PSG College of Arts & Science

An Epitome of Quality Learning

Since 1947

M.Sc.
SOFTWARE SYSTEM
(INTEGRATED COURSE)

2019 - 2024

DEPARTMENT OF COMPUTER SCIENCE

PROGRAMME: M.Sc. SOFTWARE SYSTEMS [FIVE YEARS INTEGRATED]

VISION

To provide students with the best learning experience with smart learning atmosphere

MISSION

To enable students to face the industry with full of confidence and to tune them with the Human Values and Soft Skills

PROGRAMME EDUCATIONAL OBJECTIVES

PEO 1 : Demonstrate ability to adapt to a rapidly changing environment by having learned and applied new skills and new competencies**.**

PEO 2 : Acquire the spirit of compassion, kinship and commitment for National Harmony

PEO 3 : Progressively adopt and learn continuously through ICT modules

PEO 4 : To exhibit professional attitudes and ethics by engaging in continual education, participating in professional societies, service to the communities and to assure quality, privacy and safety.

PEO 5 : Able to draw upon foundational knowledge, learn, adapt and successfully bring to bear analytical and computational approaches on changing societal and technological challenges.

PROGRAMME OUTCOMES

PO 1 : Become knowledgeable in the subject of software systems and apply the principles of the same to the needs of the Employer / Institution /own Business or Enterprise.

PO 2 : Gain Analytical skills in developing optimized software solution.

PO 3 : Understand and appreciate professional ethics, community living and Nation Building initiatives.

PO 4 : An ability to identify, formulate and develop solutions to computational programs.

PO 5 : Think critically in evaluating the design choices made and tradeoffs considered when developing software-based systems.

PO 6 : The ability to analyze, design, verify, validate, implement, apply and maintain software systems.

PO 7 : A recognition of the need for, and an ability to engage in lifelong learning.

PO 8 : Facilitate to pursue research.

PROGRAMME SPECIFIC OUTCOMES

PSO 1 : Apply the knowledge of computational algorithms, computational algorithms software techniques in the domain of software

PSO 2 : Solve the complex problems in the field of software with an understanding of the societal , legal and cultural impacts of the solution.

PSO 3 : An ability to apply design and development principles in the construction of software systems of varying complexity.

PSO 4 : Form a part of member in a team with right attitudes.

M.Sc. Software Systems [Five years Integrated]
SCHEME OF EXAMINATIONS
(For students admitted in June 2018 & onwards)

CODE NO.	SUBJECT	EXAM Duration (Hrs)	Max. Marks			Credit points
			CA	CE	Total	
	First Semester					
	Part –II					
18EU01	Communicative English **-** I **-** Interpersonal Communication	3	25	75	100	3
	Part –III					
18SSP01	**Core Course –** Programming in C	3	25	75	100	3
18SSP02	**Core Course –** Programming in Python	3	25	75	100	3
18SSP03	**Interdisciplinary Course -** Mathematics - I **(MA)**	3	25	75	100	3
18SSP04	**Interdisciplinary Course -** Applied Physics **(PH)**	3	25	75	100	3
18SSP05	**Core Course** - Lab - I (C Programming Lab)	3	40	60	100	3
18SSP06	**Core Course** - Lab - II (Programming in Python Lab)	3	40	60	100	2
18SSP07	**Core Course** - Lab - III (MS - Excel Lab)	3	40	60	100	2
	Second Semester					
	Part –II					
18EU02	Communicative English – II Academic Communication	3	25	75	100	3
	Part –III					
18SSP08	**Core Course –** Object Oriented Programming using C++	3	25	75	100	3
18SSP09	**Core Course –** Data Structures	3	25	75	100	3
18SSP10	**Core Course –** Fundamentals of Digital Computers and Architecture	3	25	75	100	3
18SSP11	**Interdisciplinary Course -** Mathematics – II **(MA)**	3	25	75	100	3
18SSP12	**Core Course –** Lab - IV (Object Oriented Programming using C++ Lab)	3	40	60	100	3
18SSP13	**Core Course –** Lab - V (Data Structures Using C Lab)	3	40	60	100	3
18SSP14	**Core Course –** Lab - VI (Interactive Media Designing Lab)	3	40	60	100	2
	Part –IV					
18AECU01	**Ability Enhancement Compulsory Course – I : Value Education**	--	100	--	100	2

CODE NO.	SUBJECT	EXAM Duration (Hrs)	Max. Marks			Credit points
			CA	CE	Total	
Third Semester						
	Part –III					
19SSP15	**Core Course -** Programming in Java	3	25	75	100	3
19SSP16	**Core Course -** Relational Database Management System	3	25	75	100	3
19SSP17	**Core Course** –Software Engineering	3	25	75	100	3
19SSP18	**Interdisciplinary Course -** Statistical Methods **(ST)**	3	25	75	100	5
19SSP19	**Interdisciplinary Course -** Financial and Management Accounting **(CO)**	3	25	75	100	3
19SSP20	**Core Course -** Lab-VII (Java Programming Lab)	3	40	60	100	3
19SSP21	**Core Course -** Lab-VIII (RDBMS Lab)	3	40	60	100	3
	Part –IV					
18AECU02	**Ability Enhancement Compulsory Course – II: Environmental Studies**	--	100	--	100	2
Fourth Semester						
	Part –III					
19SSP22	**Core Course -** User Interface Design	3	25	75	100	3
19SSP23	**Core Course** –Operating Systems	3	25	75	100	3
19SSP24	**Core Course -** Agile Software Development	3	25	75	100	3
19SSP25/ 18SSP26	**Interdisciplinary Course -** Microprocessor and Interfacing **(EL)**	3	25	75	100	3
19SSP26	**Interdisciplinary Course -** Operations Research **(ST)**	3	25	75	100	3
19SSP27	**Core Course -** Lab-IX (User Interface Design and Case Tools Lab)	3	40	60	100	4
19SSP28/ 18SSP30	**Interdisciplinary Course -** Lab-X (Microprocessor and Interfacing Lab) **(EL)**	3	40	60	100	2
	Part –IV					
18SECU01	Skill Enhancement Course – I - Information Security	--	100	--	100	2
Students should complete the Minor Project during the summer vacation						

CODE NO.	SUBJECT	EXAM Duration (Hrs)	Max. Marks			Credit points
			CA	CE	Total	
Fifth Semester						
	Part –III					
19SSP29	**Core Course -** Data Communications and Networking	3	25	75	100	3
19SSP30	**Core Course -** R Programming	--	100	--	100	4
19SSP31	**Core Course -** Software Quality Assurance and Software Testing	3	25	75	100	3
19SSP32A 19SSP32B	**Discipline Specific Elective Course I** Cloud Computing (OR) Design and Analysis of Algorithms	3	25	75	100	5
19SSP33	**Core Course** –Lab-XI (Networks Lab)	3	40	60	100	4
19SSP34	**Core Course** –Lab-XII - (R Programming Lab)	3	40	60	100	4
19SSP35	**Core Course -** Minor Project	--	40	60	100	5
	Part –IV					
18GECEDC	**Generic Elective Course – EDC**	--	100	--	100	2
18SECU02	**Skill Enhancement Course - II Online Test - [General Awareness]**	$1_{1/2}$	--	100	100	2
Sixth Semester						
	Part –III					
19SSP36	**Core Course -** Advanced Java	3	25	75	100	3
19SSP37	**Core Course -** Dynamic Programming using PHP and Bootstrap	--	100	--	100	4
19SSP38	**Core Course -** Data Warehousing and Mining	3	25	75	100	3
19SSP39	**Core Course -** Software Patterns and Architecture	3	25	75	100	3
19SSP40A 19SSP40B	**Discipline Specific Elective Course II** Cryptography (OR) Soft Computing	3	25	75	100	5
19SSP41	**Core Course** –Lab- XIII -(Advanced Java Programming Lab)	3	40	60	100	4
19SSP42	**Core Course** –Lab – XIV- (Dynamic Programming using PHP and Bootstrap Lab)	3	40	60	100	4
Seventh Semester						
	Part –III					
18SSP47	**Core Course -** Major Project – I	--	80	120	200	8
			Total			114

Course Code & Title	**18SSP01 PROGRAMMING IN C**		
Class	**I M.Sc Software Systems**	**Semester -I**	**Hours:48**
Course Objectives	● To demonstrate fundamentals of programming technique. ● To learn Input and Output statements. ● To understand the concepts of Functions and Arrays. ● To learn Pointers and User defined data types. ● To understand the File handling concepts.		

SYLLABUS

UNIT	Content	No. of Hours
I	**INTRODUCTION TO C:** The C Character Set – Identifiers and Keywords – Data Types – Constants – Variables – Declarations – Expressions – Statements – Symbolic Constants. **OPERATORS AND EXPRESSIONS:** Arithmetic Operators – Unary Operators – Relational and Logical Operators – Assignment Operators – The Conditional Operator-Library functions.	**8**
II	**INPUT AND OUTPUT STATEMENTS:** Single Character Input – Single Character Output – Entering Input Data – Writing Output Data – The Gets and Puts Function. **CONTROL STATEMENTS:** Branching – Looping – Nested Control Structures – Switch Statement – Break Statement – Continue Statement – Comma Operator – GO TO Statement.	**10**
III	**FUNCTIONS:** Defining a Function – Accessing a Function – Function Prototypes – Passing Arguments to a Function – Recursion. **PROGRAM STRUCTURE:** Storage Classes – Atomic Variables – Global Variables - Static Variables. **ARRAYS:** Defining an Array – Passing Arrays to Functions – Multidimensional Arrays.	**10**
IV	**STRINGS:** Defining a String – NULL Character – Initialization of Strings – Reading and Writing a String – Processing a Strings – Searching and Sorting of Strings. **POINTERS:** Pointer Declarations – Passing Pointers to a Function – Dynamic Memory Allocation – Array of Pointers. **STRUCTURES AND UNIONS:** Definition of Structures – User-Defined Data Types – Structures and Pointers – Passing Structures to Functions – Unions.	**10**
V	**FILE HANDLING:** Opening and Closing a File – Reading and Writing a Data File – Processing a Data File – Unformatted Data Files - Concepts of Binary Files. **LOW LEVEL PROGRAMMING:** Register Variables – Bitwise Operations – Bit Fields. **ADDITIONAL FEATURES OF C:** Enumerations – Command Line Parameters.	**10**

References	**Text Books:** 1**.** Byron Gottfried**,** “Programming with C” Tata McGraw Hill Education (India) Pvt Ltd., Third Edition, 2013. **Reference Books:** 1. YashavantKanetkar “Let Us C” , BPB Publications, 9th Revised & updated edition, Tata Mc-Graw Hill, 2013. 2**.** Stephen G Kochan R.P, “Programming in C”, Addison -Wesley, 2014.	
Course Outcomes	**CO1:**Understand the basic structure of C programming, declaration and usage of variables. **CO2**:Trace the given C program manually. **CO3:**Implement programs with pointers and arrays. **CO4:**Write C program for simple applications using structures and files. **CO5:** Manipulate text files with file handling methods.	

Course Code & Title	**18SSP02 PROGRAMMING IN PYTHON**		
Class	**I- M.Sc(Software Systems)**	**Semester I**	**Hours:48**
Course Objectives	• To enable the students to understand the core principles of the Python Language. • To use the tools to produce well designed programs in python. • To create effective GUI applications.		

SYLLABUS

UNIT	Content	No. of Hours
I	**INTRODUCTION:** Introduction to Python- Features - interactive mode and script mode. Variables- Expressions and Statements- Values-Variables – Scope- Operators and Operands - operator precedence- Expressions and Statements – input – output – Comments- void functions and functions returning values- flow of execution Conditional constructs and looping: if... else statement -While- For (range function)- break- continue- pass- Nested loops- use of compound expression in conditional constructs.	**9**
II	**BUILT IN FUNCTIONS:** Importing Modules - invoking built- in functions - functions from math module - using random module - Defining functions- invoking functions- passing parameters - **MODULES:** Modules-Standard Modules – sys- time- dir functions.	**10**
III	**STRINGS:** Creating- initializing and accessing the elements- String operators: +, *, in, not in, range slice - Comparing strings using relational operators. - String Functions & Methods - Pattern Matching. **LIST : M**utable lists- Creating- initializing and accessing the elements- traversing- appending -updating and deleting elements - List operations - Functions and Methods.	**9**
IV	**DICTIONARIES:** Concept of key-value pair- creating- initializing - accessing the elements in a dictionary- traversing- appending- updating and deleting elements- Dictionary functions - Methods **TUPLES:** Immutable concept - creating - intialising and accessing the elements - functions **FILES:** Opening Files- Files in Action – File Operations.	**10**
V	**EXCEPTIONS:** Errors- Run Time Errors- The Exception Model-Exception Hierarchy- Handling Multiple Exceptions- raise - assert-Writing Your Own Exception Classes. **GUI:** Introduction- Components and Events- The root Component-Button- Entry Widgets- Text Widgets- Checkbuttons- Radiobuttons-Listboxes- Frames- Menus- Binding Events to Widgets.	**10**
References	**Text Books:** 1. Mark Lutz, “Learning Python”, 5th Edition, 2013 (UNIT I -V). 2. Albert Lukaszewski, “MySQL for Python”, Packt Publishing, 2010 (UNIT-V) **Reference Books:** 1. Guido van Rossum and Fred L. Drake- Jr, “An Introduction to Python”, Network Theory Limited, 2011. **2.** Mark Lutz**,** “Python Pocket Reference: Python In Your Pocket”, O'Reilly Media, 5th edition, 2014.	
Course Outcomes	• Understand principles of Python • Understand object oriented programming • Understand how Python can be used for application development	

Course Code & Title	**18SSP03** **MATHEMATICS-I**		
Class	I MSc Software Systems	**Semester**	I
Course Objectives	The Course aims • to introduce the ideas about matrices • to introduce ODE , PDE and its various methods. • to learn the different methods of solving Simultaneous algebraic quation. • to learn about interpolation and its formula • to introduce different methods of Numerical Differentiation and Numerical integration		

SYLLABUS

UNIT	Content	No. of Hours
I	**Matrices:** Rank of matrices – Consistency and inconsistency – Inverse of matrix – Solution of simultaneous algebraic Equations – Eigen values and Eigen vectors.	**9 hours**
II	**Differential equations:** Second order Ordinary Differential Equations with constant coefficients – First order Partial Differential Equations(Standard I, III & IV) – Lagrange's Differential Equations.	**11 hours**
III	**Numerical methods:** Solution of System of Simultaneous Algebraic Equations: Gauss Elimination Method – Gauss Jordan Method – Gauss Jacobi Iterative Method – Gauss Seidal Iterative Method.	**9 hours**
IV	**Numerical methods:** Difference table – Interpolation –Newton's Forward Interpolation formula – Newton's Backward Interpolation Formula – Construction of polynomials – Equidistant terms with one or more missing values.	**9 hours**
V	**Numerical methods:** **Numerical Differentiation:** Newton's Forward and Newton's Backward formula to compute the Derivatives. **Numerical Integration:** The Trapezoidal rule – Simpson's 1/3rd and 3/8th rule.	**10 hours**
References	**Text Books:** 1. S. Narayanan and T.K. ManickavachagamPillai, *"**Ancillary Mathematics Volume-I**"*, S. Viswanathan (Printers & Publishers) Pvt Ltd, Reprint 2015 **Unit – I: Chapter III (Sections 3.2 to 3.4)** 2. S. Narayanan and T.K. Manickavachagam Pillai, ***"Calculus Volume III"*** S. Viswanathan (Printers & Publishers) Pvt Ltd, Reprint 2016. **Unit-II: Sections: (2.1 to 2.4, 4.5.1,4.5.3, 4.5.4, 4.6)** 3. Dr. M.K. Venkataraman "***Numerical methods in Science and Engineering***" The National Publishing Company , Reprint July 2013. **Unit – III:Chapter IV(Sections :4.1, 4.2, & 4.6)(Problems only)** **Unit – IV:Chapter V(Sections : 5.1 to 5.10, 6.1 to 6.5)(Problems only)** **Unit – V: (Sections: 9.1 to 9.3, 9.8, 9.10)(Problems only)**	
Course Outcomes	**On completion of the course, students should be able to** **CO1:** find Rank of a matrix and Solve simultaneous linear algebraic equation. **CO2:** solve different methods of ODE and PDE **CO3:** recall the different methods used to solve simultaneous algebraic equation **CO4:** use interpolation formula to obtain difference table and Construct the polynomial. **CO5:** apply various methods of numerical Differentiation and Integration	

Course Code & Title	**18SSP04 APPLIED PHYSICS**		
Class	I MSc SS	**Semester**	I
Course Objectives	The Course aims • To impart the scientific ideas of laser physics and optical fibre and its applications • To give the ideas about the fundamentals of electricity and magnetism through their governing laws • To teach the physics of semiconductor materials and dielectric polarization phenomena • To educate the magnetism of materials and their classification • To inculcate concepts of nanoscience and nanotechnology.		

SYLLABUS

UNIT	Content	No. of Hours
I	Lasers and fibre optics: Construction and working of He-Ne Laser-CO_2 Laser- Ruby Laser-Semiconductor Laser- Application-Types of optical fibre-Singled and bundled fibres- Fibre material – Attenuation – Dispersion – Fibre optic light sources – Detectors – Fibre optic communication – Principles of optical recording.	**10**
II	Electrical properties: Free electron theory of Drude and Lorentz – Weidmann –Franz law – Distinction between conductors, semiconductors and insulators on the basis of band theory -Factors affecting the resistivity of a conductor .Temperature, Alloying pressure, strain, magnetic field and environment.	**09**
III	Semi conducting materials: Intrinsic, Extrinsic Semiconductors – Material preparation: Czochralski mothod – Zone refining. Hall effect in semiconductor – Applications. Physics of PN junction diode – Junction transistor. Dielectrics:Permittivity – Dielectric constant – Dielectric polarization- Types of polarization – Break down mechanisms.	**10**
IV	Magnetic properties: Ferro magnetism : Domain theory –Hysteresis – Hard and soft magnetic materials –Curie-Weiss law – Magnetostriction. Ferrites: Preparation Properties Applications – Magnetic bubble memory.	**09**
V	Background to nanotechnology - various preparation techniques – top down and bottom up– Sol-gel processing -laser methods – ball milling – nanotechnology and nano machines - Memory devices and sensors – Nano ferroelectrics - ferroelectric random access memories – introduction – Fe RAM circuit design.	**10**
Text Books / References	**1.** Nanoelectronics and Nanosystems: From transistors to molecular devices. K.Goser, P. Glosekotter, J. Dienstuhl, Springer (2004). **2.** A text Book of Engineering Physics – M.N Avadhanalu S.Chand & Co, (2014)	
Course Outcomes	**On completion of the course, students should be able to do** **CO1:** The encryption of scientific ideas of various lasers and fiber optic system in the minds **CO2:** the enumeration of the various properties of electrical aspects of materials and electric polarization **CO3:** the classification of physical nature crystals and its related phenomena **CO4:** the resolving the dia para and ferromagnetic properties of materials experimental demonstrations **CO5:** the upgraded understanding of concepts of nanoscience and nanotechnology.	

Course Code & Title	**18SSP05 LAB - I - C PROGRAMMING LAB**	
Class	**I M.Sc Software Systems**	**Semester-I**
Course Objectives	● To learn basic and complex data types. ● To trace the execution of programs written in C language. ● To write diversified solutions using C language ● To create simple applications using derived data types & file concepts.	

SYLLABUS

Ex. No.	Content
1	i) Create a program to generate number pyramid & pattern. ii) Program to extract last two digits of given year.
2	Write an application that displays every perfect number from 1 through 1000
3	i) Program to generate fibonacci series using recursion. ii) Program to find the sum of natural numbers using recursive function. iii) Program to create a student mark sheet using branching.
4	A local discount store has a policy of putting labels with dates on all of its new merchandise. If an item has not sold within two weeks that store discounts the item by 25% for the third week, 50% for the fourth week, and 75% for the fifth week. After that no additional discounts are given. Develop the function new-price, which takes the initial price of an item and the number of weeks since the item was dated and produces the selling price of the item.
5	i) Write a program to Implement the concept of static variable. ii) Program to find the smallest and largest element in array & reverse an array element.
6	i) Write a program to implement the concept of string operations. ii) Program to find the number of vowels, consonants, digits and white spaces in a given string.
7	Write a program for printing the elements of a two-dimensional array in each of the following orders a)To- and -fro row major order b) Diagonal-major order c) Spiral order
8	Implement the concept of structure to generate an electricity bill.
9	Create and manipulate employee information system using file concept.
10	On the completion student should undertake spoken tutorial on C.
Course Outcomes	**CO1:** Understand the declaration and usage of variable. **CO2:** Write a C program for a given algorithm. **CO3:** Trace the given C program manually. **CO4:** Implement Programs with pointers and arrays. **CO5**: Create simple applications using structures and files.

Course Code & Title	**18SSP06 LAB - II - PROGRAMMING IN PYTHON LAB**		
Class	**I - MSc Software Systems**	**Semester**	**I**
Course Objectives	• To provide Basic knowledge in Python. • To learn how to use lists, tuples, and dictionaries in Python programs. • To learn how to design object-oriented programs with Python classes. • To learn how to design and program Python applications.		

SYLLABUS

S.NO	Content
1	Write a Python program to compute the GCD of two numbers. Write a Python program to find the square root of a number.
2	Write a Python program to find the maximum of a list of numbers Write a Python program to find nth prime numbers.
3	Write a Python program to implement looping concept. Write a Python Program to implement string functions.
4	Write a Python Program to implement list methods. (Append, Extend, Insert, Sort, Remove, Pop, Clear, Reverse, Copy) Write a Python program using dictionary to perform the following: Create b) Update c) Sort d) Remove e) Clear f) Copy
5	Program to Print the Pascal's triangle for n number of rows given by the user
6	Write a Python Program to implement the concept of User defined functions. Write a Python Program to perform binary search
7	Program to Find All Numbers which are Odd and Palindromes Between a Range of Numbers without using Recursion.
8	Write a Python program to design a registration form using various controls.
9	Create an application for Student Information System.
10	Create an application for Library Management System.

Course Outcomes	**CO1:** Understand the concepts of object-oriented programming as used in Python: classes, subclasses, inheritance, and overriding. **CO2**: Able to implement the concept list, tuples and dictionary. **CO3:** Be able to read data from a text file using Python.

Course Code & Title	**18SSP07 LAB - III - MS-EXCEL LAB**	
Class	**I MSc Software Systems**	**Semester I**
Course Objectives	● To Enter and edit data. ● To Format data and cells. ● To construct formulas, including the use of built-in functions. ● To Create and modify charts. ● To Preview and print worksheets.	

SYLLABUS

S.No	Contents
1	a. Program to implement excel basics (copying, range selection, changing cell color, border, merging cells). b. Find Mean, Median, and Mode using Excel.
2	Implement conditional formatting to sort data by column, slice, and table wise.
3	Analyze student mark details using if condition and built in functions.
4	Analyze student feedback and visualize using chart.
5	Plot a graph using multiple data sets.
6	Create electricity bill details using logical functions.
7	Implement the concept of macros using Excel.
8	Apply Regression Analysis for particular company information.
9	Analyze a sample sales information system using pivot table and pivot chart.
10	Enter data and prepare various reports using Excel.
Course Outcomes	**CO1:** Perform mathematical operations **CO2:** Generate reports **CO3:** Create pivot table **CO4:** Create charts

Course Code & Title	**18SSP08 OBJECT ORIENTED PROGRAMMING USING C++**		
Class	**I M.Sc Software Systems**	**Semester II**	**Hours: 48**
Course Objectives	● To understand Object oriented paradigm. ● To learn the characteristics of an object-oriented programming language: data abstraction, information hiding, inheritance, and dynamic binding of the messages to the methods. ● To learn the principles of object-oriented design and software engineering in terms of software reuse and managing complexity. ● To enhance problem solving and programming skills in C++ with extensive programming projects. ● To be exposed to the file processing and exception handling.		

SYLLABUS

UNIT	Content	No. of Hours
I	**INTRODUCTION TO OBJECT ORIENTED PROGRAMMING:** Object oriented programming-characteristics of OOPs-advantages and disadvantages of OOPs-steps in developing OOP program **INPUT AND OUTPUT STREAMS:**Features of I/O stream-keyboard and screen I/O-manipulator functions-Input and output stream flags. **POINTERS:** Pointers and functions-pointers to functions-array of pointers-pointers and strings	**8**
II	**CLASSES AND OBJECTS:** Declaration of a class-member functions-defining object of class-accessing member of a class-array of class objects-classes within classes.	**10**
III	**CONSTRUCTOR AND DESTRUCTOR:** Constructor- copy constructor-parameterized constructor -destructor- virtual destructors **SPECIAL MEMBER FUNCTIONS:** inline member functions-friend function-dynamic memory allocation-this pointer- void pointer **INHERITANCE:** single -multiple -multilevel inheritance -	**10**
IV	**OVERLOADING FUNCTIONS AND OPERATORS:** function overloading-overloading unary and binary operators **POLYMORPHISM AND VIRTUAL FUNCTIONS:** virtual functions-pure virtual functions-abstract base classes.	**10**
V	**TEMPLATES, NAMESPACE AND EXCEPTION HANDLING:** function and class template-exception handling **DATA FILE OPERATIONS:** opening and closing of files-reading and writing a character from a file-binary file operations.	**10**
References	**Text Books:** 1. D.Ravichandran, "Programming with C++",Tata McGraw Hill, Third edition, 2011. **Reference Books:** 1. BjarneStroustrup, "The C++ Programming language", Pearson Education, Fourth edition, 2013. 2. DebasishJana,"C++ and Object –Oriented Programming Paradigm" , PHI learning, Third edition, 2014.	

Course Outcomes	**CO1:** Use the characteristics of an object-oriented programming language in a program. **CO2:** Use the basic object-oriented design principles in computer problem solving. **CO3:** Implement C++ program for any given problem. **CO4:** Apply concepts of operator overloading, constructors and destructors. **CO5:** Apply object oriented concepts in real world programs.

Course Code & Title	**18SSP09 DATA STRUCTURES**		
Class	**I M.Sc Software Systems**	**Semester II**	**Hours:48**
Course Objectives	● To be familiar with basic techniques of analysis of algorithm ● To understand concepts about searching and sorting techniques ● To be familiar with advanced data structures such as balanced search trees, hash tables and priority queues ● To master the implementation of dynamic data structures such as linked lists and binary trees ● To be familiar with some graph algorithms such as shortest path and minimum spanning tree		

SYLLABUS

UNIT	Content	No. of Hours
I	**INTRODUCTION:** Basic Terminology, Data structure, Time and space complexity – Array – Structures – Pointers – Matrices - Sparse matrices - Application – String processing - ADT- Asymptote Notation- Big Oh. Omega, That- Best, Worst and Average case analysis	**8**
II	**SORTING**: Bubble sort - Insertion sort - Selection sort - Merge sort - Radix sort - Quick sort - Time and Space Complexity. **SEARCHING**: Binary search - Sequential search – Index Search – Hashing techniques – Separate chaining – open addressing – rehashing – extendible hashing.	**10**
III	**LINKED LIST**: Linked list - Dynamic memory allocation – Representation - Insertion, deletion and searching - Traversing in a list – Linked list based Polynomial addition Doubly linked list.	**10**
IV	**STACK:** Stack – Linked stack – Application – Expression - Infix-Prefix-Postfix Conversion & Evaluation - Recursion. **QUEUE:** Queue - Linked queue - Circular Queue – Dequeue - Priority Queue - Application.	**10**
V	**TREES**: Binary trees-Traversal, BST-traversing, Insertion and deletion of nodes, introduction to B Tress and B+ Tress **AVL TREES**: Introduction – Rotations- Application of all trees – Heap sort. **GRAPH**: Terminology – Representation – Traversing - Shortest path problem- Prims,Kruskal's and Dijistras.	**10**
References	**Text Books:** 1. Seymour Lipschutz – Schaum Series: "Theory and Problems of Data Structures", Tata Mc-Graw Hill, New Delhi, 2002, Fifth Edition. Unit - 1 2. Mark Allen Weiss, "Data structures and Algorithm Analysis in C", Pearson Education, New Delhi, Second Edition , Reprint 2007 Unit II-V **Reference Books:** 1. Ellis Horowitz,SartajSahni, "Fundamentals of Data Structures", Galgotia Publications, 2009. 2. Tremblay Sorenson, "An Introduction to data structures with Applications", Tata Mc-Graw Hill, Second Edition, 2010.	
Course Outcomes	**CO1:** To analyze algorithms and algorithm correctness. **CO2:** To summarize searching and sorting techniques **CO3:** To implement stack, queue and linked list operation. **CO4:** To familiarize and differentiate tree and graphs concepts. **CO5:** To choose appropriate data structure as applied to specified problem definition	

Course Code & Title	**18SSP10 FUNDAMENTALS OF DIGITAL COMPUTERS AND ARCHITECTURE**		
Class	**I M.Sc Software Systems**	**Semester II**	**Hours:48**
Course Objectives	● To enable the students to have knowledge in digital circuits. ● To gain the systematic understanding of the basic structure and various operations of digital computer. ● To aware about Boolean algebra and logical circuit diagram. ● To provide the understanding of CPU architecture and its functionality and memory design. ● To understand circuit simplification techniques.		

SYLLABUS

UNIT	**Content**	**No. of Hours**
I	**BINARY SYSTEMS:** Digital computers and digital systems – Binary Numbers – Number base conversion – Octal and Hexadecimal numbers – Binary codes – Binary Storage and Registers – Binary Logic – Integrated circuits. **BOOLEAN ALGEBRA AND LOGIC GATES:** Basic definitions – Axiomatic Definition of Boolean Algebra – Basic theorems and properties of Boolean algebra – Boolean Functions – Canonical and Standard forms – other logic operations – Digital logic gates.	**9**
II	**GATE-LEVEL MINIMIZATION**: The map methods – Product of sums simplification – Don't care conditions – NAND and NOR implementation. **COMBINATIONAL LOGIC**: Adders – Subtractors – BCD adder – Decoders – Demultiplexers – Encoders – Multiplexers **SEQUENTIAL LOGIC**: Sequential circuits –Storage element Latches and Flip flops.	**9**
III	**DATA REPRESENTATION**: Introduction – Data types - Complements – Other Binary Code – Error Detection Codes. **REGISTER TRANSFER AND MICRO OPERATIONS**: Register Transfer Language– Register Transfer – Bus and Memory Transfer – Arithmetic Micro operations – Logic micro operations – Shift Micro operations – Arithmetic Logic Shift Unit.	**10**
IV	**CENTRAL PROCESSING UNIT:** Introduction-General register organization – Stack organization – Instruction formats – Addressing Modes – Data transfer and manipulation – Program control.	**10**
V	**INPUT-OUTPUT ORGANIZATION:** Input – Output Interface - Asynchronous data transfer-Priority Interrupt– Direct Memory Access - Input - Output processor, Serial Communication. **MEMORY ORGANIZATION:** Memory hierarchy – Main Memory – Auxiliary memory – Associative memory – Cache memory – Virtual memory- Memory management hardware.	**10**

References	**Text Books:** 1. M.Morris Mano, “Digital Logic and Computer Design”, Prentice Hall of India, Fourth edition, 2014. (Units I & II). 2. M.Morris Mano, “Computer System Architecture”, Prentice Hall of India, Third Edition, Reprint 2016. (Units III, IV & V). **Reference Books:** 1. Thomas C.Bartee, “Digital Computer Fundamentals”, Tata Mc-Graw Hill, Sixth Edition, Reprint 2011. 2. John D. Carpinelli, “Computer Organization & Architecture”, Pearson Education, 9thEdition, 2014. 3. John P.Hayes, “Computer architecture and Organisation”, Tata McGraw-Hill, Third Edition, 2012.	
Course Outcomes	**CO1**:Design two-level logic functions with AND, OR, NAND, NOR and XOR gates with minimum number of gate delays or literals **CO2**:Simplify the Boolean algebra using K-maps. **CO3**:Analyze the operation of sequential circuits built with various flip-flops. **CO4**:Use K-maps to minimize and optimize two-level logic functions up to 5 variables **CO5**:Know the basic knowledge of assembly language, instruction sets and their format.	

Course Code & Title	**18SSP11** **MATHEMATICS-II**		
Class	I MSc Software systems	**Semester**	II
Course Objectives	The Course aims • to introduce the concepts of tautological implications, • to make the students to learn about normal forms, • to illustrate transportation and assignment problems, • to inculcate the knowledge in graph theory.		

SYLLABUS

UNIT	Content	No. of Hours
I	**Mathematical logic I:** Introduction – Connectives – Negation – Conjunction – Disjunction – Statement Formulas and Truth Tables – Conditional and Biconditional – well formed formulas – Tautologies – Equivalence of formulas – Duality Law – Tautological implications – Functionally complete sets of connectives – Other connectives.	**12 hours**
II	**Mathematical logic II:** Normal Forms – Disjunctive Normal forms – Conjunctive Normal Forms – Principal Disjunctive Normal forms – Principal Conjunctive Normal Forms – Ordering and Uniqueness of Normal Forms – The Theory of inference for the Statement Calculus – Rules of inference – Consistency of Premises and Indirect Method of Proof.	**12 hours**
III	**Transportation Problem:** Existence of solution in T.P. – Duality in transportation problem – The transportation table – Loops in transportation tables – Solution of a transportation problem – Finding an initial basic feasible solution – Test for optimality – Degeneracy in Transportation problem – Transportation algorithm (MODI Method) – Some exceptional cases. **Assignment Problem:** Introduction – Mathematical formulation of the problem – Solution methods of Assignment problem – Special cases in Assignment problems.	**10 hours**
IV	**Graph theory:** **Introduction:** Definition – Finite and Infinite graph – Incidence and degree – Isolated vertex ,Pendant vertex and null graph. **Paths and Circuits:** Isomorphism – Subgraphs –Walks, Paths and Circuits – Connected Graphs, Disconnected Graphs and Components– Euler Graphs – more on Euler Graphs – Hamiltonian graphs and circuits – Travelling salesman problem.	**14 hours**
V	**Graph theory:** **Trees and fundamental circuits:** Trees – Some properties of trees – Pendant vertices in a tree – Distance and Centers in a tree – Rooted and Binary trees – Spanning trees.	**12 hours**
References	**Text Books:** **1.** J.P.Tremblay and R.Manohar , “ **Discrete Mathematical Structures with Applications to Computer Science”** Hill Edition Reprint 2007. **Unit – I:** **Sections 1.2.1 to 1.2.14** **Unit – II:** **Sections 1.3.1 to 1.3.5, 1.4.2, 1.4.3** 2. Kantiswarup- P.K.Gupta and Manmohan, **“Operations Research”** (sulthan chand and sons) 15th Edition 2010. **Unit – III:** **Sections 10.1 to 10.6, 10.8 to 10.10, 10.12, 10.13, 10.15, 11.1 to 11.4**	

	3.Narasing Deo , **“Graph theory with application to engineering and computer science”,** Prentice-Hall of India Pvt.- New Delhi-1. 2016. **Unit – IV: Sections 1.1 to 1.5, 2.1,2.2,2.4 to 2.6,2.8 to 2.10** **Unit – V: Sections 3.1 to 3.5,3.7** **Reference Books:** 1**.** J.K. Sharma, **“Discrete Mathematics”** 3rd Edition. 2. P.R.Vittal, V.Malini, **“Operations Research”** Reprint 2007.
Course Outcomes	**On completion of the course, students should be able to** **CO1:** understand the concepts of equivalence formulas and tautological implications, **CO2:** work with normal forms, **CO3:** understand the mathematical tools that are needed to solve optimization problems, **CO4**: model the problems in computer science using graphs and trees.

Course Code & Title	**18SSP12 LAB IV -OBJECT ORIENTED PROGRAMMING USING C++ LAB**	
Class	**I MSc Software Systems**	**Semester II**
Course Objectives	● To write and execute programs in C++ to solve problems ● To develop skills in object oriented programming. ● To impart the knowledge required to write code with good coding practices.	

SYLLABUS

S.No	**Content**
1	a. Program to test whether the initialized value and the value input by user are same. b. An electricity board charges the following rates to domestic users to discourage large consumption of energy: For the first 100 units - 60P per unit For next 200 units - 80P per unit Beyond 300 units - 90P per unit All users are charged a minimum of Rs.50.00. if the total amount is more than Rs.300.00 than an additional surcharge of 15% is added. Write a C++ program to read the names of users and number of units consumed and print out the charges with names.
2	a. Prepare student mark list using class. b. Create library management system using array of objects.
3	a. Program to find cube of a number using inline function. b. Program to get the value from user and display it using static function.
4	a. Program using friend function: 1) Program to calculate the mean value, 2) Program to add two complex numbers b. Program to swap two numbers using pointers.
5	a. Program to overload unary operator. Write a C++ program to count the number of persons inside a bank, by increasing count whenever aperson enters a bank, using an increment(++) operator overloadingfunction, and decrease the count whenever a person leaves the bank using a decrement(--) operator overloading function inside a class. b. Program to overload binary operator. Write a C++ program to create two objects of a class called company and add their data members using an operator overloaded function for '+' operator and'-'operator.
6	Program to implement function overloading.
7	a. Program to display student details using constructor and destructor. b. Program to implement virtual function.
8	a. Program for single inheritance to get and display the user name,age, height and weight. b. Program for hierarchical inheritance to display secondary colors.
9	a. Program to add two numbers (integer,float, Char) using template. b. Program to implement exception handling.
10	On the completion student should undertake spoken tutorial on C++
Course Outcomes	**CO1:** Identify the appropriate function for solving real world problems. **CO2:** Program using C++ features (inheritance, overloading). **CO3:** Develop complex application.

Course Code & Title	**18SSP13 LAB V - DATA STRUCTURES USING C LAB**	
Class	**I M.Sc Software Systems**	**Semester II**
Course Objectives	● To develop skills to design and analyze simple linear and non linear data structures. ● To develop programs to sort and search ● To implement Abstract Data Type ● To strengthen the ability of the students to identify and apply the suitable data structure for the given real world problem. ● To enable them to gain knowledge in practical applications of data structures.	

SYLLABUS

UNIT	**Content**
1	a. Implement the concept of bubble sort. b. Implement the concept of Insertion sort. c. Implement the concept of Selection sort.
2	a. Implement the concept of Quick sort. b. Implement the concept of Merge sort.
3	a. Search a given number using Binary search. b. Search a given number using linear search in one dimension. c. Search a given number using linear search in Two Dimensional array.
4	a. Implement Stack operations using linked list. b. Implement Stack operations using Arrays
5	a. Implement Queue operations using linked list. b. Implement Queue operations using Arrays.
6	a. Convert an Infix expression to postfix expression. b. Program to evaluate an expression.
7	a. Write a C program to add two Polynomials. b. Evaluate a polynomial using C.
8	Implement Linked List and its operations (Insert, Delete, Display, count)
9	Implement Doubly Linked List and its operations (Insert, Delete, Display, count).
10	a.Create a binary search tree and traverse it using function . b.Write a program to check balanced parentheses for a given infix expression.
Course Outcomes	**CO1:** Identity the appropriate data structure for given problem **CO2:** Develop practical knowledge on the applications of data structures **CO3:** Implement the Stack ADT using both array based and linked-list based data structures. **CO4:** Implement the Queue ADT using both array based circular queue and linked-list based implementations. **CO5:** Implement binary search trees

Course Code & Title	**18SSP14 LAB VI – INTERACTIVE MEDIA DESIGINING LAB**	
Class	**I M.Sc Software Systems**	**Semester-II**
Course Objectives	• To provide students with a basic understanding of multimedia systems. • To provide real world experiences to students. • To provide new platform document. • To motivate them towards developing their career in the area of multimedia and internet applications.	

SYLLABUS

S.No	Content
1	Design a home page that displays your information.
2	Create a webpage showing image, audio and video.
3	Create a website using forms and frames.
4	Create your own visiting card using Photoshop.
5	Create a paper advertising for any commercial agency using photoshop.
6	Design Brochure for your college using photoshop.
7	Create animated e-card using Flash.
8	Create a scene with a cartoon drawing using Flash.
9	Implement a simple game with Flash script.
10	Create a static website for any organization / department / college / social media / business application.
Course Outcomes	**CO1**: Make games by using multimedia concepts. **CO2:** Create websites what they want from any multimedia software tools. **CO3:** Create own successful static websites.

Course Code & Title	**19SSP15 PROGRAMMING IN JAVA**		
Class	**II M.Sc Software Systems**	**Semester -III**	**Hours:48**
Course Objectives	**This course aims to** ● Develop the knowledge of object-oriented paradigm in the Java programming language ● Use the Java SDK environment to create, debug and run simple Java programs. ● Develop the ability to write a java program to solve specific problems. ● Learn how to use Input streams & Output Streams to read and write data from and to a source. ● Learn how applets and Swing works.		

SYLLABUS

UNIT	Content	No. of Hours
I	**INTRODUCTION TO JAVA**: The History and Evolution of Java- How java Changed the Internet- Java's magic- The Bytecode. **AN OVERVIEW OF JAVA**: Two- Paradigms- abstraction- the three OOP Principles- Lexical Issues- Java Class Libraries- Type Conversions and Castings- Bitwise Operators- Control Statements – Arrays And Strings in Java	9
II	**CLASSES:** Declaring Objects- Assigning Object Reference variables- Methods- Parameterized Constructors- this Keyword – Garbage Collection- the finalize() method- overloading methods- Overloading Constructors- argument passing- Access Control- understanding static-final- Nested and inner classes-Using Command Line Arguments. **INHERITANCE:** Super and Subclasses- Using Super - Multi Level Hierarchy – Method Overriding - Dynamic Method Dispatch - Using Abstract Classes - Using final with Inheritance. **PACKAGES AND INTERFACES:** Packages - Access protection -Classpath- Importing Packages – Interfaces- Defining and Implementing interface- Nested interfaces - applying Interfaces	9
III	**EXCEPTION HANDLING:** Fundamentals - Exception Types- Uncaught Exceptions- Using Try- Catch- Displaying a Description of an exception – Multiple catch statements- Nested try statements- throw- throws- finally- Java's built-in exception- creating Your own exception subclasses- Chained exception- Using exception **MULTITHREADED PROGRAMMING:** Java Thread model- thread priorities- synchronization- Messaging-The Thread Class and the Runnable Interface- The Main Thread- Creating a Thread – implementing Runnable- Extending Thread – Creating multiple Threads- Using isAlive() and join() - thread priorities - synchronization - inter-thread communication - Suspending - Resuming and Stopping Threads	9
IV	**STRING HANDLING**: The String Constructors - String Operations - Character Extraction –Comparison – Searching - Modifying a String - String Methods – Stringbuffer Methods. **INPUT/OUTPUT:** The Java I/O Classes and Interfaces – File - The Stream Class - The Byte Streams - The Character Streams.	9

V	**THE APPLET CLASS:** Applet Basics - Applet Architecture- An Applet Skeleton- the HTML APPLET tag **EVENT HANDLING**: Different mechanism - The Delegation Event Model - Event Classes - Event Listener Interfaces. **INTRODUCING SWING:** The Origins of Swing - Swing Is Built on the AWT -Two Key Swing Features: Swing Components Are Lightweight- Swing Supports a Pluggable Look and Feel. The MVC Connection Components and Containers - The Swing Packages - A Simple Swing Application - Event Handling -Create a Swing Applet **EXPLORING SWING** : JLabel and ImageIcon - JTextField - The Swing Buttons : JButton - JToggleButton -Check Boxes - Radio Buttons - JTabbedPane - JScrollPane - JList – JcomboBox- -JTable	**12**
References	**Text Books:** 1. Herbert Schildt, “The Complete Reference Java 2”, Tata McGraw Hill, Seventh Edition, 2010. **Reference Books:** 1. Horstmann and John Wiley, “Computing Concepts with Java 2 Essentials”- Wiley Publications – 3rdEdition, 2000. 2. Rick Decker and Stuart Hirshfield, “Programming Java”, Vikas Publications, Second Edition, 2000.	
Course Outcomes	**On completion of the course, students should be able to** **CO1:** Gain Knowledge of the structure and model of the Java programming language. **CO2**: Use the Java programming language for various programming technologies **CO3:** Develop software in the Java programming language **CO4:** Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements **CO5:** Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem	

Course Code & Title	**19SSP16 RELATIONAL DATABASE MANAGEMENT SYSTEM**		
Class	**II M.Sc Software Systems**	**Semester -III**	**Hours:48**
Course Objectives	**This course aims to** ● Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL. ● Improve the database design by normalization. ● Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data. ● Use the Relational model and how it is supported by SQL and PL/SQL. ● Solve Database problems using SQL and PL/SQL and include the use of Procedures, Functions and Triggers.		

SYLLABUS

UNIT	Content	No. of Hours
I	**INTRODUCTION:** Purpose of Database Systems - View of Data - Database Languages - Relational Databases – Database Design – Data Storage and Querying - Transaction Management - Database Architecture – Data Mining and Information Retrieval – Specialty Databases – Database Users and Administrators.	9
II	**RELATIONAL DATABASES:** Structure of Relational Databases – Database Schema – Keys – Relational Query Languages – Relational Operations. **FORMAL RELATIONAL QUERY LANGUAGES:** The Relational Algebra. **DATABASE DESIGN AND THE E-R MODEL:** The Entity-Relationship Model – Constraints – Entity-Relationship Diagrams. **RELATIONAL DATABASE DESIGN:** Normalization – Decomposition Using Functional Dependencies.	10
III	**INTERACTIVE SQL:** Invoking SQL * plus- Data manipulation in Database Management Systems – Oracle Data Types – Two Dimension Matrix Creation- Insertion of data into tables- Updating the contents of a table – Deletion operations – The many faces of the Select command- Modifying the structure of the table – Removing/Deleting/Dropping tables – Data constraints – Computations in expression lists used to select data – Logical operations – Range searching – Pattern matching – Report creation-Oracle functions – Grouping data from tables in SQL – Manipulating dates in SQL – Joins – Subqueries.	10
IV	**THE UNION, INTERSECT AND MINUS CLAUSE:** Indexes – Views – Sequences- Granting permissions- Revoking the permissions given – Creation of reports in SQL* plus. **PL/SQL**: Introduction – Execution – PL/SQL syntax, Oracle transaction locks – Cursors. **STORED PROCEDURES:** Creating Stored Procedures – An application using a Procedure - Deleting a Stored Procedure.	10
V	**STORED FUNCTIONS:** Advantages of Functions –Creating a Stored Function – An application using a Function – Deleting a Stored Function-Application using stored function. **DATABASE TRIGGERS:** Types of Triggers –Creating Triggers – Deleting Triggers-Application using triggers.	9

References	**Text Books:** 1.Silberschatz A, Korth H F, S.Sudarshan "Database System Concepts", McGraw-Hill Publishing Company, Sixth Edition, 2011 (Unit I & II). 2.Ivan BayRoss, "Commercial Application Development Using ORACLE Developer 2000", BPB Publication, New Delhi, 2017 (Unit III, IV & V) **Reference Books:** 1.RamezElmasri, ShamkantB.Navathe, "Fundamentals of Database Systems", Pearson Education, Seventh Edition, 2017. 2.Rakesh Saini, M.M.S.Rauthan, AbhaySaxena, Bindu Sharma, "Database Management System", Vayu Education of India, 2011.	
Course Outcomes	**On completion of the course, students should be able to** **CO1:**Implement the database structure. **CO2**:Trace the given schema clearly. **CO3:**Implement programs with stored functions,procedures and triggers. **CO4:**Demonstrate an understanding of the relational data model. **CO5:**Formulate, using SQL, solutions to a broad range of query and data update problems.	

Course Code & Title	**19SSP17 SOFTWARE ENGINEERING**		
Class	**II M.Sc Software Systems**	**Semester -III**	**Hours:48**
Course Objectives	**This course aims to** ● Complement with a detailed knowledge of techniques for the analysis and design of complex software intensive systems. It aims to set these techniques in an appropriate engineering and management context. ● Understand the need of software requirements and the SRS document. ● Understand the methods of implementation issues such as modularity and coding standards. ● Understand the approaches to verification and validation including static analysis, and reviews. ● Manage the development of software systems.		

SYLLABUS

UNIT	Content	No. of Hours
I	**SOFTWARE AND SOFTWARE ENGINEERING:** Nature of software - Software definition - Software application domains - Legacy software - Unique name of the webapps - software engineering - Software process - Software Engineering practice - The Essence of Practice - General Principles - Software Myths. **SOFTWARE PROCESS - PROCESS MODELS: A GENERIC PROCESS MODEL-** Framework Activity - Identifying a Task set - Process Patterns - Perspective Process models: The Waterfall model - Incremental Process models - Evolutionary Process models - Concurrent Models.	9
II	**REQUIREMENTS ENGINEERING:** Establishing the groundwork - Identifying the stakeholders - Recognizing multiple viewpoints - working toward collaboration - Eliciting requirements - Collaborative requirements gathering. Quality Function Deployment- Usage scenarios - Elicitation work Products - Developing Use Cases - Building the requirements model - Elements of the requirements model - Analysis pattern - Negotiating requirements - Validating requirements.	10
III	**REQUIREMENTS MODELING:** Flow-Oriented Modeling - Creating a Data Flow Model -Creating a Control Flow Model - The Control Specification - The Process Specification. **DESIGN CONCEPTS:** The Design Process - Software quality guidelines and attributes - The Evolution of software design –Design Concepts. **ARCHITECTURAL DESIGN:** Software Architecture - Architectural descriptions - Architectural decisions - Architectural Styles - Taxonomy of architectural styles - Architectural Patterns - Organization and refinement.	9
IV	**PROJECT MANAGEMENT CONCEPTS:** The Management Spectrum - The People - The Product: Software Scope - Problem decomposition - The Process - The Project - The W^5HH Principle. **ESTIMATION FOR SOFTWARE PROJECTS:** Observations on Estimation - The Project Planning Process - Software Scope and Feasibility - Resources - Software Project Estimation - Decomposition Techniques - Empirical Estimation Models - Estimation for Object-Oriented Projects -	10

	Specialized Estimation Techniques - The Make/Buy Decision.	
V	**PROJECT SCHEDULING** -Basic Concepts - Project Scheduling - Defining a Task Set for the Software Project - Defining a Task Network - Scheduling - Earned Value Analysis. **MAINTENANCE AND REENGINEERING:** Software Maintenance - Software Supportability - Reengineering - Business process Reengineering - Software Reengineering Reverse Engineering - Restructuring - Forward Engineering - The Economics of Reengineering. **CASE STUDIES:** Waste Management Inspection Tracking System– GameForge	**10**
References	**Text Books:** 1.Roger S Pressman, “Software Engineering: A Practitioner's Approach”, TMH, 7th Edition, 2010. **Reference Books:** 1. Subramanian Chandramouli, SaikatDutt, ChandramouliSeetharaman, B.G. Geetha, “Software Engineering”, Pearson Education, 2015. 2. Ian Somerville, “Software Engineering”, Pearson Education, 10th Edition, 2015. 3. Richard Fairley, “Software Engineering Concepts” TMH, 30th Reprint, 2008 (1st Edition, 1997). 4.www.mhhe.com/engcs/compsci/pressman/student/olc/cases.mhtml (For Unit V – Case Studies)	
Course Outcomes	**On completion of the course, students should be able to** **CO1:**Work as an individual and as part of a multidisciplinary team todevelop and deliver quality software. **CO2:**Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle. **CO3:**Demonstrate an ability to use the techniques and tools necessary forengineering practice. **CO4:**Ability to use knowledge, techniques, skills and modern toolsnecessary for software engineering practice. **CO5:**Ability to analyze, design and manage the development of acomputing-based system, component or process to meet desired needs within realistic constraints in one or more application domains.	

Course Code & Title	19SSP18	STATISTICAL METHODS	
Class	II MSc (SS)	Semester	**III**

Course Objectives:

The Course aims to

- Compute various measures of location, measure of variation and their relative measures.
- Understand the relationship between the variables using correlation and regression and also to make predictions.
- Develop hypothesis testing methodology for accepting and rejecting null hypothesis about population parameters.
- Highlight the importance of parametric and non-parametric tests by using various statistical tools.
- Train students in solving problems related to computational tool using MS Excel.

SYLLABUS

UNIT	CONTENT	No.of Hours
I	Introduction to Statistics - Type of Statistics - Population and sample - types of variables - Characteristics of Statistics – graph for qualitative and quantitative data - Bar, pie, and Histogram. **Measures of Central Tendency:** Mean, Median, and Mode – definition, Calculation for ungrouped and grouped data – **Measures of Dispersion**: QD, SD and Coefficients - calculation for ungrouped and grouped data –simple problems.	**10**
II	**Measures of Skewness:** Definition, types of skewness, calculation for ungrouped and grouped data. **Simple linear Correlation and Regression analysis**: Meaning, Independent and dependent variables - method of measures for correlation (scatter plots, Karl - Pearson's and Spearman's)- Testing the Correlation Coefficient – construction of linear regression equations - coefficient of determination - simple problems.	**10**
III	**Statistical Inferences:** Confidence Interval (CI) estimation, the concept of a confidence interval, CI for population mean (SD is known and unknown) and a population proportion. **Hypothesis testing**: concept of hypothesis testing - Large sample tests - for testing single proportion, two proportions, single mean, and two means - small sample tests: t-test – for single and two means - simple problems.	**10**
IV	**Hypothesis testing**: F-test for testing two variances – ANOVA – one-way classifications. **Chi-square test**: Testing independence of attributes and goodness fit. **Non-parametric tests:** Scales of measurement, Sign test, Run test, Mann-Whitney U test.	**10**
V	**Using Excel package** for drawing diagram and graphs, calculating measures of central decency, dispersion, Skewness, Correlation and regression, Large and small sample test (single mean, and two means), One way ANOVA, Chi-square test (independence of attributes and goodness fit).	**10**

Note: Theory carries 25 marks and problems carries 50 marks.

References:

Text Books:

1. "Fundamentals of Mathematical Statistics", Gupta.S.C, and Kapoor, V.K., Sultan Chand and Sons Publications, New Delhi, 11th Edition, 2002.
2. "Foundations of Applied Statistical Methods", Hang Lee, Springer, 2016.
3. "Statistical Methods", S. P. Gupta, Sultan Chand & Sons Publications, New Delhi,(2012).
4. "Microsoft Excel Data Analysis and Business Modeling", Wayne Winston, Microsoft Press; 5 edition, 2016.
5. "Statistical Analysis with Excel For Dummies", Joseph Schmuller, For Dummies; 4th edition, 2016.

Reference Books:

1. "Excel 2016 Bible", John Walkenbach, Wiley; 1st edition, 2015.
2. "Statistical Methods of Analysis", Chin Long Chiang, Amazon Asia-Pacific Holdings Private Limited, 2003.
3. 'Applied Nonparametric Statistical Methods', 4th Edition, Peter Sprent and Nigel C. Smeeton, Chapman & Hall/CRC Texts in Statistical Science, 2007.

Course Outcomes:

On completion of the course, students will be able to:

- Organize and summarize data using descriptive statistics and appropriate statistical graphs and diagrams.
- Interpret and solve real life business problem using the concepts of statistics.
- Predict relevant relationship between variables using correlation and regression analysis.
- Apply suitable test of significance for making decisions in hypothesis testing.
- Carryout and interpret statistical data by using various nonparametric tests.
- Solve problems related to computational tool using MS Excel.

Course Code & Title	**19SSP19** **FINANCIAL AND MANAGEMENT ACCOUNTING**		
Class	**M.Sc Software Systems**	**Semester**	**III**
Course Objectives	The Course aims to • Understand the fundamental Concepts of Accounting Principles. • Gain factual knowledge about the placement of various items in Final Accounts of a Sole Trading Concern. • Analyze the financial statements with the help of tools and techniques of Management Accounting. • Understand the importance of Budgetary Control. • Identify the managerial applications of Marginal Costing Techniques.		

SYLLABUS

UNIT	Content	No. of Hours
I	**Introduction to Accounting** Accounting **-** Meaning – Principles, Concepts and Conventions – Double Entry Book Keeping – Advantages – Journal – Ledger – Preparation of Trial Balance. (Simple problems only).	**8**
II	**Final Accounts** Final Accounts of Sole Trading Concerns – Trading, Profit and loss Account and Balance Sheet. (Simple problems only).	**10**
III	**Management Accounting** Management Accounting – Meaning – Importance – Objectives – Advantages and Limitations – Financial Statement Analysis – Types – Ratio Analysis – Significance – Limitations – Liquidity, Solvency, Activity & Profitability Ratios.	**10**
IV	**Budgetary Control** Budgetary Control – Meaning – Objectives – Requisites for a successful Budgetary Control System – Fixed and Flexible budget – Functional Budgets.	**10**
V	**Marginal Costing** Marginal Costing – Break Even Analysis – Assumptions – Uses and Limitations – BEP – Margin of Safety – Profit Volume Analysis – Mangerial Applications of Marginal Costing.	**10**
References	**Text Book** 1. Grewal .T.S, “Introduction to Accountancy”, 37th Edition, S. Chand and Co. Ltd, New Delhi, 2014. 2. Sharma. K. Gupta, “Management Accounting”, 3rd Edition, Kalyani Publishers, New Delhi, 2012. **Reference Books** 1. Gupta R.L. and Radhasamy M., “Advanced Accountancy”, 5th Edition, Sultan Chand & Sons, New Delhi, 2012. 2. Jain S.P. Narang K.L., “Advanced Accountancy”, 12th Edition, Volume I, Kalyani Publishers, New Delhi, 2014.	
Course Outcomes	**On completion of the course, students will be able to** **CO1:** Journalize, post the Accounting entries and prepare the Trial balance **CO2:** Illustrate the method of preparing Final Accounts with various adjustments. **CO3:** Apply the tools and techniques of Management Accounting. **CO4:** Prepare the various Functional Budgets. **CO5:** Assist the management in planning, controlling & decision-making.	

Distribution of Marks: 60% problems and 40% theory

Course Code & Title	**19SSP20 LAB VII -JAVA PROGRAMMING LAB**	
Class	**II M.Sc Software Systems**	**Semester-III**
Course Objectives	**This Course aims to** ● Make the student learn an object oriented way of solving problems using java. ● Make the students to write programs using multithreading concepts and handle exceptions ● Make the students do programs using I/O streams. ● Make the students to create the Graphical User Interface using Applets, AWT Components.	

SYLLABUS

S.No.	**Content**
1	a. Implement Students mark sheet and display the grade sheet along with the best student detail. b. Write a Java Program to left rotate the elements of an array.
2	a.. Write a Java Program to print the duplicate elements of an array. b.Find Third Largest Number in an Array.
3	a. Write an application that accepts two doubles as its command line arguments, multiple these together and display the product. 7. b.Write an application that accepts one command line argument; display the line of reporting if number is even or odd.
4	a. Write a Java program to implement Single Inheritance. b.Write a Java program to implement multilevel Inheritance.
5	a. Write a java program to create an abstract class named shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle,, Triangle and Circle such that each one of the classes extends the class shape. Each one of the class contains only the method print Area () that print the area of the given shape. b.Create a user defined package in java which consists of the following classes: i.Random Number generation. ii.Calculation of Area for various geometrical figures.
6	Implement employee pay slip for the employees and throw exceptions when a. Basic pay<Rs.5000 and >Rs.30,000. b. Differences between Date of joining & Date of Birth is greater than 25 years.
7	Write Java Program to Handle Divide by Zero and Array Out of Bound exceptions.
8	a.Write a Java program that implements a multi-threaded program has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd the third thread will print the value of cube of the number. b.Write a Java Program implementing Thread Priorities.

9	a.Write a Java Program to implement Reading file as Byte Streams and Character stream. b. Write a Java Program to implement Buffering the input/output stream.
10	a.Write a Java Program to check whether the given two strings are Anagram. (A string is said to be an anagram if it contains same characters and same length but in different order e.g. army and Mary are anagrams.) b.Write a java Program to print all permutations of String. c. Write a Java Program to implement string methods.
11	a.Display current date and time using Applets. b.Write an Applet that displays a counter in the middle of applet. The counter starts from zero and keeps on incrementing after every second.
12	Design a form using Java Swing package for college admission or any other enrollment of your choice.
Course Outcomes	**On completion of the course, students should be able to** • Understand how to design, implement, test, debug, and document programs. • Understand the importance of Classes & objects along with constructors, Arrays and Vectors. • Discuss the principles of inheritance, interface and packages. • Understand importance of Multi-threading & different exceptionhandling mechanisms. • Develop graphical user interfaces in Java using applet and AWT that respond todifferent user events.

Course Code & Title	**19SSP21 Lab VIII - RDBMS LAB**	
Class	**II M.Sc Software Systems**	**Semester III**
Course Objectives	**This course aims to** ● Learn schema creation for problem domain. ● Create table and query. ● Write PL/SQL block. ● Create simple applications using stored functions, triggers and stored procedures.	

SYLLABUS

S.No	Content
1	Creation of tables using SQL statements with the constraints (Primary key, not null, check, unique) and do the following operations: a)Description of a table. b)Insert at least five tuples (using single insert command, using ‘&’ to insert multiple records) c)Add a single column d)Add multiple columns e)Change column width f)Add a foreign key constraint g)Drop not null constraint h)Drop a column
2	Create a table using SQL statement and perform the following: a)Insert from already existing table b)Update records in the table c)Select command (at least 25 statements) d)Delete command
3	Generate queries using the following: a)Numeric functions b)Character/string functions
4	Generate queries using the following: a)Date/Time functions b)Math functions
5	Create two tables and perform the following: a)Set operations(union, minus) b)Nested queries
6	Create two tables and perform the following: - Joins (inner join, left join, right join, full join, self join, Cartesian join.
7	Create a table using SQL command and perform the following: a)Order the records in ascending order b)Order the records in descending order c)Group the records
8	Create a report for mark sheet (should include title, page no, date, end of report statement, aggregate functions etc.,).

9	Create a cursor to manipulate employee details.
10	Create a stored procedure for customer table.
11	Create a stored function that accepts the bank account no, account balance and returns the customer level (based on account balance) as platinum, gold and silver to the calling program.
12	Create a row trigger to insert the existing values of the salary table into a new table when the salary table is updated.
Course Outcomes	**On completion of the course, students should be able to** **CO1:** Design and implement a database schema for a given problem-domain. **CO2**: Create and maintain tables using PL/SQL. **CO3:** Populate and query a database. **CO4:** Prepare reports.

Course Code & Title	**19SSP22 USER INTERFACE DESIGN**		
Class	**II M.Sc Software Systems**	**Semester IV**	**Hours: 48**
Course Objectives	**This course aims to** ● Learn the core syntax of XML, DTD, and XML Schema. ● Understand how to create Web Pages with Links and URLs. ● Design a web page with Tables, Images & Forms ● Understand the JavaScript Elements. ● Produce functional, flexible & versatile style sheets for website.		

SYLLABUS

UNIT	Content	No. of Hours
I	**OVERVIEW OF HTML5 AND OTHER WEB TECHNOLOGIES:** Internet and Web Technologies- Internet and Web - Introduction to Web Technologies-Exploring New Features of HTML5-Structuring an HTML Document-Exploring Editors and Browsers-Creating and Saving an HTML Document-Validating-Viewing-Hosting an Web Page. **FUNDAMENTALS OF HTML:** Understanding Elements-Describing Data Types-Working with Text-Organizing Text in HTML-Working with Links and URLs.	**8**
II	**CREATING TABLES IN HTML5:** Understanding Tables-Describing the table element- Creating Simple Table-Adding Title, Caption-Specifying the properties of the Columns- Spanning Rows and Columns-Using Images in Table-Nesting Tables. **WORKING WITH IMAGES, COLORS AND CANVAS**: Inserting Images in a Web Page-Exploring Colors. **WORKING WITH FORMS:** Exploring the FORM Element-Exploring Types of the INPUT Element-Button-Multiple-Choice-TextArea-Label-Fieldset-Legend-DataList-Keygen-Output-Progress-Meter-Submitting a Form	**10**
III	**DYNAMIC HTML: Overview of JavaScript:** Exploring the features of JavaScript-Using JavaScript in an HTML Document-Exploring programming Fundamentals of JavaScript-Functions-Events-Image Maps-Animations. **JavaScript Objects:** Exploring objects in JavaScript-Exploring the Standard/ Built-in JavaScript Objects. **Working with Document Object:** Describing the Document Object-Exploring the Cookies.	**10**
IV	**CSS:** Evolution –Syntax-CSS Selectors-Inserting CSS in an HTML Document. **Backgrounds and Color Gradients:** Background of a Web Page-Exploring Color Property. **Fonts and Text Styles:** Understanding Fonts- Font Properties in CSS-Displaying, Positioning and Floating an Element-List Styles-Table Layouts.	**10**
V	**CSS: Effects, Frames and Controls:**Different types of Effects-Frames-Customizing Controls. **XML**:Exploring XML-Comparing XML with HTML-Advantages and Disadvantages of XML- Structure of an XML Document- XML Entity References-XML Parsers- Describing DTD- Defining Entities in DTD.	**10**

References	**Text books:** 1.“HTML5 Black Book”, Dreamtech press, Second Edition. **Reference Books:** 1. Elizabeth Castro, Bruce Hyslop, “HTML and CSS: Visual QuickStart Guide”, 8th Edition,2014. 2. Joe Fawcett, Danny Ayers, Liam R.E Quin, “Beginning XML”, John Wiley & Sons, Fifth edition, 2012.
Course Outcomes	**On completion of the course, students should be able to** **CO1**: Successfully design Interactive web pages **CO2:** Design user-friendly web pages for real world applications **CO3**: Use knowledge of HTML and CSS code and an HTML editor to create personal and/or business websites **CO4:** Become familiar with the JavaScript language. **CO5:** Manipulate XML Documents programmatically using DOM and JavaScript

Course Code & Title	**19SSP23 OPERATING SYSTEMS**		
Class	**II M.Sc Software Systems**	**Semester IV**	**Hours:60**
Course Objectives	**This course aims to** ● Understand Functionalities and characteristics of OS ● Understand the concepts of Process & Deadlock ● Analyze scheduling algorithms. ● Understand memory management concept. ● Familiar with I/O Systems & File System Interface.		

SYLLABUS

UNIT	Content	No. of Hours
I	**INTRODUCTION:** Operating System-Computer System organization – Operating System Structure. **OPERATING SYSTEM STRUCTURES:** Operating System services– User and operating system interface-System Calls- System Programs- Operating System Design and Implementation- Operating System structures-system Boot.	**10**
II	**PROCESS MANAGEMENT:** Process concept – Process Scheduling – Operations on Processes – Inter process communication. **PROCESS SYNCHRONIZATION:** Critical section problem –Peterson's solution- Synchronization Hardware – Mutex locks- Semaphores- Classical problems of synchronization- Monitors. **CPU SCHEDULING**: Basic Concepts- Scheduling criteria – Scheduling algorithms- Multiple processor scheduling – Real Time Scheduling – Algorithm Evaluation.	**13**
III	**DEADLOCKS**: System Model- Deadlock Characterization – Methods for Handling Deadlocks- Deadlock Prevention- Deadlock Avoidance – Deadlock Detection and Recovery from Deadlock. **MEMORY MANAGEMENT:** Swapping – Contiguous memory allocation – Segmentation- Paging.	**13**
IV	**VIRTUAL MEMORY:** Demand Paging – Page replacement – Allocation of Frames – Thrashing – Memory Mapped Files. **STORAGE STRUCTURE:** Disk structure- Disk Attachment-Disk Scheduling-Disk Management.	**12**
V	**FILE SYSTEM INTERFACE:** File concept– Access methods – Directory and Disk Structure. **FILE SYSTEM IMPLEMENTATION:** File system structure – File System Implementation-Directory Implementation-Allocation Methods – Free Space Management- Recovery. **I/O SYSTEMS:** Overview- I/O Hardware- Application I/O interface.	**12**
References	**Text Books:** **1.** Abraham Silberschatz, "Operating System Concepts", John Wiley & Sons Inc., Ninth Edition, 2013. **Reference Books:** 1. Dhamdhere D M, "Operating systems – A concept based approach", Tata McGraw Hill, 2nd Edition, 2006. 2. Harris, J. Archer, "Operating systems", Tata McGraw Hill, 1st edition, 2008. 3. William Stallings," Operating Systems Internals and Design Principles", Pearson Prentice Hall, Seventh Edition, 2012.	

Course Outcomes	**On completion of the course, students should be able to** **CO1:** Understand the basic structure of Operating Systems **CO2:** Analyze various scheduling algorithms. **CO3:** Understand Prevention & Avoidance algorithms. **CO4:** Compare various memory management concepts. **CO5:** Understand File system implementation.

Course Code & Title	**19SSP24 AGILE SOFTWARE DEVELOPMENT**		
Class	**II M.Sc Software Systems**	**Semester IV**	**Hours:48**
Course Objectives	**This course aims to** ● Learn the fundamental principles and practices associated with each of the agile development methods. ● Study the key ideas underlying agile methodologies. ● Enable the students to understand the implementation concepts of Agile Software Development. ● Carry out effectively the adoption, roll out and appropriate adaptation of agile methods in their organizations. ● Ability to learn leadership qualities		

SYLLABUS

UNIT	Content	No. of Hours
I	**INTRODUCTION TO AGILE SOFTWARE DEVELOPMENT**: Three Perspectives on Software Engineering-The Agile Manifesto-Application of Agile Software Development-Data About Agile Software Development- Agile Software Development in learning Environments. **TEAMWORK**: A Role Scheme in Agile Teams-Dilemmas in Teamwork-Teamwork in Learning Environment.	**9**
II	**CUSTOMERS AND USERS**: The Customer- The User- Customer and User in Learning environments. **TIME**: Time Related Problems in Software Projects-Tightness of Software Development Methods - Sustainable Pace - Time Management of Agile Projects - Time in Learning Environments. **MEASURES**: Why are measures needed-Who decides what is measured - What should be measured - When are measures taken - How are measures taken - Who takes the measures - How are measures used-Measures in Learning Environments.	**10**
III	**QUALITY**: The Agile approach to Quality Assurance - Test-Driven Development - Measured TDD-Quality in Learning Environments. **LEARNING**:Agile Software development Support - Learning in learning environments. **ABSTRACTION**: Abstraction Levels in Agile Software development - Abstraction in learning environments.	**9**
IV	**TRUST**: Software Intangibility and Process Transparency- Game Theory Perspective in Software Development-Ethics in Agile Teams-Diversity-Trust in Learning Environments. **GLOBALIZATION**: The Agile Approach in Global Software Development-Application of Agile Principles in Non-Software Projects-Globalization in Learning Environments. **REFLECTION**: Reflection on learning in Agile-Reflective Practitioner Perspective-Retrospective-Reflection in Learning Environments.	**10**
V	**CHANGE**: A Conceptual Framework for Change Introduction-Transition to an Agile Software Development Environments- Change in Learning Environments. **LEADERSHIP**: Leaders-Coaches-Leadership in Learning Environments. **DELIVERY AND CYCLICALITY**: Delivery-Cyclicality- Delivery and Cyclicality in Learning Environments.	**10**

Reference s	**Text books:** 1. Orit Hazzan and Yael Dubinsky, “Agile Software Engineering”, Springer, 2nd Edition, 2014. **Reference books:** 1.Orit Hazzan and Yael Dubinsky, “Agile Anywhere: Essays on Agile Projects and Beyond”,Springer,2nd Edition,2014. 2. Jim Highsmith, “Agile Project Management”, Addison-Wesley Professional; 2 edition, 2010.	
Course Outcomes	**On completion of the course, students should be able to** **CO1**: Compare agile software development to traditional softwaredevelopment models. **CO2**: Describe several agile methods for software development. **CO3**:Apply agile practices such as standup meetings, and pair programming to their software engineering practices. **CO4:** Earn how agile methods scale to large and distributed projects,including the role of systems engineering. **CO5:** Create and critique user stories for system requirements.	

Course Code & Title	**19SSP25**	**MICROPROCESSOR AND INTERFACING**	
Class	II M. Sc., Software Systems	**Semester**	IV
Course Objectives	**The Course aims** • to gain hardware knowledge on processors • to acquire the programming skills on assembly language programming • to develop interfacing techniques of various peripherals with the processor		

SYLLABUS

Unit	Content	No. of Hours
I	**Microcomputer System** Microprocessor architecture and its operations – Microprocessor initiated operations and 8085 bus organization- Internal data operations and the 8085 registers - Peripheral initiated operations – Memory classifications.	9
II	**Microprocessor Architecture and Memory Interfacing** 8085 microprocessor-microprocessor communications and bus timing - Demultiplexing the bus - Generating control signals - The 8085 MPU and its architecture - Memory interfacing - Memory structure and its requirements - Basic concepts in memory interfacing - Address decoding and memory addresses	10
III	**Instruction and Programming Techniques** Data transfer instruction – Arithmetic operations – Logic operations – Branch operations – Programming techniques – Looping, counting and indexing - Additional data transfer and 16-bit arithmetic instruction – Arithmetic operations related to memory – Rotate logic operations – Compare instruction	10
IV	**Software Development** Addition of two 8 bit numbers - addition of two 16 bit numbers - Subtraction of two 8 bit numbers- subtraction of two 16 bit numbers - ones and twos complement of 8 bit numbers - ones and twos complement of 16 bit numbers - - To find largest number in an array - To find smallest number in an array – sorting numbers in Ascending order - sorting numbers in descending order - Sum of series of 8-bit numbers - Multiplication of two 8-bit data - Division of two 8-bit data - Block data transfer.	10
V	**Interfacing:** 8255 PPI – Block diagram – Control word – I/O mode operation - Masking of least significant bits an 8-bit data – Masking of most significant bits an 8-bit data -Design of binary counter- Design of ring counter - Water level indicator using 8255 PPI.	9
References	**Text Books:** 1. Ramesh S Gaonkar, "***Microprocessor Architecture, Programming and Applications with 8085/8080A***", Wiley Eastern Ltd, 2nd Edition, 1995. (Unit-I,II,III,IV) 2. B. Ram, "***Fundamental of Microprocessor and Microcomputers***", Dhanpat Rai Publications, 5th Edition, 2003. (Unit-IV,V) **Reference Books:** 1. N. K. Srinath, "***8085 Microprocessor and Intefacing***", PHI, 4th Edition, 2005. 2. Sunil Mathur,***'Microprocessor and its Interfacing***", PHI, 2nd Edition, 2011.	
Course Outcomes	**On completion of the course, students should be able to** **CO1:** gain through knowledge on processors. **CO2:** develop software using assembly language programming. **CO3:** know the Interfacing concepts of various peripherals.	

Course Code & Title	19SSP26	OPERATIONS RESEARCH	
Class	II MSc (SS)	Semester	**IV**

Course Objectives:

The Course aims to

- Understand the basic assumptions and properties of LPP by using graphical and simplex methods.
- Structure special type of LPP's using transportation and assignment Models.
- Construct network diagrams with a single and three time estimates of activities involved in a project.
- Realize the need to study replacement and maintenance analysis techniques.
- Understand how optimum strategies are formulated in conflict and competitive environment.
- Learn the variety of performance measures of a queuing system.
- Solve some specific problems of scheduling jobs on two and three machines.

SYLLABUS

UNIT	CONTENT	No.of Hours
I	Introduction to Operation Research – Meaning -Features- Limitations of Operations Research- **Linear programming problem (LPP):** Definition - Formulation of an LPP- Graphical of an LPP- General Form, basic terms, Canonical form, Standard form and Simplex method – Duality - Simple problems.	10
II	**Transportation problem** - Finding IBFS – NCWR, Least-cost method, VAM and Optimal solution - Assignment Problem (Hungarian Method) – Simple Problems.	10
III	**Network Analysis** – concept, definition and Construction of networks - CPM & PERT analysis – Probability for completing the scheduled time - Simple problems.	10
IV	**Replacement models**: Elementary replacement models – money value fixed and money value changes with time models – Replacement of items that fail completely - Individual and group replacement policy models – simple problems. **Game Theory**: Two- person zero-sum game - Games with & without saddle points - Maximin-minimax principles - Dominance principle.	10
V	**Queuing Theory**: Definition & Characteristics of queuing system – Simple Problems in the models (M/M/1:∞/ FIFO), (M/M/1: N/ FIFO) and (M/M/C: ∞/ FIFO). **Sequencing problems**: Johnson's rule for n jobs 2 machines, n jobs 3 machines problems – Simple problems.	10

References:

Text Books:

1. "Operations Research", Gupta P K and Hira D S, Sultan Chand and Sons Publications, New Delhi, 2014.
2. "Quantitative Techniques", N.D. Vohra, Tata McGraw Hill Publications New Delhi, 1971.
3. "Operations Research", Swaroop Kanti ,Gupta P K ,Manmohan , Sultan Chand and Sons Publications, New Delhi , 11th edition, 2014.

Reference Books:

1. "Operations Research: Theory and Applications", J.K. Sharma, McMillan India. Ltd. New Delhi, 2003.
2. "Operations Research Concepts Problems & Solutions", V.K. Kapoor, Sultan Chand and Sons, New Delhi, 2014.
3. "Operations Research an Introduction", Hamady, A. Taha, Pearson Education India; 17th edition, 2002.

Course Outcomes:

On completion of the course, students will be able to:

- Formulate operations research models to solve real life problems by using graphical and simplex methods.
- Analyze the advanced methods for large-scale transportation and assignment problems.
- Undertake a project, identify bottlenecks and discover alternate work plan for a project.

- Appreciate the use of replacement analysis in handling problems like staffing problems and equipment renewal problems etc.,
- Apply various methods to select optimum strategies to win the game.
- Apply various queuing models to eliminate customers/ clients waiting period for service delivery.
- Evaluate sequencing problems of scheduling jobs on two and three machines.

Course Code & Title	**19SSP27 Lab IX - USER INTERFACE DESIGN AND CASE TOOLS LAB**	
Class	**II MSc Software Systems**	**Semester IV**
Course Objectives	**This course aims to** ● Create web pages lists, headers, tables & images. ● Develop web sites using form controls and embedding CSS in HTML document. ● Gain the knowledge of JavaScript fundamentals and objects. ● Understand about XML document structure and schema. ● Exposed to the UML diagrams and learn to map the design to code.	

SYLLABUS

S.No	**Content**
1	Create a webpage with HTML describing your department. Use paragraph and list tags. Also apply font styling like italics, underline and use header tags.
2	a)Design a timetable and display it in tabular format b)Design a mark sheet and display all your marks with subjects in a tabular format. c) Create a web page with images and include the attributes such src, alt, height, width, align, link etc..,
3	Design a signup form using various form controls.
4	Design a registration form and validate its field by using JavaScript.
5	Design the scientific calculator using JavaScript.
6	Design a web page using CSS (Cascading Style Sheets - both Internal and External) which includes the following: a) Use different font, styles: In the style definition you define how each selector should work. Then, in the body of your pages, you refer to these selectors to activate the styles. b) Set a background image for the page
7	Design an XML document to store information about a student. The information must include Name, address, Branch, Year of Joining, and e-mail id. Makeup sample data for 3 students. Create a CSS style sheet and use it to display the document.

8	Write an XML file which will display the Book information. It includes the following: 1) Title of the book 2) Author Name 3) ISBN number 4) Publisher name 5) Edition 6) Price. (a) Write a Document Type Definition (DTD) to validate the above XML file. (b) Display the XML file as follows. The contents should be displayed in a table. The header of the table should be in color GREY. And the Author names column should be displayed in one color and should be capitalized and in bold. Use your own colors for remaining columns.
9	Design and implement Library Management System through class diagram, object diagram, activity diagram, use case diagram, sequence diagram, State diagram
10	Identify the components involved in Employee Management System using interaction diagram, deployment diagram, collaboration diagram, component diagram
11	Model the Airline Reservation System with all necessary diagrams and generate the code.
12	Design and implement ATM System through all possible USE CASE tools and generate code for the same.
Course Outcomes	**On completion of the course, students should be able to** **CO1:** Develop the personal/business related web sites with images, forms **CO2:** Apply JavaScript functions,events in an HTML document **CO3:** Use style sheets effectively **CO4:** Create XML documents for various purposes **CO5:** Construct and evaluate hybrid CASE tools by integrating existing tools.

Course Code & Title	**19SSP28**	**MICROPROCESSOR AND INTERFACING LAB**	
Class	**II M. Sc., Software Systems**	**Semester**	IV
Course Objectives	**The Course aims** • *to learn various instructions of processor practically.* • *to inculcate programming skills in Assembly Language program.* • *to design hardware circuits and interface it with the processor.*		

LIST OF EXPERIMENTS

ANY 10 EXPERIMENTS

1. Addition of two 8-bit numbers
2. Subtraction of two 8-bit numbers
3. Multiplication of two 8-bit numbers
4. Division of two 8-bit numbers
5. 1's and 2's complement of a given 8-bit data
6. Largest/smallest in an array
7. Positive/negative numbers in an array
8. Number of ones and zeros in a data
9. ODD/EVEN numbers in an array
10. Ascending/ Descending order
11. Block data transfer
12. Reading/writing of data using 8255 PPI
13. Binary counter/ring counter using 8255 PPI

Course Outcomes	**On completion of the course, students should be able to** **CO1:** use various instructions of processor practically. **CO2:** develop software in Assembly Language program. **CO3:** design hardware circuits and interface it with the processor.

Course Code & Title	**19SSP29 DATA COMMUNICATIONS AND NETWORKING**		
Class	**III M.Sc Software Systems**	**Semester – V**	**Hours:60**
Course Objectives	**The Course aims to,** • Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model. • Read the fundamentals and basics of Physical layer and will apply them in real time applications. • Learn Session layer design issues, Transport layer services and protocols. • Gain core knowledge of Network layer routing protocols and IP addressing. • Enhances the skill of classifying various layers and protocolsused in networking.		

SYLLABUS

UNIT	CONTENT	No. of Hours
I	**Introduction-** Uses of Computer Networks- Network Hardware - Network Software. **The Physical Layer**-Guided Transmission Media- Wireless Transmission-Switching Techniques –Multiplexing techniques	12
II	**The Data Link Layer** - Data Link Layer Design Issues - Error Detection and Correction - Elementary Data Link Protocols - Sliding Window Protocols. **The Medium Access Control Sublayer** - Multiple Access Protocols -Data Link Layer Switching	12
III	**The Network Layer** -Network Layer Design Issues - Routing Algorithms- Congestion Control Algorithms-The Network Layer in the Internet	12
IV	**The Transport Layer** - The Transport Service-Elements of Transport Protocols - The Internet Transport Protocols: UDP - The Internet Transport Protocols: TCP	12
V	**The Application Layer-** The Domain Name System-HTTP-FTP- Electronic Mail- The World Wide Web **Network Security-** Cryptography- Symmetric-Key Algorithms- Public-Key Algorithms- Digital Signatures	12
References	**Reference Books:** 1. Andrew S. Tanenbaum, “Computer Networks”, Pearson Education International,Eighth Edition, 2013. 2. Larry L. Peterson & Bruce S. Davie, “Computer Networks – A systems Approach”, Harcourt Asia / Morgan Kaufmann Fifth Edition, 2012. 3. William Stallings, “Data and Computer Communications”, PHI, Tenth Edition, 2014.	
Course Outcomes	**On completion of the course, students should be able to,** **CO1:** Describe the functions of each layer in OSI and TCP/IP model. **CO2:** Explain the functions of Application layer and Presentation layer paradigms and Protocols. **CO3:** Discuss the Session layer design issues and Transport layer services. **CO4:** Classify the routing protocols and analyze how to assign the IP addresses for the given network. **CO5:** Improve the employability in network administration.	

Course Code & Title	**19SSP30 R PROGRAMMING**

Class	**III M.Sc Software Systems**	**Semester –V**	**Hours:48**
Course Objectives	**The Course aims to,** - Understand the basic R programming constructs. - Make the students proficient in R Objects Vectors and Lists. - Manage data frames and related packages. - Create R functions and loop functions. - Focus on skills on analysis and data visualization using real datasets.		

SYLLABUS

UNIT	CONTENT	No. of Hours
I	**Overview of R:** Basic features of R. Entering Input Evaluation- R Objects – Numbers – Attributes- Creating Vectors- Mixing Objects - Explicit Coercion. **Getting Data In and Out of R:** Reading and Writing Data- Reading Data Files with read.table()-Reading larger Datasets with read.table().Using the readr package. File Connections-Reading Lines of a text File-Reading from URL connection.	9
II	**Subsetting R Objects:** Subsetting a vector-Subsetting a Matrix- Subsetting Lists – Subsetting Nested Elements of a List-Partial Matching- Removing NA Values. Vectorized Operations, Dates and Times. **Managing Data Frames with the dplyr package: Data Frames**-The dplyr Package-dplyr Grammer-select()-filter()-arrange()-rename()- mutate()-group_by().	10
III	**Control Structures:**if-else-for Loops-Nested for Loops-while Loops- repeat Loops- next,break. **Functions:**Functions in R – Arguments - Argument Matching-Lazy Evaluation. Scoping Rules of R **Loop Functions:** Looping on the command Line- lapply()- sapply() – split() – splitting a Data Frame – tapply- apply()-Col/Row sums and Means-Other ways to Apply - mapply()- Vectorizing the function.	10
IV	**Arrays and Matrices:** Array Indexing-Subsections of an Array- Index Matrices- The Array() Function- Mixed Vector and Array Arithmetic- The Recycling Rule -The outer product of two arrays - Generalized transpose of an Array -Matrix Facilities -Matrix Multiplication. **Lists:** Constructing and modifying lists-Concatenating lists	9
V	**Statistical Graphics:** Basic Graphs - ggplot2. **Introduction to Graphical Analysis:** Box plots – Scatter plots-Pairs plots-Line charts-Pie charts-Dot charts-Bar charts-Copy graphics to other Applications. Analysis of Variance - Simple Regression- Multiple Regression	10
References	**Reference Books:** 1. Roger D.Peng, “RProgramming for Data Science”, Fifth Edition, 2016. 2. W. N. Venables, D. M. Smith, “An Introduction to R – A Programming Environment for Data Analysis and Graphics”, 2016. 3. Mark Gardener, “Beginning R, Statistical Programming Language”, Wiley India Pvt Ltd, 2013. 4. Jared P.Lander, “R for Everyone,Advanced Analytics and Graphics”, Pearson India Education, Second Edition, 2014. 5. Prashanthsingh, VivekMourya, “The Art of R Programming”,CengageLearning India,2015.	
Course Outcomes	**On completion of the course, students should be able to,** **CO1:** Solve the problems using computational methods and techniques. **CO2:** Design to use R to solve statistical problems **CO3:** Design a program using R Objects for the applications. **CO4:** Implement the applications for regression models. **CO5:**Improve the career opportunities as data analyst by comprehending the dataset using various plots in R	

Course Code & Title	**19SSP31 SOFTWARE QUALITY ASSURANCE AND SOFTWARE TESTING**		
Class	**III M.Sc Software Systems**	**Semester -V**	**Hours:48**
Course Objectives	**The Course aims to,** • Learn activities, methodologies and requirements specification. • Perform Assessment and Evaluation for project management. • Gain Knowledge about metrics for managing Quality assurance. • Understand Quality, Quality measures, standards and Plans. • Initiate the skills for incorporate various effective testing techniques and tools.		

SYLLABUS

UNIT	CONTENT	No. of Hours
I	Software project versus other projects – Contract Management and Technical Project Management – Activities covered by Software Project Management- Plans, Method and Methodologies – Setting Objectives – Requirements Specification – Management Control – Stepwise Project Planning.	9
II	Program Management and Project Evaluation – Strategic Program Management – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation – Selection of an Appropriate Project Approach.	10
III	Software Effort Estimation – Experiments Judgment – Procedural Code – Oriented Approval – Activity Planning – Project Schedule – Sequencing and Scheduling Activities – The Forward Pass – The Backward Pass – Identifying Critical Activities.	9
IV	Software Quality – The place of software quality in project planning – The importance of software quality –Defining software quality –ISO 9126-Practical software quality measures – Product versus Process quality management - External Standards – Techniques to help enhance software quality – Quality plans	10
V	Software Testing – Principles – Software Development Life Cycle Models – Types of Testing – White Box Testing – Black Box Testing – Integration Testing – System and Acceptance Testing – Performance Testing – Regression Testing.	10
References	**Reference Books:** 1. Bob hughes and mike cotterell, “Software project management”, Tata McGraw Hill, Fourth Edition, 2014. 2. SrinivasanDesikan and Gopalaswamy Ramesh, “Software testing”, Pearson Education, Eighth edition, 2013.	
Course Outcomes	**On completion of the course, students should be able to,** **CO1:** Know the software quality measures and models. **CO2:** Use testing metrics for project development. **CO3:** Apply various testing techniques and tools in test life cycle. **CO4:** Perform cost evaluation and software assessment techniques. **CO5:**Provide the knowledge to become a Software tester with Quality Assurance Techniques.	

Course Code & Title	**19SSP32A DISCIPLINE SPECIFIC ELECTIVE – I CLOUD COMPUTING**

Class	III M.Sc Software Systems	Semester –V	Hours : 60
Course Objectives	**The Course aims to,** • Basics of cloud computing and Key concepts of virtualization. • Different Cloud Computing services. • Cloud Implementation, Programming and Mobile cloud computing. • Develop skills for using the Key components of Amazon Web Services. • Understand the different collaborations in cloud computing.		

SYLLABUS

UNIT	CONTENT	No. of Hours
I	**Examining the value prepositions:** Define cloud computing – Accessing the value prepositions – Understanding cloud architecture – Understanding services and applications by type.	12
II	**Using platforms:** Understanding Abstraction and Virtualization – Exploring Platform as a Service – Using Google Web Services – Using Amazon Web Services – Using Microsoft Cloud Services. **Exploring Cloud Infrastructures:** Managing the cloud – Understanding cloud services.	12
III	**Understanding Services and Applications:** Understanding Service Oriented Architecture – Moving applications to the Cloud – Working with Cloud Based storage – Using Web Mail Services. Using the Mobile Cloud: Working with mobile Devices – Working with Mobile Web Services.	12
IV	**Cloud Computing For Everyone:** Cloud Computing for Community – Collaborating on Schedules – Collaborating on Group Projects and Events – Cloud Computing for Corporation – Managing Schedules – Managing Projects – Presenting On Road.	12
V	**Storing and Sharing:** Understanding Cloud Storage – Evaluating Online File Storage – Exploring Online Book Marking Services – Exploring Online Photo Editing Applications – Exploring Photo Sharing Communities – Controlling it with Web Based Desktops.	12
References	**Reference Books:** 1. Barrie Sosinsky, “Cloud Computing Bible”, Wiley Publications, 2011. 2. Michel Miller, “Cloud Computing”, Pearson Education, 2009. 3. Toby Velte, Antony Velte, Toby J.Velte, “Cloud Computing -A Practical Approach”, McGraw-Hill, 2009. 4. RajkumarBuyya , James Broberg, AndrzejGoscinski: Cloud Computing Principles and Paradigms, Willey 2014.	
Course Outcomes	**On completion of the course, students should be able to,** **CO1:** Define Cloud Computing and memorize the different Cloud service and deployment models **CO2:** Describe importance of virtualization along with their technologies. **CO3:** Use and Examine different cloud computing services and collaborations in their career opportunities . **CO4**: Analyze the components of open stack & Google Cloud platform and understand Mobile Cloud Computing. **CO5:** Describe the key components of Amazon web Service	

Course Code & Title	**19SSP32B DISCIPLINE SPECIFIC ELECTIVE – I** **DESIGN AND ANALYSIS OF ALGORITHMS**		
Class	**III M.Sc Software Systems**	**Semester - V**	**Hours:60**
Course Objectives	**The Course aims to,** • Develops the skill of solving problems using algorithms • Study the various ways of analyzing algorithms. • Analyze the efficiency of alternative algorithmic solutions for the same problem • Comprehend the various algorithm design techniques • Understand the limitations of various algorithms		

SYLLABUS

UNIT	CONTENT	No. of Hours
I	**Analyzing Algorithms:** The Role of Algorithms in Computing - Growth of Functions – Recurrences - The Substitution Method - The Recurrence Tree Method - The Master Method - Probabilistic Analysis and Randomized Algorithms – Amortized Analysis – Aggregate Analysis – Accounting Method.	12
II	**Brute Force And Divide and Conquer:** Brute Force – Computing an– String Matching – Closest-Pair and Convex-Hull Problems - Exhaustive Search – Travelling Salesman Problem – Knapsack Problem – Assignment problem.	12
III	**Divide And Conquer & Greedy Design Strategies:** Analysis of Quick Sort, Merge Sort – Binary Search- Strassen's Matrix Multiplication – Greedy Algorithms –Optimization Problem – method – examples – Minimum Cost Spanning Tree (Prim's and Kruskal's algorithm) - Huffman Code	12
IV	**Dynamic Programming and Other Design Strategies:** Dynamic Programming – Method - Examples –All Pairs Shortest Path Algorithm - Warshall's and Floyds Algorithm – Travelling Salesperson Problem – Backtracking – 8 Queen's Problem - Graph Coloring Problem - Branch and Bound Strategy - Knapsack Problem –Travelling Salesperson Problem.	12
V	**Np Problems :** NP-Completeness –Polynomial time - NP - Completeness Proofs – NP Complete Problems: Hamiltonian Cycle and Traveling Salesman Problems	12
References	**Reference Books:** 1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Cliford Stein, "Introduction to Algorithms", Third Edition, Prentice Hall, 2010. 2. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, 2008. 3. Kenneth A. Berman and Jerome L. Paul, "Algorithms", Cengage Learning India, 2010. 4. Alfred V Aho, John E Hopcroft and Jeffrey D Ullman, "The Design and Analysis of Computer Algorithms", First Edition, Pearson Education, 2006.	
Course Outcomes	**On completion of the course, students should be able to, CO1:** Develop the skill in analysis to solve any problem **CO2**: Propose the correct algorithmic method to solve any problem **CO3**: Ability to choose appropriate design techniques for solving problems. **CO4**: Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs. **CO5**: Sound algorithmic knowledge helps in better employment.	

Course Code & Title	**19SSP33 LAB-XI NETWORKS LAB**	
Class	**III M.Sc Software Systems**	**Semester-V**
Course Objectives	**The Course aims to,** ● Get familiar with the basic network administration commands. ● Understand the network simulator environment and visualize a network topology and observe its performance ● Analyze the traffic flow and the contents of protocol frames. ● Implement a skill of learning in client-server socket programs. ● Design and configure a network for anorganization.	

SYLLABUS

Ex. No.	Content
1	Simple Chat Program using TCP Sockets
2	Sliding Window Protocol using TCP Sockets
3	DNS using UDP Sockets
4	Tracing of TCP and UDP Connection using Wireshark
5	Performance Comparison of OSPF,EIGRP,RIP Routing Protocols using Cisco Packet Tracer
6	Implement Ping in Java
7	Finding class of the IP address
8	Congestion Control Using Leaky Bucket Algorithm
9	Configure Default Route and Static Route using Cisco Packet Tracer
10	Implement Access Control List using Cisco Packet Tracer
11	Configure Routing Information Protocol using Cisco packet tracer
12	Implement OSPF & EIGRP using Cisco packet tracer
Course Outcomes	**On completion of the course, students should be able to,** **CO1:** Execute and evaluate network administration commands and demonstrate their use in different network scenarios **CO2:** Demonstrate the installation and configuration of network Simulator in their career. **CO3:** Demonstrate and measure different network scenarios and their Performance behavior. **CO4:** Analyze the contents the packet contents of different protocols. **CO5:** Implement the socket programming for client server architecture.

Course Code & Title	**19SSP34 Lab-XII R Programming Lab**	
Class	**III M.Sc Software Systems**	**Semester –V**
Course Objectives	**The Course aims to,** • Understand the basic R programming constructs. • Make the students proficient in R Programming like vectors, Table, Data Frame • Have knowledge about data analysis and statistics solutions. • Impart the skills in programming using R in statistics and data analysis.	

SYLLABUS

Ex. No.	CONTENT
1	Write an R-Program to demonstrate working with operators (Arithmetic, Relational, Logical, Assignment operators).
2	Create an R-Program a. To Check if a Number is Odd or Even b. To check if the given Number is a Prime Number
3	Develop an R-Program a. To find the Factors of a Number b. To find L.C.M and HCF of two numbers
4	Create an R program for performing string operations
5	Using an R Program, make a Simple Calculator
6	With the help of an R-Program using recursive function a. Find the Factorial of a Number b. Find Fibonacci sequence
7	Convert decimal to binary and vice versa Using R Program
8	Develop an R Program to create a Vector and to find sum, mean for the elements in a Vector
9	Demonstrate matrix operations Using R (Addition, Subtraction, Multiplication, Division and Transpose).
10	Write an R Program a. To create a DataFrame.
	b. To access a Data Frame like a List. c. To access a Data Frame like a Matrix.
11	Write an R Program to create, access and Modify Components of a Factor.
12	Write an R Program for analyzing dataset using various charts.
Course Outcomes	**On completion of the course, students should be able to, CO1:** Solve the problems using computational methods. **CO2:** Design a program using R Objects to solve statistical problems. **CO3:** Ability to comprehend the dataset using various plots in R. **CO4**: Implement the various statistical tools in their data analyst role.

Course Code & Title	19SSP36 ADVANCED JAVA		
Class	**III M.Sc Software Systems**	**Semester - VI**	**Hours:48**
Course Objectives	**The course aims to,** • Gain knowledge about session and cookies • Apply MVC architecture in real time scenario. • Update and retrieve the data from the databases using SQL • Understand component-based Java software using JavaBeans and JSP • Develop the skill of using server side programs in the form of servlets.		

SYLLABUS

UNIT	CONTENT	No. of Hours
I	**Java Server Pages:** User Interface for the application-Scriptlets and expressions – Methods of request object – Request JSP with HTTP Get and Post Method – Regular Java classes with JSP – JSP tags –JSP errors	**9**
II	**Servlet:** Requesting a Servlet – Mapping to a URL – Methods – Instance Variables – Servlet Errors **MVC Pattern:** Forward Request and Redirect Responses – Validate Data – Include File in a JSP – web.xml File	**10**
III	**Sessions and Cookies:** Session tracking – set and get Session attributes – Methods of Session Objects URL encoding to track session without cookies Thread safe access to the session object– create, view and delete cookies – enable and disable cookies – methods for cookies – Utility class for cookies	**10**
IV	**JSP tags with Java Beans:** Introduction to Java Beans – Use Bean Tag – getProperty and setProperty tags **JSP Standard Tag Library:**JSTL Libraries – JSTL JAR Files- taglib directive – URL tag- forEach tag – forTokens tag –attributes for looping – if tag – choose tag – import tag	**10**
V	**JDBC Connectivity:** Database drivers – connecting to a database – return a result set – retrieve data from result set – insert, update and delete data – prepared statements – connection pooling. **HTTP requests and responses:**MIME types – HTTP request headers – HTTP status codes – HTTP response headers – return a tab limited file as an excel spread sheet – control caching – compress a response with GZIP – File download dialog box	**9**
References	**Reference Books:** 1. Joel Murach, Andrea Steelman, “Java servlets and JSP”, Mike Murach andAssociates inc, Second Edition, 2013. 2. HerbertSchildt, “Java - The Complete Reference”, Tata McGrawHill, Seventh Edition, 2008. 3. Jim Keogh, “J2EE- The Complete Reference”, Tata Mcgraw- Hill, First Edition,2002. 4. Alur Deepak, Malks Dan and Crupi John, “Core J2EE Patterns: Best Practices and Design Strategies”, Prentice Hall India, Second Edition, 2003. 5. Austin and Pawlan, “Advanced Programming for JAVA 2 Platform”, Pearson Education,2000. Geary M. David, “ Core JSTL Mastering the JSP standard Tag Library”, Pearson Education, 2007.	
Course Outcomes	**On completion of the course, students should be able to,** **CO1:** Knowledge of the structure and model of the Advanced Java programming language **CO2:** Develop software using MVC architecture **CO3:** Propose the use JSP, Beans and servlets by implementing them to solve the given problem **CO4:** Choose an engineering approach to solving problems, starting from the acquired knowledge of session and cookies **CO5:** Design a real time web application in their employment opportunists.	

CourseCode & Title	**19SSP37 DYNAMIC PROGRAMMING USING PHP AND BOOTSTRAP**		
Class	**III M.Sc Software Systems**	**Semester - VI**	**Hours:48**
Course Objectives	**The course aims to,** - Give basic Knowledge of PHP and MySQL, PHP form validation, understand basic concepts of database stores information via tables. - Learn how to retrieve and manipulate data from one or more tables. - Understand how server-side programming works on the web. - Develop the skill to comprehend PHP Basic syntax for variable types and calculations. - Design websites using PHP built-in functions and creating custom functions		

SYLLABUS

UNIT	CONTENT	No. of Hours
I	**Essential PHP**: Mixing HTML and PHP- comments – variables. Operators and flow control: Assignment operators- incrementing and decrementing values-string, bitwise, execution operators, operator precedence-relational, logical operators- Conditional statements, ternary operator, switch statement- for loops-while loops- do-while loops, for each loop. **Strings and Arrays**: string functions-converting to and from strings formatting. Arrays-modify, delete- handling arrays with loops- array functions-implode-explode functions-extracting data from array sorting arrays-array operators-multidimensional arrays.	10
II	**Functions:** creating- passing & returning data in arrays-passing arrays and returning arrays from functions-pass by reference- using default arguments- returning references, Lists. Variable scope-global datastatic variables, conditional functions-variable functions-nesting functions- creating include files- returning errors from functions. **Reading data in web pages:** Setting up web pages to communicate with PHP-handling text field, text areas, check boxes, radio buttons, list boxes, password controls, hidden controls, image maps, file uploads, buttons. .	10
III	**File handling:**fopen-feof –fgets – fclose - fgetc. Use of file-getcontents, file- put-contents, reading and writing a file into and from an array- use of file- exists, filesize. **Working with database**-SQL commands- Creating MySQL database-Table-insert-delete-update table. Sessions, Cookies: Setting, reading, deleting cookies, simple email creation and Sending, Storing data in sessions. Ajax: Getting started with Ajax writing Ajax- creating and opening XMLHttpRequest Object-Handling downloaded data, starting the download- Ajax with PHP-Passing data to the server with GET and POST	10
IV	**Bootstrap Scaffolding:** Bootstrap- Bootstrap File Structure – Default Gird system-Offsetting Columns- Nesting Columns – Fluid Grid System – Container Layouts-Responsive Design. **Bootstrap CSS:**Typography – code- Tables – forms – Buttons- Images – Icons.	9
V	**Bootstrap Layout Components:** Dropdown Menus – Options- Button Groups- Buttons with Dropdowns – Navigation Elements – Navbar- Breadcrumbs- Pagination – Labels-Badges – Typographic Elements- Thumbnails- Alerts- Progress Bars. **Bootstrap JavaScript Plugins :** Overview- Programmatic API – Transitions- Modal – Dropdown – Scrollspy – Toggleable Tabs- Tooltips – Popover- Alerts- Buttons – Collapse – Carousel- Typeahead – Affix	9
References	**Reference Books:** 1. Steven Holzner, “PHP: The complete Reference”, TMH publication,2011 2. Jake Spurlock, “Bootstrap”, O, Reilly Media, First Edition, 2013 3.W. Jason Gilmore, “Beginning PHP and MySQL 5: From Novice to Professional”, Apress publication, Second Edition.	

Course Outcomes	**On completion of the course, students should be able to, CO1**: Code PHP scripts to handle HTML forms. **CO2**: Write regular expressions including modifiers, operators, and metacharacters. **CO3**: Analyze and solve various database tasks using the PHP language. **CO4**: Solve common Web application tasks by writing PHP programs. **CO5**: Create dynamic websites using PHP, Bootstrap after their graduation.

Course Code & Title	**19SSP38 DATA WAREHOUSING AND MINING**		
Class	**III M.Sc Software Systems**	**Semester - VI**	**Hours:48**
Course Objectives	**The course aims to,** • Introduce the concepts of data warehousing with special emphasis on architecture. • Implement data mining functionalities in real time systems. • Be Familiar with mathematical foundations of Data Preprocessing. • Characterize the data classification and clustering techniques. • Apply the skill of selecting appropriate mining techniques in various domains and applications.		

SYLLABUS

UNIT	CONTENT	No. of Hours
I	**Data Warehouse and OLAP Technology**: An overview – Data warehouse – A Multidimensional Data Model – Data warehouse Architecture – Data Warehouse Implementation – From Data Warehousing to Data Mining.	9
II	**Introduction:**Data Mining – Functionalities – Classification of Data Mining Systems – Task Primitives – Major issues. **Data Preprocessing:** Descriptive Data Summarization – Data Cleaning – Data transformation – Data reduction – Data discretization and Concept hierarchy generation.	10
III	**Mining Frequent Patterns, Associations and Correlations:** Basic Concepts – Frequent Item set Mining methods- Various kinds of Association Rules. **Classification and Prediction:** Issues regarding classification and prediction – Classification by Decision Tree Induction – Rule based Classification.	10
IV	**Cluster Analysis:** Types of Data – Partitioning Methods- Hierarchical Methods – Density based Methods. Outlier analysis.	10
V	**Mining Object, Spatial, Multimedia, Text and Web Data:** Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Text Mining – Mining the World Wide Web.	9
References	**Reference Books:** 1. Jiawei Han &MichelineKamber, "Data Mining concepts and Techniques". Morgan Kaufmann Publishers,2010. 2.ArunK.Pujari, "Data Mining Techniques", University Press(India) Pvt Ltd. 3. PaulrajPonnaiah, "Data Warehousing Fundamentals", JohnWiley & Sons,2006. 4. SoumendraMohanty,"Data Warehousing Design, Development and Best Practices", Tata McGraw-Hill Publishing Company Ltd, 2006.	
Course Outcomes	**On completion of the course, students should be able to,** **CO1:** Understand the various stages during data warehousing and Data mining. **CO2:** Analyze the issues and techniques in data preprocessing. **CO3:** Understand the need to preprocess data before data mining. **CO4:** Implement classification and clustering techniques for predictive analysis. **CO5:**Demonstrate the mining techniques in all types of systems during their employment.	

Course Code &Title	**19SSP39 SOFTWARE PATTERNS AND ARCHITECTURE**		
Class	**III M.Sc. Software Systems**	**Semester VI**	**Hours:48**
Course Objectives	**The Course aims to,** • Use Design Patterns and develop Object Oriented Systems. • Identify Architectural Solutions to Real Time Problems. • Learn the skill to Refractor Open source Projects using Refactoring Tools. • Understand to develop simple Refactoring Tools. • Adopt new Refactoring Techniques and Implementation.		

SYLLABUS

UNIT	CONTENT	No. of Hours
I	**Introduction to Patterns:** Reusable Object Oriented Software - Motivation, Best design practices of Object Oriented Software - Coupling and Cohesion - Types of Cohesion and Coupling - Benefits of Patterns - Definition of a Pattern - Types - Pattern description - Pattern Language – IDIOMS - Frameworks,Architecture.	10
II	**Design Patterns:** Creational Patterns – Abstract factory – Builder – Factory Method – Prototype – Singleton – Structural Patterns – Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy – Behavioral Patterns – Command, Interpreter, Iterator, Mediator, memento, Observer, State, Strategy, Template Method, Visitor –Chain of responsibility – Case studies.	10
III	**Architectural Patterns:** From Mud to Structure – Layers, Pipes and Filters, Black Board, Distributed Systems – Broker Interactive Systems – **Model View Controller (MVC)** – Presentation Abstraction Control, Adaptable Systems, Reflection, Microkernel,Anti – patterns.	10
IV	**Refactoring:**Introduction– Principles of Refactoring – Bad smells in Code – Refactoring techniques – Composing Methods – Moving features between Objects - Organizing data – Simplifying conditional Expressions – Making method calls simpler – Dealing with Generalization – Design Refactoring – Technical Debt – Design Smells – Abstraction Smells, Encapsulation Smells, Modularization Smells, Hierarchy Smells – Architectural Refactoring – Refactoring Tools.	9
V	**Smells:**Design Smells – Abstraction Smells, Encapsulation Smells, Modularization Smells, Hierarchy Smells.	9
Reference Books:	1. Erich Gamma, Richard Halm, Ralph Johnsons and John Vlissidas, “Design Patterns: Elements of Reusable Object Oriented Software”, Pearson Education, 2009. 2. Frank Buschman, RegineMeunier, Hans Rohnery, Peter Sommerlad and Michael Stal, “Pattern – Oriented Software Architecture: A System of Patterns”, John Willey, 2011. 3. Martin Fowler, Kent Beck, William Opdyko, Don Roberts, “Refactoring: Improving the Design of Existing code”, Adison Wesley Longman, 2012. 4. ShanfYacoub, HanyAmmar, “Pattern – oriented Analysis and Design: Composing Patterns to Design Software Systems”, Pearson Addison - Wesley, 2003. 5.GirishSuryanarayana, Ganesh Samarthyam, Tushat Sharma, “Refactoring for Software Design Smells “Managing Technical Debt”,Morgan Kaufmann Publishers, Elsevier Ince, 2014.	

Course Outcomes	**On completion of the course, students should be able to, CO1:** Develop Object Oriented Systems using Design Patterns. **CO2:** Design and giving Architectural solutions to Real Time problems by the usage of Architectural Patterns. **CO3:** Work with Refactoring open source Projects using Refactoring Tools. **CO4:** Develop simple Refactoring Tools. **CO5:** Adopt new Refactoring Techniques which makes the Implementation highly usable

Course Code & Title	**19SSP40A DISCIPLINE SPECIFIC ELECTIVE – II CRYPTOGRAPHY**		
Class	**III M.Sc Software Systems**	**Semester - VI**	**Hours:48**
Course Objectives	**The Course aims to,** • Understand the fundamentals of Cryptography • Acquire a skill on standard algorithms used to provide confidentiality, integrity and authenticity. • Learn the various key distribution and management schemes. • Gain knowledge to deploy encryption techniques to secure data in transit across data networks • Design security applications in the field of Information technology		

SYLLABUS

UNIT	CONTENT	No. of Hours
I	**Computer and Network Security Concepts:** Computer security concepts – Security Attacks – Security services – Security Mechanisms **Classical Encryption Techniques:** Symmetric cipher model – Substitution Techniques – Transposition Techniques	**10**
II	**Block Ciphers and Data Encryption Standard:** Data Encryption Standard **Advanced Encryption Standard:** AES structure – AES transformation functions – AES key expansion	**10**
III	**Block Cipher Operation:** Electronic Codebook – Cipher Block chaining mode – Cipher feedback Mode – Output Feedback Mode- Counter Mode **Public Key Cryptography and RSA:** Principles of public key cryptosystems- The RSA Algorithm **Other Public - Key Cryptosystems:** Diffie-Hellman Key Exchange	**10**
IV	**Cryptographic Hash Functions:** Secure Hash Algorithm 512 **Message Authentication Codes:** Message Authentication Functions – HMAC Algorithm – Data Authentication Algorithm – Cipher based message authentication code **Digital Signatures:** Digital signatures **-** NIST Digital signature algorithm	**9**
V	**Intruders:** Intruders –Intrusion Detection – Password Management **Malicious Software:** Viruses and related threats – Virus Countermeasures – Distributed Denial of service attacks **Firewalls:** Firewall Design principles – trusted systems – Common criteria for Information technology security evaluation	**9**
References	**Reference Books:** 1. William Stallings, ”Cryptography and Network Security Principles and Practices”, Prentice Hall, Fourth Edition, 2013 2. V KPachghare, “Cryptography and Information Security”, PHE, 2013	
Course Outcomes	**On completion of the course, students should be able to,** **CO1:** Analyze the vulnerabilities in any computing system and hence be able to design a security solution. **CO2**: Identify the security issues as network administrator and resolve it. **CO3**: Evaluate security mechanisms using rigorous approaches, including theoretical **CO4**: Compare and Contrast different Intruders and viruses. **CO5**: Comprehend Firewall and its application.	

Course Code &Title	**19SSP40B DISCIPLINE SPECIFIC ELECTIVE – II SOFT COMPUTING**		
Class	**III M.Sc. Software Systems**	**Semester VI**	**Hours:48**
Course Objectives	**The Course aims to,** • Learn the various basic Concepts of Neural Networks and different types of Neural Network Architectures available. • Gain knowledge about Back propagation Algorithm and analyze the effect of various Tuning Parameters that can be used in a Back propagation Algorithm. • Impart the skill to differentiate the Crisp and Fuzzy Sets and study Operations which can be performed in both. • Study the working Principle of Genetic Algorithms and to understand the Importance and benefits of Encoding Process. • Understand the role of Bitwise Operators in Genetic Algorithms and to know the step by step Process Involved in Generational Cycle.		

SYLLABUS

UNIT	CONTENT	No. of Hours
I	**Associative Memory :**Auto correlators – Hetero correlators – WANG et Multiple Training Encoding Strategy – Exponential BAM – Associative Memory for Real Coded Patterns – Applications of Associative memory	9
II	**Adaptive Resonance Theory:** Introduction – Cluster Structure – Vector Quantization – Classical ART Networks – Simplified ART Architecture – ART 1 – Architecture of ART 1 – Algorithm –ART 2 - Architecture of ART 2 – Algorithm – Applications of ART.	10
III	**Fuzzy Logic**: Fuzzy Set Theory: Fuzzy versus Crisp-Crisp sets— Fuzzy sets. **Fuzzy Systems**: Crisp Logic- Predicate logic-Fuzzy Logic-Fuzzy rule based system.	10
IV	**Genetic Algorithms:** Fundamentals of Genetic Algorithms **Genetic Algorithms**:Basic concepts – Creation of offsprings – Working Principle – Encoding	10
V	**Genetic Modeling**: Inheritance operators – cross over – inversion and deletion – Mutation operator – Bit-Wise Operators – Bit-Wise operators used in GA – Generational Cycle	9
References	**Reference Books:** **1.** Rajasekaran S and VijayalakshmiPai, "Neural networks, Fuzzy Logic, and Genetic Algorithms", Prentice Hall of India, 2006. 2. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, Pearson Education, 2004. 3.Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 2004. 4. Russell C. Eberhart, "Computational Intelligence: Concepts to implementations", Morgan Kaufmann Publishers Inc., 2007.	
Course Outcomes	**On completion of the course, students should be able to, CO1:** Implement various techniques as Network Architect. **CO2**: Tune the Back propagation Algorithm according to the Network. **CO3**: Implement various Possible Operations in both Crisp as well as Fuzzy Sets **CO4**: Implement the Genetic Algorithms by the studied principle and to ensure whether all benefits of Encoding have been achieved. **CO5**: Ensure the achievability of the Role of Bitwise Operators and check whether the step by step Process has been Implemented in the Generational Cycle.	

Course Code & Title	**19SSP41 Lab-XIII ADVANCED JAVAPROGRAMMING LAB**	
Class	**III M.Sc Software Systems**	**Semester-VI**
Course Objectives	**The course aims to,** ● Design and develop Web applications ● Implement Enterprise based applications by encapsulating an application's business logic. ● Develop skills to apply various pre-built frameworks.	

SYLLABUS

Ex. No.	CONTENT
1	a. A simple servlet that generates plain text b. A servlet program which displays cookie id
2	a. Design and implement arithmetic calculator using JSP b. Simple Servlet Showing Different Styles of a Phrase
3	a. Implement the concept Java Beans concept b. Displaying Multiplication Table in Servlet for a Number Entered inHtml Page(HTML to servlet communication)
4	a. Develop a login form using Session Management
5	a. Create an application using custom JSP tags b. Incorporating HTML in JSP
6	Designing a Login Form Using Html and Displaying the Contents ofthe Login Form along with Date and Time in Servlet(Html to Servlet Communication)
7	a. Registering a New User and Displaying the Number of Visits made by the Existing User using Cookies (Html to Servlet Communication) b. Finding the Presence of a value and its Position in the Cookie List, otherwise Registering the Value as a Cookie(Html to Servlet Communication)
8	Printing Fibonacci Series (HTML, JSP, Servlet communication)
9	Create an application using JSP and JDBC connectivity
10	Mark List Processing in Servlet with Records Taken from Database (Servlet, JSP and JDBC connectivity)
11	Program to implement MVC architecture
12	Servlet program to read contents from file and write the same into another file and also display the read contents on the browser(Servlet and File Manipulation)
Course Outcomes	**On completion of the course, students should be able to,** **CO1:** Learn to access database through Java programs, using Java Data Base Connectivity(JDBC) **CO2:** Create dynamic web pages, using Servlets and JSP like code designer. **CO3:** Make a reusable software component, using Java Bean.

Course Code & Title	**19SSP42 LAB- XIV DYNAMIC PROGRAMMING USING PHP AND BOOTSTRAP LAB**	
Class	**III M.Sc Software Systems**	**Semester-VI**
Course Objectives	**The course aims to,** • Design and develop static and dynamic web pages. • Familiarize with Client-Side Programming, Server-Side Programming. • Learn a skill to use Database Connectivity to web applications. • To enable the student to program web application using the following technologies PHP & Bootstrap. • Create a dynamic website using PHP and MySQL in no time	

SYLLABUS

Ex. No.	CONTENT
1	Design a simple Webpage Using PHP
2	Design a credit card Form using Bootstrap Layout Components.
3	Implement Looping Structures Using PHP
4	Implement String Functions using Arrays
5	Design student application form using Bootstrap.
6	a. Calculate Area & Perimeter for Different Shapes using Functions b. Design a Home page Using Bootstrap CSS
7	a. Program to merge two arrays into a new Array b. Create a Website for a company using Bootstrap.
8	Design an E-mail Registration form with Various Controls
9	Program to create a Simple login and Logout using Sessions
10	Prepare an Application to implement Electricity Bill
11	Create a Bus Ticket Booking Applications
12	Develop a basic Employee Management System
Course Outcomes	**On completion of the course, students should be able to,** **CO1:**Design and develop dynamic web pages with good aesthetic sense of designing and latest technical know-how's. **CO2:**Have a good understanding of Web Application Terminologies, Internet Tools other web services. **CO3**: Learn to link and publish web sites in their working environment. **CO4**:Use cascading style sheets to design web pages **CO5:** Help the students to develop applications with different technologies and database driven applications

Generic Elective Course – [EDC] - (Cluster – VI)

Course Code & Title	**SOFTWARE PROJECT MANAGEMENT**		
Class	**Generic Elective Course – [EDC]**	**Semester : V**	**Hours:20**
Course Objectives	**The Course aims to** • Outline the needs of Software Project Management. • Understand Project approach & Project Management. • Familiar with Software estimation & Risk Assessment.		

SYLLABUS

UNIT	**Content**	**No. of Hours**
I	**INTRODUCTION:** Introduction-Project-Software Project versus other types of project-Activities-setting objectives. **AN OVERVIEW OF PROJECT PLANNING:** Stepwise project planning-Select project-Identify Project scope & objectives-Identify project Infrastructures-Project Characteristics- Identify Activities-Estimate effort-Identify activity risks-Allocate resources-Review Plan.	6
II	**SELECTION OF AN APPROPRIATE PROJECT APPROACH:** **PROCESS MANAGEMENT:** Choosing methodologies and Technologies-Software processes and process models-Waterfall Model-Spiral Model-Software prototyping-Incremental delivery-Rapid Application Development-Agile method-Extreme Programming.	7
III	**SOFTWARE EFFORT ESTIMATION:** Basics of Software estimation-Techniques – Bottom up estimation-Top down approach and parametric models. **RISK MANAGEMENT:** Risk-Categories of risk-A framework dealing with risks-Risk identification-Risk Assessment-Risk Planning-Risk Management.	**7**
References	**Text Books:** 1**.** Bob Hughes, "Software Project Management", McGraw Hill, Fifth Edition, 2010. **Reference Books:** 1. Walker Royce, "Software Project Management", Pearson Eduction, 2012. 2. Ashfaque Ahamed, "Software Project Management", CRC Press, 2012.	
Course outcomes	**On completion of the course, students should be able to do** **CO1:** Understand the basics of Software Project Management. **CO2:** Analyze estimation techniques. **CO3:** Risk management.	

GENERIC ELECTIVE COURSE – CLUSTER VI

Course Code & Title	**ENTERPRISE RESOURCE PLANNING** **(for** MCom International Business, MCom Corporate Secretaryship, MCom Computer Application &MCA**)**	
Class	**Cluster VI --Generic Elective Course**	**Hours: 48**
Course Objectives	• To modernize and integrate business processes and systems. • To provide services through an intuitive and integrated interface, and ultimately aims to: Improve Service Experience - Enhance Competitiveness - Modernize Business Processes and Systems - Automate Business Solutions.	

SYLLABUS

UNIT	Content	No. of Hours
I	**Enterprise: An Overview** - Business Functions and Business Processes - importance of Information: Characteristics of information - Types of information -Information System: Components of an information system - Different types of information systems - Management information system - Enterprise Resource Planning: Business modeling- Integrated data model. **Introduction to ERP:** Defining ER - Origin and Need for an ERP System - Benefits of an ERP System - Reasons for the Growth of ERP Market - Reasons for the Failure of ERP Implementation - Roadmap for successful ERP implementation.	9
II	**ERP and Related Technologies**: Business Process Re-engineering - Management Information systems - Decision Support Systems - Executive Information Systems- Advantages of EIS - Disadvantages of EIS - Data Warehousing - Data Mining - On-Line Analytical Processing - Product Life Cycle Management - Supply Chain Management, ERP Security.	9
III	**ERP Implementation Life Cycle:** ERP Tools and Software - ERP Selection Methods and Criteria -ERP Selection Process - ERP Vendor Selection, ERP Implementation Lifecycle - Pros and cons of ERP implementation - Factors for the Success of an ERP Implementation.	10
IV	**ERP Vendors, Consultants, and Employees**: Vendors- Role of the Vendor - Consultants: Types of consultants -Role of a Consultant. Employees: Role of employees - Resistance by employees - Dealing with employee resistance - Role of Top Management - Role of Implementation Partner.	10
V	**Future Directions in ERP**: New Trends in ERP - ERP to ERP II-Implementation of Organisation-Wide ERP, Development of New Markets and Channels - Latest ERP Implementation Methodologies - ERP and E-business - Market Snapshot - The SOA Factor.	10
References	**Text Books:** **1.** Alexis Leon, "ERP demystified", Tata McGraw-Hill, Third Edition, 2014. **Reference Books:** 1. Jagan Nathan Vaman, "ERP in Practice", Tata McGraw-Hill, 2008 2. Alexis Leon, "Enterprise Resource Planning", Second edition, Tata McGraw-Hill, 2008. 3. MahadeoJaiswal and Ganesh Vanapalli, "ERP" Macmillan India, 2009. 4. Vinod Kumar Grag and N.K. Venkitakrishnan, "ERP- Concepts and Practice", Prentice Hall ofIndia,2nd edition, 2006	
Course Outcomes	**CO1:** Enhanced Evaluation of ERP systems, Business Analytics, Future trends in ERPsystems. **CO2:** Understand the basic concepts of ERP systems for manufacturing or service companies, and the related technologies like BPR, MIS, DSS, supply chain concepts **CO3:** Understands about ERP implementation life cycle and their factors responsible for the success of implementation **CO4:** In-depth knowledge of major ERP components, including vendors, consultants and their roles. **CO5:** Acquire knowledge of typical ERP systems, and the advantages and limitations of implementing such systems	