



Shri Sangameshwar Education Society's
Sangameshwar College, Solapur [Autonomous]
 (Affiliated to Purnyashlok 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 3(3.2)
 10th August, 2021

**M.Sc (CS) SECOND YEAR
 (To be implemented from A.Y. 2021-22)**

Semester	Code	Title of the Paper	Examination			L	T	P	Credits
			SE	CA	Total				
Sem-III		Hard Core							
	HCT 3.1	PHP and JQuery	70	30	100	4	--	--	4
	HCT 3.2	Android Programming	70	30	100	4	--	--	4
		Soft Core [Any one]							
	SCT 3.1	Data Warehouse and Data Mining	70	30	100	4	--	--	4
	SCT 3.2	Internet of Things	70	30	100	4	--	--	4
		Open Elective[Any one]							
	OET 3.1	Linux Operating System	70	30	100	5	--	--	5
	OET 3.2	Basics of Networking	70	30	100	5	--	--	5
		Lab							
	HCP3.1	Practical based on HCT 3.1	35	15	50	--	--	03	2
	HCP3.2	Practical based on HCT 3.2	35	15	50	--	--	03	2
	SCP 3.1 / 3.2	Practical based on SCT 3.1 / 3.2	35	15	50	--	--	03	2
	HCP 3.3	Project-III	35	15	50	--	--	03	2
	Total for Semester-III	420	180	600	--	--	--	25	
Sem-IV		Hard Core							
	HCT 4.1	Dot Net technology	70	30	100	4	--	--	4
	HCT 4.2	Soft Computing	70	30	100	4	--	--	4
	HCT 4.3	R Programming	70	30	100	4	--	--	4
		Soft Core [Any one]							
	SCT 4.1	Artificial Intelligence	70	30	100	4	--	--	4
	SCT 4.2	Big Data Analytics	70	30	100	4	--	--	4
		Lab							
	HCP 4.1	Practical based on HCT 4.1	35	15	50	--	--	03	2
	HCP 4.2	Practical based on HCT 4.2	35	15	50	--	--	03	2
	HCP 4.3	Practical based on HCT 4.3	35	15	50	--	--	03	2
	HCP 4.4	Project-IV	35	15	50	--	--	03	2
		Tutorial	---	25	25	--	1	--	1
		Total for Semester-IV	420	205	625	--	--	--	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**

**SANGAMESHWAR COLLEGE,
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SYLLABUS FOR M.Sc(CS) (SEMESTER - III) (W.E.F. JUNE 2021)**

Academic Council 3(3.2)
10th August, 2021

HCT 3.1 PHP and JQuery (2174301)

Course Code: HCT 3.1 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: This course will provide full proficiency in basic PHP, advanced PHP concepts, client-side scripting using jQuery and working with MySQL Database

Unit No	Content	Hrs.
1	<p>PHP Basics Introduction, XAMPP & WAMPP, Configure php.ini, PHPSyntax, Variables, Strings, Constants, Operators, Echo /Print, If, Else. Elseif, Switch ,Loop:For, Foreach, While, Functions, user defined functions.</p> <p>Session and Cookies :introduction, Start a PHP session, session variables, modifysession , destroysession, Cookies ,Start a PHP Cookies, Cookie variables ,modify Cookie, destroy Cookie</p> <p>Exception Handling: Error handling, try-catch-throw, Exception, Filters, FilersAdvanced.</p>	15
2	<p>Introduction to MySQL CREATE, READ, UPDATE, DELETE, SEARCH data from table, Database Programming -PHP & MySql, architecture, PHP MySql functions for data manipulation</p>	15
3	<p>MVC Overview Codeigniter: Models, views, controllers, Installation, Working with Simple DatabaseProgram Laravel: Introduction of Laravel, Installation, DirectoryStructure ,URLRouting, Controller,View Passing Data inView, PrintVariable, ControlStatement, Build MasterLayout</p>	15
4	<p>Jquery jQuery Introduction, jQuery Installation, Alternatives to Downloading, jQuery Basics, jQuery Selectors: CSS Element ,Selector,NameSelector, IDSelector,ClassSelector,UniversalSelector,Multiple Elements E, F, G Selector,jQuery - Attributes: Get Attribute Value,Set Attribute Value, Attribute Methods jQuery - DOM Traversing: for loop, each() Method, JQuery DOM Filter Methods, JQuery DOM Traversing Methods,jQuery–CSS: Applying CSS, Setting Element Width & Height jQuery–DOM Manipulation: Content Manipulation, Element Replacement, Removing DOM Elements, after(),before(),append(),empty(), prepend(), remove(), text(),val(), jQuery EventsHandling,lick(),bind(),blur(),hover(), change(),trigger(),dblclick(),keydown(), keypress(),keyup(), mouseover(),mouseout(), jQuery Chaining,jQuery-Ajax: load(),get(),post(),ajax(),Getting JSON Data,Post JSON Data.</p>	15

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Install various PHP frameworks and develop simple PHP programs.
2	Integrate HTML forms to PHP scripts.

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3	Build Dynamic web site using server-side PHP Programming and Database connectivity.
4	Design a responsive web site.

Suggested Readings:

1. PHP: The Complete Reference-Steven Holzner.
2. Professional PHP 5-Ed Lecky-Thompson,HeowEide-Goodman, StevenD. Nowicki
3. Programming PHP- Rasmus lerdorf, Kevin Tatroe.
- 4.Learning php, mysql, javascript and css –Oreilly- Robin Nixon
- 5.jQuery Reference Guide by Chaffer Jonathan
- 6.Learning jQuery - Jonathan Chaffer, Karl Swedberg

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10th August, 2021

HCT 3.2 : Android Programming (2174302)

Course Code: HCT 3.2 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The main objective of this course is to provide the knowledge to create robust, reliable mobile applications using android services and components. Students can able to work with goole map services & SQLite database in android application

Unit No	Content	Hrs.
1	<p>Android Fundamentals Introduction to Android - Overview and evolution of Android , Features of Android, Android architecture, Components of an Android Application, Manifest file, Android Activity ,Service Lifecycle</p> <p>Android UI Design Basic UI Designing (Form widgets ,Text Fields , Layouts, [dip, dp, sip, sp] versus px) intent(in detail),All components (e.g Button , Slider, Image view, Toast) Event, Handling, Adapters and Widgets, Menu, Listview, listview events, recycler view , recycler view, Fragments, Dialogues</p>	15
2	<p>Android Thread and Notification Threads running on UI thread (runOnUiThread),Worker thread, Handlers & Runnable,AsynTask (in detail),Broadcast Receivers, Services and notifications,Toast,Alarms, Shared Preferences</p>	15
3	<p>Advanced Android Programming Content Providers – SQLite Programming, JSON Parsing, Accessing Phone Service(Call, SMS, MMS),Location based services</p>	15
4	<p>IOS Fundamentals Introduction to IOS ,IOS Architecture, Frameworks, Application Life Cycle, Features</p> <p>Swift - Introduction to Swift , General Concepts of Swift</p> <p>Xcode - Introduction to Xcode , Navigator, Editor Utility, Tools, Console, Document, Simulator, Instruments</p> <p>Startup - Application Templates, Introduction to Storyboard , Hello World Application, How ‘Hello World’ Working, Debugging Database, Plist, Preference, Sqlite Web Service, Restful Web Service (JSON & XML)</p>	15

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Design and develop user Interfaces for the Android platform.
2	Design and develop user Interfaces for the IOS platform.

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3	Implement Google Map in an application.
4	Demonstrate their ability to deploy software to mobile devices

Suggested Readings:

- 1.Kotlin Programming: The Big Nerd Ranch Guide
- 2.Java – The Complete Reference
- 3.Android Programming: The Big Nerd Ranch Guide (Big Nerd Ranch Guides)
- 4.iOS 10 Programming Fundamentals with Swift: Swift, Xcode, and Cocoa Basics Paperback by Matt Neuberg (Author)

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SCT 3.1: Data Warehouse and Data Mining (2174303)

Course Code: SCT 3.1 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The basic aim of this course is to make students acquainted with various data mining functionalities and the importance of data warehousing. In the high edge competence market, managers have to take good decisions. Based on the knowledge mined, the managers can take strategic decisions which leads to growth of business. This course helps to understand the use of models to perform classification, prediction and clustering tasks.

Unit No	Content	Hrs.
1	Introduction: Data Warehousing-Basic concepts, Data cube and its computation, Data Mining-KDD, Functionalities, Data Preprocessing and Data Visualization, Primitives	15
2	Mining Frequent Patterns, Associations and Correlations: Market Basket Analysis, Frequent Itemset Mining Methods, Pattern Evaluation Methods, Mining Multilevel, Multidimensional Associations.	15
3	Classification and Prediction: Decision Tree Induction, Naïve Bayesian Classification, Associative Classification, Classification by Back propagation, Model Evaluation, Improving Classification Accuracy	15
4	Cluster and Outlier Analysis: What is Cluster Analysis? Clustering Methods- Partitioning method, Hierarchical method, Density-Based method, Model-based methods Outlier and its detection Applications and Trends in Data Mining: Visual and Audio Data mining, Statistical data mining, Data Mining Applications, Data Mining Trends	15

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Define the data warehouse and its operations
2	Describe the process of data mining
3	Identify frequent items within data
4	Apply classification techniques to build models
5	Analyse working of different clustering algorithms

Suggested Readings:

- 1.Data Mining Concepts and Techniques (3rd Edition): Jiawei Han, MichelineKamber, Jian Pei -Morgan Kaufmann Publishers
- 2.Modern Data Warehousing, Mining and Visualization: George M.Marakas, Pearson Education

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SCT 3.2: Internet of Things (2174304)

Course Code: SCT 3.2 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The basic aim of this course is to make students study fundamental concepts of IoT. To understand roles of sensors in IoT and also to Learn different protocols used for IoT design and be familiar with data handling and analytics tools in IoT

Unit No	Content	Hrs.
1	Introduction to IoT, IoT and Digitization, Impact, Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack. Smart Objects: The “Things” in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.	15
2	IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.	15
3	An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Var	15
4	IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints – RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi, Wireless Temperature Monitoring System Using Pi, Remote access to RaspberryPi, An IoT Strategy for Smarter Cities, Smart City IoT Architecture	15

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Explain fundamental concepts of IoT
2	Explain roles of sensors in IoT
3	Explain different protocols used for IoT design
4	To be familiar with data handling and analytics tools in IoT

Suggested Readings:

1. Vijay Madiseti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition,
2. Raj Kamal, “Internet of Things: Architecture and Design Principles”, 1st Edition, McGraw Hill
3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, 1st Edition, Pearson Education
4. Srinivasa K G, “Internet of Things”, CENGAGE Learning India, 2017

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SYLLABUS FOR M.Sc(CS) (SEMESTER – III) (W.E.F. JUNE 2021)

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OET 3.1: Linux Operating System (2174305)

Course Code: OET 3.1 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The main objective of the course is to learn history and development of the Linux Operating System and to make effective use of linux utilities and shell scripting language to solve problems. Linux operating system helps to select the policies for Process Management.

Unit No	Content	Hrs.
1	<p>Introduction of Linux : History of Linux, Architecture of Linux system & features, Shell & its type, Difference between Windows and Linux. Linux Distributions, Installing and Configuring Linux OS.</p> <p>Linux File System: Hierarchy of File system, File System parts-Boot Block, Super Block, Inode Block, Data Block, File types, Mounting devices (CD/DVD, USB, hard drive partition).</p>	15
2	<p>Users & Groups Management : Create and manage Users or groups. Assigning permissions to users and Groups, File and Directory permissions- chmod, chown, chgrp.</p> <p>Linux commands :</p> <p>File and directory Management Commands:-mkdir, rmdir, cd ,pwd, file, mv, rm, ls, cat, more, less.</p> <p>Filter Commands & Editor:-Filters: head, tail, pr, cut, paste, sort, uniq, tr, grep, egrep, fgrep, sed.</p> <p>Communication commands:- mesg, talk, write, wall, mail.</p>	15
3	<p>Text Editors : vi, vim, Archive and File compression commands.</p> <p>Process Management: Shell process, System process, background and foreground process, Changing process priority with nice. Listing processes-jobs, ps, kill- premature termination of process.</p> <p>Security Enhanced Linux : Authentication-Setting Passwords, Role of system administrator</p>	15
4	<p>Introduction to LibreOffice :</p> <p>Writer (word processor) : creating letters, books, reports, newsletters, brochures, and other documents. inserting graphics and objects from other components into Writer documents.</p> <p>Calc (spreadsheet) : Working with functions for financial, statistical, and mathematical operations. Generating 2D and 3D charts.</p> <p>Impress (presentations) : Working with common multimedia presentation tools, special effects, animation, and drawing tools. Adding sounds & video clips</p>	15

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Explain basic commands of linux operating system and can write shell scripts
2	Students will be able to create file systems and directories and operate them
3	Describe and apply various file related commands

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4	Can apply the concepts of pipes and filters.
5	Can explain how processes are created and their attributes.

Suggested Readings:

1. 1. Official Red Hat Linux Users guide by Redhat, Wiley Dreamtech India
2. 2. UNIX concepts and applications by sumitabha das, mcgraw hill publication
3. 3. Linux Kernel Development by Pearson (3rd Edition)
4. 4. The Linux Programming Interface by Michael Kerrisk
5. 5. LibreOffice 4.2 Writer Guide by Libreoffice Documentation Team

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OET 3.2: Basics of Networking (2174306)

Course Code: OET 3.2 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: This is an introductory course in Data Communications and networking. It familiarizes the students with the basics of data communications, OSI model and techniques, applications and control of modern data communications networks. Topics included are network models, digital and analog transmission, multiplexing, circuit and packet switching. This course will mainly focus on developing skills in troubleshooting and designing data networks

Unit No	Content	Hrs.
1	<p>Computer Network: Introduction of Network, Uses of computer network.</p> <p>Network Components: Hubs, Switches, Repeaters, Bridges, Routers, Gateways, Network adapters, Network Topologies, Types of Networks, Inter-networking.</p> <p>Reference Model: ISO-OSI reference model, TCP/IP reference model. Connectionless ,connection oriented service</p>	15
2	<p>Transmission Media & Transmission Modes</p> <p>Guided Media : Magnetic Media, Twisted Pair, Coaxial Cable, Fiber Optic Cable</p> <p>Unguided Media : Wireless Radio Waves Microwaves, Infrared, Satellite Communication, Wireless LAN, Bluetooth</p> <p>Analog Transmission: Modem.</p> <p>Transmission Mode : Parallel, Serial, Synchronous Transmission, Asynchronous Transmission, Modulations and types :frequency, amplitude ,phase</p> <p>Multiplexing and types :Frequency, time and wavelength, Switching techniques :Circuit, Message, Packet</p>	15
3	<p>Network basic and configuration :</p> <p>Network Protocols : FTP, DNS, TelNet, SMTP, POP, HTTP, WWW, SNMP, ARP, RARP etc.</p> <p>Inside the PC: Opening the PC and identification, Study of different blocks, Assembling and disassembling.</p> <p>Network basic and configuration: Setting IP addresses, Sharing files and folders .Network troubleshooting. PING test, ipconfig etc.</p>	15
4	<p>Introduction to servers and network security :</p> <p>Types of servers: Files servers, Email Servers, Proxy servers etc.</p> <p>Basics of Internet and Intranet</p> <p>Types of Internet connections: Dialup, Broadband, Leased Line, Wi-Fi, Wi-Max, 2G, 3G, 4G, WWW, E-mails, Search Engines, Social Networking.</p> <p>Cloud application, Audio-video Conferencing. Voice over Internet Protocol (VOIP),Recovery and backup,Essential security measures.</p>	15

Co No	Expected Course Outcomes
1	<p><i>On completion of this course, the students will be able to:</i></p> <p>Explain basic concepts of data communications and networking.</p>

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2	Identify network layered models, the Open System Interconnect (OSI) and the Internet Model using TCP/IP protocols.
3	explain how noise, attenuation, and distortion affect signal transport, encoding methods of analog and digital data digital transmission. Flow and Congestion control.
	Explain the use of LAN components like Bridges, Switches, Routers etc. and the backbone networks.

Suggested Readings:

1. Computer Networking by Tannenbaum.
2. Network Security Essentials by William Stallings
3. Dorothy E. Denning, "Cryptography and Data Security", Addison-Wesley
4. Data communication and networking by William Stallings
5. Complete Reference Red Hat Enterprise Linux & Fedora Edition by Petersen Haddan
6. Analogue Network Security by Winn Schwartau, Kayley Melton & Alissa Phillips, Mark

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10th August, 2021

HCT 4.1: Dot Net technology (2174401)

Course Code: HCT 4.1 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The main objective of this course is to provide the knowledge of Dot Net Frameworks along with ASP.NET web forms and ASP.NET MVC. Student can able to design web form using various controls and also student can able to design razor pages with MVC architectures with HTML helpers.

Unit No	Content	Hrs.
1	<p>Introduction to .NET and ASP.NET : Block diagram of .net framework, The Common Language Runtime, Introduction & difference between ASP & ASP.Net 1.1 & 2.0 Application, Web Architecture Model</p> <p>Application and Page Frameworks: Application Location Options, The ASP.NET Page Life Cycle, The ASP.NET Page Structure Options, ASP.NET Page Directives, ASP.NET Page Events, Dealing with PostBacks, ASP.NET Application Folders, Global.asax</p> <p>ASP.NET Server Controls and Validation Controls: ASP.Net Server Controls, Understanding Validation, Client-Side versus Server-Side Validation, Turning Off Client-Side Validation.</p>	15
2	<p>Working with Master Pages: Need and basics of Master Pages, Master Page and Content Page, Programmatically Assigning the Master Page, Nesting Master Pages, Master Page Events.</p> <p>Site Navigation: Site Navigation technique, SiteMap file, SiteMapPath, TreeView and MenuView control, Using XML file.</p> <p>ASP.Net State Management: Application State, Session State, Client & server storing, View state, Cache, Hidden Variable, Session object, Profiles, Overview of HTTP Handler & Modules.</p> <p>Data Access with ADO.NET: ADO.NET Overview, Using Database Connections, Commands-Executing Commands, Calling Stored Procedures, Fast Data Access: The Data Reader, Data Adapter.</p>	15
3	<p>ASP.NET MVC: Introduction to .Net MVC Framework, MVC Framework Features, MVC Architecture, ASP.NET MVC Vs ASP.NET Web Forms, MVC Components, MVC Application Folders, Configuration files, global.asax, packages.config, web.config, routing</p> <p>Controllers: The Controller's Role, Action Methods, Parameters in Controller Actions</p> <p>Views: The Purpose of Views, View Basics, Strongly Typed Views, Understanding ViewBag, ViewData, The Razor View Engine, Razor Expressions, Razor Code Blocks, Layouts, Specifying a Partial View, ViewStart, Models and Strongly Typed View</p> <p>Forms : The Action and the Method, GET or POST</p> <p>HTML Helpers: Automatic Encoding, Making Helpers Do Your Bidding, Strongly Typed Helpers, Templated Helpers, Html.ActionLink</p>	15
4	<p>Data Annotations and Validation : Using Validation Annotations, Custom Error, Messages, Display, DisplayFormat, ReadOnly, DataType, Key, HiddenInput</p> <p>Entity Framework: DB-First Approach, DbContext Class, Executing the Scaffolding Template</p> <p>Introduction to AJAX: Unobtrusive JavaScript, Ajax Helpers, JSON and Client-Side Templates</p>	15

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Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Adopt Microsoft .NET Framework and ASP.NET Page structure.
2	Design a web page with various controls.
3	Implement ADO.NET to access data in a web application.
4	Adopt MVC patterns, HTML Helpers, Entity Framework & Data Annotations.

Suggested Readings:

1. Professional ASP.NET MVC, Wrox Publication
2. Pro ASP.NET MVC 5, Apress

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10th August, 2021

HCT 4.2: Soft Computing (2174402)

Course Code: HCT 4.2

Total Hours 60

Course Credits 4

Total Marks 100

Course Objectives: The main objective of the course is to expose the students to soft computing, various types of soft computing techniques, and applications of soft computing.

Unit No	Content	Hrs.
1	Fundamentals of Neural Networks: Basic concepts, models of artificial neuron, neural network architectures, characteristics, learning methods. Backpropagation networks: Architecture, backpropagation learning: input, hidden and output layer computation, error calculation, training of neural network, effect of learning rate, backpropagation algorithm.	15
2	Crisp Sets: an Overview, Fuzzy Sets: Basic Types, Basic Concepts, Fuzzy Sets Vs Crisp Sets, Additional Properties of alpha cuts, Presentation of fuzzy sets, Extension principle for fuzzy sets.	15
3	Operations on Fuzzy Sets: Types of operations, Fuzzy complements, Fuzzy Intersections, Fuzzy Unions, Crisp and Fuzzy Relation, Binary Fuzzy Relations, Binary Relation on single set, Fuzzy Equivalence Relations, Fuzzy Compatibility Relation, Defuzzification: Lambda-cuts for fuzzy sets, Lambda-cuts for fuzzy relations, Defuzzification methods.	15
4	Basic concepts, working principle, Genetic representations, Encoding: binary, octal, hexadecimal encoding, permutation encoding, value encoding, tree encoding, Fitness function, Reproduction: Roulettewheel selection, Tournament selection, Rank selection, Mutation operator, Generational Cycle, applications.	15

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Learn about soft computing techniques and their applications.
2	Analyse various neural network architectures.
3	Define the fuzzy systems.
4	Analyse the Genetic representations and their applications.

Suggested Readings:

1. Neural Networks, Fuzzy Logic and Genetic Algorithms: S. Rajasekaran, G. A. VijayalakshmiPai, PHI.
2. Fuzzy Sets and Fuzzy Logic Theory and Application: George J. Klir, Bo Yuan, PHI.
3. Fuzzy Sets Uncertainty and Information: George J. Klir, Tina A. Floger, PHI.
4. Introduction to the Theory of Neural Competition John hertz, Krogh and Richard, Addison Wesley.
5. Introduction to Artificial Neural Network: Jaeck M. Zurada, Jaico Publishing House.

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6. Neural Network and Fuzzy System A Dynamic System: Koska, PHI.

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Academic Council 3(3.2)
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HCT 4.3: R Programming (2174403)

Course Code: HCT 4.3

Total Hours 60

Course Credits 4

Total Marks 100

Course Objectives: The basic objective of this course is to introduce R-programming language along with its application in the basic statistical computing and data analysis

Unit No	Content	Hrs.
1	Fundamental of R: Introduction to R, Data Types, Data input/output Creation of vector using commands: c , rep , seq, scan. Creation of data frame using commands: data frame, edit, Arithmetic operation on vectors. Diagrammatic and Graphical representation of data- Simple bar diagram, subdivided bar diagram, pie diagram, histogram, frequency polygon, ogive curves, Box plot.	15
2	Descriptive Statistics: Measures of Central Tendency - A.M. G.M. H.M., Median, Mode, Partition values. Measures of Dispersion- Range, Quartile deviation, mean deviation, standard deviation, CV. Bivariate Data: Correlation and Regression in R.	15
3	Simulation of Random Numbers Simulation in R for Discrete distributions- Bernoulli, Binomial and Poisson distribution. Simulation in R for Continuous distributions- Exponential and Normal distribution	15
4	Hypothesis testing in R Tests of Hypothesis: t- test (one sample), t- test (two sample), Paired t- test and F- test, Chi-square test for goodness of fit, Large sample tests. One way ANOVA.	15

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Explain critical R programming
2	the use of data structures and loop functions
3	Apply various concepts to write program in R
4	Efficiently interpret and translate the reports generated using R software

Suggested Readings:

1. Learning R: A Step-by-Step Function Guide to Data Analysis 1st Edition by Richard Cotton (Author)
2. The Art of R Programming, Norman Matloff, Cengage Learning
3. R for Everyone, Lander, Pearson
4. Siegel, S. (1956), Nonparametric Statistics for the Behavioral Sciences, McGraw-Hill International, Auckland
5. R Cookbook, Paul Teetor, Oreilly
6. R in Action, Rob Kabacoff, Manning

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SYLLABUS FOR M.Sc(CS) (SEMESTER –IV) (W.E.F. JUNE 2021)

Academic Council 3(3.2)
10th August, 2021

SCT 4.1: Artificial Intelligence (2174403)

Course Code: SCT 4.1 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The basic objective of this course is to introduce the theoretical aspects of artificial intelligence. Artificial intelligence is a continuously demanding research area. It is applied in almost every domain of our life. The course is aimed to give an overview of the role of knowledge in reasoning techniques, different representation techniques of it along with knowledge of strategies behind computer playing games, expert system and language understanding by computer.

Unit No	Content	Hrs.
1	Introduction: Turing Test, What is AI, Applications of AI, The AI Problems and Techniques Problems, Problem Spaces and Search: Defining the problem as a state space search: example, production systems, problem characteristics, Issues in the Design of Search Programs Heuristic Search Techniques: Generate-and-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis	15
2	Knowledge Representation: Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Resolution, Forward Versus Backward Reasoning Slot-and Filler Structures: Semantic Nets, Frames, Conceptual Dependency, Scripts	15
3	Statistical Reasoning: Probability and Bayes' Theorem, Certainty Factors and Rule-Based Systems, Bayesian Networks, Fuzzy Logic	15
4	Game Playing: Minmax Search Procedure, Adding Alpha-Beta Cutoffs, Iterative Deepening Learning: What is learning? Learning by induction, Learning in Neural Networks, Recurrent Networks Natural Language Processing and Expert systems: Steps in Natural Language Processing, Parsing, ATN, Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition	15

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Write down applications of AI in real-world situations
2	Apply reasoning techniques on facts
3	Explain use of models in reasoning
4	Analyze the process of language understanding by computer
5	Analyze the working of expert systems

Suggested Readings:

1. Artificial Intelligence: Elaine Rich, Kevin Knight, TMH, 3rd Edition.
2. Introduction to Artificial Intelligence and Expert Systems: D W Patterson, PHI, 2nd Edition.

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SYLLABUS FOR M.Sc(CS) (SEMESTER -IV) (W.E.F. JUNE 2021)

Academic Council 3(3.2)
10th August, 2021

SCT 4.2: Big Data Analytics (2174405)

Course Code: SCT 4.2 Total Hours 60 Course Credits 4 Total Marks 100

Course Objectives: The basic objective of this course is to introduce the Big Data analytics process and how to extract meaningful insights, such as hidden patterns, unknown correlations, market trends, and customer preferences.

Unit No	Content	Hrs.
1	<p>“Big Data” in the Enterprise Big Data Concepts, Challenges. Opportunities from Big Data Enterprise Information Management :New Approach to Enterprise Information Management For Big Data, Capabilities needed for Big data Big Data Implications for Industries: Big Data Analytics, Telecom/Banking/Retail/HealthCare/IT/Operations Emerging Database Landscape: Scale-Out Architecture, RDBMS Vs Non-Relational Database Database Workload & its Characteristics ,Implication Of Big data Scale on Data Processing</p>	15
2	<p>Application Architectures For Big Data And Analytics Big Data Warehouse & Analytics, Big data Warehouse System requirements & Hybrid Architectures Enterprise Data Platform Ecosystem, Big Data and Master Data Management</p>	15
3	<p>Hadoop Framework Hadoop Architecture, History of Hadoop – Facebook, Dynamo, Yahoo, Google Components Of Hadoop Framework :HDFS, MAP Reduce Introduction to Pig, Hive, Mahout, Sqoop Installation of Single Node cluster, Multi-Node Cluster- installation of Java, hadoop configuration</p>	15
4	<p>Big Data Analytics Methodology Big data Analytics Methodology- Analyze & Evaluate Business Cases Develop Business Hypothesis-Analyze outcomes, Build & Prepare Data sets, Select & Build Analytical Model, Design For Big data Scale, Build production ready System, Setting up the Big Data Analytics System, Gathering data, Measure & Monitor.</p>	15

Co No	Expected Course Outcomes
	<i>On completion of this course, the students will be able to:</i>
1	Learn Big data and its analytics in the real world.
2	Design of algorithms to solve data intensive problems Analyze the big data framework like hadoop, pig to efficiently store and process big data to generate analytics.
3	Implementing Big Data Activities using Hive.

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Suggested Readings:

- 1.Data Analytics Made Accessible by Anil Maheshwari
- 2.Ten Signs of Data Science Maturity by Peter Guerra and Kirk Borne
- 3.Too Big to Ignore: The Business Case for Big Data by award-winning author P. Simon

**Chairman
BOS MSc. CS**