Department of Computer Science
Meenakshi College for Women (Autonomous)

B.Sc. Computer Science
Curriculum 2019-2022

Overview

Programme Specific Objectives

- To provide a strong basis in the science of computers.

- To provide a firm grounding in the Mathematics involved in computation, in order to enable the above.

- To prepare and motivate the student to pursue higher studies in the area of Computer Science / Applications / Technology.

- To prepare the student with the skills necessary to gain meaningful employment in the area of software development and related areas.

- Overall, to provide an ambience for the student to gain knowledge and skills in currently important aspects of Computer Science and to pursue a specialization of her choice.

- To also equip the student with language and communication abilities, an appreciation for other disciplines and skills, a social and environmental consciousness and a strong value base.

Eligibility

As per the norms prescribed by the University of Madras.

Credit System

Minimum credits required by a candidate to be eligible for the B.Sc. Computer Science degree:

PART	CREDITS
Part I: Language	12
Part II: English	12
Part III: Main, Allied, Electives	160
Part IV: 1) Basic Tamil / Advanced Tamil / Non-major Elective 2) Skill-Based Subjects 3) Environmental Studies 4) Value Education	24
Part V: Extension Activities	1

Extra credits (10 credits) can be earned by a candidate in Part III, by taking up Project work in the final semester.

Examination Pattern

Continuous Internal Assessment (CIA)	25 Marks
End-Semester Examination (ESE)	75 marks

To pass in a subject, the student would have to score a minimum of 40% in CIA, a minimum of 40% in ESE and a minimum aggregate of 45% in both put together according to the above weightage.

Pattern of Question Paper

Theory Examinations:

Section A: (10 * 2 marks = 20 marks)
- 10 questions given, all are compulsory.
- Two questions asked from each of the five units.

Section B: (5 * 8 marks = 40 marks)
- Student must answer any 5 out of the given 7 questions.
- At least one question is asked from each of the five units.

Section C: (2 * 20 marks = 40 marks)
- Two questions each with two parts in the either/or format are asked.
- Student must answer any one part out of the two for each of the questions.

The subjects in the syllabus of B.Sc. Computer Science is divided into five categories as follows:

1. Theory only

#	Subject Code	Subject
1	5MCS12b	Personal Software Process
2	6MCS17a	Cloud Computing
3	6MCS18a	Artificial Intelligence
4	Elective 1	
5	Elective 2	

2. Theory with Problems

#	Subject Code	Subject
1	2MCS03	Computer Architecture
2	4MCS08	Operating Systems
3	4MCS09	Computer Graphics
4	5MCS11	Computer Networks
5	5MCS13a	Microprocessors
6	6MCS15b	The UNIX Operating System

3. Application Oriented

#	Subject Code	Subject
1	1MCS01	Introduction to Computers and Digital Logic
2	3MCS05	Data Structures and Algorithms
3	5MCS14b	Database Management Systems
4	SOST	Office Suite Specialist (Theory)
5	SMMT	Multimedia (Theory)
6	3MJ08a	Business Data Processing I
7	4MJ12a	Business Data Processing II

4. Programming Language

#	Subject Code	Subject
1	2MCS04a	Object Oriented Programming with C++

#	Subject Code	Subject
2	3MCS06a	Programming in Java
3	4MCS07a	Markup and Scripting Languages
4	5MCS10b	Web Application Development
5	6MCS16a	Mobile Application Development

5. Application Oriented with Programming Language

#	Subject Code	Subject
1	1MCS02a	Problem Solving Techniques

Question paper setting guidelines for B.Sc. Computer Science, for each type of subject indicated above is as follows:

#	Subject Type	Guidelines for Question paper setting
1	Theory only	**Section A** Questions could be of the following types: • Multiple Choice / True or False • One-word/one-line answer • Definition • Give one difference/similarity between two concepts **Section B** • 4 questions – Descriptive question • 3 questions - Application of formula / Specific algorithms / Application descriptions or comparisons / Principles or guidelines, etc. **Section C** For each question, • Option a) Descriptive question • Option b) Application of formula / Specific algorithms / Application descriptions or comparisons / Principles or guidelines, etc.
2	Theory with Problems	**Section A** Questions could be of the following types: • Multiple Choice / True or False • One-word/one-line answer • Definition • Give one difference/similarity between two concepts • Simple problem **Section B** • 4 questions – Descriptive question • 3 questions - Problems / Shell scripts **Section C** For each question, • Option a) Descriptive question • Option b) Problems / Shell scripts
3	Application Oriented	**Section A** Questions could be of the following types: • Multiple Choice / True or False • One-word/one-line answer • Definition • Give one difference/similarity between two concepts • Simple problem / query / evaluation of expression, etc.

#	Subject Type	Guidelines for Question paper setting
		Section B • 4 questions – Descriptive question • 3 questions - Problems / Application of algorithm on specific data set **Section C** For each question, • Option a) Descriptive question • Option b) Problems / Application of algorithm on specific data set
4	Programming Language	**Section A** Questions could be of the following types: • Multiple Choice / True or False • One-word/one-line answer • Definition • Give one difference/similarity between two concepts • Simple code writing (maximum 3-4 lines) • Find the bug / output given a code snippet **Section B** • 3 questions – Descriptive question (with or without code snippets to illustrate) • 4 questions - Programs **Section C** For each question, • Option a) Descriptive question (with or without code snippets to illustrate) • Option b) Program
5	Application Oriented with Programming Language	**Section A** Questions could be of the following types: • Multiple Choice / True or False • One-word/one-line answer • Definition • Give one difference/similarity between two concepts • Simple code writing (maximum 3-4 lines) • Find the bug / output given a code snippet **Section B** • 2 questions – Direct descriptive related to programming language • 2 questions – Programs • 3 questions - Algorithm / Concept **Section C** For each question, • Option a) Algorithm / Concept • Option b) Program

Note: In Sections B and C, a question may be split into parts if so required.

Practical Examinations:

> The external examiner will prepare a question paper on the spot with the help of the question bank supplied by the Office of the Controller of Examinations.

Grading System

Students will be graded separately for Parts I – V. CGPA, Overall Grade and Classification will be given for Parts I, II and III only.

Scheme for conversion of marks to Grade Points and Letter Grade for each subject

RANGE OF MARKS	GRADE POINTS	LETTER GRADE	DESCRIPTION
90 – 100	9.0 – 10.0	O	Outstanding
80 – 89	8.0 – 8.9	D+	Excellent
75 – 79	7.5 – 7.9	D	Distinction
70 – 74	7.0 – 7.4	A+	Very Good
60 – 69	6.0 – 6.9	A	Good
50 – 59	5.0 – 5.9	B	Average
45 – 49	4.5 - 4.9	C	Satisfactory
00 – 44	0.0	U	Re-appear
Absent	0.0	AA	Absent

Grade Point Average (GPA) for a Semester =

$$\frac{\text{Sum of product of grade points and credits for all subjects in the semester}}{\text{Sum of the credits for the subjects in the semester}}$$

Cumulative Grade Point Average (CGPA) = $\dfrac{\text{Sum of the GPA of every semester}}{\text{Total number of semesters}}$

Overall Performance and Classification

CGPA	GRADE	CLASSIFICATION OF FINAL RESULT
9.5 – 10.0	O+	First Class – Exemplary *
9.0 and above but below 9.5	O	
8.5 and above but below 9.0	D++	First Class with Distinction *
8.0 and above but below 8.5	D+	
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	First Class
6.5 and above but below 7.0	A+	
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	B	Second Class
4.5 and above but below 5.0	C+	Third Class
0.0 and above but below 4.4	U	Re-Appear

*Applicable to candidates who have passed the courses prescribed for the programme in the first appearance; otherwise they are eligible for classification only.

Course Summary

Semester 1

Part	Code	Subject	Credits	Part Credits
Part I		Language Paper I	3	3
Part II	1GE1	English Paper I	3	3
Part III	1MCS01	Main Paper I - Introduction to Computers and Digital Logic	5	19
	1MCS02a	Main Paper II - Problem Solving Techniques	5	
	1MCSP1a	Main Practical I - Practical I: Problem Solving Techniques Laboratory	5	
	1AMCS1	Allied Paper I – Allied Mathematics I	4	
Part IV		Basic Tamil / Advanced Tamil / Non-major Elective	2	4
	OVE	Value Education	2	

Semester 2

Part	Code	Subject	Credits	Part Credits
Part I		Language Paper II	3	3
Part II	2GE2	English Paper II	3	3
Part III	2MCS03	Main Paper III - Computer Architecture	5	19
	2MCS04a	Main Paper IV - Objected Oriented Programming with C++	5	
	2MCSP2a	Main Practical II - Practical II: C++ Laboratory	5	
	2AMCS2	Allied Paper II – Allied Mathematics II	4	
Part IV		Basic Tamil / Advanced Tamil / Non-major Elective	2	4
	OEST	Environmental Studies (Theory)	1	
	OESPV	Environmental Studies (Project and Viva-Voce)	1	

Semester 3

Part	Code	Subject	Credits	Part Credits
Part I		Language Paper III	3	3
Part II	3GE3	English Paper III	3	3
Part III	3MCS05	Main Paper V - Data Structures and Algorithms	5	19
	3MCS06a	Main Paper VI – Programming in Java	5	
	3MCSP3a	Main Practical III - Practical III: Java Laboratory	5	
	3APCS1	Allied Paper III – Allied Physics I	4	
Part IV	SAR1	SBS – Analytical Reasoning I	2	6
	OECT1	SBS - English Communication Skills I (Theory)	1	
	OECP1	SBS – English Communication Skills I (Practical)	1	
	SMMT / SOST	SBS – Multimedia (Theory) / Office Suite Specialist (Theory)	1	
	SMMP / SOSP	SBS – Multimedia (Practical) / Office Suite Specialist (Practical)	1	

Semester 4

Part	Code	Subject	Credits	Part Credits
Part I		Language Paper IV	3	3
Part III	4MCS07a	Main Paper VII - Markup and Scripting Languages	5	28
	4MCS08	Main Paper VIII - Operating Systems	5	
	4MCS09	Main Paper IX – Computer Graphics	5	
	4MCSP4b	Main Practical IV - Practical IV: Markup and Scripting Languages Laboratory	5	
	4APCS2	Allied Paper IV – Allied Physics II	4	
	4APCSP	Allied Practical I – Allied Physics Practical	4	
Part IV	OGK	SBS - General Knowledge	2	4
	SAR2	SBS – Analytical Reasoning II	2	

Semester 5

Part	Code	Subject	Credits	Part Credits
Part III	5MCS10b	Main Paper X – Web Application Development	5	40
	5MCS11	Main Paper XI - Computer Networks	5	
	5MCS12b	Main Paper XII – Personal Software Process	5	
	5MCS13a	Main Paper XIII - Microprocessors	5	
	5MCS14b	Main Paper XIV – Database Management Systems	5	
		Elective / Application Oriented Paper I	5	
	5MCSP5b	Main Practical V - Practical V - Web Application Development Laboratory	5	
	5MCSP6b	Main Practical VI - Practical VI - Database Management Systems Laboratory	5	
Part IV	SAR3	SBS – Analytical Reasoning III	2	4
	OECT2	SBS - English Communication Skills II (Theory)	1	
	OECP2	SBS – English Communication Skills II (Practical)	1	

Semester 6

Part	Code	Subject	Credits	Part Credits
Part II	6GE4	English Paper IV - English for Competitive Examinations	3	3
Part III	6MCS15b	Main Paper XV – The UNIX Operating System	5	35
	6MCS16a	Main Paper XVI – Mobile Application Development	5	
	6MCS17a	Main Paper XVII – Cloud Computing	5	
	6MCS18a	Main Paper XVIII – Artificial Intelligence	5	
		Elective / Application Oriented Paper II	5	
	6MCSP7b	Main Practical VII - Practical VII: UNIX Programming Laboratory	5	
	6MCSP8a	Main Practical VIII - Practical VIII – Mobile Application Development Laboratory	5	
	6MCSPR	Project Work (Optional)	5	10
	6MCSPV	Project Viva-Voce (Optional)	5	
Part IV	OQCC	SBS – Quality Control Circles (Theory)	1	2
	OQCCP	SBS – Quality Control Circles (Presentation)	1	

Part I - Language

The Languages offered under Part I are:

Tamil

Telugu

Hindi

Sanskrit

French

Part III - Elective / Application Oriented Subjects

Electives are streamlined into 6 streams, with students encouraged to choose one stream of their preference to take up in Semester 5 and 6.

	Elective Streams	Elective I (Semester 5)	Elective II (Semester 6)
1	Computer Networks	Distributed Systems	Mobile Communications
2	Security	Network Security	Cryptography
3	System Programming	Principles of Compiler Design	System Programming with UNIX
4	Algorithms	Design and Analysis of Algorithms	Parallel Algorithms
5	Intelligent Systems	Digital Image Processing	Natural Language Processing
6	Information Systems	Data Mining	Data Warehousing

Part IV - Non-Major Electives

The following are the Non-Major Electives offered in two parts to students whose language in Part I is Tamil. (Other students have to take either Basic Tamil or Advanced Tamil.)

1. Basic Tamil
2. Advanced Tamil
3. Basic Sanskrit
4. Basic Hindi
5. Basic French
6. Basic Telugu
7. Bhagavadgita
8. Indian Constitution
9. Tourist Centres of India
10. Basic Mathematics
11. Basic Biology
12. Basic Music
13. Computer Applications
14. Basics of Retail Marketing
15. Basics of Business Insurance
16. Introduction to Financial Markets
17. Fundamentals of Insurance
18. Functional Mathematics I
19. Functional Mathematics II
20. Basics of Capital Markets
21. Indian Economy for Competitive Examinations

Part IV – Compulsory Subjects

#	Subject Code	Subject	Credits
1.	OEST	Environmental Studies (Theory)	1
	OESPV	Environmental Studies (Project and Viva-Voce)	1
2.	OVE	Value Education	2

Part IV – Skill-based Subjects

#	Subject Code	Subject	Credits
1.	OGK	General Knowledge	2
2.	SAR1	Analytical Reasoning I	2
3.	SAR2	Analytical Reasoning II	2
4.	SAR3	Analytical Reasoning III	2
5.	OQCC	Quality Control Circles (Theory)	1
	OQCCP	Quality Control Circles (Presentation)	1
6.	OECT1	English Communication Skills I (Theory)	1
	OECP1	English Communication Skills I (Practical)	1
7.	OECT2	English Communication Skills II (Theory)	1
	OECP2	English Communication Skills II (Practical)	1
8.	SMMT	Multimedia (Theory)	1
	SMMP	Multimedia (Practical)	1
9.	SOST	Office Suite Specialist (Theory)	1
	SOSP	Office Suite Specialist (Practical)	1

Course Syllabus

Semester 1

1MCS01 - Introduction to Computers and Digital Logic

OBJECTIVES:

1. To learn the functional units of a digital computer and various representation codes.
2. To learn the basic logic gates.
3. To learn to simplify Boolean functions.
4. To learn to design combinational circuits.
5. To learn sequential circuits, both synchronous and asynchronous.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand number systems, conversions among them and binary arithmetic.
2. Solve conversion and arithmetic problems in binary and decimal number systems using complements.
3. Use various techniques learnt to simplify Boolean functions and design gated circuits to realize the Boolean functions.
4. Understand specific real-world problems, formulate the problem as a Boolean function and design combinational circuits from scratch to solve the problem.
5. Explain the basic types and circuitry of flip-flops and registers.
6. Explain the design of asynchronous and synchronous counters.

Unit	Course Content	L	P	T
1	**Basic Computer Organization:** Functional units, Basic I/O devices and storage devices, Buses. **Codes:** Binary Coded Decimal Numbers – Weighted codes – Cyclic codes – Error detecting and correcting codes – Alphanumeric codes – Complement representation of numbers.	10	-	2
2	**Data Representation:** Numbering systems – Converting numbers from one base to another – Binary arithmetic operations - Representation of integers, real numbers (fixed and floating point).	8	-	2
3	**Boolean Algebra:** Six basic theorems of Boolean Algebra – Canonical Forms for Boolean Functions – Logic Gates – Karnaugh Map – Don't Care Conditions - Tabulation Method.	10	-	2
4	**Combinational Logic:** Adders – Subtractors – Code Converter - Binary Parallel Adder – Decoder – Demultiplexer – Encoder – Multiplexer.	10	-	2
5	**Sequential Logic:** Basic sequential circuit – Flip Flops: RS flip-flop, JK flip-flop, D flip-flop, T flip-flop – Triggering of flip-flops – Master-Slave flip-flop – Registers – Shift Registers – Asynchronous/Ripple Counters – Synchronous counters.	12	-	2
Total		**50**	**-**	**10**

TEXT BOOKS

1. V. Rajaraman and T. Radhakrishnan, *An Introduction to Digital Computer Design*, PHI, Third Edition.

2. M. Morris Mano, *Digital Logic and Computer Design*, PHI, 1994.

1MCS02a - Problem Solving Techniques

OBJECTIVES:
1. To imbibe a systematic approach to problem solving.
2. To learn C language and implement solutions using the various features of C.
3. To learn efficient algorithms to solve standard basic problems thus laying a firm foundation for designing algorithmic solutions to problems.

OUTCOMES:
Upon completion of the course, the student will be able to
1. Understand the notions of algorithms, programs and problem solving strategies.
2. Write C programs to solve simple problems.
3. Identify and fix bugs in / determine output of a given code snippet.
4. Explain the approach and algorithms to solving specific basic problems learnt.

Unit	Course Content	L	P	T
1	**Introduction:** Notion of algorithms and programs – Requirements for solving problems by computer – The problem-solving aspect: Problem definition phase, Getting started on a problem, The use of specific examples, Similarities among problems, Working backwards from the solution – General problem-solving strategies - Problem solving using top-down design – Implementation of algorithms – Recursion. **Basics of C Programming:** Data types – Operators – Control statements: Branching, Looping, Nested control structures – Prototypes and functions – Passing by value – Arrays – Passing arrays to functions – Multi-dimensional arrays.	8	-	2
2	**Structure and Union:** Fundamentals of Structures - Passing structures to functions - Nested structures - Array of structures - Array as structure element - Fundamentals of union - Difference between union and structure - Anonymous structures and unions. **Preprocessor basics:** Macro substitution - File inclusion directives - Compiler control directives - #pragma directive – Stringizing operator – Token pasting operator.	10	-	2
3	**Pointers in C:** Concept of pointers - Pointer types - Pointer declaration - Pointer initialization - Usage of pointers - Pointer arithmetic - Pointers as function arguments - Function returning pointer - Pointers and arrays – Multiple indirection – Pointer to constant – *const* pointer - Functions taking variable number of arguments - Dynamic memory allocation – String representation using pointers - Operations on strings - Pointers to structures and unions - Self-referential structures. **Streams:** Concept of streams – Formatted I/O - File handling - File pointer - Opening, closing, processing and updating files - ASCII and binary files.	10	-	2
4	**Algorithms:** Exchanging the values of two variables – Counting - Summation of a set of numbers - Factorial computation - Sine function computation - Sorting by insertion – Linear search - Finding the smallest divisor of an integer.	10	-	2
5	**Algorithms:** Finding the GCD of two integers - Generating prime numbers - Generating the prime factors of an integer - Raising a number to a large power – Computing the nth Fibonacci number – Array order reversal – Removal of duplicates from an ordered array.	12	-	2
Total		**50**	**-**	**10**

TEXT BOOKS
1. R. G. Dromey, *How to Solve it by Computer*, Prentice Hall of India, 1982.
2. Yashawant Kanetkar, *Exploring C*, BPB Publications, 2008.
3. Yashawant Kanetkar, *Understanding Pointers in C*, BPB Publns,1st Indian Ed, 2001.

1MCSP1a - Practical I: Problem Solving Techniques Laboratory

OBJECTIVES:

1. To learn to code, debug and execute programs in C Language in an IDE.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Code, debug and execute a C program in an IDE.
2. Implement the algorithms for the given problems in C.

Unit	Course Content	L	P	T
1	Exchanging the values of two variables	-	1	-
2	Counting	-	1	-
3	Summation of a set of numbers	-	1	-
4	Factorial computation	-	1	-
5	Sorting by insertion	-	1	-
6	Linear search	-	1	-
7	Fibonacci Series generation	-	1	-
8	Reversing the digits of an integer	-	2	-
9	Character to number conversion	-	2	-
10	Array order reversal	-	2	-
11	Calculating the GCD of two numbers	-	2	-
12	Finding the smallest divisor of an integer	-	2	-
13	Generating prime numbers	-	3	-
14	Raising a number to a large power	-	4	-
15	Removal of duplicates from an ordered array	-	4	-
16	Computing the nth Fibonacci number	-	4	-
17	Design a structure to store the employee details of an organization with the following information – Employee ID, name, age and designation. Write functions to accept, display and search for a particular employee using the employee ID. Demonstrate the use of these functions with a menu-driven main program.	-	4	-
18	Design a structure to store the name and telephone number of a person. Use files to store the records. Have appropriate functions to accept, display, modify and search based on a telephone number. Demonstrate the use of these functions with a menu-driven main program.	-	4	-
19	String manipulation using pointers and dynamic memory allocation a. Finding length of a string b. Reversing a string c. Copying a source string to destination d. Concatenating two strings e. Comparing two strings f. Check for palindrome g. Return the number of elements by which two strings differ	-	4	-
20	Write a function which scans a string from beginning to end in search of a character. If the character is found it should return a *pointer* to the first occurrence of the given character in the string. If the given character is not found in the string, the function should return a NULL.	-	4	-
21	Extend the function written above to scan the accepted string for a substring and make it return the starting position of the substring in the main string.	-	4	-

Unit	Course Content	L	P	T
22	Write a program to compress any given string such that the multiple blanks present in it are eliminated. Store the compressed message in another string.	-	4	-
23	Write a program that extends the above program to decompress and get back the original string with all its spaces restored.	-	4	-
Total		**-**	**60**	**-**

1AMCS1 - Allied Mathematics I

OBJECTIVES:

1. To learn the theory of equations, calculus, graph theory and numerical methods in order to provide a firm mathematical foundation.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the concepts of equations and apply the methods of finding the roots of equations.
2. Apply Integral Calculus to solve specific problems.
3. Understand graph theory.
4. Apply numerical methods to solve algebraic and transcendental equations.
5. Solve numerical interpolation problems using various formulae.

Unit	Course Content	L	P	T
1	Theory of equations: Roots of an equation of third degree – Relation between roots and coefficients – Symmetric functions of roots – Increasing and decreasing the roots of an equation – Reciprocal equation – Horner's method.	13	-	2
2	Calculus: Applications of Integration – Double integral and its applications – Triple integrals (Cartesian co-ordinates only).	13	-	2
3	Graph Theory: Graphs and subgraphs – Definitions and examples – Degrees – Subgraphs– Isomorphism of graphs – Trees – Matchings.	13	-	2
4	Numerical solutions of algebraic and transcendental equations by Bisection method, Newton-Raphson method and Iteration method – Solution of simultaneous linear algebraic equations by Gauss-elimination and Gauss-Seidal methods (3 equations, 3 unknowns only).	13	-	2
5	Numerical interpolations and inverse interpolations – Numerical interpolation by Newton's forward and backward interpolation formulae – Stirling's formula – Lagrange's interpolation formula – Inverse interpolation by Lagrange's inverse interpolation formula.	13	-	2
Total		**65**	**-**	**10**

TEXT BOOKS

1. Narayanan, Hanumantha Rao, Manicavachagam Pillay and Kandaswamy, *Ancillary Mathematics – Volume I*, Revised Edition, S.Viswanathan Printers and Publishers Pvt Ltd, 2007.

2. S. Arumugam and S. Ramachandran, *Introduction to Graph Theory*, Scitech Publishers, 2001.

3. P. Kandasami and K. Thilagavathy, *Calculus of Finite Differences and Numerical Analysis (Allied Mathematics)*, First Edition, S.Chand and Co., 2003.

Semester 2

2MCS03 - Computer Architecture

OBJECTIVES:

1. To learn the concepts that are building blocks of computer architecture.
2. To learn Control Unit design.
3. To know the concepts of pipelining.
4. To learn the architecture of I/O Interface and Memory.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Explain the fundamentals of Register Transfer Language.
2. Write any given expression in various instruction formats.
3. Calculate effective address of operands in a given instruction, for various addressing modes.
4. Understand design of the Control Unit.
5. Apply computer arithmetic algorithms to solve simple problems.
6. Explain the concept of pipelining and design a pipeline for a simple problem.
7. Explain I/O Interface concepts.
8. Explain the architecture and working of Main Memory, Associative Memory and Cache Memory.

Unit	Course Content	L	P	T
1	**Fundamentals of Computer Design:** Defining computer architecture - Quantitative principles of Computer design - Register transfer and micro operations - Central processing unit - general register organization - stack organization - Instruction formats - Addressing modes - Data transfer and manipulation - RISC – CISC.	8	-	2
2	**Introduction to Microprogram Control:** Control memory - Address sequencing – Basics of Control Unit design with block diagram.	10	-	2
3	**Computer Arithmetic:** Addition and subtraction of signed magnitude data and signed 2's complement data – Multiplication of signed magnitude and 2's complement data – Restoring and non restoring division algorithm.	12	-	2
4	**Pipelining:** Introduction - Instruction Pipeline - Arithmetic Pipeline – RISC Pipeline.	8	-	2
5	**Input Output Interface:** Asynchronous Transfer: Strobe Control, Handshaking, Programmed I/O, Concept of Interrupt-initiated I/O, DMA. **Main Memory:** Introduction – Memory connection to CPU (block diagram) - Associative Memory:Hardware organization - Cache Memory Basics: Concepts of Associative, Direct and Set-associative mappings.	12	-	2
Total		**50**	**-**	**10**

TEXT BOOKS

1. M. Morris Mano, Computer System Architecture, Prentice Hall of India, Third Edition.

2. John L. Hennessy and David A. Patterson, Computer Architecture – A Quantitative Approach, Morgan Kaufmann, Fourth Edition.

2MCS04a – Object Oriented Programming with C++

OBJECTIVES:

1. To appreciate the need for and characteristics of object orientation.
2. To learn the grammar of and to use the programming constructs of the C++ programming language.
3. To learn to implement programs in C++ covering the object-oriented concepts.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Explain the various basic concepts of Object-orientation.
2. Conceptualize a given problem in an object-oriented way.
3. Write a program to solve simple problems, by applying the concepts of object orientation and basic features of C++.
4. Find any bug in a given program snippet and fix it.
5. Determine the output of a given program snippet.

Unit	Course Content	L	P	T
1	**Introduction:** Complexity of software - Consequences of unrestrained complexity - Structure of complex systems - The Object Model - Evolution of object model - Definition of object oriented programming, object oriented design and object oriented analysis - Elements of object model: Abstraction, Encapsulation, Modularity, Hierarchy - Benefits of the object model. **Basic Elements of C++:** Classes and Objects - Memory allocation - Class space and object space – Access specifiers (*public*, *private*) – Static data member - Static member function – Passing objects to functions - Functions returning objects - *this* pointer – References - Constructors and destructors - Friend functions - Friend classes.	12	-	2
2	**Compile-time Polymorphism:** Default arguments in functions - Function Overloading - Ambiguity in function overloading - Overloading constructors - Copy constructor. **Use of Pointers:** Pointers to objects - pointers to class members - Dynamic memory allocation.	10	-	2
3	**Operator Overloading:** Operator overloading for unary and binary operators – Member operator function - Friend operator function. **Inheritance and Run-time Polymorphism:** Inheritance - Types of inheritance - *protected* access specifier - Virtual base class - Virtual functions and pure virtual functions – Function Overriding.	10	-	2
4	**Templates:** Function templates - Overloading of function template – Using a function template - Class templates – Using a class template. **Exception handling:** *try*, *throw*, *catch* keywords – Rethrowing a caught exception - Default *catch* clause – Derived class exceptions.	8	-	2
5	**Streams:** Formatted I/O with *ios* class functions - Manipulators - Creating own manipulators - Overloading << and >> operators.	10	-	2
Total		**50**	**-**	**10**

TEXT BOOKS

1. Herbert Schildt, *C++ - The Complete Reference*, Fourth Edition, Tata McGraw Hill.
2. Grady Booch, *Object-oriented Analysis and Design*, Second Edition, Addison-Wesley Publishing Company.

2MCSP2a - Practical II: C++ Laboratory

OBJECTIVES:

1. To learn to code, debug and execute programs in C++ in an IDE.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Design classes and draw class diagrams for the given problems.
2. Write programs in C++.
3. Code, debug and execute a C++ program to solve the given problems in an IDE.

Unit	Course Content	L	P	T
1	Write a class to represent a complex number which has the following members. Use function overloading. a. Set the value of the complex number b. Show the value of the complex number c. Add two complex numbers d. Subtract two complex numbers e. Multiply two complex numbers f. Multiply the complex number with an integer g. Add an integer to a complex number h. Subtract an integer from a complex number	-	6	-
2	Write a Point class that represents a 2-d point in a plane. Write member functions to a. Set the value of a point b. Show the value of a point c. Find the distance between two points d. Check whether two points are equal or not	-	6	-
3	Design a class to represent time in hh:mm:ss with appropriate data members. Write member functions to a. Set the time using constructor and a 'set' function b. Show the time c. Find the difference between two time objects d. Add a given duration to a time e. Convert the time object to seconds	-	6	-
4	Design a class to represent a string data type. Create a data member in the class to represent a string using an array of size 100. Implement the following functionality as member functions: a. Constructor – default and parameterized b. Function to concatenate two strings c. Function to find the length of the string	-	6	-
5	Design a class to represent a string data type. Create a data member in the class to represent a string whose size is dynamically allocated. Write the following functionality as member functions: a. Constructor – default and parameterized b. Copy Constructor c. Destructor d. Function to find the length of the string e. Function to reverse a string.	-	6	-
6	Design a class to represent a 3x3 Matrix. Overload operators to perform the following operations: a. Matrix Addition b. Matrix Multiplication	-	6	-

Unit	Course Content	L	P	T
	c. Scalar Multiplication using friend function. d. Function to count the number of objects created so far for the class.			

7	Design and implement the following classes:
	  a. A cPerson class to store the id and name of a person
	  b. A cAccount class and a cAdmin class which maintain salary details and experience details of a person respectively.
	  c. A cMaster class which maintains all information about a person.
	  d. (Implement cPerson as the base class for cAccount and cAdmin and inherit cMaster class from cAccount and cAdmin.)
		-	6	-

8	Define a class template representing a single-dimensional array.
	  a. Implement a function to sort the array elements.
	  b. Include a mechanism to detect and throw an exception for array-bound violations.
		-	6	-

9	Design a base class that represents 2-d shapes. Design derived classes to create a triangle, rectangle and circle. Include member functions to compute the area of these figures. Use Runtime polymorphism.	-	6	-

10	Design a Polynomial class with overloaded operators to perform the following operations
	  a. + (Polynomial addition)
	  b. [ ] (to access the coefficient of a particular term of the polynomial)
		-	6	-

Total		**-**	**60**	**-**

2AMCS2 - Allied Mathematics II

OBJECTIVES:

1. To learn the theory of matrices, differential equations, Laplace and Fourier transforms and numerical methods in order to provide a firm mathematical foundation.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the concept of matrices and their manipulations.
2. Solve differential equations.
3. Understand the Laplace Transform and its applications.
4. Understand the Fourier series and solve problems.
5. Use numerical methods to solve integration and differential equation problems.

Unit	Course Content	L	P	T
1	**Matrices**: Characteristic roots and characteristic vectors – Cayley-Hamilton theorem (statement only) verifications – Finding the inverse using the theorem – Symmetric and skew symmetric – Hermitian and skew Hermitian – Unitary and orthogonal matrices.	13	-	2
2	**Differential Equations**: Equations of the form $(aD2+bD+C)y = e^{ax}\Phi(x)$ where a,b,c are constants, $\Phi(X)$= sin mx, cos mx, xm, where m is an integer – Second order differential equations with variable coefficients reducible to second order differential equations with constant coefficients.	13	-	2
3	**Laplace Transforms**: Definition – Laplace Transform of eat, cos at, sin at, cosh at, sinh at, tn, where n is an integer – $e^{at}f(t)$, $t^{n}f(t)$, f(t), f '(t) – Inverse Laplace Transforms – Solving ordinary differential equations with constant coefficients (only up to order 2) using Laplace transforms.	13	-	2
4	**Fourier series**: Definition – Finding Fourier coefficients for a given periodic function with period 2π – odd and even functions (Half – range series excluded).	13	-	2
5	**Numerical Methods**: Numerical Integration and numerical solution of ordinary differential equations of order 1: Numerical integration by Trapezoidal Rule and Simpson's Rule – Solution of ordinary differential equations of 1st order by Runge-Kutta Method of order Four – Modified Euler Method.	13	-	2
Total		**65**	**-**	**10**

TEXT BOOKS

1. Narayanan, Hanumantha Rao, Manicavachagam Pillay and Kandaswamy, *Ancillary Mathematics – Volume I*, Revised Edition, S.Viswanathan Printers and Publishers Pvt Ltd, 2007.

2. S. Arumugam and S. Ramachandran, *Introduction to Graph Theory*, Scitech Publishers, 2001.

3. P. Kandasami and K. Thilagavathy, *Calculus of Finite Differences and Numerical Analysis (Allied Mathematics)*, First Edition, S.Chand and Co., 2003.

Semester 3

3MCS05 - Data Structures and Algorithms

OBJECTIVES:

1. To learn linear and non-linear data structures.
2. To learn the basic algorithmic approaches and simple applications of the same.
3. To learn specific searching and sorting algorithms.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Explain the various linear and non-linear data structures.
2. Describe the computer representation of linear and non-linear data structures.
3. Choose the appropriate data structure for simple problems.
4. Given a binary tree, traverse the tree using the traversal algorithms learnt.
5. Given a graph, traverse the graph using the traversal algorithms learnt.
6. Understand the algorithmic design strategies of Divide-and-Conquer, Greedy and Dynamic Programming and know how these strategies are applied to solve the given specific problems.
7. Explain specific searching and sorting algorithms and their characteristics.
8. Understand how to apply the specific algorithms learnt for searching and sorting, to solve any given problem.

Unit	Course Content	L	P	T
1	**Data Structures**: Definition and Classification **Algorithms**: Definition - Structure and properties – Performance analysis with step-count method - Asymptotic notation - Big-Oh definition.	8	-	2
2	**Arrays and Linked Lists:** Representation of Arrays – Insertion, deletion, searching in arrays - Stack (using array) - Queue (using array) - Circular queue (using array) – Singly linked list - Doubly linked list.	10	-	2
3	**Graphs and Trees:** Representation of Binary tree – Binary tree traversals (only recursive model) – Representation of Graphs (Adjacency Matrix, Adjacency List) – Graph Traversals (DFS, BFS).	12	-	2
4	**Introduction to algorithmic design methods:** Divide and Conquer method: Finding Max-Min – Greedy method: Knapsack problem - Dynamic Programming method: Multistage graph. (No proofs or derivations of time/space complexity required.)	12	-	2
5	**Searching and Sorting Algorithms:** Bubble Sort - Quick Sort - Merge Sort - Binary Search - Hashing.	8	-	2
Total		**50**	**-**	**10**

TEXT BOOKS

1. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, *Fundamentals of Data Structures in C++*, Second Edition, Universities Press.

2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, *Fundamentals of Computer Algorithms*, Second Edition, Universities Press.

REFERENCE BOOK

1. G. A. Vijayalakshmi Pai, *Data Structures and Algorithms Concepts, Techniques and Applications*, Tata McGraw-Hill, 2008.

3MCS06a – Programming in Java

OBJECTIVES:

1. To understand the basic characteristics of Java.
2. To know the principles of packages and interfaces.
3. To learn exceptions and I/O streams.
4. To learn Threads in Java.
5. To understand AWT controls.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Explain the various concepts and constructs involved in Java programming language.
2. Develop Java programs using basic Java constructs, interfaces and packages.
3. Design and develop user-defined exceptions.
4. Develop Java applications with threads.
5. Develop interactive Java Applet programs.
6. Develop programs with AWT controls.
7. Identify bugs in given code snippets and fix them.
8. Determine the output of a given program snippet.

Unit	Course Content	L	P	T
1	**Introduction:** The Genesis of Java – Writing a simple program - Data types - Variables – Type conversions – Single and multi dimensional Arrays – Operators – Control Statements – Instance Variables – Methods – Constructors - Declaring Objects.	8	-	2
2	**Methods:** Overloading methods – Argument passing - Access Control: *static*, *final*, Inner Classes – Inheritance - Overriding methods - Using *super* - Abstract class. **Packages**: Definition - Access Protection - Importing Packages. **Interfaces**: Definition – Implementation - Application. **Exception Handling**: *try – catch - throw - throws – finally* – Built-in exceptions.	12	-	2
3	**Multithreaded Programming**: Thread Class - Runnable interface – Synchronization – Using synchronized methods – Using *synchronized* statement - Interthread Communication - Deadlock, Suspending, Resuming and Stopping threads.	10	-	2
4	**I/O Streams:** Byte Streams - Character Streams - Reading console input – Writing console output. **String Handling**: String Class - String Buffer Class. **Applets:** Applet Class – Applet architecture – Applet skeleton – Simple applet display methods. **Event handling**: Event Classes - Event Listener Interfaces – Adapter Class.	12	-	2
5	**Introducing AWT:** Window fundamentals - Working with Frame windows – Creating frame window in an applet **Working with Graphics:** Color – Fonts – Using AWT Controls - Layout Managers – Menus – Dialog boxes - FileDialog.	8	-	2
Total		**50**	**-**	**10**

TEXT BOOKS

1. Herbert Schildt, *Java 2 - The Complete Reference,* Fifth Edition.
2. Gary Cornell, *Core Java 2 Volume I – Fundamentals,* Addison Wesley, 1999.

REFERENCE BOOK

1. H.M.Deital, P.J.Deital, *Java: How to Program*, 5th Ed., Pearson Education, 2005.

3MCSP3a - Practical III: Java Laboratory

OBJECTIVES:

1. To learn to code, debug and execute programs in Java.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Write simple programs in Java.
2. Code, debug and execute a Java program to solve the given problems.
3. Create applications using Applets and AWT.

Unit	Course Content	L	P	T
1	Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.	-	1	-
2	Implementation of Point class for image manipulation.	-	2	-
3	Using the Calendar Class, generate the calendar for a given month and year.	-	3	-
4	Write a program to do String Manipulation using Character Array and perform the following string operations: a. String length b. Finding a character at a particular position c. Concatenating two strings	-	4	-
5	Write a program to perform the following string operations using String class: a. String Concatenation b. Search a substring c. To extract substring from given string	-	4	-
6	Write a program to perform string operations using StringBuffer class: a. Length of a string b. Reverse a string c. Delete a substring from the given string	-	4	-
7	Write a program to perform the following vector operations using vector class. a. Insert element into the vector b. Return the size and capacity of the vector c. Remove element from the vector d. Replace a vector element with the given element e. Display the elements	-	4	-
8	Write a program to demonstrate multithreading using the Runnable Interface.	-	4	-
9	Write a program to demonstrate multithreading using the Thread class.	-	4	-
10	Write a threading program which uses the same method asynchronously to print the numbers 1 to 10 using Thread1 and to print 90 to 100 using Thread2.	-	4	-
11	Write a program to demonstrate the use of following exceptions. a. Arithmetic Exception b. Number Format Exception c. Array Index Out of Bound Exception d. Negative Array Size Exception	-	4	-
12	Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.	-	2	-
13	Write a program to draw a circle on an applet and change the color of circle randomly for every mouse click.	-	2	-

Unit	Course Content	L	P	T

14	Write an Applet program to draw the following and fill the figures. Use a menu.
	   a. Lines
	   b. Rectangles
	   c. Ellipses and circles
	   d. Polygons
		-	4	-

15	Write an applet program to demonstrate simple moving banner.	-	2	-
16	Write an applet program that changes the background color using Scrollbars.	-	4	-
17	Write a program to display Armstrong numbers from 1 to 1000 using frames.	-	4	-
18	Write a program to handle all the possible mouse events.	-	4	-
Total		**-**	**60**	**-**

3APCS1 - Allied Physics I

OBJECTIVES:

1. To gain knowledge of the fundamental concepts of Physics and the application of Mathematics in the physical world.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand properties of matter, statics and dynamics.
2. Understand the concepts of sound and wave mechanics.
3. Understand the fundamentals of low temperature Physics and its uses.
4. Understand the properties of light.
5. Understand basic concepts of Semiconductor Physics, electronic gates, combinational circuits and sequential circuits.

Unit	Course Content	L	P	T
1	**Properties of Matter and Mechanics**: Elastic constants – Different moduli of elasticity and their expressions – Energy stored in a stretched wire - Bending of beams – Expression for bending moment – theory and experimental determination of Young's modulus by non-uniform bending – Torsion in a wire – Determination of rigidity modulus by torsional pendulum and static torsion. Rigid body dynamics – Compound pendulum – theory – equivalent simple pendulum – reversibility of centres of oscillation and suspension – determination of g and K	7	-	1
2	**Sound**: Waves and oscillations – Simple harmonic motion – composition of two simple harmonic motion at right angles (period in ratio 1:1) – expression for the velocity of transverse waves in a stretched string – frequency of transverse waves of a stretched string – laws of transverse vibration of a string – verification of laws of transverse vibration of strings – Melde's string -transverse and longitudinal modes – determination of ac frequency using sonometer (steel and brass wire) –ultrasonics – production – Piezoelectric method – application and uses.	11	-	1
3	**Low Temperature Physics**: Joule Kelvin Effect –Theory of Porous plug experiment – Expression for temperature of inversion -Regenerative cooling – Liquefaction of gases -Helium I and Helium II – adiabatic demagnetization – expression for fall in temperature due to adiabatic demagnetization - practical application of low temperature – refrigeration – Frigidaire refrigerator – air conditioning – air conditioner – effect of CF_2Cl_2 on ozone layer	9	-	1
4	**Optics**: Interference – theory of thin films - determination of radius of curvature - Newton's rings - air wedge – determination of diameter of a thin wire – diffraction – Fresnel's explanation of rectilinear propagation of light – theory of transmission grating - determination of wavelength - optical activity – specific rotation - polarimeter.	11	-	1
5	**Electronics**: Formation of P-N Junction diode – forward and reverse bias characteristics of P N Junction – break down mechanisms – avalanche and Zener breakdown – Zener diode characteristics – Zener diode as voltage regulator – P N junction as a half wave and full wave rectifier – Bridge rectifier – Characteristic curves of transistor in common emitter mode – common emitter transistor amplifier (single stage) Binary number system – binary addition – subtraction – analog and digital signals – basic logic gates using discrete components – De Morgan's	7	-	1

Unit	Course Content	L	P	T
	theorems – NAND as Universal gate – NOR as Universal gate – half adder and full adder – half subtractor and full subtractor. – NAND latch – SR flip flop – clocked SR flip flop – edge triggered flip flop – D flip flop.			
Total		**45**	**-**	**5**

TEXT BOOKS

1. D.S. Mathur, *Properties of Matter*, S.Chand & Company, 1962.

2. Brijlal and Subrahmanyam, *A textbook of sound*, Vikas Publishing house Pvt. Ltd.

3. Brijlal and Subramanian, *Heat and thermodynamics*, S.Chand & Co., 2002.

4. Brijlal and Subrahmanyam, *A text book of Optics* , S. Chand & Co., 1985

5. Malvino and Leach, *Digital principles and applications*, MGH, New Delhi, 1991.

REFERENCE BOOKS

1. Nelson and Parker, *Advanced Level Physics*, Arnold – Heinemann, 1987.

2. Resnick and Halliday - Physics Vol. I and Vol. II - Wiley Eastern Ltd., 5th Edition.

Semester 4

4MCS07a - Markup and Scripting Languages

OBJECTIVES:

1. To understand the difference between server-side and client-side programming.
2. To learn HTML5 for designing web pages.
3. To learn XML to represent data and create user-defined tags.
4. To learn scripting languages for client-side programming.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Design simple web pages using HTML5 and XHTML.
2. Represent web data and create user-defined tags using XML.
3. Use JavaScript, VBScript and PHP to develop client-side scripting.
4. Create interactive web sites using PHP and MySQL/SQL.
5. Explain the various concepts and language constructs learnt in HTML5, XML, Javascript, VBScript and PHP.
6. Spot errors and debug code in any of these markup or scripting languages.
7. Determine the output of a code snippet.

Unit	Course Content	L	P	T
1	**HTML 5:** Introduction to HTML 5 – Introduction to New Elements – Working with Lists, Frames – Working with hyperlink and images - Working with Forms and Controls.	5	-	1
2	**XML:** XPath, XSLT - XML Programming: Introduction to DOM and SAX – Display: XHTML, XForms.	10	-	1
3	**Scripting:** Need for Scripting – Scripting vs. Programming – Client side scripting – Server side scripting. **VBScript:** Introduction – Variables - Procedures – Conditional and looping structures – Overview of Date/Time, Format, String and Conversion functions.	10	-	1
4	**JavaScript:** Introduction to JavaScript (JS) – Structure of JS – JS statements, variables, operators – Conditional and looping structures – Popup boxes – Writing a function – Events – Exception handling mechanism – Objects: String, Date, Array, Math, RegExp – Browser detection – Cookies – Form validation – Timing events – Creating an object.	10	-	1
5	**PHP:** Introduction to Hypertext Preprocessor (PHP) – Syntax: Variables, String, Arrays, Operators, Conditional and looping structures – Forms - $_GET - $_REQUEST - $_POST – Date – Include - File – Cookies – Sessions – Error handling: *die*(), *try*, *throw*, *catch* – Filters – Basics of PHP Database: Working with MySQL.	10	-	1
Total		**45**	**-**	**5**

TEXT BOOKS

1. Kogent Learning Solutions Inc, *HTML 5 in Simple Steps*, Dreamtech Press.
2. David Hunter, Andrew Watt, Jeff Rafter, et al, *Beginning XML*, 3rd Ed, Wiley Dreamtech India.
3. Lee Purcell and Mary Jane Mara, *The ABCs of JavaScript*, BPB Publications, 1997.
4. Michael Glass, Yann Le Seoarnec, Elizabeth Naramore, et al, *Beginning PHP, Apache, MySQL Web Development*, Wiley Dreamtech India, 2004.

WEBSITE

1. www.w3schools.com

4MCS08 - Operating Systems

OBJECTIVES:

1. To learn the basic concepts and responsibilities of operating systems.
2. To understand any operating system based on the concepts studied.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Articulate the main concepts, key ideas, strengths, limitations and core issues of operating systems.
2. Explain and solve problems using process and resource management algorithms.
3. Understand process synchronization.
4. Explain and solve problems using algorithms in deadlock handling.
5. Describe memory management techniques.
6. Calculate physical memory address, given a virtual memory address, based on the memory architecture.
7. Apply page replacement algorithms to solve problems.
8. Explain the basic concepts of file management.
9. Use disk scheduling algorithms to calculate effective access time.

Unit	Course Content	L	P	T
1	**Introduction:** Types of Operating Systems: Simple Batch Systems, Multi-programmed Batched Systems, Time-sharing Systems, Distributed Systems, Real–Time Systems - Hardware protection: Dual mode operation, CPU, I/O. Memory - Operating System Services - System Calls.	8	-	2
2	**Process Management:** Definition - Process states - PCB - Process Scheduling – CPU Scheduling Concepts - Scheduling Algorithms: FIFO, RR, SJF, Priority.	11	-	2
3	**Process synchronization:** Critical section problem – Semaphores - Classical problem of synchronization - Interprocess communication (IPC) – Characterization of Deadlocks, Methods of handling deadlocks: Prevention, Avoidance and Detection.	14	-	2
4	**Basic Concepts of Memory Management:** Overlay - Logical and Physical Address Space – Swapping – Contiguous Allocation – Basic concept of paging – Structure of page table (Hardware support, Protection, Sharing) - Segmentation - Calculation of Physical address for a given logical address using paging and segmentation technique.	14	-	2
5	**Virtual Memory:** Demand Paging - Page replacement - Page replacement algorithms. **File and Secondary Storage Management:** File concept - File attribute - File operations - File types - File access methods - Storage hierarchy - Disk structure – Allocation methods – Free space management - Disk scheduling algorithms.	13	-	2
Total		**60**	**-**	**10**

TEXT BOOK

1. A. Silberschatz and P.B. Galvin, *Operating System Concepts*, Sixth Edition, Addison-Wesley Publishing Co., 2002.

4MCS09 - Computer Graphics

OBJECTIVES:

1. To learn the basic concepts of computer graphics devices.
2. To learn the mathematical basis of and how to apply 2D and 3D transformation.
3. To learn about plane and space curves.
4. To learn some fundamental algorithms in raster scan graphics.
5. To learn various clipping and hidden line and hidden surface removal algorithms.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Explain the working of various 2D graphical devices.
2. Know the mathematical basis for 2D and 3D transformations.
3. Apply 2D and 3D transformations on a graphical image.
4. Explain the basic types of curve representations.
5. Understand basic algorithms for line-drawing, circle-drawing, image compression and polygon-filling for raster scan systems.
6. Apply clipping and hidden line/surface removal algorithms.

Unit	Course Content	L	P	T
1	**Basic concepts of computer graphics:** Storage tube – Cathode Ray Tube – Color CRT - Flat panel displays – Hardcopy output devices: Plotters, Printers - Interactive Input Devices: Joystick, trackball, scanner, touch panel, light pen – Picture Representation – Interacting with pictures – Interactive Devices: Logical devices, Physical devices – Data generation devices - Graphical User Interfaces.	8	-	2
2	**Basic 2D transformations:** Rotation - Reflection - Shearing - Scaling - Multiple transformations - Rotation about the origin - Reflection about a standard axis - Homogeneous Co-ordinates – Translation - Rotation about an arbitrary point (procedure only) - Reflection about an arbitrary axis (procedure only). **Basic 3D transformations:** Rotation - Reflection - Shearing - Scaling - Translation - Multiple transformations - Rotation about a standard axis - Reflection about a standard plane - Rotation about an arbitrary axis (procedure only) - Reflection about an arbitrary plane (procedure only).	14	-	2
3	**Plane Curves and Space Curves:** Curve Representation: Non-parametric and parametric curves - Representation of Space curves.	12	-	2
4	**Raster Scan Graphics:** Bresenham's line and circle drawing algorithms – Scan conversion: RLE - Polygon filling: Edge fill, Seed fill algorithms (Boundary fill, Flood fill).	12	-	2
5	**Clipping:** Sutherland-Cohen line clipping algorithm - Windowing and Viewporting **Hidden surface and Hidden line removal:** Backface removal algorithm, Z-Buffer, Hidden line elimination.	14	-	2
Total		**60**	**-**	**10**

TEXT BOOKS

1. David F. Rogers and J. Alan Adams, *Mathematical Elements for Computer Graphics*, Second Edition, Tata McGraw-Hill.
2. David F. Rogers and J. Alan Adams, *Procedural Elements for Computer Graphics*, Second Edition, Tata McGraw-Hill.

4MCSP4b - Practical IV: Markup and Scripting Languages Laboratory

OBJECTIVES:

1. To design interactive web pages using Scripting languages, Markup languages and a database, using an IDE.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Design simple web pages using the markup languages, HTML and XHTML.
2. Create dynamic web pages using Javascript, VBScript and PHP.
3. Represent web data using XML while creating websites.
4. Develop a program implementing cookies both using JavaScript and using PHP.
5. Use MySQL/SQL and PHP to design pages with data stored in a database.

Unit	Course Content	L	P	T
1	**HTML5** 1. Create an HTML document and divide the document into 4 equal sized frames and display an image in each frame. 2. Design an HTML page which includes document structure tags, title, line break, multiple headings and link to e-mail address. 3. Create an HTML file which is the main page with an image and text messages along with hyperlinks which is linked to various pages. The navigation should be such that the link takes you the appropriate page and then back to the main page. 4. Create an HTML page and add an link that opens the page of link when the user moves the mouse pointer over the link and closes when the cursor is moved out of the link without clicking. 5. Create a website as a collection of HTML pages which gives details about you. Have a homepage which has links of Personal information, Favourites, Academic excellence and any such information you want to post about yourself. The design, look and feel of the page can be designed by you.	-	9	-
2	**XML** 6. Create an XML document to describe some of the HTML tags. The description should comprise the description and example usage. 7. Create an XML document that lists at least 10 items in a shopping mall with the following details about each item – Product name, Brand name, Description, Category, Popularity rating and Cost. Validate using DTD. 8. Create an XML document that lists the desktop and laptop models available in a computer showroom. The details expected for each item – Product name, Product code, Company, Configuration (Processor No., Processor speed, Motherboard model, HD, RAM, Accessories list). Validate using XML Schema. 9. Using the XML document created in exercise 8, extract all the details of computers which use the same model processor and display them using XForm.	-	9	-
3	**VBScript** 10. Write a VBScript to find the difference between local time and GMT, using date object. 11. Write a VBScript to control the text displayed in the status bar. 12. Write a VB Script to change color of text randomly.	-	9	-
4	**JavaScript**	-	9	-

Unit	Course Content	L	P	T
	13. Write a JavaScript to create an array of elements, accept the values and display the same.			
	14. Write a JavaScript that creates a document that opens a new explorer window without toolbar, address bar and status bar, which unloads itself after one minute.			
	15. Write a program in JavaScript to change the background colour of the browser. Three buttons named Red, Blue and Green are to be displayed. When the user clicks on any one these buttons the background colour of the browser should change to the corresponding colour mentioned on the button. A suitable message about the colour chosen should be displayed on the status bar.			
	16. Create a web page that will create a cookie with the details of the user and his favourite colour. When the same username is given the next time, the colour detail should be retrieved from the cookie and displayed.			
	17. Create an order form for an online shopping site and perform all necessary validations using JavaScript.			
5	**PHP** 18. Create a PHP page which accepts the user name and displays a welcome page for the user with his name being displayed. 19. With MySQL and PHP design a simple login page which authenticates existing users for a website and allows new users to sign up. 20. Extend exercise 19 to have a cookie stored in the user machine from which the last login time of the user is retrieved and displayed in the first screen after the user logs in.	-	9	-
Total		-	45	-

4APCS2 - Allied Physics II

OBJECTIVES:

1. To gain knowledge of the fundamental concepts of Physics and the application of Mathematics in the physical world.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the concepts of modern Physics such as Nuclear Physics and Relativity.
2. Understand the concepts of electricity and magnetism.
3. Understand the fundamentals of communication electronics.
4. Understand the basic concepts in fibre optics.
5. Understand the basic concepts of basic electronic devices.

Unit	Course Content	L	P	T
1	**Modern Physics**: Critical Potential – Ionization potential and Excitation potential - Experimental Determination of critical potentials – Franck & Hertz Experiment. Nuclear Models -liquid drop model – shell model – magic numbers. Basic ideas about elementary particles and quarks - classification of elementary particles – quark model of nucleon. Relativity – Frames of references – Galilean Transformation equations – postulates of special theory of relativity – Lorentz transformation equations – length contraction – time dilation – mass energy equivalence. Wave particle duality – De Broglie wavelength – Experimental verification – G.P. Thomson's experiment.	7	-	1
2	**Electricity and Magnetism**: Biot Savrot's law – field along the axis of a circular coil –force on a current carrying conductor in a magnetic field – Fleming's left hand rule – torque on a current loop in a uniform magnetic field - moving coil ballistic galvanometer theory – damping correction – measurement of figure of merit of a B.G - uses of B.G - AC voltage and current – ac motor –single phase, three phase, star and delta connection – skin effect - electric circuit switches – fuses – circuit breaker-relay.	10	-	1
3	**Communication Electronics**: Radio broadcasting – transmission and reception – modulation – need for modulation – types of modulation – modulation factor – mathematical analysis of AM wave – side band frequency in AM wave – limitation of amplitude modulation – demodulation – essentials in demodulation – types of AM radio receiver – block diagram and explanation –straight receiver – super –heterodyne radio receiver.	10	-	1
4	**Fibre optics**: Propagation within fibre – structure of optical fibre – classification of optical fibre – modes of propagation – single mode and multimode – light propagation through an optical fibre – losses in fibre – acceptance angle – numerical aperture – advantage and disadvantage of optical communication.	10	-	1
5	**Electronics**: Operational amplifier – block diagram of op amp - characteristics of ideal op amp – equivalent circuit of an op amp – ideal voltage transfer curve – virtual ground concept – basic op amp applications – scale changer/inverter, inverting summing amplifier, non-inverting amplifier, difference amplifier, op amp as differentiator – integrator.	8	-	1
Total		**45**	**-**	**5**

TEXT BOOKS

1. R.Murugesan, *Modern Physics*, S. Chand and Co. Ltd., New Delhi, 2005.

2. Narayanamurti and Nagaratnam, *Electricity and Magnetism*, The National Publishing Co., 1988

3. Gupta & Kumar, *Handbook of Electronics*, Pragati Prakashan, 17th Revised Edition.

4. Gerd Keiser, *Optical Fibre Communication*, New York International Edns, 1991.

5. Roy Chaudhary and Shail Jain, *Linear Integrated Circuits*, New Age International (P) Ltd, 1991.

REFERENCE BOOKS

1. George Kennedy, *The Electronic Communication Systems*, Tata McGraw Hill, 1999.

2. R. Murugesan, *Electricity Magnetism* S.Chand & Co., New Delhi, 2001.

3. R.A. Gaekwad, *Operational Amplifier and Linear Integrated Circuits*, New Age International (P) Ltd, 1994.

4APCSP - Allied Physics Practical

OBJECTIVES:

1. To gain practical knowledge of the fundamental concepts of Physics.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Gain a clear, practical understanding through lab experiments, of properties of matter, sound, light, electricity and magnetism, semiconductors and electronics.

#	Title	L	P	T
1	Young's Modulus by non–uniform bending – pin and microscope	-	3	-
2	Rigidity Modulus by static torsion Rigidity Modulus by torsional oscillations	-	3	-
3	Melde's string – frequency of tuning fork	-	3	-
4	Sonometer - frequency of tuning fork	-	3	-
5	Air Wedge – thickness of a wire	-	3	-
6	Newton's rings – radius of curvature	-	3	-
7	Spectrometer- grating normal incidence – wavelength of mercury spectral lines	-	3	
8	Potentiometer – calibration of ammeter	-	3	-
9	Field along the axis of a circular coli carrying current – deflection magnetometer	-	3	
10	Figure of merit – aperiodic galvanometer	-	3	-
11	Half adder and half subtractor	-	4	-
12	Characterization of Zener diode – voltage regulation	-	4	-
13	Construction of AND & OR gates using diodes and NOT gate using transistor	-	4	-
14	NAND as universal building block NOR as universal building block	-	4	-
15	Op – Amp – Inverting & non inverting amplifier Op – Amp – summing and difference amplifier	-	4	-
Total		**-**	**50**	**-**

Semester 5

5MCS10b – Web Application Development

OBJECTIVES:

1. To learn the concepts of Web 2.0 and ASP.NET.
2. To learn programming in C#.
3. To learn to interface databases with the web application using ADO.NET.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Develop web applications using C# in the .NET Framework.
2. Explain the various concepts of ASP.NET and programming constructs and features of C#.
3. Create a web page and use ASP.NET controls.
4. Explain the concepts of ADO.NET.
5. Write code to interface a web application with a database using ADO.NET.
6. Understand the exception handling mechanism in ASP.NET and write code to implement this in programs.
7. Identify bugs in a C# code snippet and fix them.
8. Determine the output of a given C# code snippet.

Unit	Course Content	L	P	T
1	**Introduction to Web Programming:** Types of applications – Using ASP.NET – Using Visual Studio.NET	5	-	1
2	**Basic Concepts of C#:** Program startup – Program termination - Members - Member access - Signatures and Overloading - Scopes - Namespace and type names – Types – Variables - Conversions – Expressions and Operators - Statements - Namespaces – Classes – Structs – Arrays – Interfaces - Enums – Delegates - Exceptions – Attributes - Unsafe code.	10	-	3
3	**Creating Web Forms Applications:** Creating an ASP.NET web applications project – Responding to events – Where does processing occur. **Working with Web Objects:** Namespace fundamentals – Namespaces in a web application – Maintaining state information.	10	-	3
4	**Creating User Interface:** Using controls – Validating data – Navigating between forms. **Storing and retrieving data with ADO.NET:** Accessing data with ADO.NET – Using data sets on web forms – Processing transcations.	10	-	3
5	**Catching and Correcting Errors:** Using Exception-handling – Using Error pages.	10	-	3
Total		**45**	**-**	**13**

TEXT BOOKS
1. Jeff Webb with Microsoft Corporation, *Developing Web Applications with Microsoft Visual Basic .NET and Visual C#.NET*, Prentice Hall of India, Second Edition.
2. MSDN, *Microsoft C# Language Specification*, Saarc Edition.

REFERENCE BOOKS
1. David S. Platt, *Introducing Microsoft .NET*, WP Publishers, 2003.
2. Greg Buczek, *ASP.NET Developer's Guide*, Tata McGraw-Hill, 2002.

5MCS11 - Computer Networks

OBJECTIVES:
1. To learn the basic terminology of computer networking.
2. To learn OSI Reference Model with the functions of and protocols and algorithms involved in each layer.
3. To learn basics of TCP/IP protocol suite.

OUTCOMES:
Upon completion of the course, the student will be able to
1. Describe the basic aspects of computer networks, viz. network topologies, transmission modes, network categories, protocols and standards.
2. Understand in order to compare and contrast the features of OSI Reference Model and TCP/IP protocol suite.
3. Explain the responsibilities of each of the seven network layers.
4. Understand the protocols and algorithms connected with each layer.
5. Solve problems using error detection and correction methods.
6. Apply routing algorithms to calculate the shortest route in a given network.
7. Apply the Token Bucket Algorithm to avoid congestion in a given network.

Unit	Course Content	L	P	T
1	**Introduction to Computer Networks:** Uses of computer networks - Line configuration – Topology - Transmission modes, Categories of networks – Network protocols and standards - Standards organizations. **OSI Reference Model:** TCP/IP Reference Model - Comparison of OSI and TCP/IP Reference Model.	5	-	1
2	**Physical Layer:** Transmission medium - Guided transmission media: twisted pair, coaxial cable, fiber optics - Unguided transmission media: Radio transmission, Microwave transmission, Infrared wave, Millimeter wave, Lightwave transmission – Telephone network: Structure of the telephone system - Multiplexing (Basics of FDM, WDM, TDM), Switching (Basic concepts of Circuit, Message and Packet Switching).	10	-	1
3	**Data Link Layer:** Design issues, Framing, Error control, Flow control – Types of errors: Single bit error, Burst error – Error Detection: VRC, LRC, CRC – Error Correction: Single bit error correction using Hamming Code - Elementary data link protocols: Unrestricted Simplex Protocol, Simplex Stop-and-wait Protocol, Simplex Protocol for noisy channel – Basics concepts of Sliding Window Protocols - One bit Sliding Window Protocol.	10	-	1
4	**Network Layer:** Design issues - Store and forward packet switching - Services provided to the Transport layer - Connectionless services - Connection-oriented services. **Routing Algorithms:** Shortest path routing, Flooding, Distance vector routing, Link state routing, Hierarchical routing. **Congestion Control Algorithms:** General Principles, Congestion control in virtual-circuit subnets, Congestion control in datagram subnets, Leaky bucket algorithm, Token bucket algorithm.	11	-	1
5	**Transport Layer:** The Transport Service: Service primitives – Berkeley Sockets – A Simple Transport Protocols – Internet Transport Protocol: UDP - Internet Transport Protocol: TCP. **Application Layer:** Domain Name System - Electronic mail - World Wide Web.	9	-	1
Total		**45**	**-**	**5**

TEXT BOOKS
1. Andrew S. Tanenbaum, *Computer Networks*, Fourth Edition, PHI.
2. Behrouz A. Forouzan, *Data Communications and Networking*, 2nd Ed, TMH.

5MCS12b – Personal Software Process

OBJECTIVES:

1. To learn the concept of software process and PSP.
2. To learn the various phases in a software project and the importance of planning.
3. To learn the key software metrics.
4. To learn the basics of software quality management.
5. To learn the Agile Process Model.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the concepts and importance of software process and the application of PSP.
2. Explain the basics of project planning.
3. Describe the important metrics used in measuring software size, and estimating software size, resources and schedule.
4. Estimate software size using function point method and PROBE size estimating method.
5. Articulate the important PSP metrics in the GQM paradigm.
6. Explain the concepts involved in software quality including benchmarking, yield management and defect removal and prevention.
7. Describe the aspects of design in the software process.
8. Understand the Agile Process Model.

Unit	Course Content	L	P	T
1	**The Personal Software Process Strategy:** The logic for a Software Engineering discipline – The definition of a software process – Process maturity – The PSP strategy – The logic for PSP – Productivity and the PSP. **The Baseline Personal Process:** The baseline process – The PSP process elements – The PSP0 Process – PSP0 measures – Time recording log – Defect recording log - PSP0 Project plan summary – Customizing the initial process. **Introduction to Planning:** The 'why' and 'what' of a plan – Contents of a software plan – Planning a software project – Producing a quality plan.	10	-	-
2	**Measuring Software Size:** Size measures – A size measurement framework – Establishing a counting standard – Using LOC counts – Reuse considerations – LOC accounting – Calculating productivity – LOC counters. **Estimating Software Size:** Popular estimating methods – Proxy-based estimating – The PROBE size estimating method.	8	-	2
3	**Resource and Schedule Estimating:** Resource Planning – Estimating development time – Estimating task time – Schedule estimating – Earned value tracking. **Measurements in the PSP:** Overview – Fundamental process measures – Goal-Question-Metric (GQM) paradigm – General PSP objectives, goals and questions – Example of GQM.	8	-	2
4	**Software Quality Management:** Meaning of software quality – The economics of software quality – Developing a quality strategy – Process benchmarking – Yield management – Defect removal strategies – Defect prevention strategies.	8	-	2

Unit	Course Content	L	P	T
5	**Software Design:** The Design process – Design quality – Structuring the design process – Design notation – The Functional Specification – Design guidelines. **Defining the Software Process:** Need for definition of software processes – Software process basics – Process definition – Defining process phases – Process development considerations – Process evolution – The Process-development process. **An Agile View of Process:** What is Agility – What is an Agile process – Agile Process Models: Extreme Programming, Adaptive Software Development, Dynamic Systems Development Method, Scrum, Crystal, Feature Driven Development, Agile Modeling.	8	-	2
Total		**42**	**-**	**8**

TEXT BOOKS

1. Watts S. Humphrey, *A Discipline for Software Engineering*, Pearson Education Inc., 2012.
2. R. S. Pressman, *Software Engineering*, Sixth Edition, McGraw Hill International Edition, 2005.
3. Pankaj Jalote, *A Concise Introduction to Software Engineering*, Springer International Edition, 2011.

5MCS13a – Microprocessors

OBJECTIVES:

1. To learn the architecture and instruction set of the 8085 microprocessor.
2. To learn the basic concepts of select programmable interface devices.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Explain the various aspects of the architecture of the 8085 microprocessor.
2. Know the instruction set of the 8085 microprocessor.
3. Explain the 8085 stack, subroutines and interrupts.
4. Write simple assembly language programs.
5. Explain the basic concepts of interfacing devices with the 8085 microprocessor.
6. Learn the architecture and pin functions of select programmable interface devices.

Unit	Course Content	L	P	T
1	**Introduction:** Microprocessors, Microcomputers, and Assembly Language - Evolution of processors from 4-bit to 64-bit. **The 8085 Microprocessor Architecture:** Microprocessor Architecture and its operations - Memory - I/O Devices **-** The 8085 MPU - Machine Cycles of 8085 - Memory Organization.	6	-	1
2	**Introduction to 8085 Instructions:** Data Transfer Operations- Arithmetic Operations - Logic Operations - Branch Operations - The 8085 Programming Model - Writing Assembly Language Programs.	8	-	2
3	**Stack and Subroutines:** Stack - Subroutine - Restart, Conditional call and Return Instructions. **Interrupts:** The 8085 Interrupt - 8085 Vectored Interrupt - Additional I/O Concepts and Processes.	8	-	2
4	**Interfacing I/O Devices:** Basic Interfacing Concepts - Interfacing Output Displays - Interfacing Input Devices - Memory Mapped I/O. **Interfacing Data Converters:** D/A Converters – A/D Converters.	9	-	2
5	**Programmable Interface Devices:** The 8279 Programmable Keyboard / Display Interface - 8255A Programmable Peripheral Interface - Interfacing Keyboard and Seven-Segment Display - The 8254(8253) Programmable Interval Timer - The 8259A Programmable Interrupt Controller - DMA and the 8237 DMA Controller.	10	-	2
Total		**41**	**-**	**9**

TEXT BOOKS

1. Ramesh Gaonkar, *Microprocessor Architecture, Programming, and Applications with the 8085*, 5th Edition, Penram International Publishing (India) Pvt. Ltd.
2. Aditya P. Mathur, *Introduction to Microprocessors*, Tata McGraw-Hill Publishing Company Ltd., 3rd Edition, 1995.

5MCS14b - Database Management Systems

OBJECTIVES:
1. To understand the need for and functions & benefits of DBMSs.
2. To learn the E-R model and basic operations of Relational Algebra.
3. To learn Relational Database concepts and Normalization concepts.
4. To learn SQL.
5. To learn the fundamental concepts of transaction processing and database system architectures.

OUTCOMES:
Upon completion of the course, the student will be able to
1. Explain the characteristics and components of database management systems.
2. Understand E-R Model and construct an E-R diagram for a given simple database.
3. Know the fundamental operations of Relational Algebra and construct expressions.
4. Describe the features of an RDBMS.
5. Write DDL statements and SQL queries.
6. Detect and fix errors in SQL statements, and identify the output of given code.
7. Explain the use of assertions and triggers, and write SQL code to implement them.
8. Understand normalization concepts and compare the various normal forms.
9. Understand transaction management and storage file structure of DBMSs.
10. Describe the various types of database system architectures.

Unit	Course Content	L	P	T
1	**Introduction to Database Concepts:** Data and data management – Disadvantages of file-based data management – Definition, Organization, Characteristics, Benefits, Functions and Components of a DBMS - Data Models.	8	-	2
2	**ER Model:** Entity set - Relationship set – Attributes – Constraints - Keys – ER Diagram –Weak entity set - Reduction of E-R Schema – List of the six fundamental Relational Algebra operations along with basic function.	10	-	2
3	**SQL:** Data definition - *not null* constraint – *unique* constraint – *check* clause - Basic structure of SQL queries – Use of set operations (union, intersect, except) – Null values - Nested subqueries – Views – Referential Integrity - Assertions – Triggers.	12	-	5
4	**Data Normalization:** Introduction - Pitfalls in relational database design – Decomposition -Functional dependency – Normalization – 1NF, 2NF, 3NF and BCNF normal forms, Codd's Rules for relational database.	12	-	5
5	**Storage and File Structure:** File Organisation - Organization of Records in Files - Data Dictionary storage. **Transaction Management:** Transaction concept - Transaction state – Implementation of Atomicity and Durability. **Database System Architectures:** Centralized and Client-Server Architectures - Server system Architectures (Transaction server, Data server) - Parallel Systems (Speedup and scaleup, Basics of parallel database architecture) – Distributed Databases (What homogeneous and heterogeneous databases are).	12	-	2
Total		**54**	**-**	**16**

TEXT BOOKS
1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, *Database System Concepts*, Fifth Edition, McGraw Hill International Edition.
2. Alexis Leon, Mathews Leon, *Essentials of Database Management Systems*, Vijay Nicole Imprints Pvt. Ltd., 2006.

Elective I

#	Elective Streams	Elective I
1	Computer Networks	Stream 1: 5ECS1DS - Distributed Systems
2	Security	Stream 2: 5ECS1NS - Network Security
3	System Programming	Stream 3: 5ECS1CD - Principles of Compiler Design
4	Algorithms	Stream 4: 5ECS1DA - Design and Analysis of Algorithms
5	Intelligent Systems	Stream 5: 5ECS1IP - Digital Image Processing
6	Information Systems	Stream 6: 5ECS1DM - Data Mining

5MCSP5b - Practical V: Web Application Development Laboratory

OBJECTIVES:

1. To learn to code, debug and execute programs in C# on the ASP.NET framework.

OUTCOMES:

Upon completion of the course, the student will be able to
1. Develop simple web application using ASP.NET controls.
2. Code, debug and execute a C# program to solve the given problems using the .NET framework.
3. Interface a .NET web application to a database using ADO.NET.

Unit	Course Content	L	P	T
1	Develop a Program to demonstrate the concepts of boxing and unboxing.	-	1	-
2	An election is contested by 5 candidates. The candidates are numbered 1 to 5 and the voting is done by marking the candidate number on the ballot paper. Write a program to read the ballots and count the votes cast for each candidate using a array variable count. In case, a number read is outside the range 1 to 5, the ballot should be considered as a 'spoilt ballot' and the program should also be count the number of spoilt ballot.	-	2	-
3	Write a program using *while* construct and *indexer* property to display the content of a string object.	-	2	-
4	Define a Person class with three data members: name, age and gender. a. Derive a class called Employee from Person that adds a data member code to store employee code. b. Derive another class called Specialist from Employee c. Add a method to each derived class to display the information about what it is.	-	4	-
5	Write a driver program to generate an array of three ordinary employees and another array of three specialists and display information about them. Also display the information of the specialists by calling the method inherited from Employee class.	-	4	-
6	Write a program to read a name from the keyboard and display it. The program should throw an exception when the length of the name is greater than 10 characters. Design your own exception mechanism	-	4	-
7	Define a class called MyString with the following features: a. An overloaded binary+ operator that concatenates two MyString objects and creates a third object. b. An overloaded comparison operator == to compare two strings. c. An overloaded unary – (minus) operator that returns true if the string object is empty; otherwise false.	-	4	-
8	Design a structure data type named DateOfBirth to contain date, month and year of birth. Develop a C# program using this data structure that would assign your date of birth to the individual members and display the date of birth in the format, dd/mm/yy. Do not use any methods in your program.		5	
9	Develop a simple web application to create a Sign-In Form.		8	
10	Develop a simple web application to create a File Manager form.		8	
11	Develop an ASP.NET application to implement a Shopping Cart.		8	
Total		-	50	-

5MCSP6b - Practical VI: Database Management Systems Laboratory

OBJECTIVES:

1. To learn to create a database of tables for a given schema, and write SQL code or PL/SQL block to implement queries / triggers on the database.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Create a database with requisite tables, primary keys and foreign keys.
2. Write SQL code / PL/SQL block to implement given queries and triggers.

#	Title	L	P	T
1	**Video Store database** **Video** table has the following fields: catalogNo (Text), title (Text), category (Text), dailyRental (Currency), price (Currency), directorNo (Text). The primary key is catalogNo. **Member** table has the following fields : memberNo (Number), fName (Text), lName (Text), gender (Char), dateOfBirth (Date/Time), address (Text), mobileNo (Text). The primary key is memberNo. **VideoForRent** table has the following fields: videoNo (Text), available (Yes/No), catalogNo (Text). The primary key is videoNo. **RentalAgreement** table has the following fields: rentalNo (AutoNumber), dateOut (Date/Time), dateReturn (Date/Time), memberNo, (Number), videoNo(Text). The primary key is rentalNo. (For this table, set the format property for the dateOut and dateReturn fields to the format dd-mmm-yy.) 1. Only female members of the video shop. 2. Only male members of the shop who joined the shop this year in order of last name and first name. 3. All members born in the 1960s. 4. Only videos in the Children category with a daily rental rate of less than Rs. 40 and sorted according to video title. 5. Create a report for your Video table containing the catalogNo, title, category and certificate fields. Group your records according to the values in the category field and then sort on the values in the title field. 6. Create a report for your Video table containing the category, dailyRental and price fields. Group your records according to the values in the category field and then sum the values in the dailyRental and price fields. 7. Write a PL/SQL block that calculates the total number of videos rented and number returned on a given date. 8. Write a trigger that is fired when a member who wants to rent a video has outstanding dues.	-	12	-
2	**Employee Database** **Employee** (EmpNo, EmpName, Gender, Salary, Address, DNo) **Department** (DeptNo, DeptName, Location) 1. **Employee table** a. Make EmpNo as Primary key	-	6	-

#	Title	L	P	T
	b. Do not allow EmpName, Gender, Salary and Address to have null values c. Allow Gender to have one of the two values: 'M', 'F' d. Set the default salary value to Rs. 1000. 2. **Department table** a. Make DeptNo as Primary key b. Make DeptName as candidate key c. Make DNo of Employee as foreign key which refers to DeptNo of Department d. Insert few tuples into Employee and Department which satisfies the above constraints. e. Insert few tuples into Employee and Department which violates some of the above constraints f. Modify / Delete a tuple which violates a constraint g. Modify the foreign key constraint of Employee table such that whenever a department tuple is deleted, the employees belonging to that department will also be deleted.	-		
3	**Hospital Database** **Billed** (bill no number(5) - pri key, patient_no number(9), item_code number(5), charge number(7,2)) **Treatments** (phy_id number(4) - pri key, patient_no number(4) - pri key, procedure_no number(4) - pri key,date_treated date - pri key treat_result varchar2(50)) **Item** (item_code number(4) - pri key, description varchar2(50), normal_charge number(7,2)) **Physicians** (phy_id number(4) - pri key, phy_phone char(8), phy_name varchar2(50), specialization varchar(30)) **Patient** (patient_no number(4) - pri key, date_admitted date, date_discharaged date, pat_name varchar2(50), room_location char(4)) **Room** (room_location char(4) - pri key, room_accomodation char(2), room_extension number(4)) **Procedures** (procedure_no number(4) - pri key, proc_description varchar2(50)) 1. Get the PATIENT_NO, ITEM_CODE, and CHARGE from the BILLED table for a specific PATIENT_NO. 2. List all of the different charges that are stored to the table. 3. List all patients hospitalized for more than 6 days 4. List the patients who had either Dr. Vaidyanathan or Dr. David or Dr. Mohammed as a physician. 5. Show the patient names (PAT_NAME field) and associated physician names (PHY_NAME field) along with the Patient information 6. List the PATIENT_NO and DATE_DISCHARGED from the PATIENT table and the associated CHARGE from the BILLED table. 7. Write a PL/SQL block that shows the number of days for which each room was occupied during a given month. 8. Write a trigger that lists the doctors with the same specialization, which fires when a doctor newly joins the hospital.	-	12	-
4	**Sales Processing Database** **Client_master** (client_no, name, address1, address2, city, state, pincode, bal_due)	-	10	-

#	Title	L	P	T
	Product_master (Product_no, Description, Profit_percent, Unit_measure, Qty_on_hand, reorder_lvl, Sell_price, Cost_price) **Write SQL Queries for the following:** 1. Retrieve the list of names and cities of all the clients. 2. Display the information for client no 0001 and 0002. 3. Find the products with description as '1.44 drive' and '1.22 Drive'. 4. Find the list of all clients who stay in the cities 'Mumbai' or 'Delhi' or 'Madras'. 5. Find the product whose selling price is greater than 2000 and less than or equal to 5000. 6. Change the bal_due of client_no 0001, to 1000. 7. Find the products whose selling price is more than 1500 and also find the new selling price as original selling price multiplied by 15. 8. Find out the clients who stay in a city whose second letter is 'a'.			
5	**Banking database** **account** (account_number, branch_name, balance) **branch** (branch_name, branch_city, assets) **customer** (customer_name customer_street, customer_city) **loan** (loan_number, branch_name, amount) **depositor** (customer_name, account_number) **borrower** (customer_name, loan_number) 1. List all accounts of Brooklyn branch 2. List all accounts of Perryridge branch with balance < 1000. 3. List Numbers of accounts with balances between 700 and 900 4. Transfer Rs. 100 from account A-101 to A-215. 5. Delete the branch Perryridge. 6. Delete the accounts and loans of Downtown branch. 7. For all customers who have a loan from the bank, find their names, loan numbers, and loan amount. 8. Find the customer names, loan numbers, and loan amounts, for all loans at the Perryridge branch. 9. Find the names of all branches that have assets greater than atleast one branch located in Brooklyn. 10. Find the names of all customers whose street address includes the substring 'Main'. 11. Find all customers who have an account but no loan at the bank. 12. Find the average account balance at the Perryridge branch. 13. Find those branches where the average accounts balance is more than Rs. 1200. 14. Find all loan numbers that appear in the loan relation with null values for amount. 15. Find the names of all branches that have assets greater than those of at least one branch located in Brooklyn. 16. Find the names of all branches that have an asset value greater than that of each branch in Brooklyn. 17. Find all customers who have an account at all the branches located in Brooklyn. 18. Find all customers who have at most one account at the Perryridge branch. 19. Find all customers who have at least two accounts at the perryridge branch	-	20	-

#	Title	L	P	T
	20. Create a view all_customers consisting of branches and their customers. Select all the customers from all_customers view.			
	21. Create a view Perryridge_customers consisting of customers of Perryridge branch using all_customers view.			
	22. Present a new Rs. 200 savings account as a gift to all loan customers of Perryridge branch (Note: It requires insert into account and depositor).			
	23. Pay 5% interest to all accounts with a balance of Rs. 1000 or more.			
	24. List the customer names and 3 characters from 3_{rd} position of each customer name			
	25. List balance rounded to nearest hundred from account.			
	26. Display the birth date of all the employees in the following format: DD-MON-YYYY', 'DD-MON-YY', 'DD-MM-YY'			
	27. List the employee names and the day of the week (fully spelled out) in which they born			
	28. List the employees whose birthday falls between the given years X and Y			
	29. List the employees who will retire on the given year X.			
	30. Write a PL/SQL code block that will accept an account number from the user and debit an amount of Rs. 2000 from the account if the account has a minimum balance of 500 after the debit. The process is to be fired on the account table.			
Total		-	60	-

Semester 6

6MCS15b - The UNIX Operating System

OBJECTIVES:

1. To understand the salient features and components of UNIX.
2. To learn the basic commands and utilities of UNIX.
3. To learn UNIX Shell programming.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the structure of UNIX operating system and file system.
2. Understand the various types of commands in UNIX.
3. Understand pipes, filters and redirections.
4. Write shell scripts using basic commands and filters.
5. Explain shell script commands and program constructs.
6. Spot bugs in shell scripts or code snippets and debug them.
7. Determine the output of a given shell script of program code.

Unit	Course Content	L	P	T
1	**Introduction:** Salient features of Unix - Unix Components – Commands in Unix - Types of commands - Basic commands – Command substitution – Giving multiple commands – Aliases.	6	-	-
2	**Files and File Organization:** Unix files - Categories of files - Hidden files – File system – Path names – Home directory – Directory commands - File-related commands – Wild cards for filename generation – Displaying, printing and compiling files. **File Attributes and Permissions:** File ownership - File attributes - *ls, file, chmod, chown, chgrp, touch*, *umask* commands.	10	-	2
3	**I/O:** Standard I/O, Redirection Pipes and Filters - Regular Expressions: *grep* family of commands.	9	-	3
4	**Shell Variables:** System variable, Local variables – *export, read, exit* commands – Positional parameters - *set, shift* commands - Control Structures: *if-then-else* structure, *test* command, *case-esac* structure.	7	-	3
5	**Loop Structures:** *while, until, for, continue, break* commands - Arithmetic in Shell Programming: *expr* command. **Debugging Scripts:** *script, exec, eval* command.	8	-	2
Total		**40**	**-**	**10**

TEXT BOOK

1. M. G. Venkateshmurthy, *Introduction to Unix and Shell Programming*, Pearson Education India, Delhi, 2005.

REFERENCE BOOK

1. Cameron Newham & Bill Resenblatt, Learning the bash Shell: Unix Shell Programming, Third Edition, O'Reilly, 2005.

6MCS16a – Mobile Application Development

OBJECTIVES:

1. To learn the components and structure of mobile application development frameworks for Android OS based mobiles.
2. To learn how to develop simple android applications.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the basics of Android devices and the Android platform.
2. Explain the basic building blocks of Android programming required for App development.
3. Explain the components used in Activity Life Cycle.
4. Understand how to create basic user interfaces with layouts, views and fragments.
5. Explain persistence and data storage mechanism in Android.
6. Describe advanced application concepts like Networking, Animations and Google Maps services.
7. Develop and publish Android applications to Android Market.

Unit	Course Content	L	P	T
1	**Introduction to Android:** Getting Started with Android: Android Versions – Features – Architecture of Android – Tools : Android Studio, Android SDK, Android Virtual Devices, Android Developer Community. **Introduction to Android Studio**: Exploring the IDE – Debugging Android Application : Setting Breakpoints, Navigating Paused Code.	8	-	1
2	**Android User Interfaces:** Understanding Activities – Linking Activities using Intents – Fragments – Displaying Notifications – Components of a Screen – Display Orientation – Managing Screen Orientation : Persisting State Information during changes in Configuration.	11	-	1
3	**Basic Android Development:** Creating First Application – Activity Life Cycle– Data Persistance : Persisting data to Files, Creating and using Databases – Audio playback – Photo capture – Networking.	10	-	2
4	**Views and Menu with views:** Basic Views : Textview Views – Picker Views – List Views – Image View – Web View – Menu : Option Menu – Context Menu.	10	-	2
5	**Advanced Android Development:** Animations – Messaging : SMS Messaging, Sending Email – Location-Based Service – Publishing – Security : Mobile Malware.	11	-	2
Total		**50**	**-**	**8**

TEXT BOOKS
1. J.F.DiMarzio, Beginning Android Programming with Android Studio, Wrox Press Fourth Edition.
2. Reto Meier, Professional Android Application Development, Wrox Press, 2009.
3. Himanshu Dwivedi, Chris Clark, David Thiel, Mobile Application Security, Tata McGraw Hill, 2010.

WEB REFERENCES
1. http://developer.android.com
2. http://www.html5rocks.com/en/mobile
3. http://mobilehtml5.org/

6MCS17a - Cloud Computing

OBJECTIVES:

1. To understand the concept of and need for cloud computing.
2. To learn of the different types of cloud services.
3. To become familiar with some of the organizations providing cloud services and the various pros and cons of cloud services.
4. To gain an appreciation of the emergence of cloud as an essential collaborating computing paradigm.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Explain the main concepts, strengths and limitations of cloud computing.
2. Articulate the ways in which cloud computing is relevant to all.
3. Describe the various services that are available on the cloud.
4. Understand how to use cloud storage and services.
5. Understand how collaboration on cloud services is done.

Unit	Course Content	L	P	T
1	**Understanding Cloud Computing**: Cloud Computing – History of Cloud Computing – How Cloud Computing Works – Why Cloud Computing Matters – Advantages and Disadvantages of Cloud Computing – Companies in the Cloud Today. **Developing Cloud Services**: Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development: Software as a Service, Platform as a Service, Web Services, On-Demand Computing – Discovering Cloud Services Development Services and Tools: Amazon Ec2, Google App Engine, IBM Clouds	10	-	1
2	**Cloud Computing for Everyone**: For Family – For the Community – For Corporations.	10	-	1
3	**Using Cloud Services**: Collaborating on Calendars, Schedules and Task Management - Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management - Collaborating on Databases	10	-	2
4	**Using Cloud Services**: Collaborating on Word Processing - Collaborating on Spread Sheets - Collaborating on Presentations - Sharing Digital Photographs - Storing and Sharing Files - Controlling with Web-Based Desktops.	10	-	2
5	**Other Ways to Collaborate Online**: Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis	10	-	2
	Total	**50**	**-**	**8**

TEXT BOOK
1. Michael Miller, *Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online*, Que Publishing, 2008.

REFERENCE BOOKS
1. Kris Jamsa, *Cloud Computing*, Jones and Bartlett India Pvt. Ltd., 2014.
2. Barrie Sosinsky, *Cloud Computing*, Wiley-India Edition, 2013.

6MCS18a - Artificial Intelligence

OBJECTIVES:

1. To gain an understanding of what Artificial Intelligence is nd an appreciation of the kind of problems AI can help solve.
2. To learn the heuristic search and knowledge representation concepts that are fundamental to Artificial Intelligence.
3. To learn Game Playing techniques, types of learning and fundamentals of Expert Systems.
4. To learn the basic programming paradigm in the AI programming languages LISP and PROLOG.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the need and basic concepts of Artificial Intelligence.
2. Understand the algorithms involved in heuristic search.
3. Understand the importance and basics of knowledge representation.
4. Learn the concepts in game playing and working of the Minimax and Iterative deepening procedures.
5. Know the basics of AI programming languages, specifically LISP and PROLOG.
6. Understand the types of Learning.
7. Explain the basics concepts of Expert Systems.

Unit	Course Content	L	P	T
1	**Introduction to Artificial Intelligence:** What is AI **-** Problems, Problem Spaces and Search Strategies. **Heuristic Search Techniques:** Generate and Test - Hill Climbing and Back Tracking - Best-First Search: OR Graphs, A* Algorithm – Problem Reduction: AND-OR Graphs, AO* Algorithm.	10	-	2
2	**Knowledge Representation:** Issues - Using Predicate Logic – Procedural vs. Declarative knowledge – Basic concepts of knowledge representation using Rules, Frames and Semantic Nets - Forward vs. Backward reasoning – Matching – Control Knowledge.	10	-	2
3	**Game Playing:** Overview - Minimax search procedure - Adding Alpha-beta cutoffs – Additional refinements – Iterative deepening – References on specific games.	10	-	2
4	**AI Programming Languages:** Overview – The LISP and PROLOG distinction – AI development environments and systems – Programming language classifications. **Fundamentals of PROLOG:** Background, Clauses, Facts, Goals, Rule, Syntax and Characteristics. **Fundamentals of LISP:** Introduction, Basic Concepts, Syntax in general.	10	-	2
5	**Learning:** Introduction – Types of learning – Discovery – Analogy – Formal learning theory – Neural Net learning – Genetic learning. **Expert Systems:** Representing domain knowledge – knowledge acquisition.	10	-	2
Total		**50**	**-**	**8**

TEXT BOOKS

1. Elaine Rich and Kevin Knight, Artificial Intelligence, Tata McGraw-Hill, Second Edition.
2. Robert J. Schalkoff, Artificial Intelligence: An Engineering Approach, McGraw-Hill International Edition, 1990.

Elective II

	Elective Streams	Elective II
1	Computer Networks	Stream 1: 6ECS2MC - Mobile Communications
2	Security	Stream 2: 6ECS2CR – Cryptography
3	System Programming	Stream 3: 6ECS2UN - System Programming with UNIX
4	Algorithms	Stream 4: 6ECS2PA - Parallel Algorithms
5	Intelligent Systems	Stream 5: 6ECS2LP - Natural Language Processing
6	Information Systems	Stream 6: 6ECS2DW - Data Warehousing

6MCSP7b - Practical VII: UNIX Programming Laboratory

OBJECTIVES:

1. To learn to code, debug and execute programs in UNIX using shell scripts.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Write shell scripts.
2. Code, debug and execute shell scripts.
3. Solve the given problems through shell scripts.

Unit	Course Content	L	P	T
1	Write a script that asks for the user's age. If it is equal or higher than 18, print a message saying that this user is allowed to drive any vehicle. If the users age is below 16, print a message telling the user how many years he or she has to wait before legally being allowed to drive	-	4	-
2	Use an if / then /else construct that prints information about the current month. The script should print the number of days in this month, and give information about leap year if the current month is February.	-	4	-
3	Write a script that does the following: a. Display the name of the script being executed. b. Display the first, third and tenth argument given to the script. c. Display the total number of arguments passed to the script. d. Print the number of arguments.	-	4	-
4	Check whether the given number is an Armstrong Number or not.	-	5	-
5	Check whether the given number is Prime or not.	-	5	-
6	Design a menu driven program for rename, remove and copy commands	-	6	-
7	Accept any number of arguments and print them in the reverse order.	-	4	-
8	Check file permissions (read / write / execute / exit) and file types (file / directory / size zero)	-	3	-
9	Write a program to find the gross salary of an employee according to the following rules: a. If basic salary is < 1500 then HRA = 10% of basic and DA=90% of basic b. If basic salary is > = 1500 then HRA = 10% of basic and DA=90% of basic	-	4	-
10	Write a shell script that receives any number of filenames as arguments check if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.	-	6	-
Total		**-**	**45**	**-**

6MCSP8a - Practical VIII: Mobile Application Development Laboratory

OBJECTIVES:

1. To learn to code, debug and run Android Apps using Android Studio.

OUTCOMES:
Upon completion of the course, the student will be able to
1. Write programs to create Android Apps.
2. Code, debug and run the programs.
3. Create Apps for the given problems through Android programming.
4. Design and develop simple Android Apps.

Unit	Course Content	L	P	T
1	Create a Hello World App. Run the app on the emulator and on the Physical Device.	-	2	-
2	Create an app to accept the user's name and to greet him/her.	-	2	-
3	Develop an App named AppRater that suggests other Applications for users to download and try. The purpose of the application is to share fun and interesting applications with other users. The users can then rate the applications.	-	3	-
4	Develop an App to select a set of items from the given list using the Check Box component. The application is used to place an order once the items are selected.	-	4	-
5	Create an App with two different Activities using the user interface, Intent. Run the app on the emulator which allows the user to navigate from one activity to the other once a button is clicked.		3	-
6	Design an App using the List View Component to add desired items to a list.	-	4	-
7	Demonstrate an App using Menu groups in Android.	-	4	
8	Create an Application to demonstrate a Radio group button in Android.	-	4	
9	Develop an App to demonstrate the Time picker dialog in Android.	-	3	
10	Develop an app with two buttons named Save and Load using the concept of Internal Storage. Create a file by specifying its name. File must be saved and loaded when the appropriate buttons are clicked.	-	5	-
11	Develop an Application with a button called Send to send text messages from one device to another using the SMS Action in Android.	-	5	-
12	Create an Internet Connection app. Run the app on the emulator to check whether the emulator is connected to the network or not.		3	
13	Create a simple Animation App with an Image View icon to perform following activities i. Zoom In/ Zoom Out ii. Clockwise/AntiClockwise iii. Move iv. Fade v. Blink		8	
Total		**-**	**50**	**-**

Elective I

Stream 1: 5ECS1DS - Distributed Systems

OBJECTIVES:
1. To learn the basic hardware and software requirements of a distributed system.
2. To learn the different aspects of distributed system architecture.

OUTCOMES:

Upon completion of the course, the student will be able to
1. To explain the concepts of distributed systems at the hardware and software levels.
2. To understand the concepts of remote procedure call.
3. To know the concept of processes with repsect to distributed systems, and the challenges involved, viz. threads, naming, consistency and replication.
4. To know the synchronization algorithms.
5. To understand the concept of fault tolerance and security mechanisms.
6. To explain the architecture of object-based systems and distributed file systems, with special reference to CORBA and NFS.

Unit	Course Content	L	P	T
1	**Introduction**: Goals – Hardware Concepts: Homogeneous Multi Processor System, Heterogeneous Multi Processor System – Software Concepts: Distributed OS, Multi computer OS, Distributed Shared Memory System - Network OS. **Communication**: Remote Procedure Call: Basic RPC Operation, Client Stub, Server Stub, Passing value parameter, Passing reference parameter, Parameter specification and generation - Extended RPC Models: Doors, Asynchronous RPC.	8	-	2
2	**Processes**: Basic Concepts of Threads, Threads in non-distributed System, Thread Implementation, Threads in Distributed System, Multi Threaded client, Multithreaded Server. **Naming**: Basic Concepts of Names, Identifiers, Addresses -Name space. **Consistency and Replication**: Need for data Replication, Object replication, Replication as a scaling technique.	8	-	2
3	**Synchronization**: Basic concepts of Physical and Logical Clock - Clock Synchronization Algorithms: Cristian's Algorithm, Berkeley Algorithm – Election Algorithms: Bully Algorithm, Ring Algorithm - Mutual Exclusion: Centralized algorithm, Distributed algorithm.	8	-	2
4	**Fault Tolerance**: Basic Concepts - Failure Models – Process Resilience: Basic Design Issues - Recovery: Need for data recovery, Two methods of error recovery. **Security**: Basics of security threats, policies, and mechanism - Design Issues: Approaches for protection, Layering of security mechanism, Distribution of security mechanism	8	-	2
5	**Distributed Object Based System**: Introduction to CORBA – Global Architecture of CORBA -Organization of a CORBA system - Interface and implementation repository - CORBA services, Object invocation models in CORBA. **Distributed File System**: Basic Architecture of NFS	8	-	2
Total		**40**	**-**	**10**

TEXT BOOK

1. Andrew S. Tanenbaum and Maarten van Steen, *Distributed System Principles and Paradigms*, Prentice Hall of India, 2004.

Stream 2: 5ECS1NS - Network Security

OBJECTIVES:

1. To learn the importance of network security and its principles and basic concepts.
2. To gain familiarity about the various internet security protocols

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the need for security and the different approaches and principles of security.
2. Describe the various internet security protocols.
3. Explain the concept and types of user authentication, and Kerberos concepts.
4. Understand the concepts of firewalls and VPNs.
5. Explain the aspects of cryptography through case studies.

Unit	Course Content	L	P	T
1	**Introduction:** The Need for Security – Security Approaches – Principles of Security – Types of Attacks – Cryptography: Introduction – Plain Text and Cipher Text – Encryption and Decryption – Symmetric and Asymmetric Key Cryptography - Steganography.	8	-	2
2	**Internet Security Protocols**: Introduction – Basic Concepts – Secure Socket Layer(SSL) – Transport Layer Security (TLS) – Secure Hyper Text Transfer Protocol (SHTTP) – Time Stamping Protocol(TSP) - Secure Electronic Transaction – SSL Versus SET – 3-D Secure Protocol – Electronic Money – Email Security – Wireless Application Protocol (WAP) Security – Security in GSM – Security in 3G.	8	-	2
3	**User Authentication and Kerberos**: Introduction – Authentication Basics – Passwords – Authentication Tokens – Certificate-based Authentication – Biometric Authentication – Kerberos – Key Distribution Center(KDC) – Security Handshake Pitfalls – Single Sign On(SSO) Approaches.	8	-	2
4	**Network Security, Firewalls and Virtual Private Networks(VPN)**: Introduction – Brief Introduction to TCP – Firewalls – IP Security – Virtual Private Networks(VPN) – Intrusion.	8	-	2
5	**Case Studies on Cryptography and Security**: Introduction – Cryptographic Solutions – A Case Study – Single Sign On(SSO) – Secure Inter-branch Payment Transactions – Denial of Service(DOS) Attacks – IP Spoofing Attacks – Cross Site Scripting Vulnerability(CSSV) – Contract Signing – Secret Splitting – Virtual Elections – Secure Multiparty Calculation – Creating a VPN – Cookies and Privacy.	8	-	2
Total		**40**	**-**	**10**

TEXT BOOK

1. Atul Kahate, *Cryptography and Network Security*, Tata McGraw-Hill, Second Edition.

Stream 3: 5ECS1CD - Principles of Compiler Design

OBJECTIVES:

1. To learn the various aspects involved in compiler design.
2. To acquire knowledge of the design aspects in the various steps of a language compiler.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the various aspects of compiler design.
2. Explain the steps involved in the design of a lexical analyser.
3. Describe the various types of parsers and the design aspects involved.
4. Understand syntax-directed translation schemes and symbol tables.
5. Learn about Code Optimization principles and Code generation.
6. Understand code optimization techniques.

Unit	Course Content	L	P	T
1	Introduction to Compilers – **Lexical Analysis:** Role - Need - Design of a lexical analyzer – Regular Expressions – Finite Automata: Concepts of NFA - Concepts of DFA – Conversion of regular expression to finite automata – Conversion of NFA to DFA.	8	-	2
2	**Syntax Analysis:** Context free grammars - Derivations and Parse Trees – Shift reduce parsing – Operator precedence parsing – Top down parsing – Predictive parsers – LR Parsers.	8	-	2
3	**Syntax-Directed Translation:** Syntax-directed translation schemes - Postfix notation - Parse trees and syntax trees - Three-address code - quadruples and triples – Symbol tables: Contents - data structures used for representation - representing scope information.	8	-	2
4	**Code Optimization:** The principal sources of optimization - Loop optimization - DAG representation of basic blocks - Value numbers and algebraic laws - Global data-flow analysis.	8	-	2
5	**Code Generation:** Object programs - Problems in code generation - Code generation from DAG's - Peephole optimization.	8	-	2
Total		**40**	**-**	**10**

TEXT BOOK

1. Alfred V. Aho and Jeffrey D. Ullman, *Principles of Compiler Design*, Narosa Publishing House, Indian Student Print.

Stream 4: 5ECS1DA - Design and Analysis of Algorithms

OBJECTIVES:

1. To learn how to measure performance of an algorithm.
2. To learn various algorithm design strategies.
3. To gain a good understanding of how to derive performance metrics for algorithms and understand how to compare them.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Appreciate the need for performance measurement of algorithms and asymptotic notation.
2. Explain the various algorithmic design strategies with their characteristics.
3. Write and explain algorithms for specific problems, keeping to one of these design strategies.
4. Analyze the specific algorithms and express their performance complexity in asymptotic notation.
5. Understand lower bound theory and methods to establish the lower bound for solving specific problems.

Unit	Course Content	L	P	T
1	Recursive algorithms and performance measurement - Randomized algorithms: Repeated element, Primality testing (Analysis included.)	8	-	2
2	**Divide and Conquer:** General Method – Mergesort – Quicksort – Strassen's matrix multiplication. (Performance analysis included.) **Greedy Method:** General Method – Knapsack problem – Tree vertex splitting – Job sequencing with dead lines – Optimal storage on tapes. (Performance analysis/proof included.)	8	-	2
3	**Dynamic Programming:** General Method - All pairs shortest paths – Single source shortest paths - String editing. (Only methods required.)	8	-	2
4	**Back Tracking:** General Method – Sum of Subsets – Graph Coloring – Hamiltonian Cycles. (Only methods required.) **Branch and Bound:** General Method - Travelling Salesperson Problem – 0/1 Knapsack. (Only methods and problem-solving included.)	8	-	2
5	**Lower Bound Theory:** Comparison trees – Oracles and adversary arguments – Lower bounds through reduction – Basic Concepts of NP-Hard and NP-Complete.	8	-	2
Total		**40**	**-**	**10**

TEXT BOOKS

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, *Fundamentals of Computer Algorithms*, Universities Press, Second Edition.

2. S. Dasgupta, C.H. Papadimitriou, and U.V. Vazirani, *Algorithms* , Tata McGrawHill Publications, 2006.

Stream 5: 5ECS1IP - Digital Image Processing

OBJECTIVES:

1. To gain knowledge of the various characteristics and aspects of digital images.
2. To learn how to apply spatial and frequency filters for intensity and image enhancements.
3. To learn the methods of image segmentation.
4. To learn the basics of colour image processing.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
2. Understand the concept of filters.
3. Understand simple image enhancement techniques in spatial and frequency domains.
4. Explain image segmentation techniques.
5. Learn the basics of colour image processing.

Unit	Course Content	L	P	T
1	**Introduction:** Concept of Digital Image Processing - Origins – Applications – Fundamental steps in digital image processing - Components of Image Processing Systems.	8	-	2
2	**Digital Image Fundamentals**: Elements of visual perception - Light and Electromagnetic Spectrum - Image sensing and acquisition – Image Sampling and Quantization – Some basic relationships between pixels.	8	-	2
3	**Intensity Transformations**: Background - Some basic intensity transformation functions – Histogram processing - Fundamentals of spatial filtering.	8	-	2
4	**Filtering in the Frequency Domain**: Background - Preliminary concepts – Sampling and Fourier Transform of sampled functions – Basics of filtering in the frequency domain.	8	-	2
5	**Color Image Processing**: Color fundamentals - Color models – Pseudocolour processing – Basics of full colour image processing - Color transformations. **Image Segmentation**: Fundamentals – Point, Line and Edge detection – Foundation of Thresholding – Region-based Segmentation.	8	-	2
Total		**40**	**-**	**10**

TEXT BOOK

1. Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing, Prentice-Hall, Third Edition.

Stream 6: 5ECS1DM - Data Mining

OBJECTIVES:

1. To appreciate the types of problems for which Data Mining is used.
2. To learn the various issues involved in Data Mining, and how to handle them.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the concept of data discovery in various types of databases, and the need for data mining.
2. Understanding the various methods of data preprocessing.
3. Understand the need for data reduction and strategies to perform data reduction.
4. Learn the rules and algorithms involved in association rule mining.
5. Understand supervised and unsupervised learning techniques, including classification, prediction and clustering.

Unit	Course Content	L	P	T
1	**Introduction**: Data Mining tasks – Data Mining versus Knowledge Discovery in Data bases – Relational databases – Data warehouses – Transactional databases – Object oriented databases – Spatial databases – Temporal databases – Text and Multimedia databases – Heterogeneous databases - Mining Issues – Metrics – Social implications of Data mining.	8	-	2
2	**Data Preprocessing**: Why Preprocess the data – Descriptive data summarization - Data cleaning – Data Integration – Data Transformation. **Data Reduction Strategies:** Data cube aggregation - Attribute subset Selection – Dimensionality Reduction - Data Compression -- Numerosity Reduction – Clustering - Sampling.	8	-	2
3	**Association Rule Mining:** Basic concept and road map – Mining Single Dimensional Association Rules: The Apriori Algorithm –Multilevel Association Rules: Approaches to mining Multilevel Association Rules – Constraint Based Association Mining.	8	-	2
4	**Classification Techniques:** Issues regarding Classification and Prediction – Classification by Decision Tree induction – Bayesian Classification **Prediction Techniques:** Linear Regression Model - Multiple Regression Model	8	-	2
5	**Cluster Analysis:** Categorization of major Clustering Methods – Classical Partitioning Clustering Method: K-Means method, Hierarchical Clustering Methods: Agglomerative Hierarchical Clustering, Density Based Clustering Methods: DBSCAN.	8	-	2
	Total	40	-	10

TEXT BOOK

1. Jiawei Han, Micheline Kamber, *Data Mining Concepts and Techniques*, Second Edition, Elsevier, 2006.

REFERENCE BOOKS

1. Margaret H. Dunham, *Data Mining – Introductory and Advanced Topics*, Pearson, 2006.

2. S. N. Sivananda, S. Sumathi, *Data Mining*, Thomson Learning, Chennai, 2006.

Elective II

Stream 1: 6ECS2MC - Mobile Communications

OBJECTIVES:

1. To learn the concepts of mobile communication, various modulation techniques, coding and medium access control techniques used in mobile communication.
2. To gain familiarity with the mobile network protocol stack and its functions.
3. To learn basics of satellite systems in this context and wireless LAN.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the fundamental concepts of mobile communications and wireless transmission.
2. Explain the concept and aspects of modulation.
3. Differentiate between the different medium access control methods, viz. CDMA, SDMA, TDMA and FDMA.
4. Explain the applications and basic concepts of Satellite systems.
5. Understand the architecture of Wireless LAN technologies.
6. Understand the Mobile network layer and its characteristics.

Unit	Course Content	L	P	T
1	**Mobile Communication**: Introduction – Applications – Simplified Reference Model. **Wireless Transmission**: Frequencies for radio transmission – Signals – Antennas – Signal Propagation.	10	-	1
2	**Modulation**: Amplitude Shift Keying – Frequency Shift Keying – Phase Shift Keying – Advanced Frequency Shift-keying - Advanced Phase Shift-keying - Spread Spectrum – Cellular Systems.	10	-	1
3	**Medium Access Control:** Motivation for a specialized MAC – Space Division Multiple Access – Frequency Division Multiple Access – Time Division Multiple Access – Code Division Multiple Access – Comparison of SDMA, TDMA, FDMA and CDMA.	10	-	2
4	**Satellite Systems**: History – Applications – Basics – Routing – Localization – Handover – Examples. **Wireless LAN:** Infrared vs Radio Transmission – Infrastructure and ad-hoc network – IEEE 802.11 – Bluetooth: User Scenarios, Architecture.	10	-	2
5	**Mobile Network Layer**: Mobile IP – Dynamic Host Configuration Protocol – Mobile ad-hoc networks.	10	-	2
Total		**50**	**-**	**8**

TEXT BOOK

1. Jochen Schiller, Mobile Communications, Pearson Education, Second Edition.

Stream 2: 6ECS2CR – Cryptography

OBJECTIVES:

1. To learn the evolution of cryptographic systems.
2. To understand public key encryption standards, algorithms and protocols.
3. To learn the concepts of message authentication and digital signatures.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the important role of cryptography in network security.
2. Learn various encryption techniques from classical to modern.
3. Understand the important aspects of number theory used in cryptography.
4. Understand the RSA algorithm and connected protocols.
5. Learn the importance of message authentication and understand the secure hash algorithm.
6. Describe the technique, protocols and standards for digital signature.

Unit	Course Content	L	P	T
1	**Introduction**: Security Trends – OSI Security Architecture – Security attacks – Security services – Security mechanisms – Model for network security.	10	-	1
2	**Symmetric Ciphers:** Classical Encryption Techniques - Block Ciphers and the Data Encryption Standard - Advanced Encryption Standard – More on Symmetric Ciphers.	10	-	1
3	**Public-Key Encryption:** Introduction to Number Theory – Public-Key Cryptography and RSA – Key Management – Diffie-Hellman Key Exchange.	10	-	2
4	**Message Authentication and Hash Functions** – Secure Hash algorithm.	10	-	2
5	**Digital Signatures** - Authentication Protocols – Digital signature standard.	10	-	2
Total		**50**	**-**	**8**

TEXT BOOK

1. J William Stallings, Cryptography and Network Security Principles and Practices, Fourth Edition, Prentice-Hall of India, New Delhi, 2007.

Stream 3: 6ECS2UN - System Programming with UNIX

OBJECTIVES:

1. To gain an in-depth knowledge of the architecture and APIs of the UNIX operating system and file system.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand UNIX operating system and file system architecture.
2. Learn processes, signals, sockets and related data structures and kernel support.
3. Learn file, process, signals and sockets concepts and APIs.
4. Learn System V messages, semaphores and shared memory concepts and APIs.

Unit	Course Content	L	P	T
1	**Introduction to Unix Kernel**: Architecture of Unix kernel – Overview of the file subsystem: Basic concepts of file descriptor, file table – file system layout. **Internal representation of Unix files**: Basic definition of Inodes - Sample disk inode - Various fields in an inode – Super block – Pipes: pipe system call, opening, reading and writing pipes – Basic concepts of mounting and unmounting file system.	10	-	1
2	**Unix and POSIX Standards**: The POSIX Environment - The POSIX APIs - Unix and POSIX development environment - API common characteristics. **Unix File APIs**: Basic concepts – Prototypes – Functionalities - Examples of *open, creat, read, write, close, link* and *unlink* API's.	10	-	1
3	**Unix Processes**: Introduction to Unix processes - Data structure for Unix processes - Kernel support for processes. **Process APIs**: Basic concepts – Prototypes – Functionalities - Examples of *fork, _exit, wait, waitpid, exec* and *pipe* APIs.	10	-	2
4	**Unix Signals**: Basic concepts of signals - Unix Kernel support for signals – *signal*, *sigaction* and *kill* APIs. **Unix Sockets**: Introduction – The Sockets Model – Basic concepts of *socket*, *bind*, *accept, recv* and *shutdown* APIs.	10	-	2
5	**Unix system V Messages**: Kernel support for message - *msgget*, *msgsnd*, *msgrcv*, *msgctl* APIs. **Unix system V Semaphores**: Kernel support for semaphores - *semget*, *semop*, *semctl* APIs. **Unix system V Shared Memory**: Kernel support for shared memory - *shmget*, *shmat*, *shmdt*, *shmctl* APIs.	10	-	2
Total		**50**	**-**	**8**

TEXT BOOKS

1. Maurice J. Bach, The Design of the UNIX Operating System, Prentice-Hall, 1989.

2. Terrence Chan, Unix System Programming Using C++, Prentice-Hall, 1999.

Stream 4: 6ECS2PA - Parallel Algorithms

OBJECTIVES:

1. To learn the fundamentals of parallel processing.
2. To learn to visualize specific known algorithms as parallel algorithms.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Appreciate the need for parallel algorithms in the modern computing scenario.
2. Understand the PRAM algorithm and optimization.
3. Learn specific elementary parallel algorthms.
4. Implement matrix multiplication as parallel algorithm.
5. Learn various sorting methods as parallel algorithms.
6. Understand how specific algorithms on graphs can be designed as parallel algorithms.

Unit	Course Content	L	P	T
1	**Introduction:** Computational demand of Modern Science – Advent of Practical parallel processing – Parallel Processing terminology – The Sieve of Eratosthenes **PRAM Algorithms**: A model of serial computation – The PRAM model of parallel computation – PRAM algorithms – Reducing the number of processors	10	-	1
2	**Elementary Parallel Algorithms**: Classifying MIMD algorithms – Reduction – Broadcast – Prefix Sums	10	-	1
3	**Matrix Multiplication**: Sequential matrix multiplication – Algorithm for Processor arrays – Algorithms for multiprocessors – Algorithms for Multicomputers	10	-	2
4	**Sorting**: Enumeration Sort – Lower bounds on parallel sorting – Odd-Even transposition sort – Bitonic merge – Quicksort based algorithms – Random read and random write	10	-	2
5	**Graph Algorithms**: Searching a Graph – Connected Components – All-pairs shortest path – Single Source shortest path – Minimum cost spanning tree	10	-	2
Total		**50**	**-**	**8**

TEXT BOOK

1. Michael J Quinn, *Parallel Computing: theory and Practice*, 2nd Edition, Tata McGraw Hill, Delhi, 2008.

REFERENCE BOOKS

1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, *Introduction to Parallel Computing*, Second Edition, Addison Wesley, 2003.

2. S.G.Akl, *The Design and Analysis of Parallel Algorithms*, PHI, 1989.

3. F.T.Leighton, *Introduction to Parallel Algorithms and Architectures: Arrays, Trees, Hypercubes*, MK Publishers, San Mateo California, 1992.

4. Wilkinson, M.Allen, *Parallel Programming Techniques and Applications using networked workstations and parallel computers*, Prentice Hall, 1999.

Stream 5: 6ECS2LP - Natural Language Processing

OBJECTIVES:

1. To learn the basic concepts of natural language processing and the associated mathematical concepts.
2. To learn the concept of parsing of context-free grammars with respect to English.
3. To learn lexical, syntactic and semantic processing concepts for English language processing.
4. To understand the complexities and methods of word sense disambiguation.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand language models and algorithms.
2. Understand the use of automata in English language parsing.
3. Learn the various classes of words and parts of speech in English and to understand the method of tagging PoS.
4. Learn to represent English as a context-free grammar.
5. Understand how to parse sentences in the lexical, morphological, syntactic and semantic levels.
6. Understand the challenges and solutions in word sense disambiguation.

Unit	Course Content	L	P	T
1	**Introduction**: Knowledge in speech and language processing – Ambiguity – Models and Algorithms – Language, Thought and Understanding. **Regular Expressions and Automata**: Regular expressions – Finite-State automata. **Morphology and Finite-State Transducers**: Survey of English morphology – Finite-State Morphological parsing – Combining FST lexicon and rules – Lexicon-Free FSTs: The Porter Stemmer – Human morphological processing.	10	-	1
2	**Word classes and Part-of-Speech Tagging**: English word classes – Tagsets for English – Part-of-speech tagging – Rule-based part-of-speech tagging – Stochastic part-of-speech tagging – Transformation-based tagging – Other issues. **Context-Free Grammars for English**: Constituency – Context-Free rules and trees – Sentence-level constructions – The noun phrase – Coordination – Agreement – The verb phase and subcategorization – Auxiliaries – Spoken language syntax – Grammar equivalence and normal form – Finite-State and Context-Free grammars – Grammars and human processing. **Parsing with Context-Free Grammars**: Parsing as search – A Basic Top-Down parser – Problems with the basic Top-Down parser – The Earley algorithm – Finite-State parsing methods.	10	-	1
3	**Features and Unification**: Feature structures – Unification of feature structures – Features structures in the grammar – Implementing unification – Parsing with unification constraints – Types and Inheritance. **Lexicalized and Probabilistic Parsing**: Probabilistic context-free grammar – problems with PCFGs – Probabilistic lexicalized CFGs – Dependency Grammars – Human parsing.	10	-	2

Unit	Course Content	L	P	T
4	**Representing Meaning**: Computational desiderata for representations – Meaning structure of language – First order predicate calculus – Some linguistically relevant concepts – Related representational approaches – Alternative approaches to meaning. **Semantic Analysis**: Syntax-Driven semantic analysis – Attachments for a fragment of English – Integrating semantic analysis into the Earley parser – Idioms and compositionality – Robust semantic analysis.	10	-	2
5	**Lexical semantics**: Relations among lexemes and their senses – WordNet: A database of lexical relations – The Internal structure of words – Creativity and the lexicon. **Word Sense Disambiguation and Information Retrieval**: Selectional restriction-based disambiguation – Robust word sense disambiguation – Information retrieval – other information retrieval tasks.	10	-	2
Total		**50**	**-**	**8**

TEXT BOOK

1. Daniel Jurafsky and James H. Martin, Speech and Language Processing, Pearson Education (Singapore), 2002.

Stream 6: 6ECS2DW - Data Warehousing

OBJECTIVES:
1. To understand the building blocks, architecture, principles and quality control in the context of data warehousing.

OUTCOMES:

Upon completion of the course, the student will be able to
1. Understand the fundamental concepts of data warehousing.
2. Explain the various aspects of planning and warehouse project management.
3. Describe the architectural components of a DW.
4. Understand the decision-making process for selection of infrastructure for a DW.
5. Understand the dimensions of quality control with respect to a DW.
6. Learn the importance of OLAP, its features and functions.

Unit	Course Content	L	P	T
1	**The Compelling Need for Data Warehousing:** Escalating Need for Strategic Information, Operational Versus Decision-Support Systems, Data Warehousing-The Only Viable Solution-Data Warehouse Defined **Data** Warehouse**:** The Building Blocks: Defining Features- Data Warehouses and Data Marts- Overview of the Components- - Metadata in the Data Warehouse	10	-	1
2	**Planning and Project Management:** Planning Your Data Warehouse: Key Issues - The Data Warehouse Project: How is it Different? - Assessment of Readiness - The Life-Cycle Approach - The Development Phases - Project Management Considerations: Guiding Principles - Warning Signs - Success Factors - Anatomy of a Successful Project.	10	-	1
3	**The Architectural Components-** Understanding Data Warehouse Architecture - Architectural Framework – Technical architecture of Data Acquisition, Data Storage and Information Delivery. **Infrastructure as the Foundation for Data Warehousing:** Guidelines for Hardware selection for Data warehouse – Single and hybrid Platform options for Data warehouse **The Significant Role of Metadata:** Why Metadata is Important: Critical need in the Data warehouse - Metadata Repository	10	-	2
4	**Principles of Dimensional Modeling:** From Requirements to Data Design - Design Decisions - Dimensional Modeling Basics - E-R Modeling Versus Dimensional Modeling - Use of CASE Tools **Data Quality:** A Key to Success: What is Data Quality? Benefits of Improved Data Quality - Types of Data Quality Problems - Data Quality Tools	10	-	2
5	**OLAP in the Data Warehouse:** Demand for Online Analytical Processing: Need for Multidimensional Analysis - Limitations of Other Analysis Methods - OLAP Definitions and Rules - OLAP Characteristics - Major Features and Functions: General Features - Dimensional Analysis - Hyper cubes - Drill-Down and Roll-Up - Slice-and-Dice or Rotation	10	-	2
	Total	**50**	**-**	**8**

TEXT BOOK
1. Paulraj Ponniah, *Data Warehousing Fundamental Comprehensive Guide for IT Professionals*, Wiley-India, New Delhi, 2001.

REFERENCE BOOKS
1. J. Han and M. Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, New Delhi, 2001.
2. BPB Editorial Board, Data Warehousing, BPB Publications, New Delhi, 2004.

Part IV Subjects

OVE – Value Education

OBJECTIVES:

1. To imbibe a sense of personal, community, societal, environmental, cultural and national values.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand why values are essential for living.
2. Know one's personal, civic, community, societal and environmental responsibilities and the importance of adhering to them.
3. Appreciate the greatness of India's art, culture, heritage and traditions.
4. Strengthen own patriotic values and respect for the country.

Unit	Course Content	L	P	T
1	**Values**: Where do we learn our values from – Old Values are not Obsolete – Scriptures of various Religions. **Values essential for Right Living**: Hardwork, Integrity, Humility, Generosity – Personal Values - Indian Moral Values.	5	-	1
2	**Civic Responsibility**: Definition – Patriotism in today's generation: The National Anthem – Defining Value-Based Education – Mark of a Good Citizen – How to be a Good Citizen.	5	-	1
3	**Personal and Neighbourhood:** Tips for Good relationships with neighbours – Tenancy Agreements – Being a Good Neighbour. **Health and Hygiene**: Food and Cooking Hygiene – Medical Hygiene – Personal Service/Served Hygiene – Excessive Hygiene: Hygiene Hypothesis.	5	-	1
4	**Service to Society, Environment and Fellow Human Beings:** Introduction – Service to Society – Service to Community – Service to Fellow Human Beings – Service to Environment: Definition, Ways to serve our Environment, Importance of Public Participation – Methods to create Environmental Awareness – Service to Animals – Organizations which care for Animals: WWF, PFA, PETA, Blue Cross.	5	-	1
5	**Culture and Tradition**: Introduction, Important Traditions followed in India, Contribution of Indian Culture to the World – Festivals, Customs and Practices. **Appreciation of Arts and Culture**: India's Unity in Diversity – Diversities. **Cultural Heritage of India**: Language and literature – Temples of India – Art works of Modern India.	5	-	1
Total		**25**	**-**	**5**

OEST - Environmental Studies (Theory)

OBJECTIVES:

1. To study the nature of and facts about the environment.
2. To appreciate the importance of the environment by assessing its impact on the human world.
3. To study the dynamic processes and understand the features of the earth's interior and surface.
4. To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the issues and conservation measures related to all types of renewable and non-renewable resources.
2. Explain the concept and types of Ecosystems.
3. Understand Biodiversity and its conservation,
4. Describe the types of Pollution, and its prevention and control measures.
5. Understand the impact of Human Population.

Unit	Course Content	L	P	T
1	**The Multidisciplinary Nature of Environmental Studies** : Definition, Scope and Importance, Need for public awareness. **Natural Resources**: Renewable and Non-Renewable Resources: Natural Resources and Associated Problems. **Forest Resources**: Use and over-exploitation, deforestation, case studies. Timber Extraction, mining, dams and their effects on forest and tribal people. **Water Resources**: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. **Mineral Resources**: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. **Food Resources**: World food problems, change caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.	5	-	1
2	**Energy Resources**: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies. **Land Resources**: Land as a resource, land degradation, main induced landslides, soil erosion and desertification - Role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles. **Ecosystems**: Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids - Introduction, Types Characteristic features, Structure and function of the following ecosystem: (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, ocean, estuaries)	5	-	1
3	**Biodiversity and its conservation:** Introduction – Definition : genetic, species and ecosystem diversity - Biogeographical classification of India - Value of Biodiversity, consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels - India as a mega diversity nation - Hot-spots of biodiversity -	5	-	1

Unit	Course Content	L	P	T
	Threats of biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. **Environmental Pollution**: Definition - Causes, effects and control measures of: (a) Air pollutin (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards - Solid waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: floods, earthquake, cyclone and landslides.			
4	**Social Issues and the Environment:** From Unsustainable to Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people: problems and concern, Case Studies - Wasteland reclamation - Consumerism and waste products - Environment Protection Act - Air (Prevention and control of Pollution) Act - Water (Prevention and control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act **Human Population and the Environment**: Population growth, Variation among nations - Population explosion – Family Welfare programme - Environment and human health - Human Rigths - Value Education - HIV/AIDS - Women and Child Welfare - Role of Information Technology in Environment and human health - Case Studies.	5	-	1
5	**Field Work**: Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain - Visit to a local polluted site – Urban/Rural/Industrial/Agricultural - Study of common plants, insects, birds - Study of simple ecosystems-pond, river, hill slopes etc. (Field work equal to 5 lecture hours)	-	5	1
Total		**20**	**5**	**5**

SUGGESTED READING

1. Agarwal, K.C., *Environmental Biology*, Nidi Publications Ltd., Bikaner,2001
2. Bharucha Erach, *The biodiversity of India*, Mapin Publishing Pvt. Ltd.
3. Brunner R.C., *Hazardous Waste Incineration*, McGraw Hill Inc., 1989.
4. Clark R.S., *Marine Pollution*, Clanderson Press Oxford
5. Cunningham, Cooper, Gorhani, Hepworth, *Environmental Encyclopedia*, Jaico, 2001.
6. De A.K., *Environmental Chemistry*, Wiley Eastern Ltd.
7. Gleick, H.P., *Water in Crisis,* Oxford Univ.Press, 1993.
8. Heywood, Watson, *Global Biodiversity Assessment*, Cambridge Univ.Press, 1995.
9. Jadhav H, Bhosale V.M., *Environmental Protection and Laws*, Himalaya Publn House, Delhi, 1995.
10. Mckinney M.L. & School R.M., *Environmental Science Systems & Solutions*, Web Enhanced Edition, 1996.

OESPV - Environmental Studies Project and Viva-Voce

OBJECTIVES:

1. To undertake a field trip that gives a practical exposure to some aspect of the environment that was studied. This is in order to develop an appreciation for the environment and a deeper understanding of its importance.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Correlate what has been studied regarding the environment and the knowledge gained during the field trip.
2. Create a project report covering the knowledge gained during the field trip, relating it with what was learnt about the environment.
3. Cogently present the project work and answer questions on the project report.

Every student has to go on a field trip and submit a project and undergo a viva-voce examination about the same.

SAR1 - Analytical Reasoning I

OBJECTIVES:

1. To gain mathematical and verbal reasoning skills in preparation for various competitive examinations.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Solve problems in the given areas of objective arithmetic using simple methods and tricks.
2. Solve verbal reasoning problems of the given types.
3. Improve the speed of calculations while solving such problems.

Unit	Course Content	L	P	T
1	**Objective Arithmetic:** Number – H.C.F. & L.C.M. of Numbers – Decimal Fractions – Simplification.	2	-	4
2	**Objective Arithmetic:** Average – Percentage – Profit & Loss – Simple Interest.	2	-	4
3	**Objective Arithmetic:** Calendar – Clocks – Heights and Distances.	2	-	4
4	**Verbal Reasoning:** Series – Analogy – Classification - Coding & Decoding – Number, Ranking and Time Sequence Test.	2	-	4
5	**Verbal Reasoning:** Logical Sequence of Words – Situation Reaction Test – Verification of Truth of the Statement.	2	-	4
Total		**10**	**-**	**20**

Number of Credits: 2

TEXT BOOKS

1. Dr. R. S. Aggarwal, *A Modern Approach to Verbal Reasoning (Fully Solved)*, Revised Edition, S. Chand and Company Ltd., Reprint 2010.

2. Dr. R. S. Aggarwal, *Objective Arithmetic*, S. Chand and Company Ltd., Reprint 2010.

SAR2 - Analytical Reasoning II

OBJECTIVES:

1. To gain mathematical and verbal reasoning skills in preparation for various competitive examinations.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Solve problems in the given areas of objective arithmetic using simple methods and tricks.
2. Solve verbal reasoning problems of the given types.
3. Improve the speed of calculations while solving such problems.

Unit	Course Content	L	P	T
1	**Objective Arithmetic:** Square Root and Cube Root – Problems on Numbers – Chain Rule.	2	-	4
2	**Objective Arithmetic:** Time & Work – Alligation or Mixture – Compound Interest – Stock & Shares.	2	-	4
3	**Objective Arithmetic:** Linear Equations in Two Variables – Quadratic Equations - Arithmetic and Geometric Progressions.	2	-	4
4	**Verbal Reasoning:** Blood Relations – Puzzle Test – Direction Sense Test.	2	-	4
5	**Verbal Reasoning:** Data Sufficiency – Eligibility Test – Assertion and Reason.	2	-	4
Total		**10**	**-**	**20**

Number of Credits: 2

TEXT BOOKS

1. Dr. R. S. Aggarwal, *A Modern Approach to Verbal Reasoning (Fully Solved)*, Revised Edition, S. Chand and Company Ltd., Reprint 2010.

2. Dr. R. S. Aggarwal, *Objective Arithmetic*, S. Chand and Company Ltd., Reprint 2010.

SAR3 - Analytical Reasoning III

OBJECTIVES:

1. To gain mathematical and verbal reasoning skills in preparation for various competitive examinations.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Solve problems in the given areas of objective arithmetic using simple methods and tricks.
2. Solve verbal reasoning problems of the given types.
3. Improve the speed of calculations while solving such problems.

Unit	Course Content	L	P	T
1	**Objective Arithmetic:** Problems on Ages – Ratio and Proportion – Partnership.	2	-	4
2	**Objective Arithmetic:** Pipes and Cisterns – Time and Distance – Problems on Trains - Boats and Streams.	2	-	4
3	**Objective Arithmetic:** Area – Volume and Surface Areas – Trigonometry.	2	-	4
4	**Verbal Reasoning:** Logic – Statement: Arguments - Statement: Assumptions - Statement: Courses of Action.	2	-	4
5	**Verbal Reasoning:** Statement: Conclusions – Deriving Conclusions from Passages – Theme Detection – Cause and Effect Reasoning.	2	-	4
Total		**10**	**-**	**20**

Number of Credits: 2

TEXT BOOKS

1. Dr. R. S. Aggarwal, *A Modern Approach to Verbal Reasoning (Fully Solved)*, Revised Edition, S. Chand and Company Ltd., Reprint 2010.

2. Dr. R. S. Aggarwal, *Objective Arithmetic*, S. Chand and Company Ltd., Reprint 2010.

OQCC - Quality Control Circles (Theory)

OBJECTIVES:

1. To develop the skill to solve problems using a systematic approach, both as an individual and in a team.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the importance, functions and structure of quality control circles.
2. Identify problems and formulate them in a formal, structured manner.
3. Understand and use the various problem solving tools.
4. Understand and implement the process of PDCA to solve problems.
5. Gain an understanding of leadership and motivation.

Unit	Course Content	L	P	T
1	**Introduction:** Introduction to Quality Circles - Objectives of Quality Circles - Benefits of Quality Circles.	2	-	4
2	**Structure:** Structure of Quality Circles - Quality Circle Meetings - Roles of facilitators, coordinators and leader.	2	-	4
3	**Problem Identification:** Brainstorming - Problem identification.	2	-	4
4	**Data Collection:** Tools – PDCA.	2	-	4
5	**Problem Solving:** Problem solving and presentation - Leadership and Motivation.	2	-	4
Total		**10**	**-**	**20**

SUGGESTED READING

1. Reference materials from QCFI, Chennai Chapter.

2. Reference materials from Port Trust of Madras.

OQCCP - Quality Control Circles (Presentation)

OBJECTIVES:

1. To work as a part of a Quality Control Circle.
2. To identify and solve problems.
3. To develop team spirit and leadership qualities.
4. To acquire presentation skills.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Function as a part of a Quality Control Circle.
2. Identify and solve problems in a team as part of QCC.
3. Understand the importance of team work and leadership in a QCC.
4. Learn to make presentations of solved problems to an audience, effectively and within a stipulated time.

Every student would be member of a Quality Circle and will be evaluated for a project presentation.

Total Number of Credits (OQCC & OQCCP): 2

SMMT – Multimedia (Theory)

OBJECTIVES:

1. To learn the fundamental aspects of multimedia systems.
2. To learn the basics of Adobe Photoshop for image manipulation.
3. To learn Macromedia Flash to create basic 2D animation.
4. To develop an interest in image editing and animation.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Describe the features, concepts and types of multimedia systems.
2. Describe the features, tools and techniques available in Adobe Photoshop.
3. Describe the features, tools and techniques available in Macromedia Flash.

Unit	Course Content	L	P	T
1	**Introduction to Multimedia:** Sound Formats - Video Formats - Getting Started with Image file formats - Animation – Playing sounds on The Web - Playing Videos - Windows Media Formats – Working with Object Elements – Basic concepts of Media References.	1	-	-
2	**Adobe Photoshop:** Introduction - Navigating the Workspace - Working with Documents - Image Modes and Color Selection - Selections and Masks.	2	-	1
3	**Adobe Photoshop:** Layers and Blend Modes - Adding and Working with Type - Painting Tools - Retouching Tools.	2	-	1
4	**Macromedia Flash:** Introduction to Flash – Flash How to – Flash in HTML – Flash Tweening – Flash Guide Tween – Flash Tint Tween – Flash Shape Tween.	3	-	1
5	**Macromedia Flash:** Flash Button 1 – Flash Button 2 – Flash Animation – Flash Sound.	3	-	1
Total		**11**	**-**	**4**

TEXT BOOKS

1. Tay Vaughan, *Multimedia Making It Work*, Tata McGraw-Hill - Fourth Edition.

2. Robert Reinhardt, *Macromedia Flash MX Bible*, DreamTech India Pvt. Ltd - First Edition.

WEBSITES

1. www.w3schools.com

2. http://graphicssoft.about.com/od/photoshop/l/bllps5out.htm

3. http://www.baycongroup.com/flash/09_flash_site.htm#Text

SMMP – Multimedia (Practical)

OBJECTIVES:

1. To learn to use some of the tools available in Adobe Photoshop for image editing.
2. To learn to use some of the tools available in Macromedia Flash for 2D animation.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Use basic tools and techniques of Adobe Photoshop and Macromedia Flash.

Unit	Course Content	L	P	T
1	**Adobe Photoshop:** 1. Demonstrate the use of the following tools 2. Lasso tool 3. Marquee tool 4. Quick selection tool 5. Crop tool 6. Clone tool 7. Gradient tool 8. Blur tool 9. Text tool 10. Rectangle tool 11. Eyedropper tool 12. Dodge tool 13. Hand tool 14. Path Selection tool 15. Brush tool 16. Slice tool 17. Pen tool 18. Brush tool	-	6	-
2	**Macromedia Flash:** 1. Demonstrate the following features 2. Tweening 3. Guide Tween 4. Tint Tween 5. Shape Tween 6. Button 1 7. Button 2 8. Animation using acript 9. Anumation using action buttons 10. Animation with Sound.	-	9	-
Total		**-**	**15**	**-**

SOST - Office Suite Specialist (Theory)

OBJECTIVES:

1. To learn to use the important features of Microsoft Word, Excel and Powerpoint effectively.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Understand the powerful features of the word processor, spread sheet and presentation software provided by Microsoft in its Office Suite.
2. Understand how to use the various features in Microsoft Word, Excel and Powerpoint to effectively create documents, spreadsheets and presentations.

Unit	Course Content	L	P	T
1	**Microsoft Word:** Introduction - Document creation - Editing text - Formatting text – Paragraph - Font - Bullets and numbering – Find - Replace - Spellcheck - Thesaurus - Mail-merge.	2	-	-
2	**Microsoft Word:** Styles - Page Layout – Inserting tables in a document - Header and Footer - Table of contents - Printing documents - Keyboard shortcuts.	2	-	1
3	**Microsoft Excel:** Introduction - Workbooks and worksheets – Inserting and Deleting worksheets - Rows and columns - Formatting cells – Header and footer – Inserting comments – Creating charts.	2	-	1
4	**Microsoft Excel:** Sort and Filter – Formulae – Protect and share workbook – Workbook views.	2	-	1
5	**Microsoft Powerpoint:** Creating slides - Transitions - Animations and effects - Making slideshow - Inserting objects - Timing control - Adding hyperlinks – Adding pictures – Adding audio and video files - Master slide.	3	-	1
Total		**11**	**-**	**4**

TEXT BOOKS

1. Microsoft Press - Microsoft Office System 2007 Step by Step - Prentice Hall of India - 2007.

SOSP - Office Suite Specialist (Practical)

OBJECTIVES:

1. To gain hands-on experience in using the various features of Microsoft Word, Excel and Powerpoint in an efficient way.

OUTCOMES:

Upon completion of the course, the student will be able to

1. Work with documents, edit & format text, and do proofing, printing and publishing with Word.
2. Use Excel to enter, manage and format data and cells.
3. Use formulae in Excel.
4. Create presentations and use themes, layouts, transitions, animation and master slides in Powerpoint.
5. Use pictures, graphics, shapes, tables, charts, SmartArt, notes, objects, sound and video in Powerpoint presentations.

Unit	Course Content	L	P	T
1	**Microsoft Word** A. Type a half page document describing your best friend or your favourite holiday spot. Apply the following formatting features: 1. Organize the document as paragraphs 2. Justify the paragraphs 3. Set the line spacing to 1.5 4. Set font as Times New Roman 5. Set font size as 14, for the heading and font size 12 for the paragraphs 6. Underline the heading in green color (Use different underline style), make the heading bold and italic, centre it 7. Set blue color for the heading 8. Demonstrate the change case option in Word 9. Insert a Page number in the footer at the center 10. Set the Paper size as A4 and orientation as portrait 11. Check the print preview 12. Demonstrate the find and replace feature 13. Demonstrate the Auto Correct feature 14. Apply a suitable border for the heading and fill color 15. Demonstrate the use of format painter 16. Apply a page border 17. Demonstrate spelling and Grammar feature 18. Include a bulleted list of your likes and dislikes 19. Include a numbered list of few places in India you have visited 20. Highlight your interests 21. Apply a suitable water mark for the page. 22. Include a hyperlink to a relevant website 23. Use word Art for one of the side headings. 24. Insert a picture B. Draw a diagram to show the hierarchy of the employees in a company. C. Create a two page document about the basics of computers. Insert a table of Contents and a cover page for the document. D. Use Mail Merge to create invitations to invite your friends for your birthday Party.	-	5	-

Unit	Course Content	L	P	T
	E. Type a formal letter to the Head of your department, requesting her to grant you permission to attend a two day workshop. Insert a table giving the details about the workshop.			

2	**Microsoft Excel**
	A. Calculate the net pay for company employees. The following are the details given
	    1. Basic salary
	    2. Gross pay = Basic pay + allowances
	    3. Allowances = DA + HRA +CCA
	    4. PF = 12% of Basic Pay
	    5. IT = 10% of Basic Pay
	    6. Deduction = PF + IT
	    7. Net Pay = Gross pay – Deduction
	    8. Those whose Net Pay is greater than Rs. 1 lakh
	    9. Include diagonal column headings. Apply different colour schemes to the table.
	    10. Set up a page number for the sheet and place it in the footer in the centre.
	B. Use built in functions in Excel to calculate and display the following:
	    1. *Square root* of a number
	    2. To find the *factorial* of a number
	    3. *Log* of a number
	    4. Return the *remainder* of a division
	    5. Return the *sign* of a number
	    6. Search for a word in the given text and return its position
	    7. Convert a string to Upper case
	C. Use column chart to show the expenditure for maintenance, of a company given the year and amount spent. (Add Data Label, Chart Title, Chart Style, Chart Layout)
	D. Use 3D Column chart to display the income summary of a cookie shop, given the total revenue, expense, profit/Loss.
		-	5	-

3	**Microsoft Powerpoint** A. Create a Powerpoint presentation on Climate Change B. Create a Powerpoint presentation showcasing your technical capabilities, talents, interests and goals.	-	5	-
Total		**-**	**15**	**-**