MCA SYLLABUS

UNDER

CHOICE BASED CREDIT SYSTEM

FOR THE STUDENTS TO ADMITTED IN THE SESSIONS
2018-19, 2019-20, 2020-21

DEPARTMENT OF COMPUTER SCIENCE & IT,
UNIVERSITY OF JAMMU

MCA COURSE STRUCTURE

Semester-Wise Distribution of Courses and Credits

Semester I

Course No.	Title	Credits	Contact hours per week L-T-P
PSCATC102	Problem Solving & Programming in C	4	4-0-0
PSCATC103	Computer Organization & Assembly Language	4	4-0-0
PSCATC107	Operating System Principles	4	4-0-0
PSCATC108	Discrete Mathematics	4	4-0-0
PSCALC190	Practical *(based on C and Unix/Linux)*	6	0-0-10
	Total:	**22**	**16-0-10**

Semester II

Course No.	Title	Credits	Contact hours per week L-T-P
PSCATC203	Data Structures using C-Language	4	4-0-0
PSCATC208	Database Management System	4	4-0-0
PSCATC209	Computer Architecture & Microprocessor	4	4-0-0
PSCATC212	Computer Networks	4	4-0-0
PSCATC213	Application Programming using Java	4	4-0-0
PSCALC290	Practical *(based on Data Structures, Oracle and Java)*	6	0-0-10
	Total:	**26**	**20-0-10**

Semester III

Course No.	Title	Credits	Contact hours per week L-T-P
PSCATC310	Algorithm Design & Analysis	4	4-0-0
PSCATC311	Computer Graphics	4	4-0-0
PSCATC313	Web Technologies	4	4-0-0
	*Open Course-I	4	4-0-0
PSCALC390	Practical *(based on Computer Graphics and Web Technologies)*	6	0-0-10
	Total:	**22**	**16-0-10**

*Students shall register for this Course from other Departments of University. He/she may opt for MOOC course of equivalent credits instead.

Semester IV

Course No.	Title	Credits	Contact hours per week L-T-P
PSCATC420	Theory of Computation	4	4-0-0
PSCATC422	Numerical & Statistical Computing	4	4-0-0
PSCATC423	Software Engineering	4	4-0-0
  PSCATE425 PSCATE426 PSCATE427 PSCATE428	Elective-I *(any one of the following)* Python Big Data Analytics with R Machine Learning Internet of Things	4	4-0-0
	*Open Course-II	4	4-0-0
PSCALC490	Practical *(based on Numerical & Statistical Methods and Python/R)*	6	0-0-10
	Total:	**26**	**20-0-10**

*Students shall register for this Course from other Departments of University. He/she may opt for MOOC course of equivalent credits instead.

Semester V

Course No.	Title	Credits	Contact hours per week L-T-P
PSCATC504	Artificial Intelligence	4	4-0-0
PSCATC511	Principles of Complier Design	4	4-0-0
PSCATC518	.NET Technology & C#	4	4-0-0
PSCATE516 PSCATE519	Elective-II *(any one of the following)* Mobile Technologies PHP	4	4-0-0
PSCALC590	Practical *(based on .NET and PHP/Mobile Technologies)*	6	0-0-10
	Total:	**22**	**16-0-10**

Semester VI

PSCADC601

PROJECT WORK: 26 credits

The project in sixth semester shall carry 650 marks distributed as follows:

Project Component		**Marks**
Mid-Semester Presentation & Internal Evaluation		250
End-Semester Evaluation	Project Evaluation	250
	Project Viva-voce	150
	Total:	**650**

NOTE:

1. The students of Computer Science Department shall register for two courses of 4 credits each in 3rd and 4th semester in the other Departments of University.
2. Department shall offer following two open courses of 4 credits in 3rd and 4th semester for students from other Departments of University.
   - 3rd Semester: Problem Solving & Programming in C (PSCATO351)
   - 4th Semester: Object Oriented Concepts using C++ (PSCATO451)

Requirements for earning the MCA degree

The total credits required for the MCA programme are 144. The credits are distributed over three categories:

CATEGORIES	DESCRIPTION	CREDITS	
Post-graduate Semester Core Courses (PSCC)	Core Departmental Courses	128	136
Post-graduate Semester Elective Courses (PSEC)	Elective Departmental Courses	08	
Post-graduate Semester Open Category Courses (PSOCC)	Other Department Courses	08	
	TOTAL CREDITS	**144**	

Course credits assignment

Lectures and Tutorials: One lecture or tutorial hour per week per semester is assigned one credit.
Practical/Laboratory: One and half laboratory hour per week per semester is assigned one credit.

EXAMINATION:
There shall be three tests in each semester and the student shall be continuously evaluated during the conduct of each course on the basis of their performance as follows:

THEORY	Syllabus to be covered in the examination	Time allotted for the exam.	Weightage (Marks)
Minor test I (after one month)	Upto 25%	1½ hours	20%
Minor test II (after two months)	Upto 50%	1½ hours	20%
Major test * (after end of semester)	Upto 100%	3 hours	60%

*(i) 80% weightage in Major Test shall be given to those units which have not been covered in the two Minor Tests.
(ii) Certain questions may be framed in such a way which may require knowledge of more than one unit or one question may have multiple parts either subjective and/or objective from one or more units i.e. certain questions may be from across units.

Total					**100**
PRACTICAL					
Daily evaluation of practical records/Viva voce etc. (Internal Evaluation)	1	Viva voce 1	15	35	75
	2	Viva voce 2	15		
	3	Practical File	5		
	4	Internal exam + Viva voce 3	25 + 15	40	
Final Practical performance and viva voce (External Evaluation)	**100% syllabus**				75
Total					**150**

SCHEME FOR PAPER SETTING (MAJOR EXAMINATION)

The question paper shall be divided into three sections (A, B & C). No question shall be repeated in the question paper.

Section A

In this section the examiner needs to set 10 objective questions/definitions/fill in the blanks distributed uniformly over the entire syllabus. Each question shall carry 1½ marks and the candidates are required to answer all the questions.

(10 x 1½ = 15 marks)

Section B

There shall be 5 short answer type questions and shall carry 3 marks each. In this section, questions shall be covered from each unit and the candidates are required to answer all the questions.

(3 x 5 = 15 marks)

Section C

There shall be 3 long answer type questions each set from Unit ï III, IV and V with internal choice. Each question shall carry 10 marks.

(3 x 10 = 30 marks)

ATTENDANCE:

Each course (theory, practical etc.) shall be treated as an independent unit for the purpose of attendance. A student shall be required to attend a minimum of 75% of the total instruction hours in a course including tutorials and seminars in each semester. A student who fails to secure 75% attendance in a course shall not be eligible to appear in the semester examination in that course and shall be required to repeat that course.

CRITERIA FOR PROMOTION OF A STUDENT TO NEXT HIGHER SEMESTER:

A student will be eligible to proceed from 1st semester to 2nd semester, from 2nd semester to 3rd semester, from 3rd semester to 4th semester, from 4th semester to 5th semester and from 5th to 6th semester if he/she has earned 50% credits in Theory/Practical Courses cumulatively in earlier semesters of the programme and has completed the minimum attendance requirements.

ABSOLUTE GRADE SYSTEM

MARKS	Grade	Grade Points	Description of performance
≥ 90	O	10	Outstanding
≥ 75 and < 90	A+	9	Excellent
≥ 65 and < 75	A	8	Very Good
≥ 55 and < 65	B+	7	Good
≥ 50 and < 55	B	6	Above Average
≥ 40 and < 50	C+	5	Average
≥ 36 and < 40	C	4	Pass/Below Average
> 20 and < 36	D	2	Fail/Poor
≤ 20	E	0	Very Poor

ôDô and ôEô grades refer to unsatisfactory performance. The student shall have to repeat all compulsory courses where the D/E grade is obtained. The weights of ôDô and ôEô grades shall not be counted in SGPA or CGPA. Other grades would include:

GRADES	DESCRIPTION
I	Incomplete
W	Withdrawal
X	Continued Project
S	Satisfactory Completion
Z	Non Completion

CONVERSION FROM CGPA TO PERCENTAGE

The conversion of SGPA or CGPA to Percent score will be carried out by multiplication of respective SGPA or CGPA by a factor of 9.
A CGPA of 6.75 shall be considered equivalent to 60% marks.

MCA-FIRST SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test = 3 hours	Major Test = 60 marks
Examination to be held: December 2018, 2019, 2020	

COURSE NO: PSCATC102
COURSE TITLE: PROBLEM SOLVING & PROGRAMMING IN C

Course Objectives & Learning Outcomes:

- ŏ The course aims to provide exposure to problem-solving through programming.
- ŏ It aims to train the student to the basic concepts of the C-programming language.
- ŏ To compare the various programming constructs and choose the right one for the task in hand.
- ŏ To choose the right data representation formats based on the requirements of the problem.
- ŏ By learning the basic programming constructs they can easily switch over to any other language in future.

UNIT-I Problem Solving & C Basics
Steps for problem solving, Computer as a tool for problem solving. Program Design tools: Algorithm, Psuedocode and Flowchart Designing.
History of C, Characteristics of C, Introduction to GCC, compiling, linking and running a Cï program, Using MAKE Utility.
C Program Structure, Data Types, Variables and Constants, Printing Out and Inputting Variables, Constants, Type-Casting, Operators and Expressions, Order of Precedence.

10 HOURS

UNIT-II Control Statements & Arrays
Conditional Statements, Program Loops and Iteration, Library functions. Syntax, semantic, linker, logical and runtime errors.
Single and Multi-dimensional Arrays, Strings, Basic String Handling Functions.

10 HOURS

UNIT-III Functions & Further Data Types
Functions, Passing Parameters, Recursion, Storage classes. Standard C Preprocessor Directives. Standard Formatted & unformatted I/O Functions;
Defining New Data Types, Structures, Unions, Enumerated Types, Bitwise Operators, Bit Fields.

10 HOURS

UNIT-IV Pointers & Files
Pointers: Pointers arithmetic, constant void pointers. Dynamic Memory Allocation, Pointers to Pointers, Pointer to array, Array of pointers, Command line input, Pointers to a Function.
Files Character and Line Based I/O, Formatted I/O, Block I/O, File Positioning.

10 HOURS

UNIT-V File Accessibility & Graphics Programming
File Accessibility and Directories (access, stat, chmod, chown, chdir, chroot), ProcessControl: (Running Linux Commands from C, fork(), the exec family, wait(), exit()).
Graphics Programming: OpenGL Basics, OpenGL Utility Toolkit (GLUT), Defining window, Display mode, OpenGL Functions, Primitives (Points, Lines, Polygons) and Attributes, Simple graphics programs.

10 HOURS

MCA-FIRST SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: December 2018, 2019, 2020

COURSE NO: PSCATC102
COURSE TITLE: PROBLEM SOLVING & PROGRAMMING IN C

SUGGESTED READINGS:

1. B. Kernighan and D. Ritchie, ñThe ANSI C Programming Languageò, PHI., 2000.
2. Shubhnandan S. Jamwal, ñProgramming in Cò, Pearson Publications, 2014.
3. Behrouz A. Forouzan and Richard F. Gilberg, ñComputer Science A Structured Programming Approach Using Cò, PHI, 3rd Edition, 2007.
4. Jeri R. Hanly and Elliot B. Koffman, ñProblem Solving and Programming in Cò, Pearson, 5th Edition 2007.
5. Yashwant Kanetkar, ñLet us Cò, BPB Publications, 2002.
6. Edward Angel, ñOpenGL- A primerò, 3rd Edition, Addison-Wesley 2007.
7. Kurt Wall, Mark Watson, and Mark Whitis, ñLinux Programming Unleashedò, SAMS.
8. Mark Mitchell, Jeffrey Oldham, and Alex Samuel, ñAdvanced Linux Programmingò, New Riders Publishing, 2001.
9. Edward Angel, ñInteractive Computer Graphicsò, 5th Edition, Addison-Wesley 2009.

NOTE FOR PAPER SETTERS

The question paper shall be divided into three sections namely A, B and C with total weightage of 15, 15 and 30 marks respectively with detail as under:

SECTION A:
There shall be 10 objective questions distributed uniformly over the entire syllabus. Each question carries 1½ marks and the candidates are required to answer all the questions.

SECTION B:
There shall be 5 short answer type questions and each shall carry 3 marks. In this section, questions shall be set from each unit and the candidates shall be required to answer all the questions.

SECTION C:
There shall be 3 long answer type questions each set from Unit ï III, IV and V with internal choice. Each question shall carry 10 marks.

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MCA-FIRST SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: December 2018, 2019, 2020	

COURSE NO: PSCATC103
COURSE TITLE: COMPUTER ORGANIZATION & ASSEMBLY LANGUAGE

Course Objectives & Learning Outcomes:

- To describe how data is represented in computer memory.
- To demonstrate how fundamental high-level programming constructs are implemented at the machine-language level.
- To write assembly language program that can input, process and output results.
- To demonstrate the basic computer architecture.
- Students will be to apply mathematical foundations, algorithmic principles, and computer science theory to the modeling and design of computer based systems.

UNIT–I Binary Systems
Overview of digital computers, Binary Numbers, Number systems, Number based Conversions, Integer & floating point representation using IEEE FORMAT, Rules of Floating point Arithmetic, parity, Error detection and correction methods using Hamming technique, ASCII code representation, Rules of addition/subtraction for rôs, (r-1)ôs complements, BCD, excessï 3 codes.

10 HOURS

UNIT–II Boolean Algebra & Logic Gates
Basic Theorems and functions, Boolean Expressions, Laws of Boolean Algebra, Deï Morgan laws, simplification of Boolean Expressions using SOP, POS, Kï map. Logic gates, AND, OR, NOT, NAND, XOR, NOR, XNOR Gates & their design.

10 HOURS

UNIT–III Combinational Circuits
Introduction, Half & Full adders & subtractors, parallel adders and subtractors. Encoder, decoder, Multiplexer, De-Multiplexer, code converters.

10 HOURS

UNIT-IV Sequential circuits & Memory organization
Sequential circuits, Basic memory cell, Flip-flops and their types, triggering of flip flops, Registers and their types, bi-directional register.
Memory Hierarchy, Memory and its types, characteristics of memory, memory address map to CPU, cache memory.
I/O devices FD/HD disks, VDU; I/O organization, Modes of I/O transfer like DMA, programmed control, interrupts technique.

10 HOURS

UNIT–V Microprocessor & Assembly Language
Microcomputer organization, microprocessor organization, Instruction set, addressing modes, stack, subroutines and interrupts, memory organization and I/O interface.
Need and use of Assembly Language, Types of Assemblers (TASM and MASM), assembly Language programming structure, Instruction Sets (operands and opcodes), description of Registers, writing and executing simple assembly programs.

10 HOURS

MCA-FIRST SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: December 2018, 2019, 2020

COURSE NO: PSCATC103
COURSE TITLE: COMPUTER ORGANIZATION & ASSEMBLY LANGUAGE

SUGGESTED READINGS:

1. Gear, C. W.: ñComputer Organization and Programmingò, McGrawï Hill.
2. Tannenbaum, A. S.: ñStructured Computer Organizationò, Prentice-Hall of India.
3. Mano, M. M.: ñComputer System Architectureò, Prenticeï Hall, of India.
4. Langholz, G., Grancioni, J. and Kandel, A.: ñElements of Computer Organizationò, PHI.
5. Hayes: ñComputer Architecture and Organizationò, McGrawï Hill International Edition.
6. Sloan, M. E.: ñComputer Hardware and Organizationò, 2nd Edn, Galgotia publ. Pvt. Ltd.
7. Floyd: ñDigital Fundamentalsò, 3rd edn, Universal bookstall, and pvt. ltd
8. R. K Gaur: ñDigital Electronics and microprocessorò-dhantpat Rai pub.
9. Peter Abel: ñAssembly language and Programmingò.

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MCA-FIRST SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: December 2018, 2019, 2020	

COURSE NO: PSCATC107
COURSE TITLE: OPERATING SYSTEM PRINCIPLES

Course Objectives & Learning Outcomes:

- To learn the fundamentals of Operating Systems.
- To learn the mechanisms of OS to handle processes and threads and their communication.
- To learn the mechanisms involved in memory management in contemporary OS.
- To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols.
- To brief the students about basic concepts of OS like Unix/Linux and programs using shell programming.

UNIT-I Introduction to Operating Systems

Evolution of operating systems, operating systems concepts, types of operating systems, different views of the operating system, operating system services, System calls, Types of system calls. Operating system Structure, Layered Approach, Microkernels, Virtual machines.

10 HOURS

UNIT–II Process Management

Process concept, operation on processes, Inter-process communication, mutual exclusion, Process scheduling, Basic Concepts, Scheduling criteria, Scheduling algorithms,

Process Synchronization, Inter process Synchronization, Critical section Problem, Semaphores, Monitors, Message passing.

Deadlocks, System Model, Deadlock characterization, Deadlock prevention, Deadlock avoidance.

10 HOURS

UNIT–III Memory Management

Memory management, swapping, contiguous memory allocation, relocation & protection, Memory management, Paging, Segmentation, Intel Pentium Segmentation, Intel Pentium Paging, Virtual memory, demand paging, performance of demand paging, Page replacement algorithms: FIFO, Optimal, LRU, Counting based page replacement.

10 HOURS

UNIT–IV File & I/O Management

Files system structure, file system implementation, Directory Implementation.

Allocation Methods, contiguous allocation, Linked allocation, Indexed allocation Disk organization, disk space management, disk scheduling, Disk Management, RAID Structure.

10 HOURS

UNIT –V

Introduction to LINUX/UNIX: Various parts of operating system, kernel, important parts of kernel;

Files and Directories: pathname; Directory Tree; current working directory; relative pathname; referring to home directories; device files; File permissions; Pipes; tees; mount, init, Files, Directories, Processes

MCA-FIRST SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: December 2018, 2019, 2020

COURSE NO: PSCATC107
COURSE TITLE: OPERATING SYSTEM PRINCIPLES

Commands: pwd, mkdir, rmdir, ls, cat, more, mv, cp, rm, diff, wc, pwd, wc, who write, who am i, passwd, ps, kill, date, cal, man, gzip, df, chmod, mkdir, cd. Filters: pr, head, tail, cut, paste, sort, uniq, nl, tr. Regular Expression: grep; egrep; fgrep
Vi-Editor, adding and replacing text, commands in Command mode, deletion, navigation, pattern search, repeating commands, undoing last command.
Shell Programming, Shell Script, Logical Operators, If else Statement, Case structure, Looping.

10 HOURS

SUGGESTED READINGS:

1. Silberschart, Galvin, Gagne, ñOperating System Conceptsò, 9th Edition, WSE Wiley, 2016.
2. Andrew. S. Tanenbaum, ñModern operating systemsò, 4th Edition, Pearson Prentice Hall, 2018
3. Milan Milenkovic, ñOperating system-concepts and designò, 2nd Edition, McGraw Hill International Edition, 2005
4. A. S. Godbole, ñOperating systemsò, 3rd Edition, Tata McGraw hill, 2017.
5. Deitel H. M., ñOperating Systemò, 3rd Edition, Pearson Publications, 2012.
6. Madnick & Donovan, ñOperating Systemsò, Tata McGraw Hill, 2003.
7. Sumitabha Das, ñUNIX Concepts and Applicationò, 4th Edition, Tata McGraw Hill, 2017.
8. Richard L. Petersen, ñThe Complete Reference Linuxò, 6th Edition, Tata McGraw Hill, 2010.

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SECTION C:
There shall be 3 long answer type questions each set from Unit ï III, IV and V with internal choice. Each question shall carry 10 marks.

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MCA-FIRST SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: December 2018, 2019, 2020	

COURSE NO: PSCATC108
COURSE TITLE: DISCRETE MATHEMATICS

Course Objectives & Learning Outcomes:

- ð Solve counting problems by applying elementary counting techniques using the product and sum rules, permutations, combinations, the pigeon-hole principle, and binomial expansion.
- ð To analyze algorithms and programs such as finding Fibonacci numbers, Tower of Hanoi problems using recurrence relations and recursion.
- ð Students will learn core ideas in graph theory.
- ð Students will be able to model problems in Computer Science using graphs and trees.

UNIT–I Counting Techniques
Basics of counting pigeon hole principles, permutation and combination, Recurrence Relations & their solution (Homogeneous & non-homogenous), Divide & Conquer Recurrences, Decision trees.

10 HOURS

UNIT–II Posets, Hasse Diagram, Lattices and Fuzzy
Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, and complemented lattices.
Introduction to fuzzy systems, fuzzy sets, equality of fuzzy sets, normal fuzzy sets, containment, support of a fuzzy set. Alpha-level sets. Basic operation of Fuzzy sets.

10 HOURS

UNIT–III Graphs
Introduction to Graphs; Incidence and degree; Handshaking Lemma; Isomorphism; Subgraphs and Union of graphs; connectedness; Walks, Paths and Circuits; Components; Connectedness Algorithm, shortest path Algorithms, Eulerian graph; Fleuryôs algorithms, Hamiltonian graph-Necessary conditions and sufficient conditions; Travelling saleman problem; Bipartite graphs; Directed Graphs, Binary relations, connectedness in directed Graph.

10 HOURS

UNIT–IV Trees
Properties of trees; Pendant vertices in a tree: Center of a tree; Rooted an binary trees; Spanning Treesï spanning tree algorithms; Fundamental circuits; Spanning trees of a weighted graph, cutsets and cut-Vertices; Fundamental cutsets; connectivity and separativity.

10 HOURS

UNIT–V Planar graphs &Coloring
Combinatorial and geometric dual; Kuratowski's graphs; Detection of planarity; Thickness and crossings.
Colorings: Vertex coloring, Chromatic number; Chromatic polynomial, The four colour problem, edge coloring, Coloring algorithms.

10 HOURS

MCA-FIRST SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: December 2018, 2019, 2020

COURSE NO: PSCATC108
COURSE TITLE: DISCRETE MATHEMATICS

SUGGESTED READINGS:

1. N. Deo, ñGraph Theory with Applications to Engineering and Computer Scienceò, Prentice-Hall, 2018.
2. Babu Ram, ñDiscrete Mathematicsò, Pearson Publications, 2011.
3. F. Harary, ò Graph Theoryò, Addison-Wesley Publications Camp, 2001
4. J. P Trembly and R. Manohar, ñDiscrete Mathematical Structures with Applications to Computer Scienceò, 1st Edition, McGraw Hill.
5. V. Krishnamurthy, ñCombinatorics Theory and Applicationsò, Affiliated East-West Press Pvt. Ltd, 2008
6. B. Kolman, R. Busby, ñDiscrete Mathematical Structuresò, 6th Edition, Pearson Publications, 2015.

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SECTION B:
There shall be 5 short answer type questions and each shall carry 3 marks. In this section, questions shall be set from each unit and the candidates shall be required to answer all the questions.

SECTION C:
There shall be 3 long answer type questions each set from Unit ï III, IV and V with internal choice. Each question shall carry 10 marks.

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MCA-FIRST SEMESTER

Total Marks = 150	Internal Evaluation = 75 Marks
No. of Credits = 6	External Evaluation = 75 Marks
Examination to be held: December 2018, 2019, 2020	

COURSE NO: PSCALC190
PRACTICAL

Practical will be based on C and Unix/Linux.

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MCA-SECOND SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: May 2019, 2020, 2021	

COURSE NO: PSCATC203
COURSE TITLE: DATA STRUCTURES USING C-LANGUAGE

Course Objectives & Learning Outcomes:

- ŏ To impart the basic concepts of data structures and algorithms.
- ŏ To understand concepts about searching and sorting techniques.
- ŏ To understand basic concepts about stacks, queues, lists, trees and graphs.
- ŏ To understand step by step approach in solving problems with the help of fundamental data structures.
- ŏ Student will be able to analyze algorithms and its correctness.
- ŏ Student will be able to choose appropriate data structure as applied to specified problem definition.

UNIT–I Fundamental Notations
Primitive and composite data types, self-referential structures, Algorithms, Types of data structures, Operations, Time and space complexity of algorithms, Asymptotic notation.

10 HOURS

UNIT–II Linear Data Structures
Arrays, Linked lists, Stacks, Queues, operations and their complexities, Implementations, Applications.

10 HOURS

UNIT–III Non-Linear Data Structures
Trees, Binary Trees, Traversing binary trees, Threaded binary trees, Binary search trees, heaps, Graphs, Traversing graphs.

10 HOURS

UNIT–IV Indexing Structures
ISAM, m-way trees, Bï trees, B+ï trees, Hashing techniques for direct access, collision in hashing, collision resolution.

10 HOURS

UNIT–V Sorting
Internal and External sorts, Bubble sort, Insertion sort, Selection sort, Shell sort, Quick sort, Radix sort, Merge sort, Types of merging.

10 HOURS

SUGGESTED READINGS:

1. Vishal Goyal, ñA Simplified Approach to Data Structuresò, Shroff Publishers Pvt. Ltd, 2014.
2. GAV Pai, ñData Structures and Algorithmsò, Tata McGraw Hills, 2017.
3. Seymour Lipschutz, ñData Structures with Cò, Schaum Outlines, 2011.
4. Reema Thareja, ñData Structures using Cò, 2nd Edition, Oxford University Press, 2014.
5. Peter Brass, ñAdvanced Data Structuresò, 1st Edition, Cambridge University Press, 2008.

MCA-SECOND SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: May 2019, 2020, 2021

COURSE NO: PSCATC203
COURSE TITLE: DATA STRUCTURES USING C-LANGUAGE

6. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, ñFundamentals of Data Structures in Cò, Universities Press (India) Pvt. Ltd, 2008.
7. Yedidiah Langsam, Moshe J. Augenstein and Aaron M. Tenenbaum, ñData Structures using C and C++ò, 2nd Edition, Pearson Prentice Hall, 2007.
8. Adam Drozdek, ñData Structures and Algorithms in C++ò, 2nd Edition, Thomson Asia Pvt. Ltd, 2001.
9. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, ñData Structures and Algorithmsò, Pearson Education India, 2001.
10. Jean-Paul Tremblay and Paul G. Sorenson, ñIntroduction to Data Structures with Applicationò, 2nd Edition, Tata McGraw-Hill, 2001.

NOTE FOR PAPER SETTERS

The question paper shall be divided into three sections namely A, B and C with total weightage of 15, 15 and 30 marks respectively with detail as under:

SECTION A:
There shall be 10 objective questions distributed uniformly over the entire syllabus. Each question carries 1½ marks and the candidates are required to answer all the questions.

SECTION B:
There shall be 5 short answer type questions and each shall carry 3 marks. In this section, questions shall be set from each unit and the candidates shall be required to answer all the questions.

SECTION C:
There shall be 3 long answer type questions each set from Unit ï III, IV and V with internal choice. Each question shall carry 10 marks.

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MCA-SECOND SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: May 2019, 2020, 2021	

COURSE NO: PSCATC208
COURSE TITLE: DATABASE MANAGEMENT SYSTEM

Course Objectives & Learning Outcomes:

- ŏ To present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve-efficiently, and effectively-information from a DBMS.
- ŏ Design ER-models to represent simple database application scenarios and convert them into relational tables
- ŏ Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
- ŏ To familiarize students with the basic issues of transaction processing and concurrency control.
- ŏ Construct simple and moderately advanced database queries using Structured Query Language (SQL).

UNIT-I Database Management System Concepts
File based system, Need of Database Management System, Components of DBMS, Data independence, Three level architectural of Database, Centralized and client server architecture for DBMS, Introduction to hierarchical and network data models, Conventional file organizations, Inverted files.

10 HOURS

UNIT–II Relational Data Model
Relational data models, Entity relationship model, Conversion of ER diagrams to Relational Database Design, Joins, Relational algebra and relational calculus concepts, Queries using relational algebra and calculus.

10 HOURS

UNIT–III Normalisation
Concept of keys, Functional dependencies, Inference rules, Covers, Closure, Equivalence of functional dependencies, Multivalued dependencies, Theory of normalization, Normal forms (1st to 5th).

10 HOURS

UNIT–IV Concurrency Control
Transaction processing, Deadlocks, Concurrency control, Locking techniques, Timestamp ordering, Recovery management, Recovery techniques, Distributed Database Concepts.

10 HOURS

UNIT–V SQL
SQL query processing, Table creation and management, Inbuilt functions, Data integrity constraints, Views, Joins, Operators, Privileges, roles and security policies.

10 HOURS

MCA-SECOND SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: May 2019, 2020, 2021

COURSE NO: PSCATC208
COURSE TITLE: DATABASE MANAGEMENT SYSTEM

SUGGESTED READINGS:

1. Bipin C. Desai, ñAn Introduction to Database Systemsò, West-publishing company, 2012.
2. Elmasri, Navathe, Somayajulu, Gupt, ñFundamentals of Database Systemsò, Pearson Education, 1992.
3. Date, C. J., ñAn Introduction to Database Systemsò, Addison Wesley Pearson Education, 2014.
4. Narayan S. Umanath, Richard W. Scamell, ñData Modelling and Database Designò, Thomson Course Technology India Edition.
5. R. A. Parida, Vinod Sharma, ñThe power of Oracle 9iò, Firewall Media Publications.
6. DeshPande, ñSQL/PL for Oracle 8 & 8iò.

NOTE FOR PAPER SETTERS

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SECTION C:
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-x-

MCA-SECOND SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: May 2019, 2020, 2021	

COURSE NO: PSCATC209
COURSE TITLE: COMPUTER ARCHITECTURE & MICROPROCESSOR

Course Objectives & Learning Outcomes:

- To familiarize students with the components of digital electronics, logical organization and the hardware and corresponding algorithms for computer arithmetics.
- To study memory organization and the functions of each element of a memory hierarchy.
- To understand processor performance at different levels of processing.
- To familiarize students with the design of a Hardware descriptive language.
- To help the students in understanding and analyzing different hardware designs, mathematical models and design integrated applications on different software platforms.

UNIT–I Digital Electronics
Semi-conductor, p-type, n-type formation, pn junction & its characteristics, Bipolar and MOSFET transistors as current controlled and voltage controlled Switch, Basic design for AND, OR, NOT, NAND, NOR using RTL, DTL, TTL, MOS Technology, Tristate logic.

10 HOURS

UNIT–II Sequential Circuits & Computer Arithmetic
Sequential circuits: Sequence generator, counters, A/D & D/A converters.
Computer Arithmetic: Flowchart, Hardware design & algorithm for signed magnitude & 2's complement form for addition, subtraction, multiplication & division methods, floating point arithmetic.

10 HOURS

UNIT–III Memory & Register Organization
Memory: 2D/3D Static RAM, Static and Dynamic Memory, Types of ROM, associative memory and interleaved memory, Random access, Sequential access, direct access, virtual memory, cache memory.
Register transfer logic and micro-operation.

10 HOURS

UNIT–IV Microprocessor & Control Design
Internal structure of MPU, ALU & Micro-programmed control unit. Instruction format, Bit Slices, I/O interface adapter (Serial and Parallel), Memory read, Memory write, Memory map and I/O map, Interrupts and its types.

10 HOURS

UNIT–V Parallel Processing and VHDL
Classification of parallel machines, pipeline processing, Vector processing, multiprocessor system architecture-multiport memory, crossbar switch, timeshared common-bus, dual-bus, Bus arbitration.
VHDL: Introduction, Need and importance of VHDL, characteristics, basic components of VHDL.

10 HOURS

MCA-SECOND SEMESTER

Contd.

Total Marks = 100
No. of Credits = 4
Time allotted for Major Test= 3 hours
Examination to be held: May 2019, 2020, 2021

Minor Test I = 20 Marks
Minor Test II = 20 Marks
Major Test = 60 marks

COURSE NO: PSCATC209
COURSE TITLE: COMPUTER ARCHITECTURE & MICROPROCESSOR

SUGGESTED READINGS:

1. Malvino, A. P., Leach, D. P., ñDigital Principles and Applicationsò, Tata McGraw-Hill, 2011.
2. Millman and Halkias, ñIntegrated Electronicsò, McGraw-Hill.
3. Khambata, J., ñMicroprocessor and Microcomputerò, John Wiley and Applications, PHI.
4. Liu, Y. Gibson, G. A., ñMicrocomputer Systems: The 8086/808ò¸ Family, PHI, 2015
5. AlexandridisNikitas, A., ñMicroprocessor System Design Conceptsò, Galgotia Publications.
6. Stone, S., ñIntroduction to Computer Architectureò, Galgotia Publications, 2ndEdn.
7. Mano, M. M., ñComputer System Architectureò, Prentice-Hall, 2017.
8. Volnei A. Pedroni, ñCircuit design with VHDLò.

NOTE FOR PAPER SETTERS

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SECTION C:
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MCA-SECOND SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: May 2019, 2020, 2021	

COURSE NO: PSCATC212
COURSE TITLE: COMPUTER NETWORKS

Course Objectives & Learning Outcomes:

- ŏ To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- ŏ To study the fundamentals of Physical layer, and explain the types of transmission media with real time applications.
- ŏ To study data link layer concepts, design issues, and protocols.
- ŏ To gain core knowledge of Network layer routing protocols and IP addressing.
- ŏ To explore the basic knowledge of cryptography and network security.

Unit-I Fundamentals of Communication

Fundamentals of Communication, Modulation, Data Encoding, OSI reference model, TCP/IP model, network standardization, Inter-networking. Physical layer, Switching Technique, Transmission media, Co-axial, Twisted Pair and Fiber Optic Cables, Transmission Impairments, Electromagnetic Spectrum, Communication, Radio waves, Microwaves, Satellites, GSM, CDMA.

10 HOURS

Unit-II Data Transmission and Media access Concepts

Data Link layer, Design issues, Frame, Error detection and correction, Flow Control, Elementary Data link protocols, Character-oriented and Bit-oriented Protocols, Sliding window protocols.
Channel allocation methods, TDM, FDM, ALOHA, Carrier sense Multiple access protocols, Collision free protocols, IEEE standard 802 for LANS, Ethernet, Token Bus, Token ring.

10 HOURS

Unit-III Network Establishment Concepts

Network Layer, Store and Forward Packet Switching, Connectionless and Connection-oriented services, Virtual Circuit, Routing Algorithms, Shortest path, Flooding, Link State, Distant vector, Hierarchical, Broadcast and Multicast Routing. OSPF, BGP, Congestion, Congestion control algorithms.

10 HOURS

Unit-IV Internet Protocols

TCP/TP Protocol, IP Addresses, Classes of IP Addresses, Subnets, IPv6, Network layer in the Internet, Internet Control Protocols, ARP, RARP, BOOTP, DHCP, Transport Layer, Protocol Stack, TCP and UDP, Transport Services Primitives, Sockets, Socket Programming concept.

10 HOURS

Unit V Network Application

Application layer, Name service (DNS) Domain Hierarchy, Name servers, Name resolutions, Traditional applications, Telnet, FTP, SMTP, MIME, World wide web-HTTP, HTTP Methods.
Network security-Cryptographic Algorithms, DES, AES, RSA, Key exchange methods

10 HOURS

MCA-SECOND SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: May 2019, 2020, 2021

COURSE NO: PSCATC212
COURSE TITLE: COMPUTER NETWORKS

SUGGESTED READINGS:

1. Andrew S. Tanenbaum, "Computer Networks", 5 e, 2013, Pearson Education Asia.
2. Behrouz A. Forouzan, "Data Communications and Networking", 4e, 2004, Tata McGraw Hills.
3. William Stallings. "Data and Computer Communication", 7e, 2016, Pearson Education Asia.
4. Prakash C. Gupta, ñData Communications and Computer Networksò, PHI
5. Michael A. Miller, "Data and Network Communications", 2e, Delmar Thomson Learning.
6. James F. Kurose and Keith W. Ross, "Compter Networking", 3e, Pearson Education.
7. William A. Shay, ñUnderstanding Data Communications and Networksò, 2e, Thomson Asia Pvt. Ltd.
8. Peter Norton and Dave Kearns, "Complete Guide to Networking", ie, Techmedia India Ltd.
9. Douglas E. Comer, ñInternet networking with TCP/IP Vol I & IIò, 3e, PHI.

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MCA-SECOND SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: May 2019, 2020, 2021	

COURSE NO: PSCATC213
COURSE TITLE: APPLICATION PROGRAMMING USING JAVA

Course Objectives & Learning Outcomes:

- To gain knowledge about Java language.
- To understand the fundamentals of object-oriented programming in Java.
- To understand the basic principles of web application programming.
- Students will be able to design dynamic web application using database connectivity.

UNIT –I Java Language Basics
Features, Object Oriented concepts, Java Virtual Machine Concepts, Primitive Data Type And Variables, Java Keywords, Java Operators, Expressions, Control Statements and Arrays.
Class and Objects, Static methods, Constructors, Method Overloading.

10 HOURS

UNIT –II Inheritance, Packages and Interfaces
Inheritance, Access Control, Method Overriding, Garbage Collection, Abstract Classes, Polymorphism
Packages, Interfaces, Exceptions Handling, Types of Exceptions, Writing Exception Subclasses, Multithreading, Synchronization in Java.

10 HOURS

UNIT –III I/O, Files & Applets Programming
I/O in Java, Byte Stream Classes, Character Stream Classes, Reading and Writing to Console, Reading and Writing Files, The Transient and Volatile Modifiers, The String and String Buffer Class.
The Applet Class, An Applet Skeleton, Adding images & sound, Passing parameters to an applet.

10 HOURS

UNIT –IV AWT & Networking
AWT Components, Building User Interface with AWT, Handling Events, Event Delegation Model (Events, Listeners, interfaces, Anonymous Classes). Layouts and Layout Manager, Introduction to Swing Components.
Networking: InetAddress class, URL class, TCP sockets, UDP sockets.

10 HOURS

UNIT–V Database Connectivity
JDBC Overview, JDBC implementation, Connection class, Statements, Types of statement objects (Statement, PreparedStatement and CallableStatement), Types of resultset, ResultSetMetadata, Catching Database Results, Handling database Queries, JDBC and AWT.

10 HOURS

MCA-SECOND SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: May 2019, 2020, 2021

COURSE NO: PSCATC213
COURSE TITLE: APPLICATION PROGRAMMING USING JAVA

SUGGESTED READINGS:

1. Herbert Schildtï ñJava The Complete Referenceò, Tata Mcgraw Hill, Tenth edition, 2017.
2. K. Arnold and J. Gosling, ñThe JAVA programming languageò, Third edition, Pearson Education, 2000.
3. Shubhnandan S. Jamwal, ñJava 9ò, The Team, Shroff Publishers and Distributor Pvt Ltd, 2018.
4. E. Balagurusamy, ñ Programming with JAVAò, Tata McGraw Hill, Fifth edition.
5. Dietel & Dietel, ñJava How to Programò, Pearson Education, Eleventh edition.
6. Steven Holzner, ñJava2 Black Bookò, Dreamtech Press.
7. George Reese, ñDatabase Programming with JDBC and Javaò, 2nd Edition, OõReilly.
8. Bruce Eckel, ñThinking in Javaò, Prentice Hall.

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MCA-SECOND SEMESTER

Total Marks = 150	Internal Evaluation = 75 Marks
No. of Credits = 6	External Evaluation = 75 Marks
Examination to be held: May 2019, 2020, 2021	

COURSE NO: PSCALC290
PRACTICAL

Practical will be based on Data Structures, Oracle and Java.

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MCA-THIRD SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: December 2019, 2020, 2021	

COURSE NO: PSCATC310
COURSE TITLE: ALGORITHM DESIGN & ANALYSIS

Course Objectives & Learning Outcomes:

- ŏ To design and analysis of various algorithms used in computer science and engineering.
- ŏ The students would be able to learn the significance and various aspects of development of algorithms.
- ŏ At the end of this course, students would be able to analyze and compare the algorithms on the basis of complexity and design efficient algorithms.

UNIT –I Review of Algorithms and Data Structures
Introduction to algorithm analysis: Introduction to algorithms, Algorithm Specifications, performance analysis, case study on analysis of algorithms. Recursion and Induction: recursive procedures, induction proofs, proving correctness, recurrence equations, recursion. Randomized Algorithms: Basic of Probability Theory, Description of Randomized algorithms, Identifying the repeated Elements, Partiality Testing, Advantages and Disadvantages of using randomized algorithms.

10 HOURS

Unit –II Basics of Analysis
Asymptotic Bounds, Concept of Efficiency of an Algorithm, Well Known Asymptotic Functions & Notations;
Well Known Sorting Algorithms, Comparison of Sorting Algorithms, Best-Case and Worst-Case Analyses, Average-Case Analysis, Amortized Analysis.

10 HOURS

Unit–III Design Techniques-I
Divide-and-Conquer, General Method, Multiplication of two n-bit numbers, Binary Search, Merge Sort, Quick Sort, Strassenôs Matrix multiplication, Exponentiation.
Dynamic Programming, General Method, The Problem of Making Change, The Principle of Optimality, Chained Matrix Multiplication.

10 HOURS

UNIT–IV Design Techniques-II
Backtracking, General method, n-queenôs problem, Sum of subsets problem.
Greedy Algorithms, General Method, Knapsack problem, Job sequencing with deadlines, Minimum Spanning Trees, Kruskalôs Algorithm, Primôs Algorithm, Dijkstraôs Single Source Shortest Path Algorithm.

10 HOURS

UNIT–V Classification of Problems & Graphs Algorithms
Non-Deterministic Algorithms, Introduction to NP-Completeness, Establishing NP-Completeness of Problems, NP-Completeness Proofs, NP-Hard Problems.
Graphs Algorithms, Traversing Trees, Depth-First Search, Breadth-First Search, Best-First Search & Minimax Principle, Topological Sort.

10 HOURS

MCA-THIRD SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: December 2019, 2020, 2021

COURSE NO: PSCATC310
COURSE TITLE: ALGORITHM DESIGN & ANALYSIS

SUGGESTED READINGS:

1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, ñIntroduction to Algorithmsò, 3rd Edition, MIT Press, 2009.
2. E. Horowitz, S. Sahni, S. Rajasekaran, ñComputer Algorithmsò, 2nd Edition, Universities Press, 2008.
3. Saara Baase and Allen Van Gelder, ñComputer algorithms- Introduction to Design and Analysisò, 3rd Edition, Pearson Education, 1999.
4. R. C. T. Lee, S. S. Tseng, R. C. Chang & Y. T. Tsai, ñIntroduction to the Design and Analysis of Algorithms: A Strategic Approachò, 2nd Edition, Tata McGraw-Hill, 2009.
5. M. T. Goodrich and R. Tomassia, ñAlgorithm Design Foundations, Analysis and Internet examplesò, 1st Edition, John Wiley and sons, 2006.
6. Aho, Ullman and Hopcroft, ñDesign and Analysis of algorithmsò, 3rd Edition, Pearson Education, 2008.

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MCA-THIRD SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: December 2019, 2020, 2021	

COURSE NO: PSCATC311
COURSE TITLE: COMPUTER GRAPHICS

Course Objectives & Learning Outcomes:

- ŏ To introduce the components of a graphics system and make students familiar with building approach of graphics system components and algorithms related with them.
- ŏ To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
- ŏ To make students able to implement the application of computer graphics concepts in the development of computer games, information visualization, and business applications.

UNIT-I Introduction to Computer Graphics
Concept of Computer Graphics and its applications; Graphics input and output devices. Video display devices: Refreshing display devices, Random scan display device, Raster scan devices, Flat Panel Devices, color CRT, Direct View Storages Devices. Input Devices, Hard Copy Devices.

10 HOURS

UNIT-II Graphic Primitives
Concept of Graphic Primitives, points, lines etc., Line (DDA and Bresenham line algorithm), Circle (Polar, Bresenham and Mid-point circle algorithm), Ellipse (Polar and Midpoint ellipse algorithm), Area filling techniques (Boundary fill, Flood fill, scan line area fill algorithm), character generation; Aliasing, half toning, Sampling, Filtering Techniques.

10 HOURS

UNIT-III Geometric Transformations
2-dimensional Graphics: 2D Cartesian and Homogeneous co-ordinate system, Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Composite transformations.
3-dimensional Graphics: 3D Cartesian and Homogeneous co-ordinate system, Geometric transformations (translation, Scaling, Rotation, Reflection), Composite transformations.

10 HOURS

UNIT-IV Viewing & Clipping Transformations
Introduction; objectives of viewing transformation; Concept of projections: parallel projection, orthographic and oblique projections, isometric projections, perspective projections (concept of vanishing points, single point, perspective transformation, 2-point and 3-point perspective transformation and general perspective transformation with COP at the origin.
Clipping Operations: Point and Line clipping, Cohen- Sutherland and Cyrusï Beck Line Clipping algorithms.

10 HOURS

UNIT-V Three-Dimensional Object Representation
Polygon surfaces, Polygon tables, plain equation, polygon meshes, Bezier curves &Surfaces, properties of Bezier curves, Hermite Interpolation.
Hidden line and surface elimination algorithms: z-buffer, scan-line, sub-division, Painter's algorithm. Illumination Models: Diffuse reflection, Specular reflection, refracted light, texture surface patterns, Halftoning, Dithering. Surface Rendering Methods: Constant Intensity method, Gouraud Shading, Phong Shading.

10 HOURS

MCA-THIRD SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: December 2019, 2020, 2021

COURSE NO: PSCATC311
COURSE TITLE: COMPUTER GRAPHICS

SUGGESTED READINGS:

1. Hearn, D. Baker, and P. M., ñComputer Graphicsò, 2nd Edition Prentice-Hall, 2013.
2. A. P Godse, ñComputer Graphicsò, 4th edition, Technical publications Pune, 2015.
3. Newman, W. Sproul, R. F., ñPrinciples of Interactive Computer Graphicsò, 2nd Edition, McGraw Hill, 2001.
4. Rogers, D. F, ñProcedural Elements for Computer Graphicsò, 2nd Edition McGraw-Hill, 2003.
5. S. Harrington, ò Computer Graphics: A Programming Approachò, 2nd Edition, Tata McGraw- Hill, 1987.
6. Rogers, D. F., ñMathematical Elements of Computer Graphicsò, 2nd Edition, McGraw Hill Education, 2017.
7. R. A. Plastock and G. Kalley, ñComputer Graphicsò, McGraw Hill, 2017.

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MCA-THIRD SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: December 2019, 2020, 2021	

COURSE NO: PSCATC313
COURSE TITLE: WEB TECHNOLOGIES

Course Objectives & Learning Outcomes:

- ŏ Students are able to develop a dynamic webpage by the use of java script and DHTML.
- ŏ Students will be able to write a well formed / valid XML document.
- ŏ Students will be able to write a server side java application called Servlet/JSP to catch form data sent from client, process it and store it on database.
- ŏ Students will be able to connect web applications to a DBMS and perform operations on DBMS table.

UNIT-I HTML
Text Formatting Tags, META Tag, Adding Lists, Table, Embedding objects, Paragraphs, Formatting, Links, Head, Images, Tables, Lists, Blocks, Layout, Forms, Colors, Color values, Frame and Form, Form Controls, CSS, Defining Styles, Elements of Style, Linking a Style Sheet to an HTML Document, In-line Styles, External Style Sheets, Internal Style Sheets, Introduction to XML.

10 HOURS

UNIT-II JavaScript
Variables, String manipulation, Mathematical Functions, Statements, Operators, Arrays, and Functions, Data and Objects, Regular Expressions, Built-in Objects, Events, Opening a New Window, Messages and Confirmations, The Status Bar, Writing to a Different Frame, Rollover, Buttons, Moving Images.

10 HOURS

UNIT-III Servlets
Servlet Life Cycle, Servlet Request and Response Disadvantages of Servlets, Reading Headers
JSP: Scripting Elements, JSP Expression, JSP Declaration, Predefined variables/objects, using user defined functions, working with Databases Using JSP, Inserting, Updating, and Deleting Database Records.

10 HOURS

UNIT-IV ASP.NET
ASP. NET Standard Controls: Label, Textboxes, buttons, hyperlink, checkboxes, Regular expressions.
Server pages: Creating Server pages, page Life Cycle, HTTP Request Object, HTTP Response Object, Postback, Tracing & Debugging ASP. NET page.

10 HOURS

UNIT-V Server Control
State Management and Types of State Management, HTTP Cookies, HTTP Session, HTTP Application, Query String Method, State Management using Postback URL, View State.
Validation Controls, Data Bind Control and Types of Data Bind Control, Repeater, Data List, Grid View, Form View, Detail View.

10 HOURS

MCA-THIRD SEMESTER

Contd.

Total Marks = 100
No. of Credits = 4
Time allotted for Major Test= 3 hours
Examination to be held: December 2019, 2020, 2021

Minor Test I = 20 Marks
Minor Test II = 20 Marks
Major Test = 60 marks

COURSE NO: PSCATC313
COURSE TITLE: WEB TECHNOLOGIES

SUGGESTED READINGS:

1. H. M. Deitel, P. J. Dietel and A. B. Goldberg, ñInternet and Worldwide Webò, 4th edition, Pearson Education.
2. Chris bates, ñWeb Programmingò, 2nd Edition, Wiley Dreamtech India.
3. Ramesh Bangia,, òMultimedia and Web Technologyò, 2nd Edition, Firewall Media.
4. James Jaworski, ñMastering Javascript and Jscriptò, 2nd Edition, BPB.
5. Phil Hana, ñJSP: The complete Referenceò, Osborne/McGraw-Hill, 2001.
6. Jeff Rule, ñDynamic HTMLò, 1st Edition, Dreamtech Press.
7. Jose Annunziato and Stephanie Fesler Kaminaris, ñJava Server pages in 24 Hoursò, 1st Edition, Techmedia.
8. https: //www. w3schools. com/
9. https: //www. Javatpoint. com/

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SECTION B:
There shall be 5 short answer type questions and each shall carry 3 marks. In this section, questions shall be set from each unit and the candidates shall be required to answer all the questions.

SECTION C:
There shall be 3 long answer type questions each set from Unit ï III, IV and V with internal choice. Each question shall carry 10 marks.

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MCA-THIRD SEMESTER

Total Marks = 150	Internal Evaluation = 75 Marks
No. of Credits = 6	External Evaluation = 75 Marks
Examination to be held: December 2019, 2020, 2021	

COURSE NO: PSCALC390
PRACTICAL

Practical will be based on Computer Graphics and Web Technologies.

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OPEN COURSE SYLLABUS
In 3rd Semester:

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: December 2019, 2020, 2021	

COURSE NO: PSCATO351
COURSE TITLE: PROBLEM SOLVING & PROGRAMMING IN C

Course Objectives & Learning Outcomes:

- ŏ The course aims to provide exposure to problem-solving through programming.
- ŏ It aims to train the student to the basic concepts of the C-programming language.
- ŏ To compare the various programming constructs and choose the right one for the task in hand.
- ŏ Choose the right data representation formats based on the requirements of the problem.
- ŏ By learning the basic programming constructs they can easily switch over to any other language in future.

UNIT-I Problem Solving& C Basics

Steps for problem solving, Computer as a tool for problem solving. Program Design tools: Algorithm, Psuedocode and Flowchart Designing.
History of C, Characteristics of C, Introduction to GCC, compiling, linking and running a Cï program, Using MAKE Utility.
C Program Structure, Data Types, Variables and Constants, Printing Out and Inputting Variables, Constants, Type-Casting, Operators and Expressions, Order of Precedence.

10 HOURS

UNIT-II Control Statements & Arrays

Conditional Statements, Program Loops and Iteration, Library functions. Syntax, semantic, linker, logical and runtime errors.
Single and Multi-dimensional Arrays, Strings, Basic String Handling Functions.

10 HOURS

UNIT-III Functions & Further Data Types

Functions, Passing Parameters, Recursion, Storage classes. Standard C Preprocessor Directives. Standard Formatted & unformatted I/O Functions;
Defining New Data Types, Structures, Unions, Enumerated Types, Bitwise Operators, Bit Fields.

10 HOURS

UNIT-IV Pointers & Files

Pointers: Pointers arithmetic, constant void pointers. Dynamic Memory Allocation, Pointers to Pointers, Pointer to array, Array of pointers, Commandline input, Pointers to a Function.
Files Character and Line Based I/O, Formatted I/O, Block I/O, File Positioning.

10 HOURS

UNIT-V File Accessibility & Graphics Programming

File Accessibility and Directories (access, stat, chmod, chown, chdir, chroot), ProcessControl: (Running Linux Commands from C, fork(), the exec family, wait(), exit())
Graphics Programming: OpenGL Basics, OpenGL Utility Toolkit (GLUT), Defining window, Display mode, OpenGL Functions, Primitives (Points, Lines, Polygons) and Attributes, Simple graphics programs.

10 HOURS

OPEN COURSE SYLLABUS
In 3rd Semester:

Contd.

Total Marks = 100 — Minor Test I = 20 Marks
No. of Credits = 4 — Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours — Major Test = 60 marks
Examination to be held: December 2019, 2020, 2021

COURSE NO: PSCATO351
COURSE TITLE: PROBLEM SOLVING & PROGRAMMING IN C

SUGGESTED READINGS:

1. B. Kernighan and D. Ritchie, ñThe ANSI C Programming Languageò, PHI., 2000.
2. Behrouz A. Forouzan and Richard F. Gilberg, ñComputer Science A Structured Programming Approach Using Cò, PHI, 3rd Edition, 2007.
3. Jeri R. Hanly and Elliot B. Koffman, ñProblem Solving and Programming in Cò, Pearson, 5th Edition 2007.
4. Yashwant Kanetkar, ñLet us Cò, BPB Publications, 2002.
5. Edward Angel, ñOpenGL- A primerò, 3rd Edition, Addison-Wesley 2007.
6. Kurt Wall, Mark Watson, and Mark Whitis, ñLinux Programming Unleashedò, SAMS.
7. Mark Mitchell, Jeffrey Oldham, and Alex Samuel, ñAdvanced Linux Programmingò, New Riders Publishing, 2001.
8. Edward Angel, ñInteractive ComputerGraphicsò, 5th Edition, Addison-Wesley 2009.

NOTE FOR PAPER SETTERS

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SECTION C:
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MCA-FOURTH SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022	

COURSE NO: PSCATC420
COURSE TITLE: THEORY OF COMPUTATION

Course Objectives & Learning Outcomes:

- To apply mathematical foundations, algorithmic principles and computer science theory to the modeling and design of computational systems.
- To demonstrate knowledge of basic mathematical models of computation and describe how they relate to formal languages.
- To understand the limitations of computers and know about unsolvable problems.

UNIT–I Regular Languages and Expressions
Sets, Relations and Functions, Symbols, Alphabet, Strings, Backus-Naur Form, Languages, Grammar, Classification of Grammars, Regular Set, Regular expressions, Algebra of Regular expressions, Regular grammar, Regular languages, Closure properties of Regular languages, Applications of regular expressions.
10 HOURS

UNIT–II Finite Automata
Deterministic Finite Automata (DFA) Non-Deterministic Finite Automata (NFA), ŮNFA, Equivalence Finite Automata, Equivalence of Regular Expression and Finite Automata, Pumping Lemma for Regular Languages, Applications of finite automata, Mealy and Moore Machines.
10 HOURS

UNIT–III Context Free Grammar (CFG)
Production rules and derivation, Types of Productions, Reduction of Grammar, Chomsky Normal Form, Griebach Normal Form, Pushdown Automata (PDA), Equivalence between CFG and PDA, Context Free Language, Closure properties for context free languages, Pumping Lemma for Context free languages, Applications of Context Free Grammar.
10 HOURS

UNIT–IV Turing Machines
Description, Transition diagram, Roles of Turing machine, Church-Turing Thesis, Modular Construction of complex Turing machines, Extensions of Turing machines, Non-Deterministic Turing Machines. Universal Turing Machine, Turing acceptable and Turing decidable languages.
10 HOURS

UNIT–V Function Theory
Recursive Function Theory and Unsolvable Problems Partial, total and constant functions, Primitive recursive functions; Unbounded minimalisation and μ-recursion.
Decidable and Undecidable Problems, The Halting Problem, Reduction to Another Undecidable Problem, Undecidability of Post Correspondence Problem.
10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022

COURSE NO: PSCATC420
COURSE TITLE: THEORY OF COMPUTATION

SUGGESTED READINGS:

1. H. R. Lewis and C. H. Papadimitriou, ñElements of the Theory of Computationò, Prentice Hall of India, 2nd Edition.
2. J. E. Hopcroft, R. Motwani and J. D Ullman, ñIntroduction to Automata Theory, Languages and Computationò, Pearson Education Asia, 3rd Edition, 2008.
3. Michael Sipser, ñIntroduction to the Theory of Computation, Thompsonò, Second Edition, 2006.
4. Jeffrey Shallit, ñA Second Course in Formal Languages and Automata Theoryò, Cambridge University Press, 2008.
5. K. L. P. Mishra and N. Chandrasekaran, ñTheory of Computer Scienceò, Prentice Hall, 3rd Edition. 2006.
6. Rogers H., ñTheory of Recursive Functions and effective computingò, Mcgraw-Hill, 1987.
7. J. C. Martin, ñIntroduction to Languages and Theory of Computationò, Tata Mcgraw Hill, 3rd Edition, 2007.

NOTE FOR PAPER SETTERS

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SECTION C:
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MCA-FOURTH SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022	

COURSE NO: PSCATC422
COURSE TITLE: NUMERICAL AND STATISTICAL COMPUTING

Course Objectives & Learning Outcomes

- ð To demonstrate understanding of numerical and statistical methods in support of the analysis, design and application for problem solving in the field of information technology.
- ð To compute solution of algebraic and transcendental equation by numerical methods like Bisection method and Newton Raphson method.
- ð To apply method of interpolation and extrapolation for prediction.
- ð To recognize elements and variable in statistics and summarize qualitative and quantitative data.

UNIT-I Solutions of Equations

Iterative Methods: Zeros of a single transcendental equation; Newton-Raphson Methods, Rate of Convergence of NR method; Polynomial Evaluation; Birge vieta Methods.
Solutions of Simultaneous Linear equationsï Gauss elimination method and pivoting, III conditioned equations and refinement of solutions; Gaussï Seidal interactive Method, Gauss-Jacobi method.

10 HOURS

UNIT-II Numerical differentiation and Integration

Numerical differentiation and Integration, Solutions of Differential Equations; Modified Eulerôs Method, Runga-Kuta method (2^{nd} and 4^{th}); Automatic error monitoring, Numerical Integration Newton's cotes of Integration. Trapezoidal rule, Simpsonôs 1/3rd and 3/8th rule.

10 HOURS

UNIT-III Basics of Statistics and Interpolation

Basic Statistics: Measures of central tendencies:-Mean, Median, Mode; Measures of dispersion: Range variance and standard deviation; Frequency distribution and cumulative frequency distributions; Linear correlation coefficient; Linear regression; Non-linear regression.
Interpolation: - Newtonôs Forward, Backward & Langrangeôs interpolation.

10 HOURS

UNIT-IV Probability

Discrete Probability Distributions: Binomial (Derivation, mean and variance and fitting of Binomial distribution), Poisson (Poisson as a limiting case of Binomial distribution, mean and variance and fitting of Poisson distribution.
Normal distribution, mean and variance of normal distribution. Studentôs T- test.

10 HOURS

UNIT-V Statistical and Sampling Theory

Concept of Population, Sample; Importance of Sampling and its advantages, Sampling distributions (mean, standard deviation and probability distribution).
Statistical decisions, hypothesis testing, type-1 and type-2 errors, level of significance, one tailed and two tailed tests. Comparison sample means (analysis of variance, ANOVA-one way);
Chi-square testing (test of independence, testing of goodness of fit, population variance).

10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022

COURSE NO: PSCATC422
COURSE TITLE: NUMERICAL AND STATISTICAL COMPUTING

SUGGESTED READINGS:

1. Stoer, Bullrich, ñComputer Oriented Numerical Methods, Springer Verlagò, 2nd Edition, 1980.
2. S. D. Conte & Carl De Boor, ñElementary Numerical Analysis, Macgraw hillò, 3rd Edition, 1980.
3. Krishnamurthy, ñE. V., Sen, S. K.: Computer Based Numerical Algorithmò, East West Press, 2nd Edition, 1984.
4. Rajaraman, V., ñComputer Oriented Numerical Methods, Prentice Hall Indiaò, 3rd Edition, 1993.
5. Draper, N. A., Smith, H, ñApplied Regresion Analysisò, John-Wiley and Sons, 3rd Edition, 1998.
6. Anderson, T. W, ñAn Introduction to Multivariate Statistical Analysisò, John-Wiley and Sons, 3rd Edition, 2009.
7. Morrison, D. F., ñMultivariate Statistical Methodsò, McGraw-Hill, 2nd Edition, 1978.

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The question paper shall be divided into three sections namely A, B and C with total weightage of 15, 15 and 30 marks respectively with detail as under:

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MCA-FOURTH SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022	

COURSE NO: PSCATC423
COURSE TITLE: SOFTWARE ENGINEERING

Course Objectives & Learning Outcomes:

- ð To gain knowledge of basic SW engineering methods and their appropriate application.
- ð To understand software testing approaches such as unit testing and integration testing.
- ð To produce efficient, reliable, robust and cost-effective software solutions.
- ð Students will be able to perform independent research and analysis.
- ð Students will be able to analyze, design, verify, validate, implement, apply, and maintain software systems.

UNIT-I Introduction
Evolution of Software Engineering, Software Engineering: A layered technology, process frame work and software engineering paradigms, Software process technology, Software Requirements Analysis, Analysis Principles, Modeling the system architecture, Software prototyping and specification.

10 HOURS

UNIT-II Software Design
Design Process, Concepts, Principles, Architectural Design, Data Design, Mapping requirements into Software Architecture, Effective modular design, Procedural Design, Interface design, HCI design.

10 HOURS

UNIT-III Software Quality Planning and Project Management
Evaluation of individual projects: Technical assessment, cost-benefit analysis (Evaluation Techniques), and Risk evaluation, Concept of Software Project Management and its importance,
software cost estimation techniques, different types of project metrics, Models for cost estimation (COCOMO, Putnamôs, function point), Introduction to project scheduling, project schedules, project and activities, scheduling activities, Schedule development methods (Critical Path Method, Critical Chain Scheduling, PERT).

10 HOURS

UNIT-IV Software Quality Assurance
Introduction, Quality Planning, Quality Assurance, Quality Control, Tools and Techniques of Quality Control, Pareto analysis, Six Sigma, Cost of Quality, software quality metrics (McCalôs Quality Model, Boehmôs Quality Model, Dromeyôs Quality Model), Capability maturity models.

10 HOURS

UNIT-V Software Testing and Maintenance
Testing Issues, Testing Object-Oriented Systems, Testing Techniques: White Box Testing, Black-Box Testing, Testing Strategies: Unit Testing, Integration and Validation testing, System Testing, Introduction to maintenance, characteristics, maintenance task, Reverse Engineering, Re-engineering, Clean room Software engineering.

10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022

COURSE NO: PSCATC423
COURSE TITLE: SOFTWARE ENGINEERING

SUGGESTED READINGS:

1. Roger, S. Pressman, ñSoftware Engineering: A practitionerôs Approachò, McGraw Hill, 5th Edition.
2. Walker Royce, ñSoftware Project Managementò, Pearson Education, 2004.
3. Pankaj Jatlote, ñAn Integrated Approach to Software Engineeringò, Narosa Publication, 3rd Edition.
4. Shari Lawrence, PF Legger, ñSoftware Engineering Theory and Practiceò, Pearson Education, 2nd Edition.
5. R. E. Fairley, ñSoftware Engineering Conceptsò, McGraw Hill.
6. Ian Sommerviille, ñSoftware Engineringò, Pearson Education.
7. Robert S. Arnold, ñSoftware Re-engineeringò, IEEE Comp. Society, 2003.
8. Lorenz and Kidd, ñObject Oriented Software Metricsò, Prentice Hall.
9. Booch, ñObject-Oriented Analysis and Design with Applicationsò, Addison-Wesley, 3rd Edition, 2007.

NOTE FOR PAPER SETTERS

The question paper shall be divided into three sections namely A, B and C with total weightage of 15, 15 and 30 marks respectively with detail as under:

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MCA-FOURTH SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022	

COURSE NO: PSCATE425
COURSE TITLE: PYTHON

Course Objectives & Learning Outcomes:

- ð To understand the basic and advanced features of core language built-ins.
- ð To implement various packages of python library.
- ð To communicate using sockets, write client and server side scripts.
- ð To design and implement basic applications with database connectivity.
- ð Students will gain basic and advanced programming concepts of Python.

UNIT-I Introduction
Installing and working with python, Data Types: Identifiers and keywords, integral types, floating-point types, strings, Sequence types: Tuples, Named tuples, lists, Set Types: Sets, Frozen sets, Mapping types: dictionaries, iterating and copying collections. Control structures: conditional branching, looping, Exception handling: catching and raising exceptions, custom exceptions, custom functions: names and docstring, argument and parameter unpacking.

10 HOURS

UNIT-II Modules and Packages
Modules and packages, Overview of python standard library, Classes in python, inheritance, odds and ends, iterators, generators, generator expression.

10 HOURS

UNIT-III File Handling and Database programming
Writing and Reading Binary Data, Writing and Parsing Text Files, Writing and Parsing XML Files, Random Access Binary Files, DBM data bases, SQL databases.

10 HOURS

UNIT-IV Networking and Web programming
Sockets introduction, Creating a socket, using a socket, disconnecting, non-blocking sockets, CGI, Server client program using CGI, mod_python, FastCGI and SCGI, mod_wsgi, WSGI, MVC, Templates, Data persistence, Frameworks-Django, Turbogears, Zope, etc.

10 HOURS

UNIT-V Python Django Framework
Introduction to Django Web Framework, features of Django, Installing Django, MVC model, HTTP concepts, Views, URL Mapping, Creating Template Objects, Form validation and Error Messages, Form Display, Django Models, Model Fields, Model Inheritance, CRUD on DB, Session and Caching, Dynamic Webpages, Toggle Hidden Content.

10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022

COURSE NO: PSCATE425
COURSE TITLE: PYTHON

SUGGESTED READINGS:

1. Mark Summerfield, ñProgramming in python 3: A Complete Introduction to Python Programmingò.
2. Mark Lutz, ñLearning Pythonò, O Reily, 4th Edition, 2009.
3. Brian K. Jones, ñPython Cookbookò.
4. Alex Martelli, ñPython in a nutshellò.
5. Tim Hall and J-P Stacey, ñPython 3 for Absolute Beginnersò, 2009.
6. Python online documentation: www. python.org/doc.

NOTE FOR PAPER SETTERS

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SECTION C:
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MCA-FOURTH SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022	

COURSE NO: PSCATE426
COURSE TITLE: BIG DATA ANALYTICS USING R

Course Objectives& Learning Outcomes

- ð To know the fundamental concepts of big data and analytics.
- ð To explore tools and practices for working with big data.
- ð To know about the research that requires the integration of large amounts of data.
- ð To work with big data tools and its analysis techniques.
- ð To analyze data by utilizing clustering and classification algorithms.

UNIT-I Introduction to Big Data
Evolution of Big dataï Best Practices for Big data Analyticsï Big data characteristicsï Validatingï The Promotion of the Value of Big Dataï Big Data Use Cases- Characteristics of Big Data Applicationsï Perception and Quantification of Value -Understanding Big Data Storageï A General Overview of High-Performance Architectureï HDFSï MapReduce and YARNï Map Reduce Programming Model.

10 HOURS

UNIT-II Clustering and Classification
Advanced Analytical Theory and Methods: Overview of Clusteringï K-meansï Use Casesï Overview of the Methodï Determining the Number of Clustersï Diagnosticsï Reasons to Choose and Cautions.-Classification: Decision Treesï Overview of a Decision Treeï The General Algorithmï Decision Tree Algorithmsï Evaluating a Decision Treeï Decision Trees in Rï Naïve Bayesï BayesóTheoremï Naïve Bayes Classifier.

10 HOURS

UNIT-III Association and Recommendation System
Advanced Analytical Theory and Methods: Association Rulesï Overviewï Apriori Algorithmï Evaluation of Candidate Rulesï Applications of Association Rulesï Finding Association& finding similarityï Recommendation System: Collaborative Recommendation- Content Based Recommendationï Knowledge Based Recommendation- Hybrid Recommendation Approaches.

10 HOURS

UNIT-IV Stream Theory
Introduction to Streams Conceptsï Stream Data Model and Architectureï Stream Computing, Sampling Data in a Streamï Filtering Streamsï Counting Distinct Elements in a Streamï Estimating momentsï Counting oneness in a Windowï Decaying Windowï Real time Analytics Platform(RTAP) applicationsï Case Studiesï Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics.

10 HOURS

UNIT-V NOSQL Data Management for Big Data and Visualization
NoSQL Databases: Schema-less Modelsó Increasing Flexibility for Data Manipulation-Key Value Stores-Document Storesï Tabular Storesï Object Data Storesï Graph Databases Hiveï Sharding ï - Hbaseï Analyzing big data with twitterï Big data for E-Commerce Big data for blogsï Review of Basic Data Analytic Methods using R.

10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022

COURSE NO: PSCATE426
COURSE TITLE: BIG DATA ANALYTICS USING R

Tools and Platforms: Hadoop

SUGGESTED READINGS:

1. Anand Rajaraman and Jeffrey David Ullman, ñMining of Massive Datasetsò, Cambridge University Press, 2012.
2. David Loshin, ñBig Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graphò, Morgan Kaufmann/El sevier Publishers, 2013.
3. EMC Education Services, ñData Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Dataò, Wiley publishers, 2015.
4. Bart Baesens, ñAnalytics in a Big Data World: The Essential Guide to Data Science and its Applicationsò, Wiley Publishers, 2015.
5. Dietmar Jannach and Markus Zanker, ñRecommender Systems: An Introductionò, Cambridge University Press, 2010.
6. Kim H. Pries and Robert Dunnigan, ñBig Data Analytics: A Practical Guide for Managersò CRC Press, 2015.
7. Jimmy Lin and Chris Dyer, ñData-Intensive Text Processing with Map Reduceò, Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers, 2010.

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MCA-FOURTH SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022	

COURSE NO: PSCATE427
COURSE TITLE: MACHINE LEARNING

Course Objectives & Learning Outcomes:

- ŏ To introduce students to state-of-the-art methods and modern programming tools for data analysis.
- ŏ To understand complexity of Machine Learning algorithms and their limitations.
- ŏ To understand modern notions in data analysis oriented computing.
- ŏ Student will be able of performing experiments in Machine Learning using real-world data.
- ŏ Student will be able to identify algorithmic aspects in machine learning and data mining tasks, evaluate correctness and efficiency of the used methods, and their applicability in each current situation.

Unit-I Machine Learning Basics
Introduction to Machine Learning, Types of machine Learning: supervised, unsupervised, semi supervised and reinforcement learning, Steps in the design of learning system, Training and testing, Cross Validation, Performance prediction parameters, Applications of machine learning.

10 HOURS

Unit-II Supervised Learning
Labelled data, Classification and its algorithms: Nearest Neighbour, Naive-Bayes classifier, Decision trees**,** Linear regression, Logistic regression, Support vector machines, Principal component analysis**.**

10 HOURS

Unit-III Unsupervised Learning
Unlabelled data, Clustering and its types, Partition clustering, Hierarchical Clustering, Fuzzy clustering, Density based clustering, Model based clustering, K-means clustering, Applications of Clustering.

10 HOURS

Unit-IV Artificial Neural Networks & Fuzzy Logic
Basic structure of ANNs, Activation functions, Learning Rules, Types of ANN: feed forward and feedback, applications of neural networks.
Fuzzy Logic: Introduction, Membership function, Operations on fuzzy Sets, Applications of fuzzy logic.

10 HOURS

Unit-V Reinforcement and Semi-supervised Learning
Introduction, Q learning, Temporal Difference Learning, Learning from Examples, Reward Hypothesis.
Genetic algorithm: Introduction, Steps involved in genetic algorithm, Applications of genetic algorithm. Introduction to Deep learning concepts.
Tools and Platforms: Introduction to WEKA and PYTHON.

10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022

COURSE NO: PSCATE427
COURSE TITLE: MACHINE LEARNING

SUGGESTED READINGS:

1. Machine Learning, ñA Probabilistic Perspectiveò, MIT Press, 2012 by Kevin Murphy.
2. Christopher M. Bishop , ñPattern Recognition and Machine Learningò, Springer, 2006.
3. Shai Shalev-Shwartz, Shai Ben-David, ñUnderstanding Machine Learning: From Theory to Algorithmsò.
4. Haykin, S. "Neural Networks and Learning Machines. Prentice Hall." New York (2008).
5. Timothy J. Ross, ñFuzzy Logic with Engineering Applicationsò, John Wiley & Sons, 2010.
6. Montgomery, D. C., and G. C. Runger, ñApplied Statistics and Probability for Engineersò, John Wiley & Sons, Sixth Edition, 2013.
7. Shai Shalev-Shwartz and Shai Ben-David, ñUnderstanding Machine Learning: From Theory to Algorithmsò, Cambridge University Press, 2014.
8. NPTEL lectures on Introduction to Machine Learning.

NOTE FOR PAPER SETTERS

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MCA-FOURTH SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022	

COURSE NO: PSCATE428
COURSE TITLE: INTERNET OF THINGS

Course Objectives & Learning Outcomes

- ð To understand the basics of Internet of Things (IoT) and its application sectors.
- ð Understand M2M and Internet of Things.
- ð Understand and become proficient in Internet of Things platforms.
- ð Understand and apply Internet of Things T protocols appropriately.
- ð Design and develop Internet of Things based applications.

UNIT-I Introduction and Concepts of IOT
Introduction to IOT, definition and characteristics of IOT, Architecture of Internet of Things, Physical and logical design of IOT, IOT enabling technologies, IOT levels and deployment templates, Domain specific IOTs, home automation, cities, environment, Domain specific IOTs, Energy, retail, agriculture, industry, health and lifestyle

10 HOURS

UNIT-II IOT and M2M Communication
M2M, difference between IOT and M2M, ETSI M2M Architecture, system architecture, ETSI M2M SCL resource structure, Security in ETSI M2M framework, SDN and NFV for IOT, IOT system management, need for IOT system management, SNMP, Network operator requirements, NETCONF-YANG, IOT system management with NETCONF-YANG, IoT Design methodology-case study on IOT system for Weather Monitoring.

10 HOURS

UNIT-III IOT Platforms
Introduction to Hardware used for IoT: Microcontrollers, Microprocessors, SoC, Sensors 2 C, I 3 1 8. Introduction to Arduino, Pi, Spark, Intel Galileo etc.

10 HOURS

UNIT-IV IOT Technical Standards and Protocols
RF Protocols: RFID, NFC; IEEE 802. 15. 4: ZigBee, Z-WAVE, THREAD; Bluetooth Low Energy (BLE), IPv6 for Low Power and Lossy Networks (6LoWPAN) and Routing Protocol for Low power and lossy networks (RPL), CoAP, XMPP, Web Socket, AMQP, MQTT, WebRTC, PuSH, Architectural Considerations in Smart Object Networking.

10 HOURS

UNIT-V Developing Internet of Things
IoT platforms design methodology, IoT Physical devices and endpoints, IoT Systems: Logical design using Python, IoT physical servers and cloud offerings (Cloud computing for IoT).

10 HOURS

MCA-FOURTH SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022

COURSE NO: PSCATE428
COURSE TITLE: INTERNET OF THINGS

SUGGESTED READINGS:

1. Arshdeep Bahga, Vijay Madisetti, ñInternet of Things, A Hands-on Approachò, University Press, First Edition 2015.
2. Oliver Hersent, David Boswarthick, Omar Elloumy, ñThe Internet of Thingsò, First Edition, 2015.
3. Michael Miller, ñThe Internet of Things, How Smart TVs, Smart Cars, Smart Homes, and Smart Cities are changing the Worldò, Pearson, First edition, 2015.
4. https://thingsee.com/blog/quality-hardware-list-for-your-iot-projects.

NOTE FOR PAPER SETTERS

The question paper shall be divided into three sections namely A, B and C with total weightage of 15, 15 and 30 marks respectively with detail as under:

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SECTION C:
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MCA-FOURTH SEMESTER

Total Marks = 150	Internal Evaluation = 75 Marks
No. of Credits = 6	External Evaluation = 75 Marks
Examination to be held: May 2020, 2021, 2022	

COURSE NO: PSCALC490
PRACTICAL

Practical will be based on Numerical & Statistical Methods and Python/R.

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OPEN COURSE SYLLABUS
In 4th Semester:

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022	

COURSE NO: PSCATO451
COURSE TITLE: OBJECT ORIENTED CONCEPTS USING C++

Course Objectives & Learning Outcomes:

- ŏ To learn advanced features of the C++ programming language as a continuation of the previous course.
- ŏ To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.
- ŏ Students will be able to use the characteristics of an object-oriented programming language in a program.
- ŏ Students will be able to use the basic object-oriented design principles in computer problem solving.

Unit–I The Object Oriented Methodology and C++ basics

Paradigms of Programming Languages, Evolution of OO Methodology, Basic Concepts of OO Approach, Comparison of Object Oriented and Procedure Oriented Approaches, Benefits of OOPs, Introduction to Common OO Language, Applications of OOPs, Object-based programming languages.
Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between C and C++. Basic program construction, working with variables and const qualifiers.

10 HOURS

Unit–II Programming Constructs

Input output statements: cin, cout, comments, escape sequence, manipulators, type conversion, operators, and library functions.
Control statements, Structures, Enumeration, Functions, passing arguments to functions, reference arguments, overloaded functions, inline functions, default arguments, variables and storage class and returning by reference, Arrays and Strings.

10 HOURS

Unit–III Classes & Operator Overloading

Objects and Classes, defining class, c++ objects as physical objects, c++ objects and data types, object as function argument, constructors, as function argument, overloaded constructors, copy constructors, returning objects from functions, this pointer, structures and classes, static class data, static functions, friend functions, const and classes, array of objects.
Overloading unary and binary operator, Data conversions (built-in & user defined data types).

10 HOURS

Unit–IV Inheritance & Virtual Functions

Inheritance concept, derived class and base class, derived class constructors, overloading member functions, class hierarchies, public, private & protected inheritance, levels of inheritance, multiple inheritance, Virtual Inheritance, new and delete operator.
Early & late binding, Virtual functions.

10 HOURS

OPEN COURSE SYLLABUS
In 4th Semester:

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: May 2020, 2021, 2022

COURSE NO: PSCATO451
COURSE TITLE: OBJECT ORIENTED CONCEPTS USING C++

Unit–V Files I/O & Generic Programming

File Input/Output & Exception Handling: Using istream/ostream member functions, Understanding implementation of Files, Writing and Reading Objects. Understanding of working and implementation of Exception Handling.

Understanding Generic Functions with implementation of searching sorting algorithm. Understanding Class Templates using Implementation of Generic stack, linked lists, Understanding Components of Standard Template Library, Working of STL Elements.

10 HOURS

SUGGESTED READINGS:

1. Bjarne Stroustrup, ñThe C++ Programming Languageò, 3rd edition, Addision Wesley.
2. Herbert Schildt, ñC++ The Complete Referenceò, McGraw Hill.
3. Robert Lafore,ò Object Oriented Programming in C++ò, Galgotia publ.
4. E. Balagursamy, ñObject Oriented Programming using C ++ò, Tata McGraw Hill.
5. D. Ravichandran, ñProgramming with C++ò, Tata Mcgraw Hill.
6. Scott Meyers, ñEffective C++: 50 Specific Ways to Improve Your Programs and Designsò, Addison Wesley.
7. S. B. Lippman and J. Lajoie, ñC++ Primerò, 3rd edition, Addison Wesley.
8. Bruce Eckel, ñThinking in C++ò, President, Mindview Inc., Prentice Hall, 2nd edition.

NOTE FOR PAPER SETTERS

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MCA-FIFTH SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: December 2020, 2021, 2022	

COURSE NO: PSCATC504
COURSE TITLE: ARTIFICIAL INTELLIGENCE

Course Objectives & Learning Outcomes

- ŏ To provide a strong foundation of fundamental concepts in Artificial Intelligence
- ŏ To analyze and design a real world problem for implementation and understand the dynamic behavior of a system.
- ŏ To enable the student to apply these techniques in applications which involve perception, reasoning and learning.
- ŏ To use different machine learning techniques to design AI machine and enveloping applications for real world problems.

UNIT-I Introduction
Introduction to AI: History of AI, Basic Elements of AI, Introduction to Turing Machine, Turing Test and Rational Agent Approaches; State Space Representation of Problems, Game Playing, Min-Max Search, Alpha Beta Cutoff Procedures.
Introduction to Expert system, Expert System Life Cycle, Study of existing expert systems like MYCIN and DENDRAL.

10 HOURS

UNIT-II Searching Techniques
Heuristic Search techniques-Hill Climbing, Best first search: OR graph, A* algorithm, Problem Reduction: AND-OR graph,
The AO* Algorithm. Constraint satisfaction: Introduction and algorithm.

10 HOURS

UNIT-III Knowledge Representation
Knowledge Representation Structures: Prepositional Logic, First Order Predicate Logic, CNF, DNF, Prenex Normal Form, Resolution, Unification, Inference Mechanisms Semantic Nets, Frames, Scripts, conceptual dependences, Procedural & Declarative knowledge, Reasoning, Uncertainty.

10 HOURS

UNIT–IV Multi Agent Systems and Genetic Algorithms
Multi Agent Systems: Agents and Objects; Agents and Expert Systems; Generic Structure of Multiagent System, Semantic Web, Agent Communication, Knowledge Sharing using Ontologies, Agent Development Tools.
Genetic Algorithms (GA): Encoding Strategies, Genetic Operators, Fitness Functions and GA Cycle; Problem Solving using GA.

10 HOURS

UNIT–V Understanding Natural Languages
Understanding Natural Languages: Parsing techniques, context free and transformational grammars, transition nets, augmented transition nets, Fillmore's grammar; grammar-freeanalyzers, sentence generation.

10 HOURS

MCA-FIFTH SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: December 2020, 2021, 2022

COURSE NO: PSCATC504
COURSE TITLE: ARTIFICIAL INTELLIGENCE

SUGGESTED READINGS:

1. Kevin Knight, Elaine Rich, B. Nair, ñArtificial Intelligenceò, McGraw Hill Education.
2. Charniak, E., ñIntroduction of Artificial Intelligenceò, Narosa Publishing House.
3. S. Russell and P. Norvig, ñArtificial Intelligence: A Modern Approachò, Pearson Education, 2nd Edition.
4. George F. Luger, ñArtificial Intelligenceò, Pearson Education.
5. Dan W. Patterson, ñIntroduction to Artificial Intelligence and Expert Systemsò, PHI.
6. Barrat, James, ñOur final invention: Artificial intelligence and the end of the human eraò, Macmillan, 2013.

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MCA-FIFTH SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: December 2020, 2021, 2022	

COURSE NO: PSCATC511
COURSE TITLE: PRINCIPLES OF COMPILER DESIGN

Course Objectives & Learning Outcomes:

- ð To introduce principal structure of compiler, basic theories and methods used for different parts of compiler.
- ð To impart knowledge of fundamentals of language translator, structure of a typical compiler, parsing methods etc.
- ð To design various phases of compiler such as Lexical analyzer, parser etc.
- ð To distinguish different optimization techniques in the design of compiler.
- ð Students will be able to design and develop a comprehensive Compiler for a given language.

UNIT-I Compiler Structure & Lexical Analysis
Compiler Structure: Compilers and Translators, Analysis- Synthesis Model of Compilation, Various Phases of Compiler, Pass Structure, Bootstrapping & Compiler Construction Tools.
Lexical Analysis: Interface with input, parser and symbol table, token, lexeme and patterns, difficulties in lexical analysis, Error Reporting, Regular definition, Transition diagrams, LEX.
Capabilities of Lexical Analyzer.

10 HOURS

UNIT-II Finite Automata
Finite Automata: Nondeterministic Finite Automata, Deterministic Finite Automata, Subset Construction, Thompsonôs construction, DFA State Minimization.
The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG.

10 HOURS

UNIT-III Parsing
Basic Parsing Techniques: Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers, Non-recursive Predictive Parsers, Bottomï up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers.
YACC, Syntax Directed Definitions, Type checking.

10 HOURS

UNIT-IV Memory Management & Intermediate Code Generation
Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management.
Error Detection and Recovery: Lexical phase errors, Syntactic phase errors, Semantic errors.
Intermediate Code Generation: Different Intermediate forms: three address code, Quadruples & Triples.

10 HOURS

MCA-FIFTH SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: December 2020, 2021, 2022

COURSE NO: PSCATC511
COURSE TITLE: PRINCIPLES OF COMPILER DESIGN

UNIT-V Code Optimization & Generation

Sources of optimization, Local optimization, Loop optimization, Peephole optimization
Issues in the design of Code Generator, Basic Blocks and Flow Graphs, Transformations on Basic Blocks, DAG, Code Generation Algorithm, Register Allocation and Assignment.

10 HOURS

SUGGESTED READINGS:

1. Alfred V Aho, Jeffrey D. Ullman, ñPrinciples of Compiler Designò, Narosa Publ. House.
2. A. V. Aho, R. Sethi and J. D Ullman, ñCompiler: principle, Techniques and Toolsò, Addison Wesley.
3. Tremblay and Sorenson: "The theory and Practice of Compiler Writing", McGraw Hill, 1985.
4. Londan: "Compiler Construction", Thomson Learning.
5. H. I. Holub, ñCompiler Design in Cò, Prentice Hall.
6. Appel, Andrew W., ñModern compiler implementation in Cò, Cambridge university press, 2004.
7. Louden, Kenneth C, "Compiler construction", Cengage Learning, 1997.

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MCA-FIFTH SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: December 2020, 2021, 2022	

COURSE NO: PSCATC518
COURSE TITLE: .NET Technology & C#

Course Objectives & Learning Outcomes:

- To develop correct, well-documented programs using the C# programming language; learn to develop object-oriented programs using C# classes and objects; learn to use Windows Forms and WPF to create GUI-based programs.
- To demonstrate how to design, code, compile, and execute business-oriented programs using the C# programming language commands.
- Students will be able to build web applications and validate form data using server-side validation controls
- Students will be able to create dynamic Web applications that interact with a database using server-side programming.

UNIT-I .NET Framework & C#
The. NET Framework: Introduction, Benefits, Components; C# program structure, Creating console application.
C# Language: Introduction, data types, value types, reference types, identifiers, variables, constants, literals, C# operators, expressions, control structures.

10 HOURS

UNIT-II C# Fundamentals and Object Oriented Concepts
Methods, Arrays, Strings, Structures, Enumerations, Generics, Classes and Objects, class and method modifiers, Inheritance, Polymorphism and Interfaces, Properties and Indexers, delegates and Events.

10 HOURS

UNIT-III Assemblies, Exceptions, Multithreading and Windows Applications
Namespaces, assemblies, Microsoft Intermediate Language (MSIL), Metadata, Attributes, Reflection, Exceptions, Multithreading, Building windows Application, working with C# controls, Event Handling, Graphics Device Interface (GDI).

10 HOURS

UNIT-IV File Handling and LINQ
Streams, Types of Stream, Standard I/O Streams ī Console, Handling text in files, Dealing with Binary files, Binary Reader and Binary Writer, Serialization / Deserialization, Lambda Expressions, Anonymous Methods, Basic LINQ operations.

10 HOURS

UNIT-V ADO.NET and Database Connectivity
Introduction to ADO. NET, Major Components of ADO. NET, Establishing Database Connections, Connection objects, Command objects, Datasets, Data readers, Querying Databases, Data Grid Views, Data Validation.

10 HOURS

MCA-FIFTH SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: December 2020, 2021, 2022

COURSE NO: PSCATC518
COURSE TITLE: .NET Technology & C#

SUGGESTED READINGS:

1. E Balagurusamy, ñProgramming in C#ò, Tata McGraw Hill, 3rd edition, 2010.
2. Mark Michaelis, "Essential C# 4. 0ò, Pearson Education, 3rd edition.
3. Ivor Horton, ñBeginning Visual C++ 2008ò, wrox, 2008.
4. Herbert Schildt, ñC# 4. 0-The Complete Referenceò, McGraw Hill Education, 2010.
5. Joseph Albahari& Ben Albahari, ñC# 5. 0 in a Nutshellò, OôReilly, 2012.
6. Tim Patrick, ñMicrosoft ADO. NET 4 step by stepò, OôReilly, 2010.
7. Hejlsberg, Anders, Scott Wiltamuth, and Peter Golde, ñC# language specificationò, Addison-Wesley Longman Publishing Co., Inc., 2003.

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MCA-FIFTH SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: December 2020, 2021, 2022	

COURSE NO: PSCATE516
COURSE TITLE: MOBILE TECHNOLOGIES

Course Objectives & Learning Outcomes:

- To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
- To understand the typical mobile networking Infrastructure through a popular GSM protocol
- To understand the ad hoc networks and related concepts.
- Students will be able to develop new mobile application.

UNIT-I Basic of Mobile Technology & Smart Client

Mobile Devices -Definition, m-commerce, m-business, component of wireless environment, wireless communication, mobile device classification, Wireless Network -WPANS, WLAN, WWANS (1 G, 2G, 2. 5G, 3G).

Introduction to Mobile Communications and Computing, Mobile Computing, novel applications, limitations and architecture;

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, security in MANETs.

10 HOURS

UNIT-II Cellular Concept and Its Initial Implementations

The cellular concept, Multiple access technologies for cellular systems, Cellular system operation and planning (General principles, System Architecture, Location updating and call setup), Handoff and power control

Initial implementations of the cellular concept: The AMPS system, TACS system, NMT system, NTT system, Concluding remarks.

10 HOURS

UNIT-III Digital Cellular Mobile Systems

Introduction, GSM: The European TDMA digital cellular standard, GSM standardization and service aspects GSM reference architecture and function partitioning, GSM radio aspects, Security aspects, GSM protocol model, Typical call flow sequences in GSM, Evolutionary directions for GSM, Introduction to GPRS, Architecture and Services.

10 Hours

Unit-IV Mobile Data Communications and Protocols

Introduction, Circuit switched data on analog cellular networks, Circuit switched data on digital cellular networks, high speed Circuit switched data in GSM, Packet switched data services on cellular networks, Packet data in analog cellular networks, CDPD (cellular digital packet data), Packet data in digital cellular, Evolution of cellular mobile data capabilities: The EDGE concept, Data over lower power wireless or cordless telecommunication networks, Data services over DECT (Digital enhanced cordless telecommunications), Data services in PACS (Personal Access communications System).

Protocols and Platforms for Mobile Computing: WAP, Bluetooth. XML. J2ME. JavaCard. PaImOS, Windows CE. SymbianOS. Unux for Mobile Devices. Android.

10 HOURS

MCA-FIFTH SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: December 2020, 2021, 2022

COURSE NO: PSCATE516
COURSE TITLE: MOBILE TECHNOLOGIES

UNIT-V Android Basic & Its components

Introduction to Android -History of android, The Open Handset Alliance, Android SDK installation, Android SDK & their codenames, Advantages of android, The Android O/S Architecture, Over view of IDE for Android application, AVD, launching and starting AVD (android virtual device) Managing Application Resources -What are resources, resource value types, storing different resource values types (string, string arrays, Boolean, colors, integer, animation, & menus)

Android Application Components- Activities & its life cycle, Services & its life cycle, Broadcast receiver, Content provider, Intents, shutting down component, Android Manifest File in detail, Use of Intent Filter.

10 HOURS

SUGGESTED READINGS:

1. Raj Kamal, ñMobile Computingò, Oxford University Press-New Delhi, 2nd Edition.
2. Jochen Schiller, ñMobile Communicationsò, Addison-Wesley, 2nd Edition, 2004.
3. Stojmenovic and Cacute, ñHandbook of Wireless Networks and Mobile Computingò, Wiley, 2002.
4. Reza Behravanfar, ñMobile Computing Principles: Designing and Developing Mobile Applications with UML and XMLò.
5. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren, ñFundamentals of Mobile and Pervasive Computingò, McGraw-Hill Professional, 2005.
6. Hansmann, Merk, Nicklous, Stober, ñPrinciples of Mobile Computingò, Springer, 2nd Edition, 2003.
7. Martyn Mallick, ñMobile and Wireless Design Essentialsò, Wiley DreamTech, 2003.
8. shane conder, Lauren darcey, ñAndroid wireless application developmentò, 2nd Edition, Addison ï Welsey.
9. Rick rogers, John Lombardo, ñAndroid Application Developmentò, OõReilly.
10. Reto Meier, ñProfessional Android 2 application developmentò, Wrox.

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MCA-FIFTH SEMESTER

Total Marks = 100	Minor Test I = 20 Marks
No. of Credits = 4	Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours	Major Test = 60 marks
Examination to be held: December 2020, 2021, 2022	

COURSE NO: PSCATE519
COURSE TITLE: PHP

Course Objectives & Learning Outcomes:

- To understand the concepts of PHP and its advantages over other languages.
- To provide students with the skills and knowledge necessary to create dynamic database-driven websites using both PHP.
- To familiarize with PHP built-in functions and creating custom functions.
- To understand how to create sessions, modify and destroy cookies.
- Students will be able to test, debug and develop simple web application using server side PHP programming and Database Connectivity using MySQL.

UNIT-I PHP Basics
Introduction: XAMPP & WAMPP, Configure php. ini, PHP Syntax, data types, variables, Strings, Constants, Operators, Echo / Print, conditional statements, loops, user defined functions
Arrays, Date and Time, include/ include_once, require/require_once;PHP Form ;$_GET, $_POST, $_REQUEST, $_DELETE, File Upload.

10 HOURS

UNIT-II Session and Cookies
Session: introduction, Start a PHP session, session variables, modify and destroy session. Logins and passwords: Create a session, use a login to limit access to one or more pages.
Cookies: Start a PHP Cookies, Cookie variables, modify and destroy Cookie.
Error handling in PHP: -Displaying errors, warnings, types of errors, error levelsin PHP, logging Errors and ignoring errors.

10 HOURS

UNIT-III Working with Files and Directories
File system basics, understanding file permissions, setting file permissions, PHP permissions, accessing files, writing to files, deleting files, moving the file pointer, reading files, examining file details, working with directories, viewing directory content.

10 HOURS

UNIT-IV PHP MVC
Codeigniter: Models, views, controllers, installation, working with Simple Database Pgm file.
Laravel: Introduction, Installation, Directory Structure, URL Routing, Controller View, Passing Data in View, Print Variable, Build Master Layout, Include a File, Form Handling, Connecting Database, Validation Preserving the Data, File Uploading, Simple Crud Operation(CREATE, READ, UPDATE, DELETE, SEARCH).

10 HOURS

MCA-FIFTH SEMESTER

Contd.

Total Marks = 100 | Minor Test I = 20 Marks
No. of Credits = 4 | Minor Test II = 20 Marks
Time allotted for Major Test= 3 hours | Major Test = 60 marks
Examination to be held: December 2020, 2021, 2022

COURSE NO: PSCATE519
COURSE TITLE: PHP

UNIT-V Patterns and Sending Emails

Strings & Patterns: quoting, matching, extracting, searching, replacing, formatting, PCRE, NOWDOC, encodings.

Configuring PHP for email, Sending email with mail(), using headers, reviewing SMTP, using PHPMailer. Security: sanitizing data to prevent SQL Injection, buffer overflow, etc.

10 HOURS

SUGGESTED READINGS:

1. Ratschiller, Tobias, and Till Gerken, ñWeb application development with PHP 4. 0ò, New Riders, 2000.
2. Ware, Brent, ñ Open source development with LAMP: using Linux, Apache, MySQL and PHPò, Addison-Wesley Longman Publishing Co., Inc., 2002.
3. Welling, Luke, and Laura Thomson, ñPHP and MySQL Web developmentò, Sams Publishing, 2003.
4. Sklar, David, and Adam Trachtenberg, ñPHP cookbookò, O'Reilly Media, Inc., 2006.
5. Popel, Dennis, ñLearning PHP Data Objectsò, Packt Publishing Ltd, 2007.
6. Lerdorf, Rasmus, Kevin Tatroe, and Peter MacIntyre., ñProgramming Php", O'Reilly Media, Inc., 2006.

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MCA-FIFTH SEMESTER

Total Marks = 150	Internal Evaluation = 75 Marks
No. of Credits = 6	External Evaluation = 75 Marks
Examination to be held : December 2020, 2021, 2022	

COURSE NO: PSCALC590
PRACTICAL

Practical will be based .NET and PHP/Mobile Technologies.

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MCA- SIXTH SEMESTER

COURSE NO: PSCADC601
PROJECT WORK

No. of Credits = 26
Examination to be held: May 2021, 2022, 2023

The scheme of evaluation regarding Project work shall be as follows:

The project in sixth semester shall carry 650 marks distributed as follows:

Project Component		Marks
Mid-Semester Presentation & Internal Evaluation		250
End-Semester Evaluation	Project Evaluation	250
	Project Viva-voce	150
	Total:	650

The student is required to take up project work of four to six months duration. The student will submit a synopsis at the beginning of the semester for approval from the department. The student will have to present the progress of the work through Mid-Semester Presentation after two months duration. The date of Mid-Semester Presentation will be communicated by the department and will be displayed on the departmental notice board. All the students are required to keep in touch with the respective supervisor allotted by the department. The evaluation of Mid-Semester presentation shall be internal, to be done at the departmental level.

End semester evaluation will be carried by Board of Examiners consisting of Head of the Department, one/two Senior Professors of concerned subject nominated by the Vice-Chancellor and one or more outside expert(s) to be appointed by the Vice-Chancellor out of the panel to be provided by the Head of the Department who shall evaluate/asses final practical performance/dissertation of the students. Majority of the examiners shall form the quorum for the purpose. Each student shall carry out the project in the Department/Other Institution/Organization as approved by the Department under the supervision of a teacher assigned by the Department.

In case a student has failed to submit his project report by the date fixed by the department or his work is found unsatisfactory, he may be asked to take more time to work in such manner as may be decided by the Head. The ñI gradeò shall be awarded for incomplete Project/ Dissertation work. The result of such students shall be announced separately by the university.

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