



Shri Sangameshwar Education Society's
Sangameshwar College, Solapur [Autonomous]
 (Affiliated to Purnashlok Ahilyadevi Holkar Solapur University, Solapur)
 Kannada Linguistic Minority Institute
NAAC Accredited with 'A' Grade (III Cycle CGPA 3.39)

STRUCTURE OF M.Sc(CS) PROGRAMME UNDER CBCS PATTERN Faculty of Science

Academic Council 1(6)
 2nd July, 2020

M.Sc (CS) FIRST YEAR (To be implemented from A.Y. 2020-21)

Semester	Code	Title of the Paper	Examination			L	T	P	Credits
			SE	CA	Total				
Sem-I		Hard Core							
	HCT1.1	Object Oriented Programming using C++	70	30	100	4	--	--	4
	HCT1.2	Database Management System	70	30	100	4	--	--	4
	HCT1.3	Design and Analysis of Algorithms	70	30	100	4	--	--	4
		Soft Core [Any one]							
	SCT1.1	Research Methodology	70	30	100	4	--	--	4
	SCT1.2	Software Engineering and Testing	70	30	100	4	--	--	4
		Lab							
	HCP1.1	Practical based on HCT 1.1	35	15	50	--	--	03	2
	HCP1.2	Practical based on HCT 1.2	35	15	50	--	--	03	2
	HCP1.3	Practical based on HCT 1.3	35	15	50	--	--	03	2
	HCP1.4	Project	35	15	50	--	--	03	2
		Tutorial	---	25	25	--	1	--	1
	Total for Semester-I		420	205	625	--	--	--	25
Sem-II		Hard Core							
	HCT2.1	Advanced JAVA	70	30	100	4	--	--	4
	HCT2.2	Python Programming	70	30	100	4	--	--	4
		Soft Core [Any one]							
	SCT2.1	Digital Image Processing	70	30	100	4	--	--	4
	SCT2.2	Computer Communication Network	70	30	100	4	--	--	4
		Open Elective[Any one]							
	OET2.1	Office Automation	70	30	100	5	--	--	5
	OET2.2	Web Technology	70	30	100	5	--	--	5
		Lab							
	HCP2.1	Practical based on HCT 2.1	35	15	50	--	--	03	2
	HCP2.2	Practical based on HCT 2.2	35	15	50	--	--	03	2
	SCP2.1/2.2	Practical based on SCT 2.1/2.2	35	15	50	--	--	03	2
	HCP2.3	Project	35	15	50	--	--	03	2
	Total for Semester-II		420	180	600	--	--	--	25



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Program Outcomes

The main Aim of the MSc program is to provide students with technical and scientific research capabilities that enable them to work as Computer Professionals and researchers. The Program also enhances moral and ethical values, and interpersonal skills of the students.

Objectives of MSc (CS) Program:

1. To provide adequate strong knowledge and skill about core subject in Computer Science.
2. To develop students as System Analyst, Data Administrator, Demonstration Officer.
3. To train students in Computer Programming & Applications.
4. To enhance students analytical design and implementation skills for efficient software solution.
5. To build successful professionals who are able to get employment or work as freelancer.
6. To make students aware about research areas and motivate for Ph. D Program.

Post Graduate Attributes in MSc (CS):

1. Ability to think deeply when forced with new knowledge
2. Ability to develop creative, critical and evidence-based responses to professional challenges.
3. Ability to construct innovative solutions.
4. Able to well prepared for living, learning and working in a digital Society.
5. Able to flexible and resilient and act with integrity in constant changing circumstances in Computer Science field.
6. Ability to apply their knowledge in practice including in multi-disciplinary or multi-professional perspectives.
7. An understanding of Social and civic responsibility and ability to apply ethical standards in relation to major area of study.



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**DETAILED SYLLABUS
Of
COURSES OFFERED BY THE PROGRAMME**

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SYLLABUS FOR M.Sc(CS) (SEMESTER – I) (W.E.F. JUNE 2020)**

HCT 1.1 Object Oriented Programming Using C++ (2074101)

Academic Council 1(6)

2nd July, 2020

Course Code: HCT 1.1 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The main objective of this course is to have students identify object oriented techniques and concepts including class, abstract data, inheritance, polymorphism, exception handling and other advanced techniques.

Unit No	Content	Hrs.
1	Introduction to Object-Oriented Programming Basic Concepts of OOP, Benefits of OOP, Application of OOP Overview of C++: History of C++, Applications of C++, iostream File, insertion & extraction operator, Tokens, Keywords, Identifiers, Constants, Basic Data Types, User Defined Data Types, Derived Data Types, Compiling, linking and running a C++ program, Scope Resolution Operators, Control Structures Functions in C++: Inline Function, Function with Default Argument Classes and Objects: Specifying Class, Access Specifiers, Defining Member Function, Creating Object, Accessing Class Members, Nesting of Member Function, Making Outside Function As Inline, Private Member Function, Array Within Class, Array of Objects, Static Data Member, Static Member Function, Object As Function Arguments, Returning Object, Object Assignment, Friend Function, Friend Class Pointer References & The Dynamic Allocation Operators: Pointers To Objects, this Pointer, Reference Parameter, call by reference and return by reference, Passing References to Objects, Returning Reference, Independent Reference, C++'S Dynamic Allocation Operators, Initializing Allocated Memory, Allocating Array, Allocating Objects	15
2	Constructor & Destructor Constructors, Parameterized Constructors, Constructor Overloading, Constructor with Default Argument, Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructor, Destructor Overloading as polymorphism: Function Overloading, Concept of Operator Overloading, Rules for Overloading Operators, Operator Overloading Restrictions, Overloading Unary Operators, Overloading Binary Operators, Overloading Binary Operators Using Friend, Overloading New & Delete, [], [], Comma Operator, <<, >> operators, Manipulation of Strings Using Operators	15
3	Inheritance Concept of Inheritance, Types of Inheritance, Making a Private Member Inheritable, when Constructor & Destructor Functions are Executed, Pointer to Derived Class Virtual Functions & Polymorphism: Virtual Base Class, Virtual Function, Pure Virtual Function, Early Vs. Late Binding Exception handling in C++: Basics of Exception Handling, Exception Handling Mechanism: try, throw, catch; Multiple catch Blocks, catch-all exception handler, User Defined Exception	15
4	The C++ I/O System Basics C++ Streams, C++ Stream Classes, Unformatted I/O Functions, Formatted Console I/O Functions, Managing Output with Manipulators, Creating your own	15

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	Manipulators, Templates: Introduction, Function Templates, Class Templates, Class Templates with Multiple Parameters, Out of Class Definition of Member Functions, Overloading of Template Functions, Member Function Template	
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Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Identifies the difference between the top-down and bottom-up approach.
2	Demonstrate the object-oriented programming approach with C++.
3	Design & implement various forms of inheritance & calling base class constructors.
4	Implements exception handling mechanism in code to handle runtime errors.

Suggested Readings:

1. C++: The Complete Reference: Herbert Schildt, Tata McGraw Hill
2. Object Oriented Programming with C++: E. Balguruswami
3. Thinking In C++: Bruce Eckel

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SYLLABUS FOR M.Sc(CS) (SEMESTER – I) (W.E.F. JUNE 2020)**

HCT 1.2 Database Management System (2074102)

Academic Council 1(6)
2nd July, 2020

Course Code: HCT 1.2 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The primary objective of the course is to make students aware about database management systems and its widespread application in everyday scenarios. As we are now in 'World of Data', it is very important for every computer science student to know how this huge amount of data is stored, retrieved and managed at various locations. The course particularly emphasizes on fundamentals of relational database systems including its architecture and manipulations. It also enables students to understand transaction processing, concurrency control and failure handling and parallel processing of databases.

Unit No	Content	Hrs.
1	Introduction to DBMS Database – Definition and architecture, Advantages of DBMS, Data models, Three-schema architecture and data independence, ER diagrams, Types of keys, cardinality, specialization, generalization, aggregation, Relational Algebra, Relational Calculus Relational database design: Functional dependencies, Multivalued Dependencies, Normalization, Query processing and optimization	15
2	SQL and PL/SQL DDL, DML, DCL, Select: From, Where, Order by, Group by, Having, Intersect, Union, Distinct, Between, In, Between, Different types of functions, Delete, Update, Insert, Nested queries, joins, create, alter and drop, constraints, index, views, Triggers, Grant, Revoke, Commit, RollBack, Savepoint, PL/SQL: %Type, %Rowtype, Exception, Cursor, Packages	15
3	Transaction Management and Concurrency Control Transaction – properties, states, Concurrency control techniques-lock based, timestamp based, Serializability Database Recovery: Recovery concepts, Catastrophic and non catastrophic failures, Recovery techniques – Deferred Update and Immediate Update techniques, Shadow Paging, checkpoint, Recovery in multi-database environments, Database backup and recovery	15
4	Parallel Databases I/O Parallelism, Inter and Intra Query Parallelism, Inter and Intra operation Parallelism, Design of Parallel Systems Distributed Databases: Centralized v/s Distributed databases, Types of distributed databases, Distributed data storage, Commit protocols Object – Relational Databases: Abstract DataTypes, Nested Tables, Varying Arrays, Large Objects	15

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Explain various data models
2	Apply the normalization technique in the software applications
3	Design various kinds of SQL queries for retrieving relevant data
4	Compare different database recovery techniques
5	Describe parallel processing of different queries

Suggested Readings:

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1. Database System Concepts by Henry F Korth, Abraham Silberschatz, S. Sudharshan, Sixth Edition, McGraw Hill, 2011
2. Fundamentals of Database System by R. Elmasri, S.B. Navathe, Pearson Education/Addison Wesley, 2008.
3. An Introduction to Database Systems: C. J. Date, Pearson Education India.

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SYLLABUS FOR M.Sc(CS) (SEMESTER – I) (W.E.F. JUNE 2020)

HCT 1.3 Design and Analysis of Algorithm (2074103)

Academic Council 1(6)

2nd July, 2020

Course Code: HCT 1.3

Total Hours 60

Course Credits 4

Total Marks 100

Course Objectives: The basic objective of the course is to gain knowledge about understanding basic data structures and different types of algorithms

Unit No	Content	Hrs.
1	Fundamental notions Primitives and composite data types, choice of data structure and complexity of an algorithm. Stacks: Processing the stacks, Linked list implementation, Application of Stacks for expression solving, Non recursive implementation of recursive Algorithms Queues: Processing the queues, Linked list implementation, Dequeues, Priority queues and their applications	15
2	Linked List Processing linked list, Circularly linked list, Doubly linked list, Multilinked lists, String and characters manipulation using arrays and linked list. Trees: Representation of hierarchical relationships, Tree processing, Binary trees, linked list implementation, traversal algorithms, tree traversals, Binary trees, Threaded binary trees, Height balanced trees, General Trees.	15
3	Sorting and searching Various sorts viz. Insertion, Bubble sort, Selection sort, Quick sort, Merge sort, Radix / Bucket sort, searching algorithms and their complexities, . Binary tree indexing, B-tree indexing, Hash indexing.	13
4	Divide and Conquer Method The general method ,merge sort,binary search,finding maximum and minimum, Strassen's matrix multiplication, Quick sort Greedy strategy: The general method, knapsack problem, scheduling algorithms-Job scheduling , single source shortest path Dynamic Programming The general method, multistage graph, 0/1 knapsack Backtracking: The general method, 8-queen's problem, graph coloring problem, knapsack problem, knapsack problem	17

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Understand basic data structures such as arrays, linked lists, stacks and queues
2	Demonstrate algorithm for efficiently searching and sorting
3	Describe algorithm for problem solving using Divide and Conquer Method, Greedy strategy & Backtracking techniques.
4	Explain competitive analysis and to which situations it applies.

Suggested Readings:

1. Data structures and algorithms- Alfred Aho, John Hopcraft and Jeffrey Ullman, Addison, Wesley publication
2. Introduction to data structures- Bhagat Singh and Thomas

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Nap, West Publishing Company

3. Fundamentals of computer Algorithms- ELLIS HOROWITZ & SARTAJ SAHNI, computer Science press 1803 Research Blvd. Rockville, Maryland 20850

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SYLLABUS FOR M.Sc(CS) (SEMESTER – I) (W.E.F. JUNE 2020)

SCT 1.1: Research Methodology (2074104)

Academic Council 1(6)

2nd July, 2020

Course Code: SCT 1.1 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The basic objective of the course is to understand some basic concepts of research and its methodologies. To identify appropriate research topics and to select and define appropriate research problem and parameters

Unit No	Content	Hrs.
1	Foundations of Research Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method –Understanding the language of research –Concept, Construct, Definition, Variable. Research Process: Problem Identification & Formulation –Research Question–Investigation Question –Measurement Issues – Hypothesis –Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing –Logic & Importance.	15
2	Research Design Concept and Importance in Research –Features of a good research design – Exploratory Research Design concept, types and uses, Descriptive Research Designs –concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. Qualitative and Quantitative Research: Qualitative research Quantitative research –Concept of measurement, causality, generalization, replication. Merging the two approaches. Measurement: Concept of measurement–what is measured? Problems in measurement in research –Validity and Reliability. Levels of measurement –Nominal, Ordinal, Interval, Ratio. Concept of Online Publication, Impact Factor, H-Index e-Journal.	15
3	Sampling Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample –Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample –Practical considerations in sampling and sample size	15
4	Data Analysis Tabulation of data Construction of frequency distribution Cumulative frequency distribution. Difference between graphs and diagram. Representation and interpretation of data using various graphs and diagrams. Graphs: Histogram and Ogive curves. Charts: Simple, Multiple, Subdivided bar diagram and Pie chart. Bivariate analysis –Cross tabulations and Chi-square test including testing hypothesis of association. Introduction to Data Analysis using SPSS.	15

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Co No	Expected Course Outcomes <i>On completion of this course, the students will be able to:</i>
1	Explain meaning, objectives, Motivation & characteristics of scientific methods of research
2	Learn aspects of testing of hypothesis in the perspective of research
3	Describe importance of research and different types of research & problem of measurements in research design with illustrative examples
4	Students will understand the basic concepts of population, sample, and different sampling strategies of data collection & students will be able to decide which sampling scheme is to be preferred while data collection

Suggested Readings:

1. Research Methodology Methods and Techniques by C.R Kothari , New Edge International Pub
2. Essentials of Research Methodology By Thangamani Ramalingam
3. Research Design Qualitative ,Quantitative and Mixed Methods Approaches By John W Cresweel and J David Cresweel

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SYLLABUS FOR M.Sc(CS) (SEMESTER – I) (W.E.F. JUNE 2020)

SCT 1.2: Software Engineering and Testing (2074105)

Academic Council 1(6)

2nd July, 2020

Course Code: SCT 1.2

Total Hours 60

Course Credits 4

Total Marks 100

Course Objectives: The basic objective of software Engineering is to gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.

Unit No	Content	Hrs.
1	<p>Introduction To Software Engineering : Nature of Software, Software Process, Software Engineering Practice, Software Myths, SDLC, Generic Process model.</p> <p>Analysis and comparison of Process Models: Waterfall Model, Spiral Model, Incremental Models, Evolutionary Models, RAD Model, Specialized Process Models, Introduction to CleanRoom Software Engineering.</p>	15
2	<p>Requirement Analysis Requirements Capturing requirements engineering[elicitation, specification, validation, negotiation, prioritizing requirements, real life application case study.] software Requirement Specification.[SRS].</p> <p>Overview of Analysis Modeling: Elements of the analysis model, data modeling, functional modeling, behavioral modeling, the mechanics of structured analysis, data dictionary.</p>	15
3	<p>UML models use case diagram, class diagram and Sequence diagram, data modeling, data and control flow, model, behavioral modeling using state diagrams - real life application case study.</p> <p>Design Concepts & Principles: Software Design and software Engineering, design process, Design principles, Design concepts, Design methods-Data design, Architectural design and process, Interface design, Procedural design.</p>	10
4	<p>Software Testing Concepts Purpose of Software Testing, Testing Principles, Testing aspects: Requirements, Test cases, Strategies for Software Testing, Test Life Cycle, Faults & Failures, Planning Verification and Validation, Software Inspections, Levels of Testing</p> <p>White-Box Testing: Test Adequacy Criteria, Static Testing, Structural Testing, Code Complexity Testing, Mutation Testing, Data Flow Testing.</p> <p>Black-Box Testing: Test Case Design Criteria, Requirement Based Testing, Positive and Negative Testing, Boundary Value Analysis and Equivalence Partitioning State Based Testing, Domain Testing.</p> <p>Software Quality Assurance [SQA]: Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models.</p>	10

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Explain software engineering life cycle including the specification, design, implementation, and testing of software systems .

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2	Explain the software Requirement Specification documents, data dictionary
3	Explain UML models, Design concepts & principles
4	Explain software testing concepts, White Box and Black Box testing

Suggested Readings:

1. Software Engineering[Fifth Edition]: Roger S. Pressman, McGraw Hill, 1997.
2. Software Engineering: Shooman, McGraw Hill, 1987.
3. Software Engineering: Ian Sommerville, Addison Wesley, 1985.
4. Fundamentals of Software Engineering: Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Prentice Hall India, 2003.
5. Tom Pender, "UML Bible", John Wiley & sons
6. William E. Perry, "Effective Methods for Software Testing", John Wiley and Sons.

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SYLLABUS FOR M.Sc(CS) (SEMESTER -II) (W.E.F. JUNE 2020)**

HCT 2.1 Advanced Java (2074201)

Academic Council 1(6)

2nd July, 2020

course Code: HCT 2.1 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The basic objective of this course is to develop web applications with the help of JDBC, JSP, Servlet technology, JSTL libraries and Hibernate.

Unit No	Content	Hrs.
1	Servlet Introducing CGI, Introducing Servlet, Advantages of Servlet over CGI, Features of Servlet, Introducing Servlet API, javax.servlet package, javax.servlet.http package Introducing Servlet, Advantages of Servlet over CGI, Features of Servlet, Servlet life Cycle, Working with GenericServlet and HttpServlet ,RequestDispatcher interface Include() and forward(), Use of RequestDispatcher, Introducing session ,Session tracking mechanism ,Cookies ,Advantages & disadvantages, use of cookies, Hidden form field ,Advantages & disadvantages ,use of Hidden form field, URL rewritten Disadvantages, use of URL rewritten, HttpSession, Advantages & disadvantages use of URL HttpSession	18
2	JSP Introduction to JSP, Advantages of JSP over Servlet, JSP architecture, JSP life cycle Implicit objects in JSP- request, response, out, page, pageContext, application, session, config, exception, JSP tag elements- Declarative, Declaration, scriptlet, expression, action. Java Bean- Advantages & Disadvantages, useBean tag- setProperty and getProperty, Bean In Jsp, JSTL core tag: General purpose tag, conditional tag, networking tag ,JSTL SQL tags, JSTL formatting tags, JSTL xml tags, Custom tag: empty tag, body content tag, iteration tag, simple tag Introducing internationalization & Java: local class, ResourceBundle class	18
3	Hibernate Introduction Hibernate(HB), Architecture of HB, Application of HB: HB with annotation, HB web application, Inheritance mapping: Table per Hierarchy(TPH), TPH using annotation, Table Per Concrete (TPC), TPC using annotation, Table Per Subclass (TPS), TPS using annotation. Collection mapping: Mapping list, one to many by list, one to many by bag, one to many by set, one to many by map.	12
4	Spring Introduction to spring, Spring modules, Spring application, Dependency injection: constructor Injection (CI), CI dependant object, CI with collection, CI with map, CI inheriting bean, Spring JDBC: JDBC template, PreparedStatement, ResultSetExtractor, RowMapper, NamedParameter, Simple JDBC template, Spring with Hibernate	12

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Develop any application using the MVC framework.

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2	Develop website in any local language of any country
3	Implement use xml document with java to represent data

Suggested Readings:

1. "JDBC, Servlet and JSP Black Book" - Santosh Kumar K
2. "Java EE Server programming" - Sharanam Shah and Vaishali Shah.
3. "Java Server Programming Black book"
4. "Hibernate"- Sharanam Shah & Vaishali Shah
5. "Spring Persistence with Hibernate"- Paul Tepper Fisher, Brian D Murphy.

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SYLLABUS FOR M.Sc. (CS) (SEMESTER -II) (W.E.F. JUNE 2020)**

HCT 2.2 Python Programming (2074202)

Academic Council 1(6)
2nd July, 2020

Course Code: HCT 2.2 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The course is designed to provide the detailed practical knowledge of Python – a most popular programming language preferred by professionals like system analysts, data scientists, and application developers. Its widespread use and simplicity makes it worth to learn it efficiently. The course covers from basic python objects, its various constructs through its use in desktop and web application development. It also outlines the use of python libraries in data analysis.

Unit No	Content	Hrs.
1	<p>String, List, Tuple ,Dictionary ,Function, Module, Set, Package</p> <p>String -Declaring string ,String manipulation using string functions, formatting string literals</p> <p>List-Introduction to list ,list functions</p> <p>Tuple- Introduction to tuple ,manipulating tuple.</p> <p>Dictionary- Introduction, Accessing values in dictionaries, create,delete and update dictionary items.Function- Types of function, Defining function ,calling function, advantages of function</p> <p>function parameters, Anonymous function, Global and local variables, inbuilt functions-map,zip,reduce,filter</p> <p>,any,chr ,ord etc. Modules-Importing module, creating and exploring modules ,math module, time module,random module, OS,calendar,sys etc.</p> <p>Set-Introduction to set, manipulate set. Package-Introduction, importing from package, json</p> <p>File-File opening ,closing file, various types of file modes, reading and writing to file manipulating directories Exception handling - try,else, finally, raise keyword.</p> <p>Regular Expression- various types of regular expression, using match and search function.</p> <p>GUI -Introduction to GUI library ,Advantages ,Layout management ,Events and binding Drawing on canvas(line,oval,rectangle etc)</p> <p>widget such as</p> <p>Frame,Label,Button,Checkbutton,Entry,Listbox,Radiobutton,Text,Spinbox etc.</p> <p>Database-Introduction, Connections, Executing queries, Transactions ,Error Handling</p>	20
2	<p>OOPs Concept</p> <p>Introduction to OOP, Classes and objects, Inheritance Method overloading and method overriding ,Abstract method and Abstract class, Interfaces in python ,Abstract class VS Interfaces,constructor,instance methods ,class methods, static methods.</p> <p>Generators- Introduction, communicating with generators with send()</p> <p>Decorators -Introduction, simple function decoratoes, classes as decorators, chained decorators decorator arguments Threads - Introduction, Uses of Threads, creating Thread without using a class, creating a Thread by creating a Sub Class to Thread Class, creating a Thread</p>	15

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	without creating a Sub Class to Thread Class, Communication between Threads, Thread communication using notif() and wait() methods	
3	Networking Sockets and Networking ,TCP/IP protocol, User Datagram Protocol(UDP), knowing IP address, Reading the source code of a Web Page, TCP/IP server , TCP/IP client ,UDP server UDP client ,File server ,File client ,Two way communication between server and client, sending a simple mail,Socket Basics, socket module, network clients,creating network servers Data science using python Data Frame -Creating Data Frame from an Excel Spreadsheet, Creating Data Frame from .csv file, Creating Data Frame from python Dictionary, Creating Data Frame from python List of Tuples, Operations on Data Frames. Data visualization -Bar Graph ,Histogram ,Creating a pie chart ,creating line graph	15
4	NumPY Introduction, creating NumPYarrays, indexing and slicing in NumPy. Pandas -Introduction, installation of panda, data frame, series, range data, slice data,drop a column,, concatenation. Django -Introduction to django, django templates, introduction to WSGI	10

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Apply basic python objects and libraries to build desktop application5
2	Design the programs implementing OOP concepts
3	Analyze the data using visualization techniques
4	Apply modules for data manipulation
5	Describe the process of web application development

Suggested Readings:

1. Core Python Programming , R.Nagesh Rao,Dreamtech Press.
2. Learn Python the hard way,Zed A.SHAW.
3. Introduction to Computer Science using python,Charles Dierbach,WILEY India Edition.

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SYLLABUS FOR M.Sc(CS) (SEMESTER –II) (W.E.F. JUNE 2020)

SCT 2.1: Digital Image Processing (2074203)

Academic Council 1(6)
2nd July, 2020

Course Code: SCT 2.1 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: To introduce the concepts of image processing and basic analytical methods to be used in image processing. To familiarize students with image enhancement and restoration techniques, To explain different image compression techniques.

Unit No	Content	Hrs.
1	Introduction Digital image processing, Applications of digital image processing, Fundamental steps in digital image processing, and Components of an image processing system. Digital image fundamentals: Image sampling and quantization, some basic relationships between pixels, Linear and nonlinear operation. Image enhancement in the spatial domain: Some basic gray level transformations, Histogram processing, Enhancement using arithmetic/logic operations, Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters.	15
2	Image enhancement in the frequency domain Introduction to the Fourier transform and frequency domain, Smoothing frequency-domain filters, Sharpening frequency domain filters, homomorphic filtering. Image restoration: A model of the image degradation/restoration process, Noise models, Restoration in the presence of noise only-spatial filtering, Periodic noise reduction by frequency domain filtering.	15
3	Morphological image processing Preliminaries, Dilation and erosion, Opening and closing, the hit-or-miss transformation, Some basic morphological algorithms. Image segmentation: Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region-based segmentation, Segmentation by morphological watersheds.	15
4	Representation and description Representation, Boundary descriptors, Regional descriptors, Use of principal components for description, Relational descriptors. Object recognition: Patterns and pattern classes, Recognition based on decision- theoretic methods, Structural methods.	15

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Explain the fundamental concepts of a digital image processing system.
2	Evaluate the techniques for image enhancement and image restoration.
3	Analyze images in the frequency domain using various transforms.
4	Interpret image segmentation and representation techniques.

Suggested Readings:

- Digital image processing: Gonzalez and Woods, 4th edition, Pearson.
- Image Processing, Analysis and Machine Vision: Milan Sonka, Vaclav Hlavac, Roger Boyle, 3rd Edition, Brooks/Cole .

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3. Fundamentals of Digital Image Processing: Anil K. Jain, Pearson.

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SYLLABUS FOR M.Sc(CS) (SEMESTER –II) (W.E.F. JUNE 2020)**

SCT 2.2: Computer Communication Network (2074204)

Academic Council 1(6)
2nd July, 2020

Course Code: SCT 2.2 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The basic objectives of this course are to Study the basic taxonomy and terminology of the computer networking and describe the OSI and TCP/IP models, acquire knowledge of the application layers and presentation layers, and understand the session layer design issues. Read the fundamentals and basics of the physical layer, and apply them to real-time applications.

Unit No	Content	Hrs.
1	<p>Introduction</p> <p>Uses of Computer networks: Business Applications, Home Applications, Mobile Users, Social Issues;</p> <p>Network Hardware: Local Area Networks, Metropolitan Networks, Wide Area Networks, Wireless Networks, Home Networks, Internetworks; Network Software: Protocol Hierarchies, Design Issues for the Layers,</p> <p>Connection-Oriented and Connectionless Service Primitives, Relationship of Services to Protocols; Example of Networks: The Internet, The ARPANET, NSFNET, Internet usage, Architecture of the internet.</p> <p>Data Link Layer</p> <p>Data Link Layer Design Issues: Services Provided to the Network Layer, Framing, Error Control, Flow</p> <p>Control; Error Detection and Correction: Error-Correcting Codes, Error-Detecting Codes; Elementary Data Link Protocols: An Unrestricted Simplex Protocol, A Simplex Stop-and-Wait Protocol, A Simplex Protocol for a Noisy Channel; Sliding Window Protocols: A One-Bit Sliding Window Protocol, A Protocol Using Go Back N, A Protocol Using Selective Repeat; Example Data Link Protocols: HDLC—High-Level Data Link Control, The Data Link Layer in the Internet.</p>	12
2	<p>Network Layer</p> <p>Network Layer Design issues: Store and Forward packet Switching, Services Provided to the Transport Layer, implementation of Connectionless Service, Implementation of Connection-oriented Services, Comparison of Virtual Circuit and Datagram subnets; Routing algorithms: The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link state Routing, Hierarchical Routing, Broadcast Routing, Routing for Mobile Hosts; Congestion Control Algorithms: General Principles of Congestion Control, Congestion Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnet, Load Shedding, Jitter Control; Quality of Service: Requirements, Techniques for Achieving Good Quality of Service; Internetworking: Differences in Networks, Network Connection, Concatenated Virtual Circuits,</p> <p>Connectionless Internetworking; Tunneling; Internetwork Routing, Fragmentation; The Network Layer in the Internet: The IP Protocol, IP Addresses, Internet Control Protocols, Mobile IP; IPV6.</p>	18
3	<p>The Transport Layer</p> <p>The Transport Service: Services Provided to the Upper Layers, Transport Service Primitives, Berkeley Sockets; Elements of Transport Protocols: Addressing, Connection Establishment, Connection Release Flow Control and</p>	18

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	Buffering, Multiplexing, Crash Recovery; The Internet Transport Protocol – UDP: Introduction to UDP, Remote Procedure Call, The Real-Time Transport Protocol; The Internet Transport Protocols – TCP: Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, Modeling TCP Connection Management TCP Transmission Policy, TCP Congestion Control, Wireless TCP and UDP.	
4	The Application Layer DNS – The Domain Name System: The DNS Name Space, Resource Records, Name Servers; Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery; The World Wide Web: Architectural Overview, Static Web Documents, Dynamic Web Documents, HTTP, Performance Enhancements, The Wireless Web.	12

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Explain the Data Communications System and its components.
2	Identify the different types of network topologies and protocols.
3	Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
4	Identify the different types of network devices and their functions within a network.

Suggested Readings:

1. Computer Networks: Andrew S. Tanenbaum, 4th Edition, Pearson Education, Asia, 2002.
2. Communication Networks: Fundamental Concepts and Key Architectures, Alberto Leon-Garcia, Indra Widjaja, Tata McGraw Hill, 2006.
3. Data Communications and Networking: Behrouz A. Forouzan, Tata McGraw Hill, Second Edition, 2001.

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SYLLABUS FOR M.Sc(CS) (SEMESTER -II) (W.E.F. JUNE 2020)

OET 2.1 : Office Automation (2074205)

Academic Council 1(6)
2nd July, 2020

Course Code: OET 2.1 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The basic objective of this course is to enable students to create professional Word documents and Excel. Spreadsheets, PowerPoint presentations using Microsoft Office Tools Suite.

Unit No	Content	Hrs.
1	Introduction to Computer Computer Architecture, Introduction to Hardware and Software, Input and Output Devices, Computer Memory, Physical units demo of computer machine. Microsoft Accessories: Notepad, WordPad, MS paint Basic DOS commands : Comparison of DOS and Windows. Switching Between DOS and Windows , Basic DOS Commands (File/Directory Manipulations, Copying of files and Disks, Delete/Undelete)	10
2	Microsoft Word Word Processing Basic An Introduction to Word Processing, Opening Word Processing Package, The Menu Bar, Using the Help, Using the Icons below menu bar. Opening Documents and Closing documents: Opening Documents, Save and Save AS, Page Setup, Printing of Documents, Display/Hiding of Paragraph Marks and Inter Word Space Moving Around in a Document, Scrolling the Document, Scrolling by line/paragraph, Fast Scrolling and Moving Pages. Table Manipulation: Concept of table: Rows Columns and Cells, Draw Table, Changing cell Width and Height, Alignment of Text in Cell, Copying of cell, Delete/insertion of row and columns, Borders for Table. Printing: Printing, Print Preview, Print a selected page, Page setting	15
3	Microsoft PowerPoint Basics: Difference between presentation and Document, Using Power Point, Opening a PowerPoint Presentation, Using Wizard for creating a presentation Creation of Presentation: Title, Text Creation, Fonts and Sizes, Bullets and indenting, Moving to Next Slide Preparation of Slides: Selection of type of Slides, Importing text from word documents, Moving to next Slide, The Slide manager Preparation of Slides: Selection of type of Slides, Importing text from word documents, Moving to next Slide, The Slide manager Providing aesthetics Slide Designs, Background and Text colors, Making your own slide format, Footnotes and slide numbering Presentation of the Slides: Using the Slide Show, Printing the Slides and Handouts, Slide sorter, Title sorter	13
4	Microsoft Excel Elements of Electronics SpreadSheet Application/usage of Electronic SpreadSheet, Opening of Spread Sheet, The menu bar, Creation of cells and addressing of cells, Cell inputting Manipulation of cells Enter texts numbers and dates, Creation of tables, Cell Height and Widths, Copying of cells. Providing Formulas: Using basic functions / formalism a cell, Sum	12

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	function,Average,Percentage, Other basic functions,Mathematical equations,User defined equations	
5	Introduction to Internet and Operating System Basic of Computer networks: LAN,MAN,WAN Internet: Client Server Architecture,Mobile Technology,Server Side and client side languages, Html,URL Introduction,Email access and Creation of account,Internet Banking with security certification ,Browser types ,Data Downloading Operating System: Unix/Linux,Windows (System S/W Application S/W and Driver S/W.) Different Software Tools : Audio and Video,Word to PDF and PDF to Word, Image Reader And Converter, Scanner handling , Control Panels (System setting).	10

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Design and maintain document documents using MS Word
2	Design and maintain spreadsheets using MS Excel
3	Design slide shows using MS Power Point
4	Use different types of software tools like Audio and Video,Word to PDF and PDF to Word, Image Reader And Converter, Scanner handling

Suggested Readings:

1. Computer Fundamental by V.Rajaraman PHI Learning View All
2. Computer Fundamental MS-Office by Anupama Jain,Avneet Mehra Vitasta Publishing Pvt.Ltd 3.MS-OFFICE Training Guide by Satish Jain M. Geetha, Kratika BPB pub.

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SYLLABUS FOR M.Sc(CS) (SEMESTER –II) (W.E.F. JUNE 2020)

OET 2.2 : Web Technology (2074206)

Academic Council 1(6)
2nd July, 2020

Course Code: OET 2.2 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The main objective of this course is to understand the principles of creating an effective web page including HTML, HTML5, CSS. Learn techniques of responsive web design, including media queries. Develop basic programming skills using Javascript.

Unit No	Content	Hrs.
1	Overview of HTML Introduction to web technology, Introduction to internet, Requirement of Internet, Introduction to HTML, structure of HTML, creating and opening of HTML file, Tags-Singular and paired tags, text formatting tags, Anchor Tags, List, Image, Image mapping, table, Frames and frameset.	10
2	Introduction to HTML5 : Introduction to HTML5, Need of HTML5, DOCTYPE element, Tags- Header, Section, Article, Nav, Footer, Figure, Aside, Input tags in HTML5 (Placeholder, Autofocus, Required, attributes), Graphics in HTML5, Media Tags in HTML5	10
3	Basics of CSS Introduction to CSS, Use of CSS, Advantages of CSS, Types of CSS, Types of selectors, Properties-Background, Border, Text, Font, Margin, Padding, Box Model, Link, Lists, Table, Opacity, Floating, Advance in CSS-Animation, Multiple column layout, User Interface, 2D/3D transformation, overflow, Display, Positioning, Media Type, Values Replaced content, CSS-Rounded corners, Multiple backgrounds, User Interface.	15
4	Interactive Web Pages using Form Form Object, Text Element, Button Element, Submit Element, Reset element, Radio Element, Progress Bar, CheckBox, Working With Basics of XML - Introduction to XML, Difference Between HTML and XML, Creating xml Document	10
5	Introduction to JavaScript : Introduction to JavaScript, JavaScript Variables, Data types, Operators, Built-in Functions in JavaScript, Control Structures in JavaScript, Built in Objects (Math, String, Date) and User defined objects, DOM, JavaScript Validation and Event handling Array, History, Navigator, location, windows, Validation in JavaScript, Event and Event handling in JavaScript	15

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Designs site and page using different types of HTML & HTML5 tags.
2	Apply styles to pages using CSS & CSS 3.
3	Handle user input & data with form elements & javascript.
4	Validate user data using javascript

Suggested Readings:

1. HTML5 Black Book by Kogent Learning Solutions Inc Dreamtech

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Press

2. Beginning HTML and CSS Rob Larsen Wrox Publication
3. HTML_&_CSS_The_Complete_Reference Thomas A. Powell. (Fifth Edition).McGraw Hill
4. Computer Fundamentals MS Office-Including Internet and Web technology by Anupam Jain,Navneet Mehra Vitasta Publishing Pvt.Ltd.

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