MCA –Second Year [FourthSemester]

Code No.	Title	Credit Pattern as per CBCS Policy* (* As per the SRTMUN policy for affiliated colleges as well as for Campus schools)					
		Affiliated Colleges/ Institutes			**Univ. Campus Schools**		
		Internal Credits	**External Credits**	**Total Credits**	**Internal Credits**	**External Credits**	**Total Credits**
Elective Courses-3(Chose any one)							
MCA-R401 A	Cyber Security and Digital Forensics	01	03	**04**	02	02	**04**
MCA-R401 B	Cryptocurrency and Blockchain Technologies						
MCA-R401 C	Deep Learning						
MCA-R401 D	Game Development						
Elective Courses-4 (Chose any one)							
MCA-R402 A	Advanced Web Technology	01	03	**04**	02	02	**04**
MCA-R402 B	Artificial Intelligence and machine learning						
MCA-R402C	Quantum Computing						
MCA-R402D	Digital Marketing and Business Analytics						
Practical / Lab							
MCA-R405	Lab-10: Based on Elective Course-3	01	01	**02**	01	01	**02**
MCA-R406	Lab-11: Based on Elective Course-4	01	01	**02**	01	01	**02**
MCA-R407	Lab-12: Project Work	06	06	**12**	06	06	**12**
MCA-R408	Project Viva voce		02			02	**02**
MCA-R409	Seminar	01		**01**	01	01	**01**
Total Credits		**11**	**16**	**25**	**13**	**15**	**27**

MCA-R401 A	Cyber Security and Digital Forensics

Course Objectives
1.Understand basics of cyber security
2 Acquire the knowledge of various tools and methods used in cyber crime
3 Learn the fundamentals of digital forensic
4 Apply appropriate skills and knowledge for solving digital forensic problems

Course Outcomes
CO1 Demonstrate understanding of basic concepts in cyber security **Understanding**
CO 2 Make use of various tools and methods used in cybercrime **Applying**
CO 3 Adapt fundamental knowledge of digital forensics **Creating**
CO 4 Determine skills and knowledge for solving digital forensics Problems **Evaluating**

Unit-1:	Introduction to Cyber Security	
Cybercrime and origins of the world, Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA- 2000, A global Perspective on cybercrimes. **Self learningTopic:**Amendments to the Indian IT Act(2008).		
		4hrs
Unit-2:	Cyber offenses & Cybercrimes	
How criminal plan the attacks, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses, E-Mail Spoofing, Spamming,data diddling , salami attack, Cyber defamation, Internet Time Theft,SocialEngg, Cyber stalking, Cyber café and Cybercrimes, Botnets, Attack vector, Cloud computing, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era. **Self learning Topic:** Security Challenges Posed by Mobile Devices.		
		7 hrs
Unit-3:	Tools and Methods Used in Cybercrime	
Phishing, Password Cracking, Keyloggers and Spywares, Virus ,worms and trojans, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer OverFlow, Attacks on Wireless Networks,Identity Theft (ID Theft) **Self learning Topic:** Various types of viruses,Worms and Trojans		
		6 hrs
Unit-4:	Introduction to Digital Forensics	
Introduction to Digital Forensics and its uses. Need of digital Forensics, Digital forensic life cycle, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing and Antiforensics. **Self learning Topic:** Various digital forensic models/ framework		
		5 hrs
Unit-5:	Data Recovery and Evidence Collection	
Data Recovery: Defined, data backup and recovery, role of backup in data		

recovery, Data recovery solutions, Hiding and recovering Hidden data Evidence Collection and Data Seizure: What is digital evidence, rules of evidence, Characteristics of evidence, Types of evidence, Volatile evidence, General procedure for collecting evidence, Methods of collection and collection steps, Collecting and archiving, Evidence handling procedures, Challenges in evidence handling Duplication and Preservation of Digital Evidence **Self learningTopic:**Symmetric and Asymmetric Encryption		
		8 hrs
Unit-6:	**Network Forensic and Steganography**	
Network Forensics : Network Fundamentals, Network Types, Network security tools and attacks, Intrusion Detection Systems (types and advantages and disadvantages) Email Investigations – E-Mail protocol, E-Mail as Evidence, Working of EMail, Steps in the E- Mail communication, IP Tracking, E-Mail Recovery, Android Forensic-Android forensic- The evolution of Android, The Android model, Android security, The Android file hierarchy, The Android file system, Android Data Extraction Techniques: Manual data extraction,Logical data extraction, Physical data extraction Cyber Forensics Tools: Tool Selection, hardware, Software, Tools (FKT, PKT) Steganography – categories of steganography in Forensics (Text, Image, Audio) **Self learning Topic:** Various forms of Internet Frauds		

Text Books:	
1.	Nina Godbole, SunitBelapurCyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives –, Wiley India Publications Released: April 2011
2.	John Sammons, "The Basics of Digital Forensics", Elsevier 2012

Reference Books	
1.	Computer Forensics, Computer Crime Scene Investigation. By John R. Vacca, Charles River Media, INC. 2nd Edition
2.	Jain, Dr. dhananjay R. Kalbande,Digital Forensic The Fascinating world of Digital forensic

MCA-R401 B	Cryptocurrency and Blockchain Technologies

Course Objectives
1. Understand basic crypto currency concepts.
2. Understand the working and transactions of bit coin.
3. To analyze the function of Blockchain technique.

Course Outcomes
CO1 Understand crypto currency concepts**Understanding**
CO 2 Should be able to understand the working and transactions of bit coin**Applying**
CO 3 Should know the different advanced transactions and scripting techniques**Creating**
CO 4 Knowledge on analyzing the function of Blockchain**Evaluating**

Unit-1:	Introduction

Bitcoin - History of Bitcoin - Uses, Users, Choosing a Bitcoin Wallet - Quick Start - Getting Your First Bitcoin - Finding the Current Price of Bitcoin - Sending and Receiving Bitcoin - How it Works, Transactions - Blocks, Mining, and the BlockchainBitcoinOverview.Transaction Inputs and Outputs - Transaction Chains - Making Change - Common Transaction Forms - Constructing a Transaction - Getting the Right Inputs - Creating the Outputs - Adding the Transaction to the Ledger - Bitcoin Mining - Mining Transactions in Blocks - Spending the Transaction

	4 hrs

Unit-2:	Bitcoin Core:

The Reference Implementation - Bitcoin Development Environment - Compiling Bitcoin Core from the Source Code - Selecting a Bitcoin Core Release - Configuring the Bitcoin Core Build - Building the Bitcoin Core Executables - Running a Bitcoin Core Node - Running Bitcoin Core for the First Time - Configuring the Bitcoin Core Node - Bitcoin Core Application Programming Interface (API) - Getting Information on the Bitcoin Core Client Status - Exploring and Decoding Transactions - Exploring Blocks - Using Bitcoin Core

	7 hrs

Unit-3:	Wallets and Transactions

Wallet Technology - Overview Nondeterministic (Random) Wallets - Deterministic (Seeded) Wallets - HD Wallets (BIP-32/BIP-44) - Seeds and Mnemonic Codes (BIP-39) - Wallet Best Practices - Using a Bitcoin Wallet - Wallet Technology Details - Mnemonic Code Words (BIP-39) - Creating an HD Wallet from the Seed - Using an Extended Public Key on a Web Store Transactions - Transactions in Detail – Transactions Behind the Scenes - Transaction Outputs and Inputs - Transaction Outputs - Transaction Inputs - Transaction Fees - Adding Fees to Transactions Transaction Scripts 59 and Script Language - Turing Incompleteness - Stateless Verification - Script Construction (Lock + Unlock) - Pay-to-Public-Key-Hash (P2PKH) - Digital Signatures (ECDSA) - How Digital Signatures Work - Verifying the Signature - Signature Hash Types (SIGHASH) - ECDSA Math - The Importance of Randomness in Signatures - Bitcoin Addresses, Balances, and Other Abstractions

	6 hrs

Unit-4:	Advanced Transactions and Scripting:

Multisignature -Pay-to-Script-Hash (P2SH) -P2SH Addresses -Benefits of P2SH -Redeem Script and Validation -Data Recording Output (RETURN) -Time locks -Transaction Lock time (nLocktime) -Check Lock Time Verify (CLTV) -Relative time locks -Relative time locks with nSequence -Relative time locks

with CSV -Median-Time-Past -Time lock Defense Against Fee Sniping-Scripts with Flow Control (Conditional Clauses) -Conditional Clauses with VERIFY Opcodes -Using Flow Control in Scripts -Complex Script Example		
		5 hrs
Unit-5:	**The Bitcoin Network -**	
-Peer-to-Peer Network Architecture -Node Types and Roles -The Extended Bitcoin Network -Bitcoin Relay Networks -Network Discovery -Full Nodes -Exchanging Inventory - Simplified Payment Verification (SPV) Nodes - Bloom Filters -How Bloom Filters Work -How SPV Nodes Use Bloom Filters -SPV Nodes and Privacy - Encrypted and Authenticated Connections -Tor Transport -Peer-to-Peer Authentication and Encryption -Transaction Pools		
		8 hrs
Unit-6:	**Block chain**	
The Blockchain Structure of a Block -Block Header -Block Identifiers: Block Header Hash and Block Height -The Genesis Block -Linking Blocks in the Blockchain - Merkle Trees -Merkle Trees and Simplified Payment Verification (SPV) -Bitcoin Test Blockchains - Testing Playground -The Segregated Witness Testnet -The Local Blockchain - Using Test Blockchains for Development,		
Text Books:		
1.	Mastering Bitcoin: Programming the Open Block chain, Andreas M. Antonopoulos, Shroff/O'Reilly; Second edition, 2017.	
2.	Imran Bashir,MasteringBlockchain,Packt Publishing Limited ,2016.	
Reference Books		
1.	ArshdeepBahga ,Blockchain Applications: A Hands-On Approach , 2017.	

MCA-R401 C	Deep Learning

Course Objectives **1** To understand dataset and pre-processing to build neural network models. **2**To apply appropriate learning rules for each of the architectures and build several neural networkmodels. **3**To learn different regularization and optimization techniques used in deep learning **4**To identify the problems, choose relevant deep learning algorithms and analyze the results forrespective applications.	
Course Outcomes **CO1** Demonstrate Tensor flow/Keras deep-learning workstations.**Understanding**	

CO 2 Choose appropriate data preprocessing techniques to build neural network models.**Applying** **CO 3** Analyze different regularization and optimization techniques used in deeplearning.**Creating** **CO 4** Build neural network models using deep learning algorithms-CNN and RNN to solve real world problems.**Evaluating**	

Unit-1:	**Introduction to Tensor flow/Keras**	
Installation, Importing Libraries and Modules. **Self Learning Topic:-**Setting up a deep-learning workstation.		
		2hrs
Unit-2:	**Dataset**	
Working with Dataset-Loading the dataset, Splitting dataset into training and testing data sets. **Self Learning Topic:-**Data representations for neural networks		
		2hrs
Unit-3:	**Data Preprocessing Techniques**-	
Numerical Data, Feature Scaling, Handling Missing Values, Categorical Data and String Data Types, Encoding, Data Splitting. **Self Learning Topic: -** Outliers detection.		
		6 hrs
Unit-4:	**Artificial Neural Networks**-	
McCulloch-Pitts neuron, single layer perceptron network, multi-layer perceptron network, Back propagation network. **Self Learning Topic:-** Adaline Network **Regularization Techniques-** Dataset Augmentation, Early Stopping, Dropout. **Self Learning Topic:-** Optimization techniques(any one)		
		5 hrs
Unit-5:	**Deep Neural Network Algorithm**	
Convolutional Neural Network(CNN)- Introductionto convnets, Adding a classifier, Training the convnet on given data set, The convolutionoperation, The max-pooling operation, Evaluating the model, analysing and visualizingresults. **Self Learning Topic: -** Pre-trained Convnet.		
		8 hrs
Unit-6:	**Deep Neural Network Algorithm-Recurrent Neural Network (RNN)**	
Training the model with RNN layers, Evaluating the model, analyzing and visualizing results. **Self Learning Topic: -** Pre-trained RNN.		

Text Books:	
1.	François Chollet, Deep Learning with Python, 2018 by Manning Publications Co. ISBN 9781617294433.
2.	Deep Learning Tutorial Release 0.1, LISA lab, University of Montreal
Reference Books	
1.	Sebastian Raschka, VahidMirjalili, Python Machine Learning: Machine Learning and DeepLearning with Python,3rdEdititon, Packet Publishing.

MCA-R401 D	Game Development

Course Objectives	
1 Learn Unity framework for Game Development 2 Implement object oriented programming concepts in Game Development 3 Demonstrate use of Game development components 4Use gaming assets for designing 3D games	

Course Outcomes **CO1** Build Games using Object Oriented Programming Concepts. **Understanding** **CO 2** Simplify Game Development Process using Unity Framework. **Applying** **CO** 3 Develop state of art 2D games**Creating** **CO 4** Plan creation of 3D games and Test them.**Evaluating**	

Unit-1:	**Unity UI Basics**	
The Layout, Game Window, Toolbar, Selecting and Focusing, Snaps, 3d Objects **Self Learning Topics:** Exploring the Editor		
		2 hrs
Unit-2:	**Game Development Components**	
Game Objects,Models,Materials and Textures,Trrain,Environments,Lights and Cameras, Sound Effects **Self Learning Topics:** IDE components		
		2 hrs
Unit-3:	**Unity C# Scripting**	
C# variables in Unity 3D ,C# numbers in Unity 3D,C# conditionals in Unity 3D,C# arrays & loops in Unity 3D ,C# functions & methods in Unity 3D, Object oriented programming & inheritance in C# for Unity **Self Learning Topics**: Software Development life cycle		
		6 hrs
Unit-4:	**Managing State and Transitions**	
Object Metadata, Processing the Auxiliary Objects, Handling Object Visibility, Handling Special Cases **Self Learning Topics**: State Machine		
		5 hrs
Unit-5:	**Physics and Special Effects**	
Games implementing the concepts of -Adding New Assets, Combining Physics and Keyframe Animation, Particle Systems, Other Special Effects,Collisions,Prefabs and animations, Unity Physics Joints, Unity 2D Effectors **Self Learning Topics:** Designing virtual world		
		8 hrs
Unit-6:	**Unity 3D Game**	
3D Game Assets for your games in Unity, Unity 3D interface overview, Project creation & importing assets into Unity, Working with lighting & materials in		

Unity 3D,Altering shaders in Unity 3D,Switching build platforms in Unity 3D,Moving objects in Unity 3D,Coroutines & wait times in Unity 3D,Inheritance & reusability in Unity 3D ,Working with audio in Unity 3D
Self Learning Topics: Extending your Unity 3D Game

Text Books:		
1.	Blackman, Sue. Beginning 3D Game Development with Unity 4: All-in-one, multi-platform game development. Apress, 2013. ISBN: 1430248998	
2.	Goldstone, Will. Unity game development essentials. Packt Publishing Ltd, 2009. ISBN: 184719818x	
Reference Books		
1.	Murray, Jeff W. C# game programming cookbook for Unity 3D. CRC Press, 2014.	
2	Paris Buttfield-addison , Jon Manning , Tim Nugent,Unity Game Development Cookbook: Essentials For Every Game, O'reilly Media, ISBN: 1491999152	

MCA-R402 A	Advanced Web Technology

Course Objectives

1. Focuses on building interactive web sites and web applications.
 2   Advanced Web Technologies are based on ASP.Net technology with VB.
3. To learn creating interactive web applications using server controls,
database and Ajax

Course Outcomes
CO1 Apply the concept of Client Server architecture.
CO 2 Develop web applications using standard ASP.Net control and validation control.
CO 3 Design and develop interactive web applications using master page and theme.
CO 4 Develop asynchronous web application using database programming and Ajax.

Unit-1:	**Introduction to ASP.Net Web Programming & IDE**

1.1 Basics of ASP.NET
1.1.1 Features of ASP.NET
1.1.2 Differences between ASP.NET and Classic ASP
1.1.3 Web Applications and Webpage
1.1.4 Components of Web application
1.1.5 Client Server Architecture

Creating simple Web Application in ASP.NET
1.2.1 Introduction to Visual Studio
1.2.2 Creating a New Web Project (ASP.NET)
1.2.3 Opening an Existing Web Site
1.2.4 Building Web Sites
1.2.5 Set up of work environment, start page, the menu system, toolbars, the new project dialog
box, graphical designer, code designer

1.3 Working with ASP.Net Web Forms.
1.3.1 Types of ASP.Net Files
1.3.2 Web Form Round Trip
1.3.3 Stages in Web Form Processing
1.3.4 ASP.Net Objects (Request, Response, Server, Application, Session)

	6 hrs

Unit-2:	ASP.Net Server Controls	
2.1 Introduction of HTML Controls, ASP.Net Server Controls and Validation Controls 2.2 Working with Properties, Events & Methods of Server Controls (Button, TextBox, Label, CheckBox, CheckBox list, Radio Button, Link Button, ListBox, Drop Down List, Image, Hyperlink, Panel, Place Holder, File Upload) 2.3 Validation Controls (Required Field Validator, Compare Validator, Range Validator, Regular Expression Validator,Custom validator, Validation Summary, Validation Group)		
		14 hrs
Unit-3:	State Management in ASP.Net	
3.1 State Management 3.1.1. View State 3.1.2. Session State 3.1.3. Application State 3.1.4. QueryString 3.1.5. Cookies 3.2 ASP.Net Configuration 3.2.1. Global.asax application file 3.2.2. Web.config file		
		6 hrs
Unit-4:	Working with Master Page & Themes	
4.1 Master Pages 4.1.1 Create Master pages 4.1.2 Create & Develop Content Pages 4.1.3 Nest Master Page 4.1.4 Access master page controls from content page 4.2 Themes 4.2.1 Create theme 4.2.2 Applying existing theme to an application 4.2.3 Create Skin 4.2.4 Applying skin to a control		
		6 hrs
Unit-5:	Database Programming using ADO.Net and AJAX	

5.1 ADO.Net Components 5.1.1 Connection Object 5.1.2 Command Object 5.1.3 DataReader 5.1.4 DataSets & Data Adapter 5.1.5 DataView 5.2 Insert, Update, Delete and DataBinding operation using Data Grid, Data List and Repeater Control			
		5 hrs	

Unit-6:	ASP.Net AJAX Control	
	5.3.1 Ajax Framework 5.3.2 ScriptManager, UpdatePanel & Update Progress Bar Control of Ajax Develop simple web application with AJAX controls	

Text Books:

1.	Murach's ASP.Net Web Programming in VB-Net	Mike Murach	Mike Murach & Associates
2.	ASP.NET: The Complete Reference Book	Matthew Macdonald	McGraw Hill education

Reference Books

1.	Programming in Visual Basic. NET	Julia Case Bradley, Anita C. Millspaugh	McGraw Hill, latest edition
2	Visual Basic .net Comprehensive Concepts and Techniques	Shelly, cashman, Quasney	Cengage learning, 2012

MCA-R402 B	Artificial Intelligence and machine learning

Course Objectives	
1.Understand different AI concepts **2** Elucidate knowledge of Artificial Intelligence techniques for problem solving **3** Understand Artificial intelligence search strategies and neural networks **4** Provide an insight into the fundamentals of Machine Learning Techniques	

Course Outcomes	
CO1 Interpret Artificial Intelligence concepts intelligence concepts **Understanding** **CO 2** Apply Artificial intelligence techniques for problem solving. **Applying** **CO** 3 Analyze the fundamentals of machine learning, the learning algorithms and the paradigms of supervised and un-supervised learning **Creating** **CO 4** Identify methods to improve machine learning results for better predictive performance.**Evaluating**	

Unit-1:	**Introduction to AI**	
Artificial Intelligence, Application of AI, AI Problems, Problem Formulation, Intelligent Agents, Types of Agents, Agent Environments, PEAS representation for an Agent, Architecture of Intelligent agents. Reasoning and Logic, Prepositional logic, First order logic, Using First-order logic, Inference in First-order logic, forward and Backward Chaining **Self-Learning topics: Expert systems**		
		2 hrs
Unit-2:	**Search Strategies**	
Solving problems by searching, Search- Issues in The Design of Search Programs, Un-Informed Search- BFS, DFS; Heuristic Search Techniques: Generate-And- Test, Hill Climbing, Best-First Search, A* Algorithm, Alpha beta search algorithm, Problem Reduction, AO*Algorithm, Constraint Satisfaction, Means-Ends Analysis **Self-Learning topics: Tabu search**		
		2 hrs
Unit-3:	**Artificial Neural Networks**	
Introduction, Activation Function, Optimization algorithm- Gradient decent, Networks- Perceptrons, Adaline, Multilayer Perceptrons , Backpropagation Algorithms Training Procedures, Tuning the Network Size **Self-Learning topics: Maxnet algorithm**		
		6 hrs
Unit-4:	**Introduction to ML**:	
Machine Learning basics, Applications of ML,Data Mining Vs Machine Learning vs Big Data Analytics.		

Supervised Learning- Naïve Base Classifier, , Classifying with k-Nearest
Neighbour classifier, Decision Tree classifier, Naive Bayes classifier.
Unsupervised Learning - Grouping unlabeled items using k-means clustering,
Association analysis with the Apriori algorithm Introduction to reinforcement
learning
Self-Learning topics: Density Based Clustering,K-medoid

		5 hrs
Unit-5:	**Forecasting and Learning Theory**	

Non-linear regression,
Logistic regression, Random forest, Baysian Belief networks, Bias/variance
tradeoff, Tuning Model Complexity, Model Selection Dilemma
Clustering **:** Expectation-Maximization Algorithm, Hierarchical Clustering,
Supervised Learning after Clustering, Choosing the number of clusters,
Learning using ANN
Self-Learning topics: Maximum Likelihood Estimation

		8 hrs
Unit-6:	**Kernel Machines & Ensemble Methods**	

Introduction, Optimal Separating Hyperplane, Separating data with maximum
margin, Support Vector Machine (SVM), Finding the maximum margin, The
Non-Separable Case: Soft Margin Hyperplane, Kernel Trick, Defining
Kernels
Ensemble Methods : Mixture Models, Classifier using multiple samples of the
data set, Improving classifier by focusing on error, weak learner with a
decision stump, Bagging , Stacking, Boosting ,Implementing the AdaBoost
algorithm, Classifying with AdaBoostBootstrapping and cross validation
Dimensionality Reduction: Introduction, Subset Selection,
Principal Components Analysis, Multidimensional Scaling, Linear
Discriminant Analysis.
**Self-Learning topics: SMO Algorithm, Feature selection – feature ranking and subset
selection**

Text Books:	
1.	George F Luger, Artificial Intelligence, Fifth Edition-2009, Pearson Education Publications ,ISBN-978-81-317-2327-2
2.	Stuart Russell, Peter Norvig ,Artificial Intelligence – A Modern Approach, , Pearson Education / Prentice Hall of India, 3rd Edition, 2009 .ISBN- 13: 978-0136042594
Reference Books	
1.	Elaine Rich, Kevin Knight, S.B. Nair, Artificial Intelligence, 3rd Edition, Tata McGraw Hill-2008., ISBN 10: 0070087709 / ISBN 13: 9780070087705
2	Anandita Das ,Artificial Intelligence and Soft Computing for Beginners-,2nd Edition, ShroffPublication, ISBN- 9789351106159

MCA-R402C	Quantum Computing

Course Objectives 1. Impart the basic concepts of the emerging field of Quantum Computing **2** Learn and use various Quantum Computing algorithms **3** Demonstrate the working of basic quantum computing operations **4** Identify the basic requirements for implementing Quantum Computers	

Course Outcomes **CO1** Understand basic principles and components of Quantum Computing **Understanding** **CO 2** Analyze Quantum Computing algorithms. **Applying** **CO** 3 Design programs to perform basic Quantum Computing operations **Creating** **CO 4** Identify classes of problems that can be solved using Quantum Computing.**Evaluating**	

Unit-1:	**Overview of Traditional Computing**	
Computers and the Strong Church-Turing thesis, Circuit Model of Computation, Linear Algebra Formulation of the Circuit Model, Reversible Computation, Dirac Notation, Operators, Functions of Operators **Self-Learning Topics:** Basic Linear Algebra		
		6 hrs
Unit-2:	**Qubits and General Quantum Operations**	
State of a Quantum System, Composite Systems, Measurement, Mixed States and General Quantum Operations: Mixed States, Partial Trace, General Quantum Operations **Self-Learning Topics**: Binary Operations		
		2 hrs
Unit-3:	**Quantum Model of Computation**	
The Quantum Circuit Model, Quantum Gates: 1 Qubit Gates, Universal Sets of Quantum Gates, Discrete Set of Universal Operations. **Self-Learning Topics**: Basic Gates		
		6 hrs
Unit-4:	**Programming for a QPU**	
One Qubit: Physical Qubit, Introducing the Circle Notation, QPU Instructions; Multiple Qubits: Circle Notation for Multi-Qubit Registers, Single Qubit Operations in Multi-Qubit Registers, QPU Instructions; Quantum Teleportation **Self-Learning Topics**: Additional QPU Instructions for Multiple Qubits		
		5 hrs
Unit-5:	**Quantum Arithmetic & Logic**	
Arithmetic on a QPU, Building Increment and Decrement		

Operators, Adding Two Quantum Integers, Negative Integers, Quantum Conditional Execution, Mapping Boolean Logic to QPU Operations, Basic Quantum Logic. **Self-Learning Topics**: Overview of Quantum Phase Estimation		
		8 hrs
Unit-6:	**QPU Applications**	
	Real Data: Non-integer Data, QRAM, Matrix Encodings: How can a QPU Operations represent a Matrix; Quantum Supersampling (QSS): What can a QPU do for Computer Graphics, Conventional Supersampling, Computing Phase-Encoded Images. **Self-Learning Topics**: Shor's Factoring Algorithm	
Text Books:		
1.	Kaye P, Laflamme R, Mosca M. An introduction to quantum computing. Oxford university press; 2007. ISBN No. 0198570007	
2.	Johnson, Eric R., NicHarrigan, and Mercedes Gimeno-Segovia. Programming Quantum Computers: Essential Algorithms and Code Samples. O'Reilly; 2019.	
Reference Books		
1.	Nielsen MA, Chuang I. Quantum computation and quantum information. Cambridge University Press; 2012. ISBN No. 9780511976667	
2	Silva V. Practical Quantum Computing for Developers. Apress; 2018. ISBN No. 9781484242179	

MCA-R402D	Digital Marketing and Business Analytics

Course Objectives
1. Examine and explore the role and importance Digital Marketing in the current business scenario.
02 Familiarize with the various Digital Marketing Tools.
03 Apply Digital Marketing tools for formulating a Digital Marketing Strategy.
04 Understand Digital Marketing Campaigns using various Tools and measure their effectiveness.

Course Outcomes
CO1 Understand the role of Digital Marketing **Remembering**
CO2 Demonstrate use of various Digital Marketing Tools. **Understanding**
CO3 Discuss key element of Digital Marketing Strategy. **Applying**
CO4 Understand use of Digital Marketing Tools for Digital Marketing Campaigns **Analyzing**
CO5 Assess / Measure the effectiveness of the Digital Marketing Campaigns.**Evaluating**
CO6 Demonstrate practical skills using common digital marketing tools like SEO, SEM, Content Marketing **Creating.**

Unit-1:	**Fundamentals of Digital Marketing:**

Digital Marketing. Digital Marketing Strategy. Skills Required in Digital Marketing, Digital Marketing Plan,
Digital Marketing:
Introduction to Display Marketing, Types of Display Ads, Buying Models, Display Plan, Analytics Tools.
Dignified Digital Marketing – Ethics and Data Privacy
Self Learning Topics: What makes a Good Ad? Programmatic Digital Advertising, YouTube Advertising

	6 hrs

Unit-2:	**Search Engine Advertising**

Introduction, Understanding Ad Placement, Understanding AdRanks, Creating First Ad Campaign, Enhance Your Ad Campaign, Performance Reports.
Social Media Marketing
Building a Successful Strategy
Facebook Marketing
Facebook Marketing for Business, Anatomy of an Ad Campaign, Adverts, Facebook Insights, Other Marketing Tools, Other Essentials
Self Learning Topics:
Campaign Management, Running Campaigns, Lead Generation, Qualified Leads

		2 hrs
Unit-3:	**LinkedIn Marketing**	
Importance of LinkedIn Presence, LinkedIn Strategy, Sales Leads Generation Using LinkedIn, Content Strategy, LinkedIn Analytics, Targeting, Ad Campaign **Twitter Marketing** Getting Started with Twitter, Building a Content Strategy, Twitter Usage, Twitter Ads, Twitter Analytics, Twitter Tools and Tips for Marketers		
		6 hrs
Unit-4:	**Instagram**	
Mobile Marketing Mobile Usage, Mobile Advertising, Mobile Marketing Toolkit, Mobile Marketing Features, Campaign Development Process, Mobile Analytics **Self Learning Topics:** Addressing the Diversity in India through Mobile		
		5 hrs
Unit-5:	**SEO**	
Search Engine, Concept of Search Engine Optimization (SEO), SEO Phases, On Page Optimization, Off Page Optimization, Social Media Reach, Maintenance **Self Learning Topics:** SEM		
		8 hrs
Unit-6:	**Web Analytics**	
Data Collection, Key Metrics, Making Web Analytics Actionable, Multi-Channel Attribution, Types of Tracking Codes, Mobile Analytics, Universal Analytics, Competitive Intelligence **Self Learning Topics:** Interpretation of various Charts available in Google Analytics. How to connect Offline with Online.		
Text Books:		
1.	Digital Marketing, Seema Gupta, McGraw Hill Education (India) Private Limited	
2.	Social Media& Mobile Marketing: Includes Online Worksheets Puneet Singh Bhatia ,ISBN: 9788126578078	
Reference Books		
1.	Digital Marketing for Dummies, Ryan Deiss& Russ Henneberry, John Wiley & Son, Inc.	
2	Social Media Marketing All-In-One, Jan Zimmerman, Deborah Ng, John Wiley & Sons Inc.	

MCA-R405	Lab-10: Based on Elective Course-3

The practical's are based on the syllabus of related elective topic, The concerned faculty should identify at least 10 (ten) different experiments(01ccredit) along with one mini project task (01credit)is expected in the laboratory work

MCA-R406	Lab-11: Based on Elective Course-4

The practical's are based on the syllabus of related elective topic, The concerned faculty should identify at least 10 (ten) different experiments(01ccredit) along with one mini project task (01credit)is expected in the laboratory work

MCA-R407	Lab-12: Project Work

Course Objective

1 Acquaint with the process of identifying the needs and converting it into the problem.

2 Adapt to a rapidly changing environment by having learned and applied new skills, new technologies and provide solutions to the problems in various application domains.

3 Conceptualize knowledge with emphasis on team work, effective communication, critical thinking and problem solving skills.

4. Inculcate the process of innovation, self-learning and research

Lab Course Outcomes: On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Demonstrate the ability to produce a technical document.	Understanding
CO2	Identify problems based on environmental, societal & research needs.	Applying
CO3	Apply Knowledge and skills to analyze and interpret data by applying appropriate research methods to solve societal problems in a group.	Applying
CO4	Design and evaluate solutions for complex problems.	Creating
CO5	Build small groups to work effectively in team on medium scale computing projects.	Creating
CO6	Create value addition for the betterment of the individual and society	Creating

Guidelines for Lab 12 –Project

1. Students shall form a group of 2 to 3 students.
2. Students should do survey and identify needs, which shall be converted into problems
 In consultation with the faculty Supervisor/Guide/HOD/Internal Committee of faculties.
The project contact hours shall be allotted in the time table and 2 hours workload shall be considered for the guide/ supervisor.
3. Students shall submit an implementation plan in the form of Gantt/PERT/CPM chart, which will cover weekly activity of project.
4. A log book to be prepared by each group, wherein the group can record weekly work progress, Guide/Supervisor can verify and record notes/comments.
5. Faculty may give inputs during project activity; however, focus shall be on self learning.
6. Students in a group shall understand the problem effectively, propose multiple solutions and select the best possible solution in consultation with Guide/ Supervisor.
7. Students shall convert the best solution into a working model using various components of their domain areas and demonstrate.
8. The solution to be validated with proper justification and project report to be compiled in standard format of SRTM University, Nanded. (Student can discuss or contact the concerned guide.)

Assessment of Project:
I) Term work (3 credits /75 Marks):
The progress of the mini project to be evaluated on a continuous basis.
In continuous assessment focus shall also be on each individual student, assessment based on individual's contribution in group activity, their understanding and response to questions.

Distribution of Term work marks shall be as below;
o Marks awarded by guide/supervisor based on log book : 25
o Self contribution and use of skill set in project : 25
o Quality of Project report : 25

II) Project Internal Examination (3 credits /75 Marks):
Report should be prepared as per the guidelines issued by the SRTM University .
The students shall present a seminar on project and demonstrate their understanding of need/problem.
Project shall be evaluated through a presentation and demonstration of working model by the student project group to a panel of examiner at Institute level.
Project shall be assessed based on following points:
- Quality of survey/ need identification.
- Clarity of Problem definition based on need.
- Innovativeness in solutions.
- Feasibility of proposed problem solutions and selection of best solution.
- Cost effectiveness.
- Societal impact.
- Full functioning of working model as per stated requirements.
- Effective use of skill sets.
- Contribution of an individual as a member or leader.
Clarity in written and oral communication.

III) Project External Examination (6 + Project Viva-Voce 2 credits total 8 credits /200 Marks):
This examination will be conducted as per university examination section guidelines of SRTM University, Nanded.

MCA-R409	Seminar	01 credit 25 marks

Course Seminar Topics (Suggestions not compulsory)
· Web mining
· spatial data mining
· SVM/ nural network
· Decision tree classification
· Clustering methods
· Outlier detection methods
· Baysian classifiers naive bayes and bayes net
· Regression
· Different data pre-processing techniques
· spatial data mining
· Lazy learner methods
· Machine learning, Data mining, Business intelligence
· Machine learning vs Deep learning
· Classification vs Clustering
· Market Basket Analysis

· Data preprocessing
· outlier analysis applications
· eager vs lazy learners
· Density based clustering vs Distance based clustering
· Linear - Non linear regression
· Parametric-non parametric estimation
· Overfitting and underfitting in the context of classification
· Linear and Quadratic discriminant analysis
· Regression v/s classification
· Classifier performance measures
· Supervised and unsupervised learning
· Balancing errors in hypothesis testing
· Standard sampling practices for a successful survey for reliable sample data

Candidate has to present for 15 minute PowerPoint presentation