (b) Learn to use Scrum framework for implementing Agile methodology for executing a software development process.
- (c) Learn to monitor a software development project using a Scrum tool.

Course Outcome 7 (CO5):

- (a) Understand the concepts of Software Configuration Management.
- (b) Learn about build and deployment environments.
- (c) Understand the concepts of Continuous Integration and essential practices.
- (d) Understand the concepts of deployment automation and learn to use Ansible.

Model Question paper

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

First Semester MCA Degree Examination (R&S)

Course Code: 20MCA107

Course Name: ADVANCED SOFTWARE ENGINEERING

Total Marks: 60

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks. Marks

1. Why is Software Engineering important? (3)
2. What are the desired requirements of a good software engineering model? (3)
3. What is the purpose of a version control system? (3)
4. Explain the different ways to fix commits in Git (3)
5. What is anti-pattern? (3)
6. What is an abstract test? (3)
7. Distinguish between black box testing and white box testing. (3)
8. Draw a model Sprint Backlog for the login module of a simple web portal (3)



9. Write a short note on release candidate (3)
10. Differentiate continuous delivery and continuous deployment (3)

PART B

Required to answer one question from each module in full.

Each module carries 6 marks for either of the questions.

Module I

11. Prepare a basic Software Requirements Specification for Savings Bank accounts. (6)

OR

12. How is Use Case different from User Stories? Enlist the advantage of each. (6)

Module II

13. How do you create, switch and view branches in Git? explain how to merge commits between branches. (6)

OR

14. You have cloned a repository which was then modified by another developer. You make changes locally and try to execute push. What are the possible outputs? How will you solve the problems, if any? (6)

Module III

15. Explain the important design patterns. (6)

OR

16. When are assertions and expected error tests used in Unit tests? (6)

Module IV

17. Write down the scrum. (6)

OR

18. Differentiate Black box testing and White box testing. Give appropriate example for each for “only black box testing is possible” and “necessary to do white box testing” scenarios. (6)

Module V

19. Explain the strategy for implementing Continuous integration. (6)

OR



20. What is a deployment pipeline? Explain the anatomy of a deployment pipeline with a (6) neat diagram. Comment on the various stages of a deployment pipeline.

Syllabus

Module 1 [8 hrs]

Introduction to Software Engineering: What is Software Engineering, Characteristics of Software.

Life cycle of a software system: software design, development, testing, deployment, Maintenance.

Project planning phase: project objectives, scope of the software system, empirical estimation models, COCOMO, staffing and personnel planning.

Software Engineering models: Predictive software engineering models, model approaches, prerequisites, predictive and adaptive waterfall, waterfall with feedback (Sashimi), incremental waterfall, V model; Prototyping and prototyping models.

Software requirements specification, Eliciting Software requirements, Requirement specifications, Software requirements engineering concepts, Requirements modelling, Requirements documentation. Use cases and User stories.

Module 2 [10 hrs]

Programming Style Guides and Coding Standards; Literate programming and Software documentation; Documentation generators, Javadoc, phpDocumentor.

Version control systems basic concepts; Concept of Distributed version control system and Git; Setting up Git; Core operations in Git version control system using command line interface (CLI): Clone a repository; View history; Modifying files; Branching; Push changes, Clone operation, add, commit, log, diff commands, conflict resolution. Pushing changes to the master; Using Git in IDEs and UI based tools.

Software Quality: Understanding and ensuring requirements specification quality, design quality, quality in software development, conformance quality.

Module 3 [10 hrs]

OOP Concepts; Design Patterns: Basic concepts of Design patterns, How to select a design pattern, Creational patterns, Structural patterns, Behavioural patterns. Concept of Anti-patterns.

Unit testing and Unit Testing frameworks, The xUnit Architecture, Writing Unit Tests using at least one of Junit (for Java), unittest (for Python) or phpdbg (PHP). Writing tests with Assertions, defining and using Custom Assertions, single condition tests, testing for expected errors, Abstract test.



Module 4 [10 hrs]

Concepts of Agile Development methodology; Scrum Framework.

Software testing principles, Program inspections, Program walkthroughs, Program reviews; Blackbox testing: Equivalence class testing, Boundary value testing, Decision table testing, Pairwise testing, State transition testing, Use-case testing; White box testing: control flow testing, Data flow testing.

Testing automation: Defect life cycle; Regression testing, Testing automation; Testing non-functional requirements.

Module 5[10 hrs]

Software Configuration Management: Using version control, Managing dependencies, Managing software configuration, Managing build and deployment environments.

Continuous Integration: Prerequisites for continuous integration, Essential practices.

Continuous Delivery: Principles of Software delivery, Introduction and concepts.

Build and deployment automation, Learn to use Ansible for configuration management.

Test automation (as part of continuous integration), Learn to set up test automation cases using Robot Framework.

Notes

1. At the end of Module 1, conduct the following class work with appropriate evaluation points: Prepare Software Specification Document for a moderately complex process flow system (e.g. Broadband fault booking and resolution system covering technical, operational and commercial aspects, covering organizational and subscriber use cases).
2. At the end of Module 2, clone an open source project using Git and perform all based operations.

Reference Books

1. Philip A. Laplante, *What Every Engineer Should Know about Software Engineering*, CRC Press [Module 1]
2. Murali Chemuturi, *Mastering Software Quality Assurance: Best Practices, Tools and Technique for Software Developers*, J Ross Publishing [Module 2]
3. Ben Straub, Scott Chacon, *Pro Git*, 2nd Edition, Apress [Module 2]
4. Erich Gamma et. al., *Design Patterns: Elements of Reusable Object-Oriented Software*, Addison-Wesley [Module 3]
5. Vaskaran Sarcar, *Java Design Patterns: A Hands-On Experience with Real-World Examples*, Apress [Module 3]
6. Alistair Cockburn and Robert Cecil Martin, *Agile Software Development: The Cooperative Game (2nd edition)*, Addition Wesley [Module 4]



7. Ken Schwaber , *Agile Software Development with Scrum*, Pearson [Module 4]
8. Lisa Crispin, *Agile Testing: A Practical Guide for Testers and Agile Teams*, Addison Wesley
9. Paul Hamill, *Unit Test Frameworks*, O'Reilly Media [Module 4]
10. Glenford J. Myers, et. al., *The Art of Software Testing*, Wiley [Module 4, 5]
11. Lee Copeland, *A Practitioner's Guide to Software Test Design*, Artech House Publishers [Module 4, 5]
12. Jez Humble and David Farley, *Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation*, Pearson Education [Module 5]

Web-based Resources

1. *Git Handbook* <https://guides.github.com/introduction/git-handbook/> Retrieved 8 July 2020 [Module 2]
2. *Git User Manual* <https://mirrors.edge.kernel.org/pub/software/scm/git/docs/user-manual.html> Retrieved 8 July 2020 [Module 2]
3. *Introduction to Software Engineering/Quality* https://en.wikibooks.org/wiki/Introduction_to_Software_Engineering/Quality Retrieved 8 July 2020 [Module 2]
4. *Understanding software design patterns* <https://opensource.com/article/19/7/understanding-software-design-patterns> Retrieved 8 July 2020 [Module 3]
5. *The Scrum Guide* <https://www.scrumguides.org/docs/scrumguide/v2017/2017-Scrum-Guide-US.pdf> Retrieved 8 July 2020 [Module 4]
6. *unittest — Unit testing framework* <https://docs.python.org/3/library/unittest.html> Retrieved 8 July 2020 [Module 4]
7. What is CI/CD? <https://www.redhat.com/en/topics/devops/what-is-ci-cd> Retrieved 8 July 2020 [Module 5]

Course Contents and Lecture Schedule

No	Topic	No. of Lecture Hours
1	Software Engineering	
1.1	What is Software Engineering, Characteristics of Software Engineering	1
1.2	Life cycle of a software system	1
1.3	Project planning	1
1.4	Software Engineering Models	2
1.5	Software Requirements Specification	3
2	Industry Best Practices	
2.1	Programming style guides and coding standards	1
2.2	Software version control systems, basic concepts	1
2.3	Git distributed version control system, introduction	2
2.4	Common operations in Git	4



No	Topic	No. of Lecture Hours
2.5	Software quality, achieving	2
3	System Design Methodologies	
3.1	Object Oriented Programming	1
3.2	Software Design Patterns	4
3.3	Unit Testing concepts and xUnit architecture	1
3.4	Unit testing frameworks: Junit, unittest, phpdbg	2
3.5	Writing unit test code	2
4	Agile Development Methodology	
4.1	Agile Development methodology, introduction	2
4.2	Scrum framework	5
4.3	Automated testing	3
5	Continuous Integration and Continuous Development (CI/CD)	
5.1	Configuration Management	2
5.2	Continuous Integration, concepts and practices	2
5.3	Continuous Delivery, concepts and practices	2
5.4	Build and deployment automation	2
5.5	Test automation for CI/CD	2



20MCA131	PROGRAMMING LAB	CATEGORY	L	T	P	CREDIT
		PRACTICAL	0	1	3	2

Preamble: This course introduces a basic step towards program writing and develops the logical ability and problem-solving skill using Python Programming Language. Students are able to do testing and debugging of code written in Python.

Prerequisite: None

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

CO 1	Understands basics of Python Programming language including input/output functions, operators, basic and collection data types
CO 2	Implement decision making, looping constructs and functions
CO 3	Design modules and packages - built in and user defined packages
CO 4	Implement object-oriented programming and exception handling.
CO 5	Create files and form regular expressions for effective search operations on strings and files.

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	2							
CO 2	3	3	3	2	2							
CO 3	3	3	3	3	3						1	
CO 4	3	3	3	3	3						1	
CO 5	3	3	3	3	3						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:

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

End Semester Examination Pattern:

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



Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Familiarizing Text Editor, IDE, Code Analysis Tools etc // Use any IDE like PyCharm, PyDev...
2. Display future leap years from current year to a final year entered by user.
3. List comprehensions:
 - (a) Generate positive list of numbers from a given list of integers
 - (b) Square of N numbers
 - (c) Form a list of vowels selected from a given word
 - (d) List ordinal value of each element of a word (Hint: use ord() to get ordinal values)
4. Count the occurrences of each word in a line of text.
5. Prompt the user for a list of integers. For all values greater than 100, store 'over' instead.
6. Store a list of first names. Count the occurrences of 'a' within the list
7. Enter 2 lists of integers. Check (a) Whether list are of same length (b) whether list sums to same value (c) whether any value occur in both
8. Get a string from an input string where all occurrences of first character replaced with '\$', except first character.
[eg: onion -> oni\$n]
9. Create a string from given string where first and last characters exchanged. [eg: python -> nythop]
10. Accept the radius from user and find area of circle.
11. Find biggest of 3 numbers entered.
12. Accept a file name from user and print extension of that.
13. Create a list of colors from comma-separated color names entered by user. Display first and last colors.
14. Accept an integer n and compute n+nn+nnn.
15. Print out all colors from color-list1 not contained in color-list2.
16. Create a single string separated with space from two strings by swapping the character at position 1.
17. Sort dictionary in ascending and descending order.



18. Merge two dictionaries.
19. Find gcd of 2 numbers.
20. From a list of integers, create a list removing even numbers.

Course Outcome 2 (CO2)

1. Program to find the factorial of a number
2. Generate Fibonacci series of N terms
3. Find the sum of all items in a list
4. Generate a list of four digit numbers in a given range with all their digits even and the number is a perfect square.
5. Display the given pyramid with step number accepted from user.

Eg: N=4

```

1
2 4
3 6 9
4 8 12 16

```

6. Count the number of characters (character frequency) in a string.
7. Add 'ing' at the end of a given string. If it already ends with 'ing', then add 'ly'
8. Accept a list of words and return length of longest word.
9. Construct following pattern using nested loop

```

*
* *
* * *
* * * *
* * * * *
* * * *
* * *
* *
*

```

10. Generate all factors of a number.



11. Write lambda functions to find area of square, rectangle and triangle.

Course Outcome 3(CO3):

1. Work with built-in packages
2. Create a package graphics with modules rectangle, circle and sub-package 3D-graphics with modules cuboid and sphere. Include methods to find area and perimeter of respective figures in each module. Write programs that finds area and perimeter of figures by different importing statements. (Include selective import of modules and import * statements)

Course Outcome 4 (CO4):

1. Create Rectangle class with attributes length and breadth and methods to find area and perimeter. Compare two Rectangle objects by their area.
2. Create a Bank account with members account number, name, type of account and balance. Write constructor and methods to deposit at the bank and withdraw an amount from the bank.
3. Create a class Rectangle with private attributes length and width. Overload '<' operator to compare the area of 2 rectangles.
4. Create a class Time with private attributes hour, minute and second. Overload '+' operator to find sum of 2 time.
5. Create a class Publisher (name). Derive class Book from Publisher with attributes title and author. Derive class Python from Book with attributes price and no_of_pages. Write a program that displays information about a Python book. Use base class constructor invocation and method overriding.

Course Outcome 5 (CO5):

1. Write a Python program to read a file line by line and store it into a list.
2. Python program to copy odd lines of one file to other
3. Write a Python program to read each row from a given csv file and print a list of strings.
4. Write a Python program to read specific columns of a given CSV file and print the content of the columns.
5. Write a Python program to write a Python dictionary to a csv file. After writing the CSV file read the CSV file and display the content.

Syllabus:

Input, Output and Import Functions, Operators, Data Types, Decision Making & Loops, Functions, Modules and Packages, File Handling, Object Handling, Exception Handling, Regular Expressions



Reference Books

1. Wesley J. Chun, “*Core Python Applications Programming*”, 3rd Edition , Pearson Education, 2016
2. Charles Dierbach, “*Introduction to Computer Science using Python*”, Wiley, 2015
3. Jeeva Jose, “*Taming Python by Programming*”, Khanna Publishers, New Delhi, 2018
4. Downey, A. et al., “*How to think like a Computer Scientist: Learning with Python*”, John Wiley, 2015

Web References

1. <https://archive.org/details/MIT6.00SCS11>
2. <https://www.coursera.org/course/pythonlearn>
3. <http://www.learnerstv.com/Free-Computer-Science-Video-lectures-ltv163-Page1.htm>
4. <https://www.coursera.org/learn/python-databases>

Course Contents and Lab Schedule

Topic	No. of hours
1. Input, Output and Import Functions	3
2. Operators	5
3. Data Types	6
4. Decision Making & Loops	6
5. Functions	5
6. Modules and Packages	6
7. File Handling	5
8. Object Handling	5
9. Exception Handling	2
10. Regular Expressions	4



20MCA133	WEB PROGRAMMING LAB	CATEGORY	L	T	P	CREDIT
		PRACTICAL	0	1	3	2

Preamble: With a dynamic learn-by-doing focus, this laboratory course encourages the students to explore the designing of web application by implementing the relevant and recent techniques. This course challenges the students to exercise their creativity in both programming and designing.

Prerequisite: Basic understanding of computer programming, Internet and Database etc. is very helpful.

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

CO 1	Explore markup languages features and create interactive web pages using them.
CO 2	Learn and design client-side validation using scripting languages.
CO 3	Design front end web page and connect to the back-end databases.
CO 4	Do Client-side & Server-side scripting
CO 5	Develop Web 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	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:

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

End Semester Examination Pattern:

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



Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Model a simple HTML file to demonstrate the use of different tags. (K3)
2. Create a HTML file to link to different HTML page which contains images, tables, and also link within a page. (K6)
3. Create a HTML page with different types of frames such as floating frame, navigation frame & mixed frame. (K6)
4. Analyze CSS by applying the different styles using inline, external & internal style sheets in a HTML file. (K4)
5. Demonstrate a registration form using HTML. (K3)

Course Outcome 2 (CO2)

1. Create a HTML page to explain the use of various predefined functions in a string and math object in java script. (K6)
2. Generate the calendar using JavaScript code by getting the year from the user. (K6)
3. Create a HTML registration form and to validate the form using JavaScript code. (K6)
4. Evaluating JavaScript Event Handling for every click of a button to change the background color of a HTML page. (K5)
5. Create a HTML page to display a new image and text when the mouse comes over the existing content in the page using JavaScript Event Handling. (K6)
6. Create a HTML page to show online exam using JavaScript. (K6)

Course Outcome 3(CO3):

1. Develop a PHP program to connect to a database and retrieve data from a table and show the details in a neat format. (K6)

Course Outcome 4 (CO4):

1. Outline a registration form using PHP and do necessary validations. (K4)
2. Compose Electricity bill from user input based on a given tariff using PHP. (K6)



3. Build a PHP code to store name of students in an array and display it using print_r function. Sort and Display the same using asort & arsort functions. (K6)
4. Build a PHP code to store name of Indian Cricket players in an array and display the same in HTML table. (K6)

Course Outcome 5 (CO5):

1. Develop Web applications using HTML and PHP and deploy. (K6)
2. 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 to search for a book with the title specified by the user and to display the search results with proper headings. (K6)
3. Develop a web application for Airline Reservation System using any PHP framework (Laravel, CodeIgniter, Symfony, CakePHP etc.). (K6)
4. Test the application on an Application Server. (K5)

Syllabus

Introduction To Web: Client/Server concepts, Components of Web Application, Types of Web Content, Overview of HTTP - HTTP request – response, Generation of dynamic web pages, Application Servers, Web Security.

Markup Language (HTML): Formatting and Fonts, Commenting Code, Anchors, Backgrounds, Images, Hyperlinks, Lists, Tables, Frames, HTML Forms.

Cascading Style Sheet (CSS): The need for CSS, Basic syntax and structure, Inline Styles, Embedding Style Sheets, Linking External Style Sheets, Backgrounds, Manipulating text, Margins and Padding, Positioning using CSS.

Client Side Scripting using JavaScript: Core features, Data types and Variables, Operators -Expressions and Statements, Functions, Objects, Array, String - Date and Math related Objects, Document Object Model, Event Handling, Form handling and validations.

An overview of Relational Database Design: Tables, Attributes, Tuples, Primary keys, Foreign keys, Indexes, DDL Commands – CREATE, ALTER, DROP and TRUNCATE; DML Commands – SELECT, INSERT, UPDATE and DELETE.



Server Side Scripting using PHP: Setting up the environment (Example - XAMP server), PHP Programming basics - Print/echo, Variables and constants, Strings and Arrays, Operators, Control structures and looping structures, Functions, Reading Data in Web Pages, Embedding PHP within HTML, Establishing connectivity with database, Debugging with phpdbg.

Web Application development in any PHP framework (Laravel, CodeIgniter, Symfony, CakePHP etc.): Naming convention, MVC model, Connectivity with Database, Database interaction.

Debugging web apps: Browser debugging tools (Any browser web developer tools) - View and change the DOM and CSS, Console, Debug JavaScript, View and debug network activity, Performance tools etc.

Reference Books

1. David Flanagan, "*JavaScript: The Definitive Guide*", 6th Edition", O'Reilly Media
2. Douglas E Comer, "*The Internet Book: Everything You Need to Know About Computer Networking and How the Internet Works*", 4th Edition, Prentice Hall
3. Harvey Deitel and Abbey Deitel, "*Internet and World Wide Web - How To Program*", 5th Edition, Pearson Education
4. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "*Database System Concepts*", McGraw Hill Education, 6th Edition (2011)
5. Steve Suehring, Tim Converse, and Joyce Park, "*PHP6 and MySQL Bible*", Wiley India Pvt Ltd (2009)
6. Steven Holzner, "*PHP-The Complete Reference*", Tata McGraw Hill, 1st Edition (2007)
7. Thomas A Powell, Fritz Schneider, "*JavaScript: The Complete Reference*", 3rd Edition, Tata McGraw Hill

Web Resources

1. <http://php.net/manual/>
2. <https://pepa.holla.cz/wp-content/uploads/2016/08/JavaScript-The-Definitive-Guide-6th-Edition.pdf>
3. <http://index-of.es/PHP/PHP6%20and%20MySQL%20Bible.pdf>
4. <https://www.udemy.com/course/html5-fundamentals-for-beginners/>
5. <https://www.udemy.com/course/programming-in-javascript/>
6. <https://www.udemy.com/course/php-mysql-tutorial/>



List of Lab Experiments/Exercises

1. Create a simple HTML file to demonstrate the use of different tags.
2. Create a HTML file to link to different HTML page which contains images, tables, and also link within a page.
3. Create a HTML page with different types of frames such as floating frame, navigation frame & mixed frame.
4. Create a HTML file by applying the different styles using inline, external & internal style sheets.
5. Create a registration form using HTML.
6. Create a HTML page to explain the use of various predefined functions in a string and math object in java script.
7. Generate the calendar using JavaScript code by getting the year from the user.
8. Create a HTML registration form and to validate the form using JavaScript code.
9. Create a HTML page to change the background color for every click of a button using JavaScript Event Handling.
10. Create a HTML page to display a new image and text when the mouse comes over the existing content in the page using JavaScript Event Handling.
11. Create a HTML page to show online exam using JavaScript.
12. Develop a registration form using PHP and do necessary validations.
13. Compose Electricity bill from user input based on a given tariff using PHP.
14. Build a PHP code to store name of students in an array and display it using print_r function. Sort and Display the same using asort & arsort functions.
15. Build a PHP code to store name of Indian Cricket players in an array and display the same in HTML table.
16. Develop a PHP program to connect to a database and retrieve data from a table and show the details in a neat format.
17. Develop Web applications using HTML and PHP and deploy.
18. 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 to search for a book with the title specified by the user and to display the search results with proper headings.



19. Develop a web application for Airline Reservation System using any PHP framework (Laravel, CodeIgniter, Symfony, CakePHP etc.).
20. Test the application on an Application Server.

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

Topic	No. of lectures
Client/Server concepts, Components of Web Application, Types of Web Content, Overview of HTTP - HTTP request – response, Generation of dynamic web pages, Application Servers, Web Security.	1Hr.
HTML - Formatting and Fonts, Commenting Code, Anchors, Backgrounds, Images, Hyperlinks.	4 Hrs.
HTML - Lists, Tables, Frames, HTML Forms.	4 Hrs.
The need for CSS, Basic syntax and structure, Inline Styles, Embedding Style Sheets, Linking External Style Sheets, Backgrounds.	4 Hrs.
CSS - Manipulating text, Margins and Padding, Positioning using CSS.	4 Hrs.
JavaScript: Core features, Data types and Variables, Operators - Expressions and Statements.	3 Hrs.
JavaScript: Functions, Objects, Array, String - Date and Math related Objects, Document Object Model, Event Handling.	4 Hrs.
JavaScript: Form handling and validations.	4 Hrs.
An overview of Relational Database Design: Tables, Attributes, Tuples, Primary keys, Foreign keys, Indexes, DDL Commands – CREATE, ALTER, DROP and TRUNCATE.	4 Hrs.
DML Commands – SELECT, INSERT, UPDATE and DELETE.	4 Hrs.
PHP: Setting up the environment (Example - XAMP server), PHP Programming basics - Print/echo, Variables and constants.	4 Hrs.
Strings and Arrays, Operators, Control structures and looping structures.	4 Hrs.
Functions, Reading Data in Web Pages, Embedding PHP within HTML, Establishing connectivity with database.	4 Hrs.
PHP framework: naming convention, MVC model, Connectivity with Database, Database Interaction.	6 Hrs.



20MCA135	DATA STRUCTURES LAB	CATEGORY	L	T	P	CREDIT
		PRACTICAL	0	1	3	2

Preamble: This is the companion course of 20MCA105 Advanced Data Structures and provides the students hands-on experience of the advanced data structures which will boost up the knowledge and confidence of students in applying these techniques while dealing with real life computing problems.

Prerequisite: Basic Data Structures, Knowledge of any programming language, preferably 'C'.

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

CO 1	Use Debuggers, Profilers and advanced Compiler options.
CO 2	Implement the Set and Disjoint Set Data Structures.
CO 3	Understand the practical aspects of Advanced Tree Structures.
CO 4	Realise Modern Heap Structures for effectively solving advanced Computational problems.
CO 5	Implement Advanced Graph algorithms suitable for solving advanced computational 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	2				3		1					
CO 2	3	2	2		1							
CO 3	2	2	3	2	1		1					
CO 4	2	3	3	2	1		1					
CO 5	3	3	2	1	2		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:

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



End Semester Examination Pattern:

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

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Write a C program 'sum.c' to add two numbers. Read the input from Standard Input and write output to Standard output. Compile and generate sum.out which is then debug with gdb.
2. Modify 'sum.c' by adding a function for finding the sum of two numbers. Then profile the executable with gprof.

Course Outcome 2 (CO2)

1. Create the Set ADT with Add, Remove, Union, Intersection and Difference operations. Implement using Bit Strings.
2. Implement the Disjoint set ADT with Create, Union and Find operations.
3. Implement Kruskal's algorithm using Disjoint sets.



Course Outcome 3(CO3):

1. Implement B-Tree and its operations..
2. Implement Red Black Tree and the associated operations.

Course Outcome 4 (CO4):

1. Create the Binomial Heap ADT and implement the basic operations.
2. Use any Mergeable Heap to implement Single source shortest path algorithm.

Course Outcome 5 (CO5):

1. Finding the strongly connected components of a directed graph.
2. Prim's Algorithm for Minimum cost spanning tree.

Syllabus:

Based on the syllabus of 20MCA105 Advanced Data Structures.

Text Books

1. Cormen T.H., Leiserson C.E, Rivest R.L. and Stein C, *Introduction to Algorithms*, Prentice Hall India, New Delhi, 2004

Reference Books

1. Kleinberg, Jon, and Eva Tardos. *Algorithm design*. Pearson Education India, 2006.
2. Aho A.V., Hopcroft J.E., and Ullman J.D., *Data Structures and Algorithms*, Pearson Education, New Delhi, 1983.
3. Sahni S., Data Structures, *Algorithms, and Applications in C++*, Mc Graw Hill, Singapore, 1998.

Web Reference

1. <https://gcc.gnu.org/onlinedocs/gcc/Option-Summary.html>
2. <https://www.gnu.org/software/gdb/documentation/>
3. https://ftp.gnu.org/old-gnu/Manuals/gprof-2.9.1/html_mono/gprof.html



Course Contents and Lecture Schedule

Topic	No. of hours
1. Advanced use of gcc : Important Options -o, -c, -D, -l, -I, -g, -O, -save-temps, -pg	1
2. Familiarisation with gdb : Important Commands - break, run, next, print, display, help	1
3. Using gprof : Compile, Execute and Profile	1
4. Review of Basic Data Structures (Array, List, Stack, Queue, Trees) <ul style="list-style-type: none"> a. Merge two sorted arrays and store in a third array b. Circular Queue - Add, Delete, Search c. Singly Linked Stack - Push, Pop, Linear Search d. Doubly linked list - Insertion, Deletion, Search e. Binary Search Trees- Insertion, Deletion, Search 	8
5. Set Data Structure and set operations (Union, Intersection and Difference) using Bit String.	3
6. Disjoint Sets and the associated operations (create, union, find)	3
Topic	No. of hours
7. Binomial Heaps and operations (Create, Insert, Delete, Extract-min, Decrease key)	4
8. B Trees and its operations	4
9. Red Black Trees and its operations	4
10. Graph Traversal techniques (DFS and BFS) and Topological Sorting	4
11. Finding the Strongly connected Components in a directed graph	3
12. Prim's Algorithm for finding the minimum cost spanning tree	3
13. Kruskal's algorithm using the Disjoint set data structure	3
14. Single Source shortest path algorithm using any heap structure that supports mergeable heap operations	3



SEMESTER – 2

20MCA102	ADVANCED DATABASE MANAGEMENT SYSTEMS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	

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 and ER features.
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)	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 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. (K3 & K4)



Course Outcome 2 (CO2):

1. Evaluate and design good table structures to control data redundancies and anomalies. (K5 & 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. (K2 & K4)
3. Assess the common algorithms for concurrency control. (K5)
4. Define deadlock and discuss the strategies for managing deadlocks. (K1 & 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. (K3 & K4)

Course Outcome 5 (CO5):

1. Describe the basics of query processing and evaluate the query processing cost. (K2 & 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)



Model Question Paper

Reg No.: _____		Name: _____
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY		
MODEL QUESTION PAPER M.C.A.DEGREE EXAMINATION		
Course Code: 20MCA102		
Course Name: ADVANCED DATABASE MANAGEMENT SYSTEMS		
Max. Marks: 60		Duration: 3 Hours
PART A		
<i>Answer all questions, each carries 3 marks.</i>		Marks
1	Define weak entity set with an example.	(3)
2	With the help of a diagram explain the different levels of data abstraction?	(3)
3	Differentiate between BCNF and 3NF with an example.	(3)
4	Explain functional dependency with suitable example.	(3)
5	Discuss the ACID properties of transaction.	(3)
6	Define deadlock and discuss the strategies for managing deadlocks.	(3)
7	Diagrammatically represent the basic steps in query processing.	(3)
8	Differentiate static and dynamic hashing.	(3)
9	Illustrate the different types of Distributed Databases.	(3)
10	Define collection and document in MongoDB.	(3)
PART B		
<i>Answer any one question from each module. Each question carries 6 marks.</i>		
Module I		
11	Draw an E-R diagram of a college database with entities student, staff, course, teacher, clerk, department & hostel? Relationship names must be meaningful	(6)



	and there should be an ISA relationship also in diagram.	
OR		
12	Explain the relational model concept and discuss the different relational model constraints.	(6)
Module II		
13	Analyse the common anomalies found in databases? How can we eliminate it through normalization?	(6)
OR		
14	Define Normalization. Explain 1NF, 2NF and 3NF in detail.	(6)
Module III		
15	Define deadlock. How can we deal with deadlocks?	(6)
OR		
16	Explain concurrency control with locking methods.	(6)
Module IV		
17	Explain the various RAID levels with appropriate diagrams.	(6)
OR		
18	Differentiate between Dense index and Sparse index with example.	(6)
Module V		
19	Explain HBase and Cassandra.	(6)
OR		
20	Explain XML and its applications.	(6)
**** 2014		



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 – The Entity-Relationship model: Entity Set, Relationship Set, Attributes – Constraints: Mapping cardinalities, Key Constraints, Participation Constraints - E-R Diagrams: Basic structure, Complex attributes, Roles, Non binary relationship sets, Weak Entity Set, Relational Database Design using ER- to Relational Mapping – Extended ER Features: Specialization, Generalization, Attribute inheritance, Constraints on generalization, Aggregation.

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. (for Module 1 Refer Chapter 1 [1.1 to 1.3, 1.9,1.12], Chapter 2 [2.1-2.3,2.5], Chapter 6 [6.1], Chapter 7 [7.2, 7.3, 7.8(7.81. To 7.8.5)], for Module 4 Refer Chapter 10 [10.3, 10.5, 10.6], Chapter 11 [11.1, 11.2, 11.3(11.3.1), 11.4.5 and module 5 Refer Chapter 19 [19.1,19.2, 19.3 - Distributed Databases], Refer Chapter 22 [22.1 to 22.6 - Object Based Databases]).
2. Ramez Elmasri, Shamkant B.Navathe, " *Fundamentals of Database Systems* ", Pearson Education, 5th Edition, 2007. (for Module 1 - Refer Chapter 7 [7.1] - 7.1.1 - Relational Database Design using ER- to Relational Mapping) and for Module 2 - Refer Chapter 10 [10.2.2 and 10.2.4], Refer Chapter 11 [11.4 - Join dependencies and Fifth Normal Form).
3. Guy Harrison, " *Next Generation Databases: NoSQL, NewSQL, and Big Data* ", Apress, 1st Edition, 14 December 2015. Refer Chapters 8 and 3 (for Module 5 - Next Generation Databases and CAP Theorem).



4. Rob, Peter and Carlos Coronel, “*Database Principles: Fundamentals of Design, Implementation and Management*”, 9th Edition, 2011. (for Module 2, refer chapter 6) and (for module 3, refer chapter 10) and (for Module 5, refer Chapter 14 -XML).

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 (nptel) <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	<i>Module I: Relational Databases</i>	<i>15 hrs</i>
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	1 hr
1.6	The Relational Algebra: Fundamental Operations, Formal definition of the relational algebra, additional relational algebra operations	2 hr
1.7	The Entity-Relationship model: Entity Set, Relationship Set, Attributes	1 hr
1.8	Constraints: Mapping cardinalities, Key Constraints, Participation Constraints	2 hr
1.9	E-R Diagrams: Basic structure, Complex attributes, Roles, Non binary relationship sets, Weak Entity Set	1 hr
1.10	Relational Database Design using ER- to Relational Mapping	2 hr
1.11	Extended ER Features: Specialization, Generalization, Attribute inheritance, Constraints on generalization, Aggregation.	2 hr
2	<i>Module II: Database Design</i>	<i>9 hrs</i>
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



No	Topic	No. of Lectures
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 hrs
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 hrs
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



No	Topic	No. of Lectures
5	<i>Module V: System Architecture, Object Oriented Databases, XML and NoSQL</i>	<i>13 hrs</i>
5.1	Distributed Databases: Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions	2 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	Norelational Databases – MongoDB Sharding and Replication	1 hr
5.11	Hbase	1 hr
5.12	Cassandra	1 hr



20MCA104	ADVANCED COMPUTER NETWORKS	CATEGORY	L	T	P	CREDIT
		GENERAL	3	1	0	4

Preamble: This course intends to provide insight into Advanced Computer Networks. A software professional should have an understanding of layered network architecture. Various kinds of network architectures, issues in integrating networks to modern application development are to be addressed. It is also intended to expose the student to modern technologies such as IPV6 and software defined networks. More detailed treatment can be done through seminars, assignments and talks by eminent external experts.

Prerequisite: Basic concepts of computer operating systems.

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

CO 1	Comprehend the terminology and concepts of basic communication model, analyse the protocol layers and design application layer protocols.
CO 2	Understand and analyse the various transport layer protocols.
CO 3	Compare and contrast various routing algorithms in the network layer.
CO 4	Understand and analyse the concepts of link layer and physical layer.
CO 5	Understand how modern cellular and wireless networks work

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	2		3		2	
CO 2	3	3	2		2	2			3		2	
CO 3	3	3			2	2	2		3		2	
CO 4	3	3				2			3		2	
CO 5	3	3				2			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
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 HTTP request-response behavior with a neat diagram.
2. Compare and contrast OSI and TCP/IP network reference models.
3. Explain the importance of layering in data communication.

Course Outcome 2 (CO2)

1. Explain the process of three-way handshaking in TCP.
2. Compare and contrast Multiplexing and De-multiplexing process in transport layer.
3. Explain How TCP is controlling congestion during data transmission.

Course Outcome 3(CO3):

1. Explain how multicast routing is used in routing protocols.
2. Compare and contrast IPV4 and IPV6.
3. Differentiate virtual circuits and datagram networks.

Course Outcome 4 (CO4):

1. Explain how parity is used to achieve error detection in data communication.
2. Illustrate IEEE 802.3 frame structure.
3. Write short notes on routers, switches and bridges.



Course Outcome 5 (CO5):

1. List out and explain the various IEEE 802.11 WLAN Components.
2. Explain the architecture of Bluetooth in personal area networks.
3. Explain any six network attacks and their counter measures.

Model Question paper

Part A

1. Differentiate HTTP persistent and non-persistent communication.
2. List out and explain the functionalities of different DNS records.
3. Compare TCP and UDP at transport layer.
4. Demonstrate how stop-and-wait protocol is used for reliable data transfer.
5. Explain how IPv6 solve the problem of IPv4 exhaustion?
6. Explain how ARP is working in data link layer?
7. A series of 8-bit message blocks to be transmitted across a data link using CRC for error detection. A generator polynomial of $x^3 + x^2 + 1$. is to be used. Message transmitted as 110010. Explain how CRC check is implemented?
8. Classify various wired media used in short and long distance communication.
9. Explain Network Address Translation (NAT).
10. Explain piconet topology of Bluetooth? [3x10=30 Marks]

Part B

Module 1

11. List and explain ISO/OSI layers and their functions. [6 Marks]
- OR
12. Describe various service models in Quality of Service (QOS). [6 Marks]

Module 2

13. Write a short note on:
 - a. Stop-and-wait [3 Marks]
 - b. Go-back-N [3 Marks]

OR

14. Explain the principles of congestion control with its fairness and efficiency. [6 Marks]



Module 3

15. Define routing? Explain the process of link state routing with OSPF protocol.

OR

[6 Marks]

16. What is Virtual circuit? Explain the connection management in Virtual circuit with suitable diagrams.

[6 Marks]

Module 4

17. Write a short note on:

a. Collision based multiple access protocol

[3 Marks]

b. Token based multiple access protocol

[3 Marks]

OR

18. Explain IEEE 802.3 Ethernet frame format with its access protocol.

[6 Marks]

Module 5

19. What is Bluetooth? Explain the various layers of Bluetooth with a neat diagram.

[6 Marks]

OR

20. Write a short note on:

a. Traffic analysis tools

[3 Marks]

b. Troubleshooting

[3 Marks]

Syllabus

Module	Contents	Hours
I	Overview of Computer Networks and the Internet. History. Protocols, Review of last mile technologies used for internet access. Packet switching. Basic ideas about delay queuing throughput. Concept of Quality of Service, Protocol layering . OSI model and TCP model Application layer protocols - Client-server architecture Network layer 7 application architecture, Web, HTTP, FTP, SMTP, POP3, and DNS, Peer-to-peer file sharing networks	10



Module	Contents	Hours
II	Transport Layer Protocols: Introduction to transport layer, Multiplexing and de-multiplexing, Principles of Reliable data transfer - Stop-and-wait and Go-back- N design and evaluation, Connection oriented transport TCP, Connectionless transport UDP, Principles of congestion control -efficiency and fairness	10
III	Network Layer Protocols: Virtual circuits and datagrams, Principles of routing, internet protocol Ipv4 CIDR Routing algorithms: Link-state and distance vector routing, Routing on the internet RIP OSPF and BGP, Multicast routing. Introduction to IPV6 and software defined networks, Open flow	10
IV	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, Switching and bridging, Media, Signal strength and interference. Data encoding. Ethernet switches , Routers MAC, ARP, FIB	8
V	IEEE 802.11 Wi-Fi, Bluetooth, and cellular networks,Threats and attacks, Network Address Translation , Firewalls, VPNs, Introduction to network management, SNMP, Overview of tools and troubleshooting, Traffic analysis tools and Configuration management.	10

Textbooks:

1. Behrouz A Forouzan, Firouz Mosharraf, “*Computer Networks: A top down Approach*”, McGraw Hill Education, 1 st Edition (2011).
2. James F Kurose and Keith W Ross, “*Computer Networking: A Top - Down Approach*”, Pearson Education; 6 th Edition (2017).

Reference Books:

1. Kevin R. Fall, W. Richard Stevens, “*TCP/IP Illustrated, Volume 1 -The Protocols*”, Pearson Education, 2 nd Edition (2014).
2. Larry Peterson, Bruce Davie, “*Computer Networks, A systems Approach*”, Morgan Kaufmann Publishers, 5th Edition (2011).
3. Uyless Black, “*Computer Networks: Protocols, Standards and Interface*”, Prentice HallIndia Learning Private Limited, 8 th Edition (2015).
4. William Stallings, “*Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud*”, Pearson Education, 1 st Edition (2016)
5. *The Illustrated Network: How TCP/IP Works in a Modern Network* 2nd edition Walter Goralski Morgan Kaufmann Publications

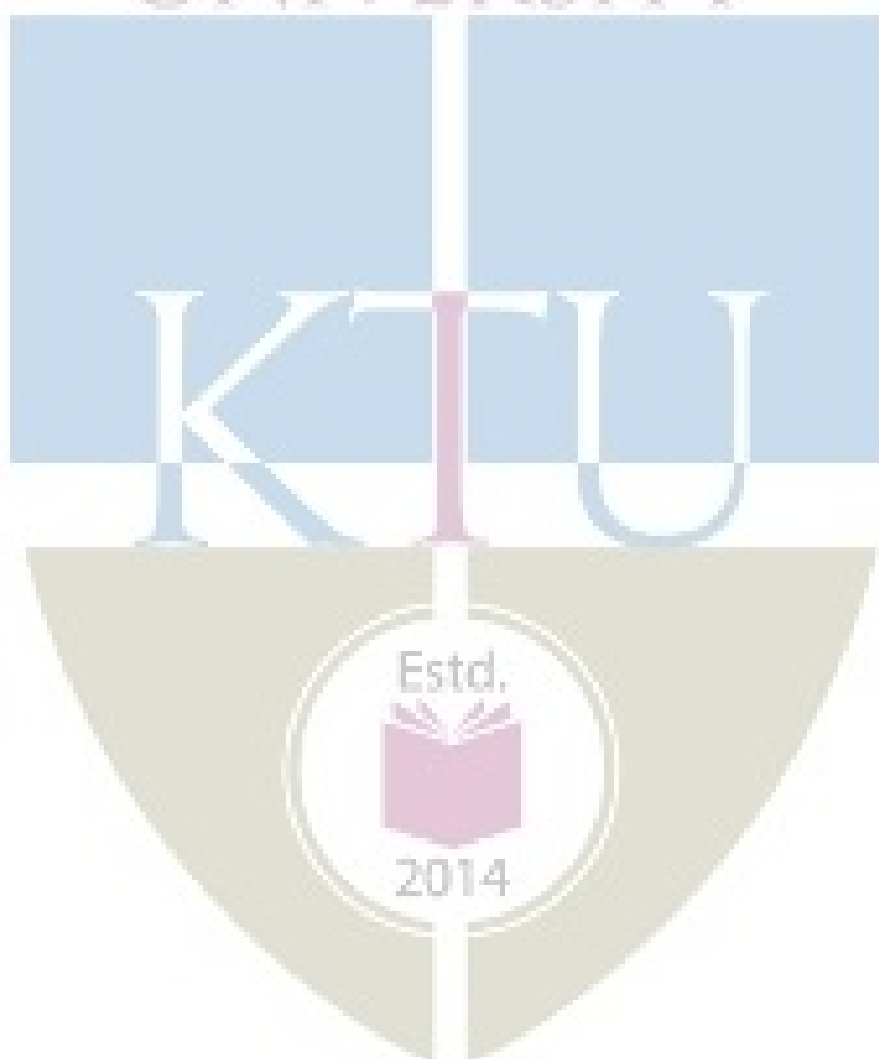


Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1		
1.1	Overview of Computer Networks and the Internet. History. Protocols , Review of last mile technologies used for internet access. Packet switching.	2
1.2	Basic ideas about delay queuing through put. Concept of Quality of Service Protocol layering . OSI model and TCP model	4
1.3	Application layer protocols - Client-server architecture Network application architecture, Web, HTTP, FTP, SMTPPOP3 and DNS, Peer-to-peer file sharing networks	4
2		
2.1	Transport Layer Protocols: Introduction to transport layer	2
2.2	Multiplexing and demultiplexing, Principles of Reliable data transfer - Stop-and-wait and Go-back- N design and evaluation	3
2.3	Connection oriented transport TCP, Connection less transport UDP	3
2.4	Principles of congestion control -efficiency and fairness	2
3		
3.1	Network Layer Protocols: Virtual circuits and datagrams	2
3.2	Principles of routing, internet protocol Ipv4 - NAT , Routing algorithms: Link-state and distance vector routing,	3
3.3	Routing on the internet RIP OSPF and BGP, Multicastingrouting.	2
3.4	Introduction to IPV6 and software defined networks	2
4		
4.1	Link layer and Physical Layer: Introduction to link layer - Error detection (parity, checksum, and CRC)	2
4.2	Multiple access protocols (collision and token based), IEEE 802.3	2
4.3	Ethernet, Switching and bridging, Media, Signal strength and interference. Data encoding. Ethernet switches , Routers MAC, ARP, FIB	4



No	Topic	No. of Lectures
5		
5.1	IEEE 802.11 Wi-Fi, Bluetooth, and cellular networks,	3
5.2	Threats and attacks, Firewalls, NAT,VPNs, Introduction to network management, SNMP,	4
5.3	Overview of tools and troubleshooting, Traffic analysis tools and Configuration management.	3



20MCA162	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 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. 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 units 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)



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



Topic	No. of lectures
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



20MCA164	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 the 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 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 importance of inter-personal skills in the 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 the 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 job and person fit for 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			
20MCA164 – Organisational Behaviour			
Max. Marks: 60			Duration: 3 Hours
PART A			
	<i>Answer all questions, each carries 3 marks.</i>		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		
<i>Answer any one question from each module. Each question carries 6 marks.</i>		
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



<i>Module III</i>		
15	Compare and contrast Maslow's need hierarchy theory with Herzberg's two-factor theory of motivation.	6
<i>OR</i>		
16	What is the relationship between stress and personality? What aspects of personality might tend to increase or decrease stress?	6
<i>Module IV</i>		
17	Why groupthink is to be avoided? How might a manager attempt to ensure that groupthink does not occur in his / her group?	6
<i>OR</i>		
18	What are the potential problems with upward and downward communications? How can managers alleviate these problems?	6
<i>Module V</i>		
19	What are the obstacles to change organisational culture? How can change be brought about?	6
<i>OR</i>		
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



20MCA166	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: 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 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) $\lambda a.(a \lambda b.(b a))$

ii) $\lambda x.\lambda y.\lambda z.((z x) (z y))$

iii) $(\lambda f.\lambda g.(\lambda h.(g h) f) \lambda p.\lambda q.p)$

iv) $\lambda fee.\lambda fi.\lambda fo.\lambda fum.(fum (fo (fi fee)))$

v) $(\lambda p.(\lambda q.p \lambda x.(x p)) \lambda i.\lambda j.(j i))$

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. $[(a,b) \mid a \leftarrow [1..8]; \text{even } a; b \leftarrow [a+3..4]; \text{odd } b]$
 - B. $["Party" \mid k \leftarrow [1..5]]$
 - C. $['*' \mid i \leftarrow [1..3]; j \leftarrow [1,2]]$
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 funky

```
funky :: Int -> Int
```

```
funky n
```

```
|n == 0 = 0
```

```
|otherwise = 1 + funky (n-1)
```

Predict the output of f for all $n \geq 0$? 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 : $\lambda > \text{dupli } [1, 2, 3]$ ANS: [2,2]

OR

20. Define a queue data type in Haskell along with any two operations on it as well as 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



20MCA168	VIRTUALISATION CONTAINERS	AND	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: 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 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 VM 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 2 sub-divisions and carry 6 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

- Explain the need and applications of virtualization.
- Describe the hypervisor architecture.
- 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 the configuring 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			
20MCA168 VIRTULAIISATION AND CONTAINERS			
Max. Marks: 60			Duration: 3 Hours



PART A		
	<i>Answer all questions, each carries 3 marks.</i>	Marks
1	Explain the 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		
<i>Answer any one question from each module. Each question carries 6 marks.</i>		
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)



<i>Module III</i>		
15	Briefly explain the VM life cycle.	(6)
<i>OR</i>		
16	Describe any VM scheduling algorithm.	(6)
<i>Module IV</i>		
17	Explain the Breadth First Search algorithm with a suitable example.	(6)
<i>OR</i>		
18	Compare virtual machines and containers	(6)
<i>Module V</i>		
19	Explain the importance of security and isolation in Docker.	(6)
<i>OR</i>		
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



20MCA172	ADVANCED OPERATING SYSTEMS	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: This course intends to provide insight into more 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 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 [3 marks]
a. mutex [3 marks]
b. semaphore [3 marks]

Module 2

13. Write short notes on [3 Marks]
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

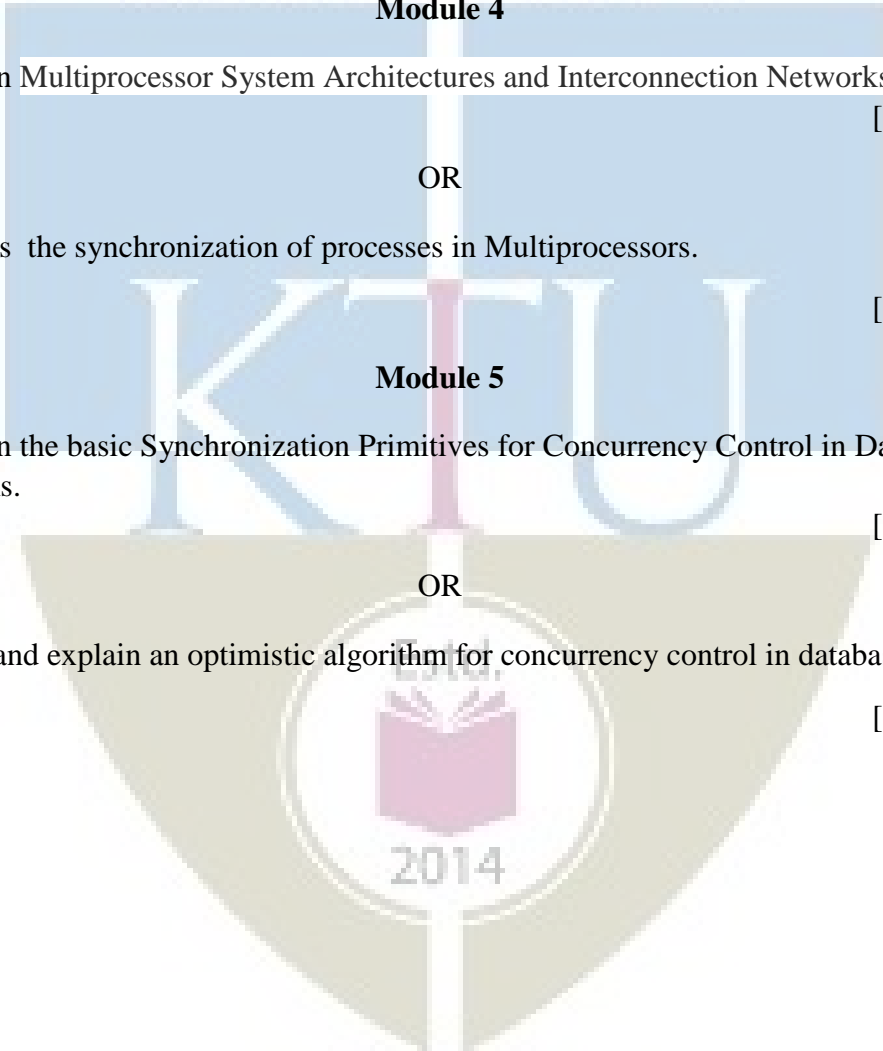
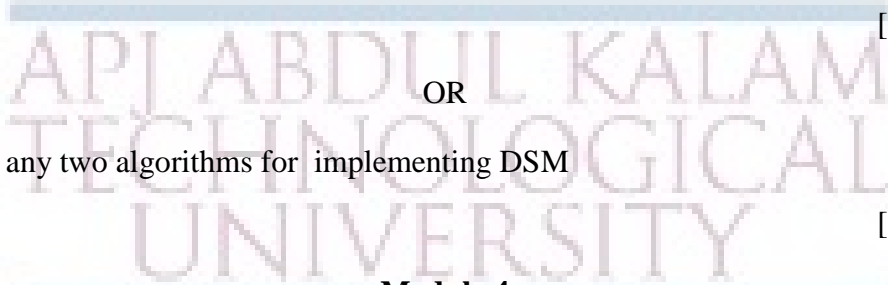
19. Explain the basic Synchronization Primitives for Concurrency Control in Database systems.

[6 Marks]

OR

20. Write and explain an optimistic algorithm for concurrency control in database systems.

[6 Marks]



Syllabus

Module	Contents	Hours
I	<p>Overview: Functions of Operating System –Design Approaches –Types of Advanced Operating Systems.</p> <p>Synchronization Mechanisms: Concept of Processes and Threads –The Critical Section Problem – Other Synchronization Problems:– Monitor –Serializer – Path Expressions.</p> <p>Distributed Operating Systems:- Issues in Distributed Operating System – Communication Networks And Primitives –Lamport’s Logical clocks – Causal Ordering of Messages.</p>	10
II	<p>Distributed Mutual Exclusion:- Classification - Requirements – Measuring Performance – Lamport’s Algorithm – Rickart-Agarwala Algorithm – Suzuki-Kasami’s Broadcast Algorithm.</p> <p>Security: Potential Security Violations – Design Principles for Secure Systems –The Access Matrix Model and Implementation- The Access Control list Method.</p>	10
III	<p>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.</p>	10
IV	<p>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.</p>	8
V	<p>Database Systems: Problem of Concurrency Control – Serializability – Basic Synchronization Primitives for Concurrency Control – Lock-Based Algorithms – Time-Stamp Based Algorithms – Optimistic Algorithms.</p>	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.	4
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	5



No	Topic	No. of Lectures
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.	4
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



20MCA182	BUSINESS MANAGEMENT	CATEGORY	L	T	P	CREDIT 4
		ELECTIVE	3	1	0	

Preamble: The 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 so many resources in the present day 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 idea regarding 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 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: 20MCA182			
Course Name: BUSINESS MANAGEMENT			
Max. Marks: 60		Duration: 3 Hours	
PART A			
<i>Answer all questions, each carries 3 marks.</i>			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 softwares.		(3)
PART B			
<i>Answer six questions, one full question from each module and carries 6 marks.</i>			
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	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, 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>

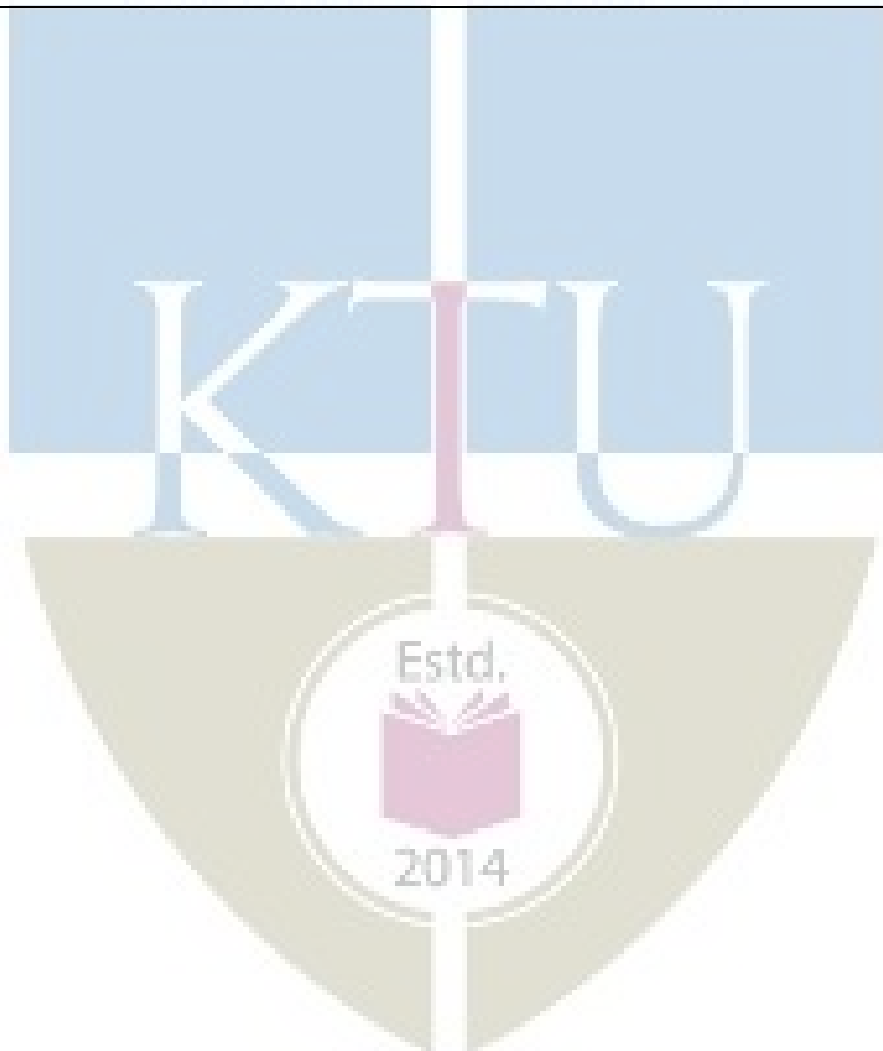


Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	Introduction to Management: Basic Managerial 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



No	Topic	No. of Lectures
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



20MCA184	EMBEDDED SYSTEMS	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: This course introduces students to the basic concepts behind 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 individual components involved 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 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 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 about 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: 20MCA184		
Course Name: Embedded Systems		
Max. Marks: 60	Esid.	Duration: 3 Hours
PART A		
<i>Answer all questions, each carries 3 marks.</i>		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 about 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		
<i>Answer any one question from each module. Each question carries 6 marks.</i>		
Module I		
11	Differentiate Embedded system and General Computing System.	(6)
OR		
12	Explain about the Classification of Embedded systems.	(6)
Module II		
13	Explain in detail about Design Challenges in Embedded System Design.	(6)
OR		
14	Explain about the Hardware-Software Co-Design in an Embedded System.	(6)
Module III		
15	With the help of suitable diagrams explain about UML Building Blocks.	(6)
OR		
16	Describe the Fundamental Issues in Hardware Software Co-Design.	(6)
Module IV		
17	Explain about any three Digital Electronic Components in Embedded systems with the help of suitable diagrams.	(6)
OR		
18	Explain about Embedded Firmware Development Languages.	(6)
Module V		



19	Explain in detail about the commonly used techniques for the Integration of Hardware and Firmware.	(6)
OR		
20	A lot of factors needs 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. Steve 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



20MCA186	COMPUTER GRAPHICS	CATEGORY	L	T	P	CREDIT
		ELECTIVE	3	1	0	4

Preamble: This subject intends to provide an overview of the foundations of Computer Graphics rendering. Special emphasis is laid on modern 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 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):

4. Explain the workflow in the computer graphics pipeline.
5. How does alpha composition affect image appearance?
6. Explain Eigen vectors and Eigen values?



Course Outcome 2 (CO2)

4. Explain some of the pitfalls of Bresenham line drawing algorithm.
5. Explain Affine transformation and its purpose.
6. Compare the mid-point and Bresenham circle drawing algorithms.

Course Outcome 3(CO3):

4. Explain how anti-aliasing affects the image quality.
5. Explain projective transformation.
6. Explain Field of View.

Course Outcome 4 (CO4):

4. Explain some of the benefits of using Triangle meshes.
5. How is Phong shading different from Artistic Shading?
6. How is texture mapping for rasterized image performed.

Course Outcome 5 (CO5):

4. Explain what makes Ray Tracing a highly system intensive rendering process.
5. How can transparency be achieved using ray tracing.
6. 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

21. Explain the concept and idea behind pixels.
22. Write three major applications of computer graphics.
23. Explain the term antialiasing?
24. Demonstrate how the DDA Line drawing algorithm works with a simple example of your own.
25. What is the purpose of tiling multidimensional arrays.
26. Explain the meaning and purpose of graphics APIs?
27. Explain the concept of ray tracing?
28. Explain the basic concept behind ray-object intersection and how it is established.
29. Explain what is meant by color space and give examples.
30. What is meant by a High Dynamic Range image? [3x10 =30 Marks]



Part B

Module 1

31. Explain the process of converting an analog image to a digital image. [6 Marks]

OR

32. Write a note on the following

a. RGB Color Space [3 marks]

b. Matrix Diagonalisation [3 marks]

Module 2

33. Write short notes on

c. Projective Transformation [3 Marks]

d. Perspective Projection [3 Marks]

OR

34. Explain a typical Graphics Pipeline. [6 Marks]

Module 3

35. Compare the various graphics APIs citing their advantages and disadvantages. [6 Marks]

OR

36. Explain the various specialized data structures used in computer graphics [6 Marks]

Module 4

37. Explain how shading and shadowing are achieved using Ray Tracing. [6 Marks]

OR

38. Explain the geometry for graphics hardware. [6 Marks]

Module 5

39. Explain the methods for Nighttone mapping. [6 Marks]

OR

40. Explain how accurate direct lighting can be achieved. [6 Marks]

[6 Marks]



Syllabus

Module	Contents	Hours
I	<p>Introduction to computer graphics: Major Areas and Major Applications, Preliminary discussion on Graphics Pipeline, Numerical Issues, Efficiency and Coding Graphics Programs.</p> <p>Raster Images: Raster Devices, Images, Pixels, RGB Color and Alpha Composition.</p> <p>Fundamentals of Signal Processing for Images and Sampling Theory(Theoretical understanding only).</p> <p>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).</p>	9
II	<p>Fundamentals of shape drawing:- Line drawing - DDA and Bresenham Algorithms, Circle drawing: Mid Point and Bresenham.</p> <p>Transformations(2D, 3D):, Translation and Affine Transformations, Inverse of Transformation Matrices, Coordinate transformations.</p> <p>Viewing: Viewing Transformations, Projective Transformation, Perspective Projection, Field of View</p> <p>Graphics Pipeline: Rasterization, Operations, Antialiasing, Culling primitives for efficiency.</p>	11
III	<p>Surface shading: Diffuse Shading, Phong Shading, Artistic Shading.</p> <p>Texture Mapping: 2D and 3D Mapping, Texture Mapping for Rasterized Triangles, Bump Textures, Displacement Mapping, Shadow Maps.</p> <p>Data Structures for Graphics: Triangle Meshes, Scene Graphs, Spatial Data Structures, BSP Tree for visibility, Tiling Multidimensional Arrays.</p> <p>Graphics APIs: Intuitive understanding of role of Graphics APIs such as OpenGL, Direct3D(DirectX), Vulkan etc. – No programming required</p>	10
IV	<p>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.</p> <p>Using Graphics Hardware: Introduction, Geometry for Hardware, Processing Geometry using Pixels.</p>	8



Module	Contents	Hours
V	<p>Light: Radiometry, Transport Equation, Photometry;</p> <p>Colors: Colorimetry, Color Spaces, Chromatic Adaption, Color Appearance;</p> <p>Tonal Reproduction: Classification, Dynamic Range, Image Formation, Frequency based Operators, Gradient Domain Operators, Gradient Domain Operators, Spatial Operators, Division, Sigmoids, Night Tonemapping.</p> <p>Global Illumination: Particle tracing for Lambertian scenes, Path Tracing, Accurate Direct Lighting.</p> <p>Reflection Models: Real World Materials, Implementing Reflection Models, Specular Reflection models, Smooth layered Model, Rough Layered Model.</p>	11

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



No	Topic	No. of Lectures
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.	4
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



No	Topic	No. of Lectures
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 Tonemapping.	3



20MCA188	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 analyze 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-trivial problems
CO 6	Analyze 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 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 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 about 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 & 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 cryptarithmic 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 3 gallons. 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 waterjug problem

(6)

OR

12. Solve missionaries and cannibals problem

(6)

13. Explain blind search strategies in detail

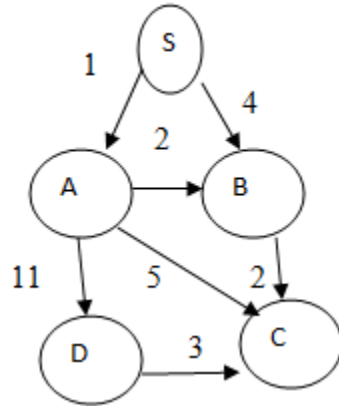
(6)

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 expertsystems,Languages and tools – Typical expert system examples.*Fuzzy Logic:* - Fuzzy Variables ,Fuzzy Sets and Fuzzy Set Operations, Typical Examples using FuzzySets.

Text Books

1. Kevin Night and Elaine Rich, “*Artificial Intelligence (SIE)*”, McGrawHill-2008.
2. StuartRussel 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 annealing	
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	



20MCA192	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 growth 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.

Prerequisite: General awareness on internet essentials, web technologies, 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 analyze 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 2 sub-divisions and carry 6 marks

Course Level Assessment Questions

Course Outcome 1 (CO1):

4. Discuss the need for protection of intellectual property.
5. Explain TRIPS Agreement.
6. Illustrate types of patent applications.

Course Outcome 2 (CO2)

4. Explain Trademark Infringement and Protection of trademarks.
5. Explain the rights conferred by copyright, registration and ownerships of copyrights.
6. Discuss about software copyright.

Course Outcome 3(CO3):

4. Discuss the need for protection of design and explain Design Act, 2000.
5. Explain basic concepts of Geographic Indications such as filing, granting and Protection of geographic indications.
6. Describe the procedure of discovering and protecting of trade secret.



Course Outcome 4 (CO4):

4. Explain the need for cyber laws.
5. Discuss protection of copyright on cyberspace.
6. Explain ISP in cyberspace.

Course Outcome 5 (CO5):

4. Explain different amendments on IT Act 2000.
5. Discuss Terrorism on cyberspace.
6. Explain offences of misrepresentation.

Model Question paper

Part A

21. Categorize various patent applications.
22. Explain the criteria for categorizing an invention as patentable or non-patentable.
23. What are the requirements for filing trademarks?
24. Explain copyright and the rights conferred by copyrights.
25. Explain the term geographical indications by giving suitable examples.
26. What is meant by design under the Design Act,2000?
27. Describe the risks associated with cyber space.
28. What is meant by the term cyber laws.
29. Explain cyber stalking and phishing.
30. Define the term hacking and explain its essentials. [3 x 10 =30 Marks]

Part B

Module 1

31. Describe the procedure for registration of patents. [6 Marks]
- OR
32. 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

33. Explain the methods for transferring copyrights. [6 Marks]
- OR
34. Describe software copyright and how can software be classified according to copyrights. [6 Marks]



Module 3

35. What is industrial design? Describe the salient features of Design act, 2000. [6 Marks]

OR

36. How are the trade secrets dealt with under the Indian law? Discuss. [6 Marks]

Module 4

37. Explain the essential requirements of cyber squatting. [6 Marks]

OR

38. Discuss about cyber space and the protection of copyrights on cyberspace. [6 Marks]

Module 5

39. Explain the objectives and features of Information Technology Act 2000. [6 Marks]

OR

40. What do you mean by cyber crimes? Discuss the nature and types of cyber crimes. [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



Module	Contents	Hours
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,hyperlinking 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-punishment for Abetment and Attempt to commit offences under the IT act.	10

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:



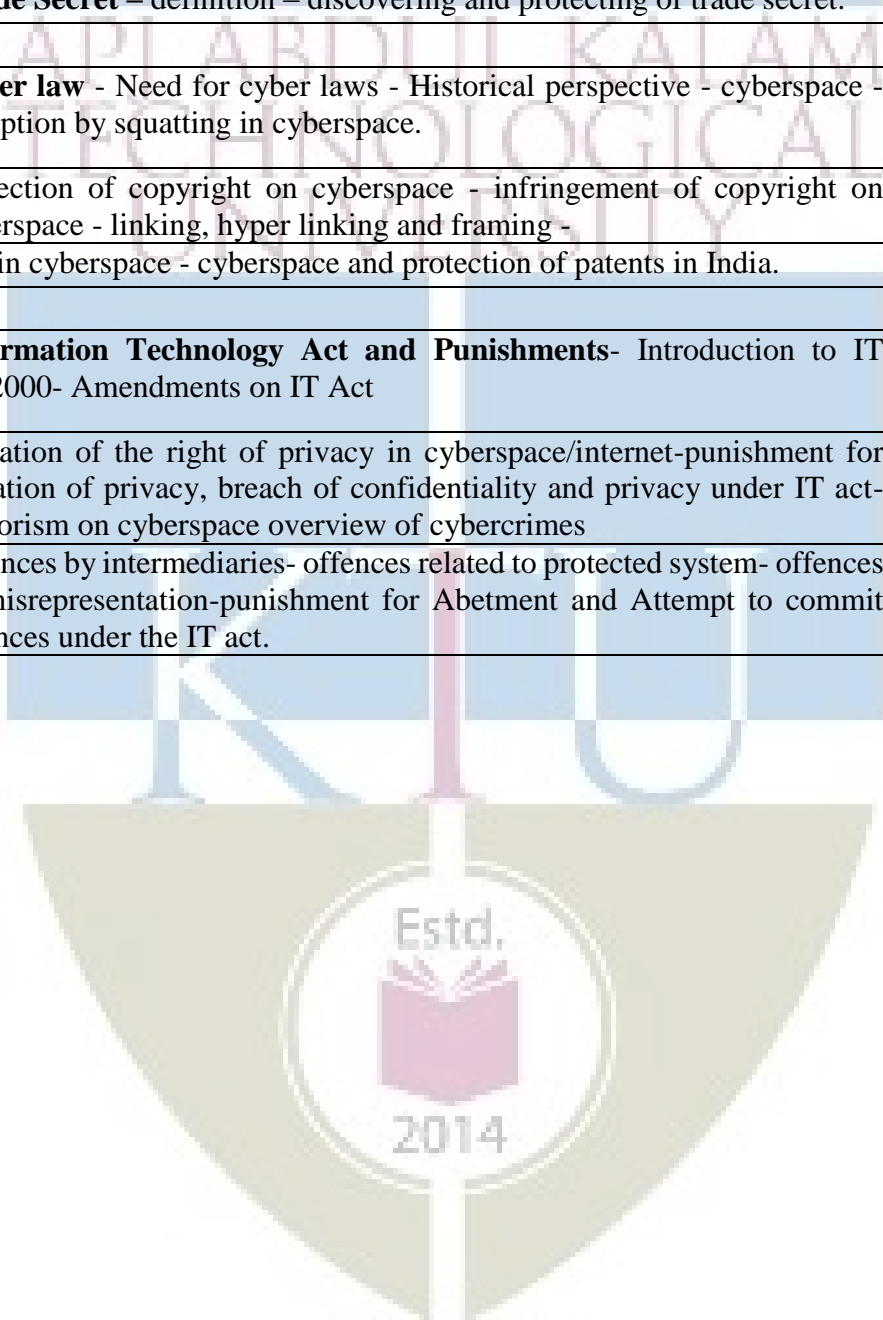
5. D.Bainbridge, “**Introduction to Computer Law**”, Pearson Education
6. RohasNagpal, “**Cyber Crime & Corporate Liability**”, CCH, 2008
7. <https://www.udemy.com/course/cyber-security-law/>
8. <https://www.coursera.org/specializations/introduction-intellectual-property>

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



No.	Topic	No. of Lectures
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 Act2000- 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



20MCA132	OBJECT ORIENTED PROGRAMMING LAB	CATEGORY	L	T	P	CREDIT
		PRACTICAL	0	1	3	2

Preamble: This course enables the students to understand the concepts of object-oriented programming and to develop skills using these paradigms using Java.

Prerequisite: Knowledge of any programming language preferred.

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

CO 1	Understand object-oriented concepts and design classes and objects to solve problems
CO 2	Implement arrays and strings.
CO 3	Implement object-oriented concepts like inheritance, overloading and interfaces
CO 4	Implement packages, exception handling, multithreading and generic programming. Use java.util package and Collection framework
CO 5	Develop applications to handle events using applets
CO 6	Develop applications using files and networking concepts

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	3							
CO 2	3	2	2		3							
CO 3	3	2	2		3							
CO 4	3	2	2		3							
CO 5	3	3	3		3	2			3		3	
CO 6	3	3	3		3	2			3		3	

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:

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

End Semester Examination Pattern:

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

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Define a class 'product' with data members pcode, pname and price. Create 3 objects of the class and find the product having the lowest price.
2. Read 2 matrices from the console and perform matrix addition.



3. Add complex numbers
4. Read a matrix from the console and check whether it is symmetric or not.
5. Create CPU with attribute price. Create inner class Processor (no. of cores, manufacturer) and static nested class RAM (memory, manufacturer). Create an object of CPU and print information of Processor and RAM.

Course Outcome 2 (CO2)

1. Program to Sort strings
2. Search an element in an array.
3. Perform string manipulations
4. Program to create a class for Employee having attributes eNo, eName eSalary. Read n employ information and Search for an employee given eNo, using the concept of Array of Objects.

Course Outcome 3(CO3):

1. Area of different shapes using overloaded functions
2. Create a class 'Employee' with data members Empid, Name, Salary, Address and constructors to initialize the data members. Create another class 'Teacher' that inherit the properties of class employee and contain its own data members department, Subjects taught and constructors to initialize these data members and also include display function to display all the data members. Use array of objects to display details of N teachers.
3. Create a class 'Person' with data members Name, Gender, Address, Age and a constructor to initialize the data members and another class 'Employee' that inherits the properties of class Person and also contains its own data members like Empid, Company_name, Qualification, Salary and its own constructor. Create another class 'Teacher' that inherits the properties of class Employee and contains its own data members like Subject, Department, Teacherid and also contain constructors and methods to display the data members. Use array of objects to display details of N teachers.
4. Write a program has class Publisher, Book, Literature and Fiction. Read the information and print the details of books from either the category, using inheritance.
5. Create classes Student and Sports. Create another class Result inherited from Student and Sports. Display the academic and sports score of a student.



6. Create an interface having prototypes of functions area() and perimeter(). Create two classes Circle and Rectangle which implements the above interface. Create a menu driven program to find area and perimeter of objects.

7. Prepare bill with the given format using calculate method from interface.

Order No.

Date :

Product Id	Name	Quantity	unit price	Total
101	A	2	25	50
102	B	1	100	100
Net. Amount				150

Course Outcome 4 (CO4):

1. Create a Graphics package that has classes and interfaces for figures Rectangle, Triangle, Square and Circle. Test the package by finding the area of these figures.
2. Create an Arithmetic package that has classes and interfaces for the 4 basic arithmetic operations. Test the package by implementing all operations on two given numbers
3. Write a user defined exception class to authenticate the user name and password.
4. Find the average of N positive integers, raising a user defined exception for each negative input.
5. Define 2 classes; one for generating multiplication table of 5 and other for displaying first N prime numbers. Implement using threads. (Thread class)
6. Define 2 classes; one for generating Fibonacci numbers and other for displaying even numbers in a given range. Implement using threads. (Runnable Interface)
7. Producer/Consumer using ITC
8. Program to create a generic stack and do the Push and Pop operations.
9. Using generic method perform Bubble sort.
10. Maintain a list of Strings using ArrayList from collection framework, perform built-in operations.
11. Program to remove all the elements from a linked list
12. Program to remove an object from the Stack when the position is passed as parameter
13. Program to demonstrate the creation of queue object using the PriorityQueue class
14. Program to demonstrate the addition and deletion of elements in deque
15. Program to demonstrate the creation of Set object using the LinkedHashSet class
16. Write a Java program to compare two hash set



17. Program to demonstrate the working of Map interface by adding, changing and removing elements.
18. Program to Convert HashMap to TreeMap

Course Outcome 5 (CO5):

1. Program to draw Circle, Rectangle, Line in Applet.
2. Program to find maximum of three numbers using AWT.
3. Find the percentage of marks obtained by a student in 5 subjects. Display a happy face if he secures above 50% or a sad face if otherwise.
4. Using 2D graphics commands in an Applet, construct a house. On mouse click event, change the color of the door from blue to red.
5. Implement a simple calculator using AWT components.
6. Develop a program that has a Choice component which contains the names of shapes such as rectangle, triangle, square and circle. Draw the corresponding shapes for given parameters as per user's choice.
7. Develop a program to handle all mouse events and window events
8. Develop a program to handle Key events.

Course Outcome 6 (CO6):

1. Program to list the sub directories and files in a given directory and also search for a file name.
2. Write a program to write to a file, then read from the file and display the contents on the console.
3. Write a program to copy one file to another.
4. Write a program that reads from a file having integers. Copy even numbers and odd numbers to separate files.
5. Client server communication using Socket – TCP/IP
6. Client Server communication using DatagramSocket - UDP

Syllabus:

Classes and Objects, Constructors, Method Overloading, Access Modifiers, Arrays and Strings, Inheritance, Interfaces, Abstract classes, Dynamic Method Dispatch, String, Packages, Introduction to java.util, Collection framework, User defined packages, Exceptions, Multithreading, Applets, Graphics, File, Generic programming, Socket Programming



Reference Books

1. Herbert Schildt, “*Java The Complete Reference*”, Seventh Edition, Tata McGraw-Hill Edition
2. C. Thomas Wu, “*An introduction to Object-oriented programming with Java*”, Fourth Edition, Tata McGraw-Hill Publishing company Ltd.
3. Cay S. Horstmann and Gary Cornell, “*Core Java: Volume I – Fundamentals*”, Eighth Edition, Sun Microsystems Press.
4. K. Arnold and J. Gosling, “*The JAVA programming language*”, Third edition, Pearson Education.
5. Paul Deitel and Harvey Deitel, “*Java, How to Program*”, Tenth Edition, Pearson Education
6. Rohit Khurana, “*Programming with Java*”, Vikas Publishing, 2014.
7. Timothy Budd, “*Understanding Object-oriented programming with Java*”, Updated Edition, Pearson Education.
8. Y. Daniel Liang, “*Introduction to Java programming*”, Seventh Edition, Pearson Education.

Web Reference

- <https://www.hackerrank.com/domains/java>
- <https://www.geeksforgeeks.org/java-tutorial/>
- <https://www.w3resource.com/java-tutorial/>
- <https://www.w3resource.com/java-exercises/>
- <https://nptel.ac.in/courses/106/105/106105191/>
- <https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs08/>
- <https://www.coursera.org/learn/object-oriented-java>
- <https://www.edx.org/course/object-oriented-programming-in-java-2>



Course Contents and Lab Schedule

Topic	No. of hours
1. Classes and Objects.	3
2. Constructors, Method Overloading, Access Modifiers	2
3. Arrays and Strings.	4
4. Inner class – static and non-static	2
5. Inheritance, Multiple inheritance - implementation using interfaces	3
6. Method overriding, Abstract classes, Dynamic Method Dispatch	3
7. Interfaces and Packages, StringBuffer class	3
8. Introduction to java.util package – Vector, Scanner, StringTokenizer	2
9. Collection framework – ArrayList, LinkedList, Stack, Queue, Set, Map	3
10. User defined packages	2
11. Exceptions – User defines exceptions	2
12. Multithreading – Thread class	2
13. Inter Thread Communication	2
14. Generic programming	2
15. Applets, Graphics – 2D	3
16. Event handling in Applet	3
17. File	3
18. Socket Programming	3



20MCA134	ADVANCED DBMS LAB	CATEGORY	L	T	P	CREDIT
		PRACTICAL	0	1	3	2

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: 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	Comparison between 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)			
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:

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

End Semester Examination Pattern:

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



Course Level Assessment

Questions Course Outcome 1 (CO1):

1. 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. Usage of concerned Online/Cloud Storage Management Systems like MongoDB Atlas, Cassandra DataStax etc. (K6)
3. 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/databases-5-sql>
3. Introduction to MongoDB <https://www.coursera.org/learn/introduction-mongodb>
4. Apache Cassandra <https://www.edureka.co/cassandra>
5. NoSQL systems <https://www.coursera.org/learn/nosql-databases>
6. <https://hbase.apache.org/>
7. <https://couchdb.apache.org/> <https://aws.amazon.com/dynamodb/>
8. <https://aws.amazon.com/dynamodb/>

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	<i>An overview of relational database design using MySQL/ MariaDB/ PostgreSQL etc. (Apply the following basic queries on an Employee/ Student database etc.)</i>	6 hrs
1.1	<ul style="list-style-type: none">• DDL Commands• DML Commands• Imposing restrictions on database (DCL & TCL Commands)	3
1.2	<ul style="list-style-type: none">• 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



No	Topic	No. of Lectures
2	<i>PL/SQL Programs</i>	4 hrs
2.1	<ul style="list-style-type: none"> • Trigger, Cursor, Stored Procedures and Functions 	4
3	<i>Introduction to NoSQL Databases</i>	2 hrs
3.1	<ul style="list-style-type: none"> • Installation and configuration of any one of the NoSQL databases - MongoDB/ Cassandra/ HBase/ CouchDB/ Amazon DynamoDB/ Redis/ Neo4j etc. 	2
4	<i>Designing Databases using NoSQL</i>	2 hrs
5	<i>Query Processing</i>	8 hrs
5.1	<ul style="list-style-type: none"> • Performing CRUD operations • Retrieving Data from a NoSQL database • Usage of aggregate functions, regular expressions etc. 	8
6	<i>NoSQL Administration</i>	2 hrs
6.1	<ul style="list-style-type: none"> • Security, Monitoring & Backup • Create Users and Roles 	2
7	<i>NoSQL shell commands</i>	6 hrs
7.1	<ul style="list-style-type: none"> • Perform Sharding, Replication (Master-Slave/ Master-Less/ Peer-to-Peer Architectures), Clustering, Partitioning, Indexing (Corresponding to the selected NoSQL Database) 	6
8	<i>Deployment</i>	16 hrs
8.1	<ul style="list-style-type: none"> • Local Deployment NoSQL and Front-End: PHP/Java/Python (MongoDB/ Cassandra etc.) 	4
8.2	<ul style="list-style-type: none"> • Cloud Deployment NoSQL and Cloud: Amazon DynamoDB/ Google Bigtable/ Azure Cosmos DB 	8
8.3	<ul style="list-style-type: none"> • Familiarization of Atlas/ DataStax corresponding to the selected NoSQL Database 	4
9	<i>Micro project</i>	10 hrs



20MCA136	NETWORKING & SYSTEM ADMINISTRATION LAB	CATEGORY	L	T	P	CREDIT
		PRACTICAL	0	1	3	2

Preamble: This laboratory course is intended to provide the background knowledge required for a software professional in the fields of networking and system administration. Students will acquire necessary knowledge to deploy and administer systems.

Prerequisite: Basic understanding of computer programming, Internet and operating systems

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

CO 1	Install and configure common operating systems.
CO 2	Perform system administration tasks.
CO 3	Install and manage servers for web applications.
CO 4	Write shell scripts required for system administration.
CO 5	Acquire skill sets required for a DevOps.

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		2		2							
CO 2	1		2									
CO 3			2		2							
CO 4					2							
CO 5	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:

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

End Semester Examination Pattern:

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

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Install latest version of Ubuntu on a virtual box, set up a static ip address to it and install drupal environment.
2. You are given a computer with very low hardware resources. It is to be used as a kiosk. Identify and install a suitable Linux distribution. You can simulate it in a virtual environment.



Course Outcome 2 (CO2)

1. You are given a system which is connected to internet. However, users logging on to the system are unable to access internet from their browser. Trouble shoot the issue,clearly documenting the steps you have taken (Possible issues to look for are browser configuration, network connectivity, routing, ip address configuration,DNS resolution)
2. You are given a system which boots to a non graphical environment. You are also given a shell script which is designed for a specific task. Your task is to make sure that the script runs every time the system boots up. Write/modify necessary scripts for this.
3. You are required to add 100 users to a Linux system. Details of the users to be added were collected from a web form to a csv file. The csv may contain errors such as wrong case or missing fields. Write a script to add users using the data provided in the csv file with proper error checking.

Course Outcome 3(CO3):

1. You are given a bare bone installation of latest version Ubuntu. Assume that the system is accessible from internet. Your task is to successfully install word press (or any other web application) on this server. Clearly indicate the steps taken and software installed for this task.
2. Assume that you have an installation of old version Ubuntu. However, it does not have the latest version of virtual box (or some other application). The new version is available as a binary on a website. Upgrade to this version.

Course Outcome 4 (CO4):

- 1.Look at the system log files. Write a shell script to extract the last login details of a particular user and list out all failed logins. Store the results to a file. The user name should be given as a command line argument.
- 2.Write a shell script to display the details of a particular process currently running. Assume that you have necessary permissions. The process name/id is to be given as a command line argument

Course Outcome 5 (CO5):

- 1.Capture network traffic on your system. Using wireshark find out all http and https traffic to a specific host.
- 2.Write an Ansible playbook to deploy a new Linux VM on a remote server.

Syllabus:

Introduction to Computer hardware. Study of various peripherals. Study of common operating systems. File system organization in common operating systems.



Study of command line environment in common operating systems. Study of command line tools for system administration.

Shell scripting: bash shell, shell scripts for system management.

Study of startup scripts.

Study of server software for common applications such as http, ftp, dns, dhcp.

Practical study of Ipv4 and Ipv6 networking protocols. Setting up firewalls.

Virtual machines and containers. Configuration and deployment.

List of Lab Experiments/Exercises

To gain proficiency in command line tools and operations, it is highly recommended to use a terminal window instead of GUI tools. This will later help the student with latest approaches in maintaining cloud based infrastructure. virtualbox/queemu. may be used for this.

1. Introduction to Computer hardware: Physical identification of major components of a computer system such as mother board, RAM modules, daughter cards, bus slots, SMPS, internal storage devices, interfacing ports. Specifications of desktop and server class computers. Installation of common operating systems for desktop and server use. (Students may be asked to formulate specification for computer to be used as Desktop, Web server)
2. Study of a terminal based text editor such as Vim or Emacs. (By the end of the course, students are expected to acquire following skills in using the editor: cursor operations, manipulate text, search for patterns, global search and replace)
Basic Linux commands, familiarity with following commands/operations expected
 1. man
 2. ls, echo, read
 3. more, less, cat,
 4. cd, mkdir, pwd, find
 5. mv, cp, rm ,tar
 6. wc, cut, paste
 7. head, tail, grep, expr
 8. chmod, chown
 9. Redirections & Piping
 10. useradd, usermod, userdel, passwd
 11. df,top, ps
 12. ssh, scp, ssh-keygen, ssh-copy-id
3. File system hierarchy in a common Linux distribution, file and device permissions, study of system configuration files in /etc, familiarizing log files for system events, user activity, network events.
4. Shell scripting: study bash syntax, environment variables, variables, control constructs such as if, for and while, aliases and functions, accessing command line arguments passed to shell



scripts. Study of startup scripts, login and logout scripts, familiarity with systemd and system 5 init scripts is expected.

5. Installation and configuration of LAMP stack. Deploy an open source application such as phpmyadmin and Wordpress.
6. Installation and configuration of common software frame works such as Laravel. (Student should acquire the capability to install and configure a modern framework)
7. Build and install software from source code, familiarity with make and cmake utilities expected.
8. Introduction to command line tools for networking
IPv4 networking, network commands: ping route traceroute, nslookup, ip. Setting up static and dynamic IP addresses. Concept of Subnets, CIDR address schemes, Subnet masks, iptables, setting up a firewall for LAN, Application layer (L7) proxies.
9. Analyzing network packet stream using tcpdump and wireshark. Perform basic network service tests using nc.
10. Introduction to Hypervisors and VMs, Xen or KVM , Introduction to Containers: Docker, installation and deployment.
11. Automation using Ansible: Spin up a new Linux VM using Ansible playbook



APJ ABDUL KALAM
TECHNOLOGICAL
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KTU

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):

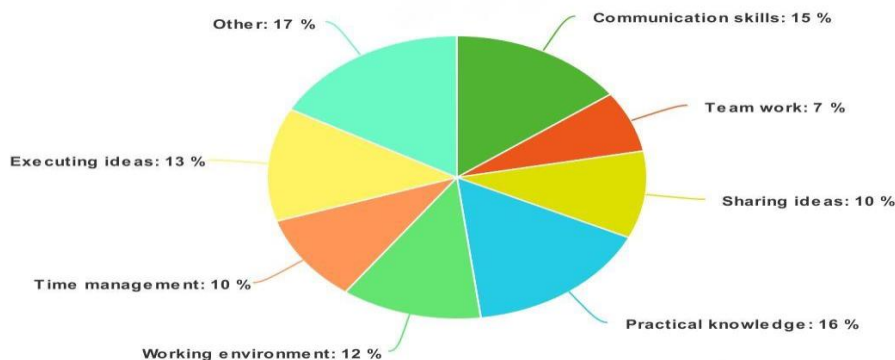
1. Compare active and intensive listening. (K5)
2. Outline the strategies for listening. (K4)
3. Create notes while listening to a video on a particular topic by using outline method. (K6)

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

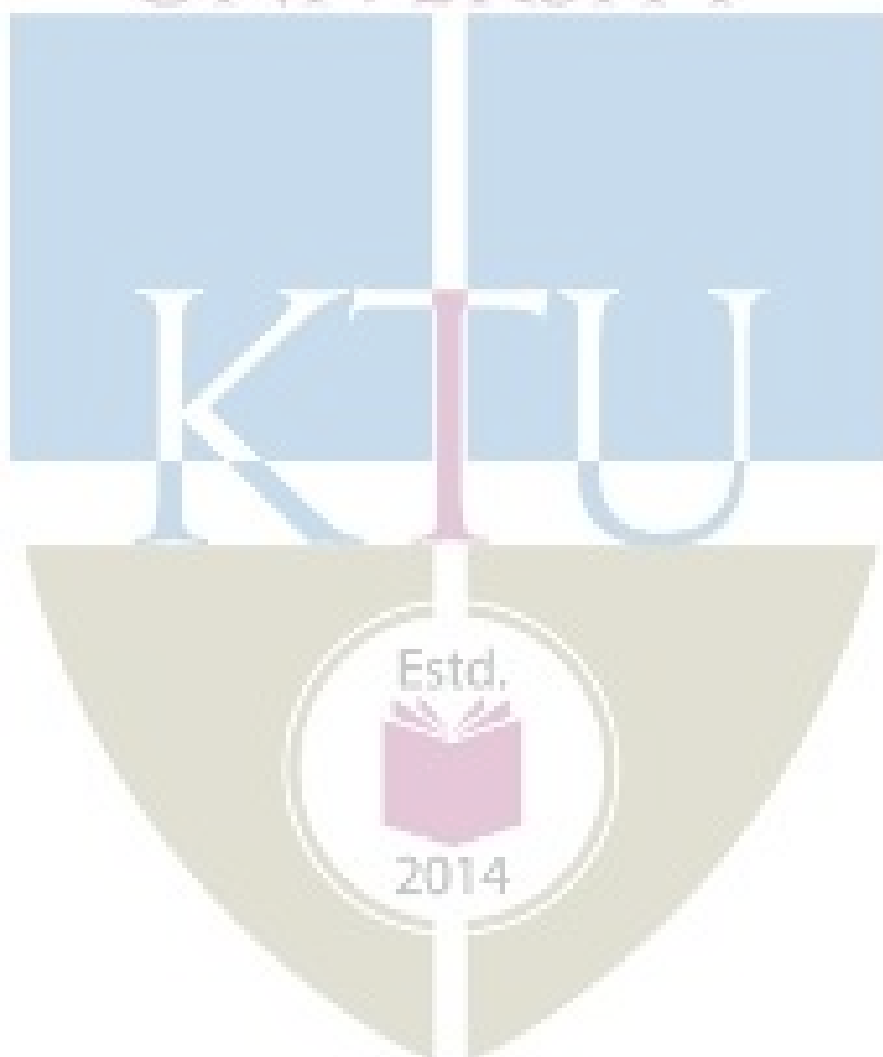
Course Contents and Lecture Schedule

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

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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 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 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 $(a, b) \in R$ 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 $f: R \rightarrow R$ defined by $f(x) = 2x + 3$ is a bijection (K3)
3. Let $f, g: Z \rightarrow Z$ 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 $y(x) = x \sin x - 3 \cos x$ (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/#>

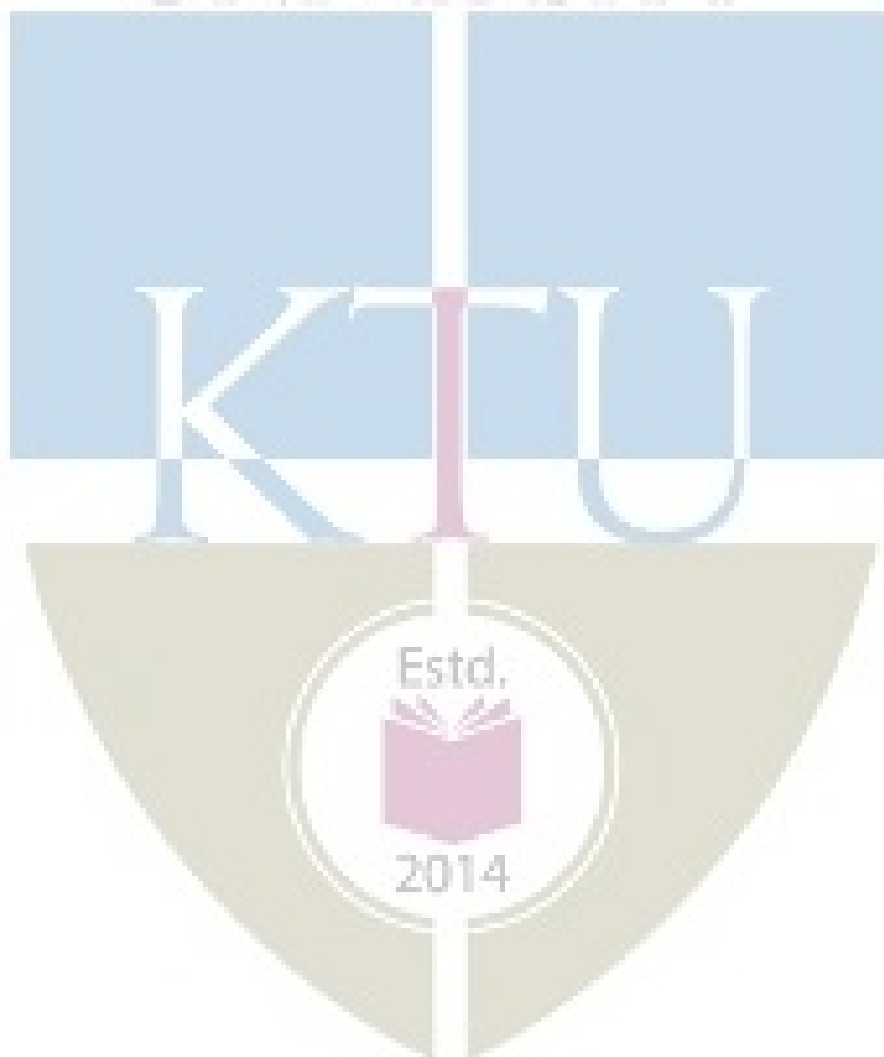
Course Contents and Lecture Schedule

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 (<i>concept only - not for examination</i>)	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

ABDUL KALAM
TECHNOLOGICAL
UNIVERSITY



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 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 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 $1+3+5+\dots+N$, 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 $1+3+5+\dots+N$.

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.yspuniversit.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 $1+3+5+\dots+N$.	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 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. 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

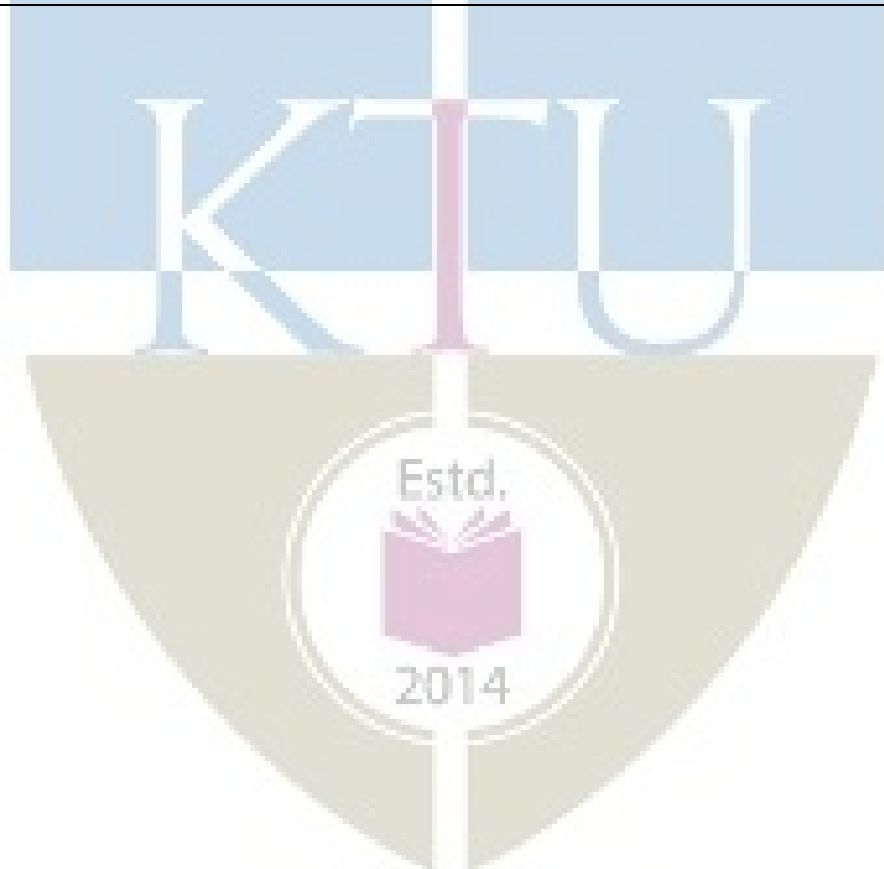
1. Craig Zacher, John Rourke “PC Hardware The complete reference” Tata McGraw-Hill Edition 2012.

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 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 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.eduoix.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.



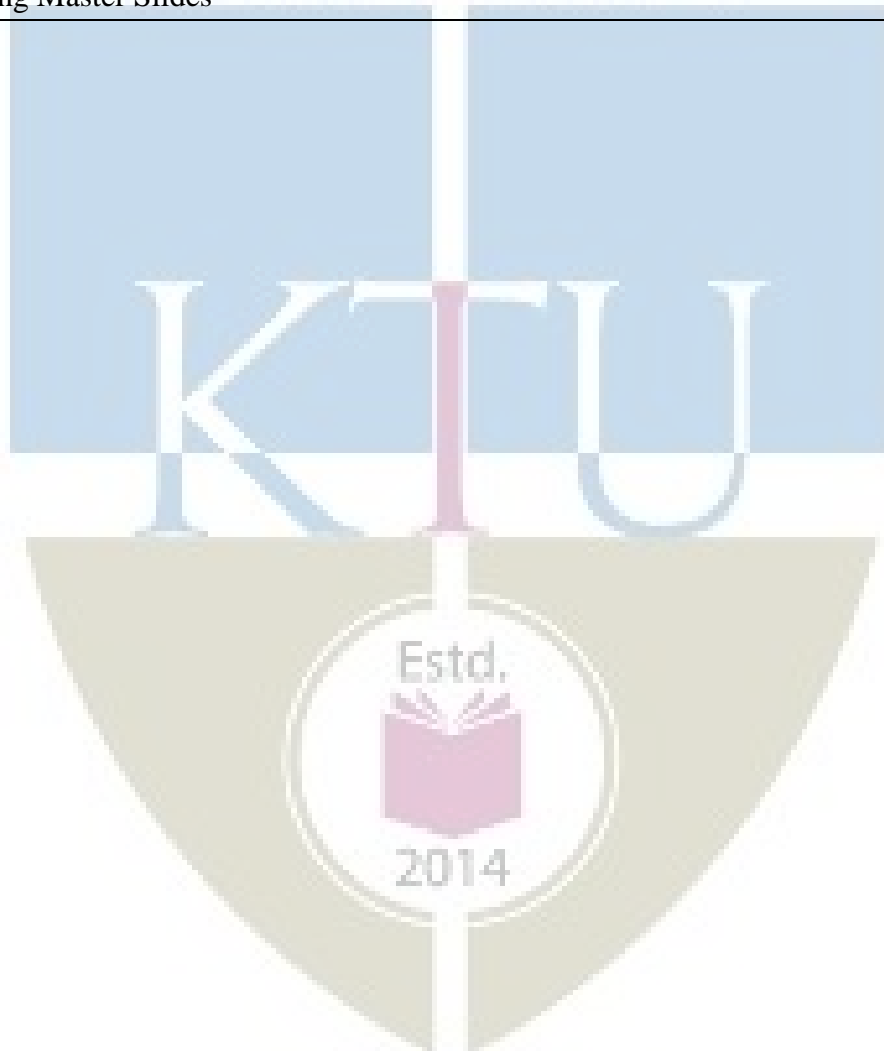
8. Inserting Cover Page, Blank Page, Page Break, Insert Pictures and its formatting, Shapes, SmartArt and Charts, Hyperlinks using different methods, Bookmarks, Header & footer, Page numbering, Adding Textbox, Auto Text, WordArt, Drop Cap, Adding Objects, Equations and Symbols to document.
9. Tables-Adding 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 disassembling 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 disassembling 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 disassembling 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.



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



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 your 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=1mJJ3ULjWYQ
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.com/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=mLefVAvKsRk
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/worksheets/en/English_as_a_Second_Language_(ESL)/Sequence_words/Sequencer_hd35532qf	https://www.youtube.com/watch?v=sFrHK7cHzkA
9	Phrases and Clauses	https://www.softschools.com/quizzes/grammar/phrase_or_clause/quiz282_5.html	https://www.youtube.com/watch?v=z45UdL0WTro



10	Direct and Indirect Speech	https://www.perfect-english-grammar.com/reported-speech-exercise-10.html	https://www.youtube.com/watch?v=LVB4O0BSZBQ
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Vocabulary

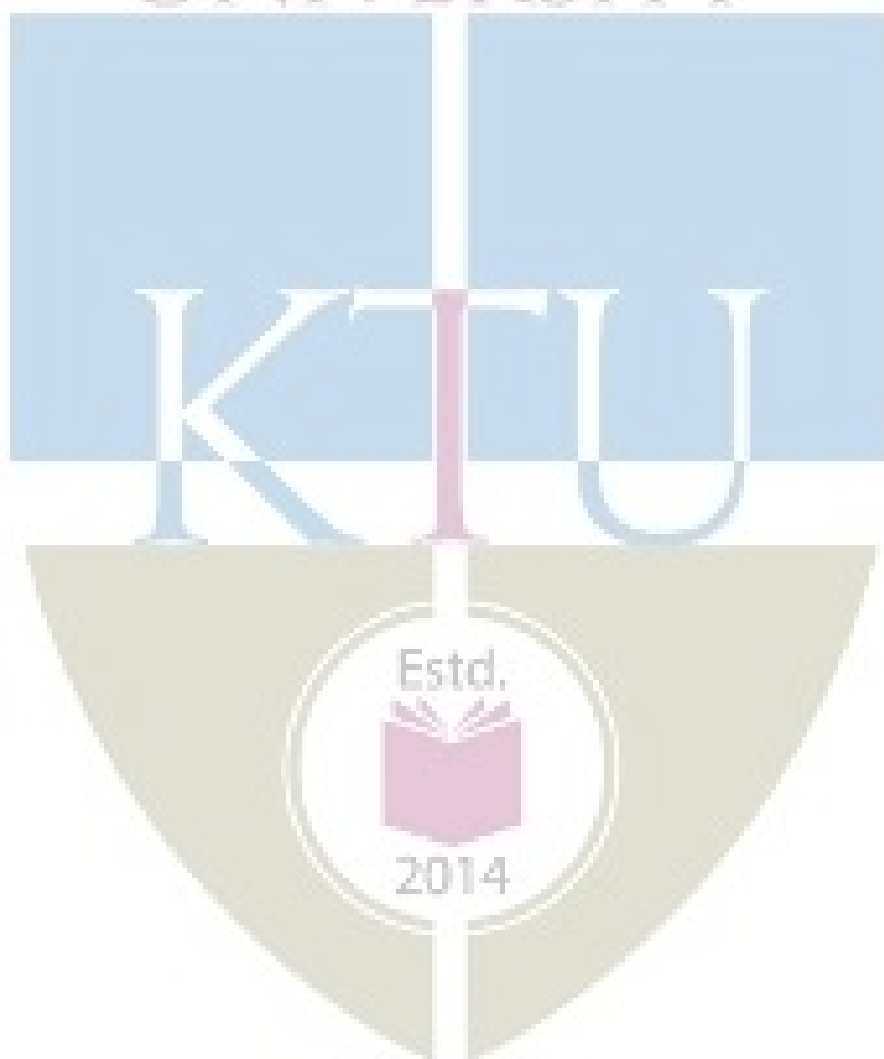
Sno	Topic	Link
1	Compound Words	https://www.englisch-hilfen.de/en/exercises/structures/compounds.htm
2	Acronyms	https://www.tolearnenglish.com/exercises/exercise-english-2/exercise-english-113150.php
3	Guessing meaning from context	https://www.grammarbank.com/context-clues-worksheet.html
4	Homophones	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 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 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):

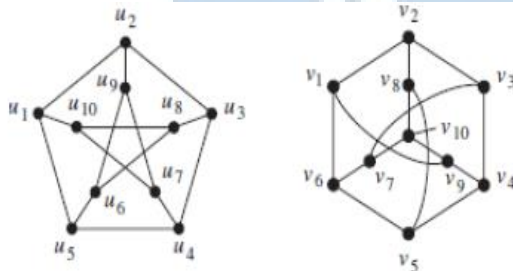
1. Describe the principle of mathematical induction. (K1)
2. Explain the generalized pigeonhole principle. (K2)
3. Use pigeonhole principle to show that among any $n+1$ positive integers not exceeding $2n$ there must be integer that divides one of the other integers. (K3)

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):

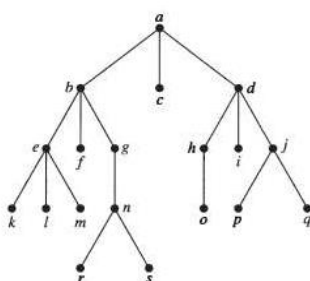
1. Determine the adjacency matrix for K_n . (K3)
2. Determine the given pair of graph is isomorphic. Exhibit an isomorphism or provide a rigorous argument that none exists. (K3)



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 Remainder 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 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. 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 Complement 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 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 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. $f(n) = n! / (\text{sum of factors of } n)$, if n is not prime and $f(n) = n! / (\text{sum of digits of } n)$, 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.

Structure 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).



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

Web Resources

- <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 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 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, (iv) 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=f7aaJ7d6QIQ
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&utm_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

