SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

(NAAC Re-accredited with 'A' Grade)

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड.

CURRICULUM FRAMEWORK AND SYLLABUS

FOR OUTCOME BASED EDUCATION IN MCA (02 Years Program)

Second year / Third Semester

For the students admitted to SY from the Academic year 2021-2022 onwards

MCA (02 Years Program)- Second Year [Third Semester]

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
Core Courses (Compulsory)							
MCA-R301	Visual Programming Tools	01	03	**04**	02	02	**04**
MCA-R302	Mobile Application Development	01	03	**04**	02	02	**04**
MCA-R303	Python Programming	01	03	**04**	02	02	**04**
Elective Courses-1(Chose any one)							
MCA-R304 A	Object oriented Analysis and Design (OOAD)	01	03	**04**	02	02	**04**
MCA-R304 B	Management Information System (MIS)						
MCA-R304 C	Software Project Management						
MCA-R304 D	Linux Administration						
Elective Courses-2 (Chose any one)							
MCA-R305 A	Digital Image Processing	01	03	**04**	02	02	**04**
MCA-R305 B	Visualization and Cloud Computing						
MCA-R305 C	Data Sciences						
MCA-R305 D	Internet of Things (IoT)						
Practical / Lab							
MCA-R306	Lab-7: Visual Programming Tools	01	01	**02**	01	01	**02**
MCA-R307	Lab-8:Mobile Application Development	01	01	**02**	01	01	**02**
MCA-R308	Lab-9: Python Programming	01	01	**02**	01	01	**02**
Open Elective Course (Chose any one)							
MCA-R309 A	University recognized MOOC (NPTEL/ SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR RUSA sponsored Future Oriented Courses OR	01	00	**01**	01	00	**01**
MCA-R309 B	Cyber Security (In-house Open Elective)						
Total Credits		**09**	**18**	**27**	**14**	**13**	**27**

The detailing of Third semester is as below,

Code:	MCA-R301	Visual Programming Tools	Credits: 04
Unit-1:	**Web Components**		
Introduction to Internet, Web Client/Server Model, Protocols for Web Client/Server Communication, Understanding Web Server IIS.			
Unit-2:	**Introduction to ASP.NET**		
DOT NET Framework, CLR, Framework Class Library, Garbage Collection, MSIL, Web Services, COM+ Component Services, Intro to ASP.NET, ASP.NET and HTML Controls, ASP.NET Events and Events Handler.			
Unit-3:	**Web Programming with VB.**		
Data Types, Variables, Expressions, Flow Control, Operators, Conditional Statements, Looping Structures, Arrays, OOP Concepts, Objects, Properties, Methods, Classes, Scope, Events			
Unit-4:	**Essentials ASP.NET**		
Working with Web forms, Directory Structure in ASP.NET, ASP.NET Compilation Model, Code behind Model, Working with Web form Controls, Navigation Controls, Validation Controls, Validation Groups, Client/Server Side Validation.			
Unit-5:	**ASP.NET Master Page**		
ASP.NET Master Page Overview, Master Page Layout with CSS, Master Page Directive and Content Place Holder, Creating and Applying Themes, Cookies, ASP.NET Session State, Application State			
Unit-6:	**Data Access with ADO.NET**		
Working with ADO.NET, Overview of ADO.NET Objects, Working with Connection Object, Command Object, Data Adapter Object, Data Set Object, Data Reader Object, Data Table Object.			
Text Books:			
1.	ASP.NET3.5 in C# and VB- Bill Evjen, S. Hanselman, Devin Rader, Wrox Publication		
2.	Ado.Net: The Complete Reference- Michael Otey, Tata McGraw-Hill Education		
3.	ASP.net – The Complete Reference- Matthew MacDonald, Tata McGraw Hill		
Reference Books			
1.	ASP.NET and VB.NET Web Programming - Coruch Matt J, Addison Wesley.		
2.	Beginning ASP.NET - John Wiley and Sons, Wrox Publication.		
3.	ASP.NET in C# and VB- Bill Evjen, S. Hanselman, Devin Rader, Wrox Publication		

Code:	MCA-R302	Mobile Application Development	Credits: 04
Unit-1:	**Introduction**		
Introduction to Mobile Computing, Introduction to Android Development Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development, Android User Understanding B4A for Android: Installing Basic4Android and Android SDK, Install and configure Basic4Android, Installing Android Emulator, My first program (MyFirstProgram.b4a), Second program (SecondProgram.b4a)			
Unit-2:	Understanding Android Mobiles		
Understanding Android Mobiles and the IDE of B4A Screen sizes and resolutions (Special functions like 50%x, 50dip, PerXToCurrent, PerYToCurrent - 50%x, DipToCurrent - 50dip), Understanding various Android Emulators for B4A, Understanding B4A bridge (The Designer, Tools, General Setting) Menu and Toolbar, Toolbar, File menu, Edit menu, Project menu, Tools menu, Code area, tabs			
Unit-3:	**Process and Activity life cycle**		
Variables and objects, Variable Types, Names of variables, declaring variables, Simple variables, Array variables, Array of views (objects), Type variables, Casting, Scope(Process variables, Activity variables, Local variables), Tips and Modules(Activity modules, Code modules, Service modules)			
Unit-4:	**Understanding Basic Language**		
Program flow, Process Globals routine, Globals routine, Activity Create (First Time As Boolean) routine, Activity Resume routine, Activity Pause (User Closed As Boolean) routine, Expressions (Mathematical expressions, Relational expressions, Boolean expressions), Conditional statements (If – Then – End If, Select – Case) Loop structures (For – Next, Do – Loop), Subs (Declaring, Calling a Sub, Naming, Parameters, Returned value),Events, Libraries (Standard libraries, Additional libraries folder)			
Unit-5:	**Creating User Interfaces**		
Menu example, TabHost example, Button toolbox example, Scroll View examples, SQLite Database (SQLite Database basics, SQLite Database example program), GPS (GPS Library, GPS Objects)			
Unit-6:	**Advanced concepts**		
String manipulations, Files (File object, Text Writer, Text Reader, Text encoding), Graphics and Drawing			
Text Books:			
1.	Fundamentals of Mobile Computing- Prasant Kumar Pattnaik, Rajib Mall, PHI Learning Pvt.Ltd, New Delhi.		
Reference Books			
1.	Java: A Beginner‟s Guide		
2.	Learning Java by Building Android Games- John Horton, Packt Publishing.		
3.	Android Programming for Beginners- John Horton, Packt Publishing.		

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Code:	MCA-R303	Python Programming	Credits: 04
Unit-1:	**Introduction to Python:**		
Python Basics: Data Types, Operators, Input/Output Statements, Creating Python Programs. Python Flow Control statements Decision-making statements, Indentation, Conditionals, loops, break, continue, pass statements Strings lists, Tuples, dictionaries.			
Unit-2:	**Python Functions:**		
Defining functions, DOC strings, Function parameters: default, keyword required and variable length arguments, key-word only parameters, local and global variables, pass by reference versus value, Anonymous functions, Recursion.			
Unit-3:	**Functional Programming:**		
Mapping, Filtering and Reduction, Lambda Functions, List Comprehensions.			
Unit-4:	**Object Oriented Programming:**		
Definition and defining a class, Constructor, Destructor, self and del keywords, Access to Attributes and Methods, geattr and hasattr attributes, Data, Regular Expressions: Defining Regular Expressions and String Processing			
Unit-5:	**File I/O and Exceptions Handling:**		
File object attributes, Read and Write into the file, Rename and Delete a File. Handling Exceptions, Built-in Exceptions and User defined Exceptions. GUI Programming: Introduction to Python GUI Programming, Tkinter Programming, Tkinter widgets, Events and Bindings			
Unit-6:	**Working with Django PART-I:**		
Rendering Templates into HTML and Other Formats, Understanding Models, Views, and Templates, Separating the Layers(MVC)-Models, Views, Templates, Overall Django Architecture.			
Text Books:			
1.	Timothy A. Budd: Exploring Python, Tata McGraw-Hill,2011.		
2.	Python Essential Reference, David Beazley, Third Edition		
Reference Books			
1.	Ascher, Lutz: Learning Python,4th Edition, O'Reilly, 2009		
2.	Wesley J Chun: Core Python Applications Programming, Pearson Education,3rdEdition,2013		
3.	Programming with python, A users Book, Michael Dawson, Cengage Learning Python Bible		

Code:	MCA-R304 A	Object Oriented Analysis and Design	Credits: 04
Unit-1:	**Overview of Object Oriented Systems Development:**		
Two Orthogonal Views of the Software, Concept of Object Oriented Software, Importance of Object Oriented Software, Object Oriented Future, Object Oriented Systems Development Methodology, Overview of Unified Approach.			
Unit-2:	**Object Basics:**		
An Object Oriented Philosophy, Objects, Object Behavior, Object Oriented Properties, Association and Aggregation.			
Unit-3:	**Object Oriented Systems Development Life Cycle:**		
The Process of Software Development, Developing Good Quality Software, Use Case Driven Approach for Object Oriented Systems Development, Reusability.			
Unit-4:	**Object Oriented Methodologies:**		
Introduction, Types of Object Oriented, Methodologies, Patterns, Unified Approach.			
Unit-5:	**Unified Modeling Languages (UML):**		
Overview of Unified Modeling Language (UML), Static and Dynamic Models, UML Diagrams, UML Class Diagrams, Use-Case Diagrams, UML Dynamic Modeling, Implementation diagrams, Model Management: Package and Model Organization, UML Extensibility, UML Meta-Model.			
Unit-6:	**Object Oriented Analysis and Designing of Classes**		
Complexity in Object Oriented Analysis, Business Process Modeling and Business Object Analysis, Use-Case Driven Object Oriented Analysis, Use-Case Model, Developing Efficient Documentation Designing Classes: The Object Oriented Design Principles, UML Object Constraint Language (OCL), Strategies for Designing Classes, Class Visibility: Designing Public Private and Protected Protocols, Designing Classes: Refining Attributes, Designing Methods and Protocols, Packages and Managing Classes.			
Text Books:			
1.	Object-Oriented Analysis and Design with Applications (3rd Edition), Grady Booch, Robert A. Maksimchuk, Michael W. Engel, and Bobbi J. Young		
2.	Head First Object-Oriented Analysis and Design, Brett D. McLaughlin, Gary Pollice, and Dave West		
3.	Object-Oriented Analysis and Design with the Unified Process, . Satzinger, Robert B. Jackson, and Stephen D. Burd		
Reference Books			
1.	Principles of Object-Oriented Analysis and Design, James Martin and James J. Odell		

Code:	MCA-R304B	Management Information System	Credits: 04
Unit-1:	**Management Information system**		
Need, Purpose and objectives-contemporary approaches to MIS–Information as a strategic resources-use of information for competitive advantage-capital MIS as an instrument for the organizational change.			
Unit-2:	**Information Management and Decision Making**		
Model of Decision Making – Classical, administrative and Herbert Simon‟s Models, Attributes of Information & its relevant to decision making – Types of Information.			
Unit-3:	**Information Technology**		
Definition, IT Capabilities and their organizational impact – Telecommunication and Networks – Types and Topologies of Networks – IT in enabled Services such as call Centers, Geographical Information System etc			
Unit-4:	**DBMS & Systems Analysis and Design**		
Data warehousing and Data mining, System Development Life Cycle – Alternative Systems Building Approaches – Proto Typing Development Strategies-Structured Analysis -Prototyping- Rapid Developing Tool s – CASE Tool s –Object oriented systems (only introduction to these tools and techniques).			
Unit-5:	**Decision Support System**		
Group Support System – Executive Information Systems - Executive Support Systems –Experts Systems and Knowledge based Experts Systems – Artificial Intelligence.			
Unit-6:	**Management Issues in MIS**		
Information Security and controls- Quality assurance – Ethical and Social Dimension – Intellectual Property Rights as related to IT services/ IT products – Managing Global Information Systems.			
Text Books:			
1.	Brown, C.V., DeHayes, D.W., Hoffer, J.A., Martin, E.W., & Perkins, W.C. (2012). Managing Information Technology. (7th Ed). Pearson/Prentice Hall.		
2.	Management Informant ion Systems, Jawadekar Tata McGraw Hill.		
Reference Books			
1.	Management Information Systems-Landon 7th Edition, Pearson Education, Asia.		
2.	Management Information Systems, Davis and Olson, Tata McGraw Hill .		
3.	Management Information Systems, Jayant Oke.		

Code:	MCA-R304 C	Software Project Management	Credits: 04
Unit-1:	**Fundamentals of Project Management**		
Definition, Characteristics of Project, Types of Project, Project Phases, Project management Process, Project life cycle, Project Life Cycle Models			
Unit-2:	**Project formulation**		
Significance of project formulation, Step-Wise Approach to Project formulation, Feasibility analysis, Cost Benefit Analysis, Cash flow forecasting, Return on Investment.			
Unit-3:	**Software project Approach Selection**		
Project Vs Activity, Activity Planning, Planning Approaches, Process models, Waterfall model, V Model, Spiral model, Software prototyping, appropriate model selection			
Unit-4:	**Software Effort Estimation**		
Software estimation techniques, Estimation Approaches, Definition of Project scheduling, Project controls and importance, Network techniques of Project Management: Gantt chart, CPM, PERT, COCOMO			
Unit-5:	**Risk and Uncertainty Decisions**		
Project Risk, Types of Project Risk, Identification of Risk, Risk Prioritization, Project risk Analysis, Qualitative analysis and Quantitative analysis, Sensitivity Analysis, Break Even analysis, Risk Planning			
Unit-6:	**Resource Allocation**		
Resources, Barman's Priority list, Cost Schedules, Software quality assurance, relation between software quality and software productivity, Role of project manager in software development			
Text Books:			
1.	Software Project Management, Bob Hughes and Mike Cottrell, Tata McGraw Hill.		
2.	Project Management, S. Chaudhary, Tata McGraw Hill.		
Reference Books			
1.	Project-Preparation, Appraisal, Budgeting and Implementation, Prassna Chandra, Tata McGraw Hill.		
2.	Software Project Management: A real-world Guide to Success, Joel Henry, Pearson education.		

Course Code:	MCA-R304D	**Course Name:** Linux Administration	Credits: 4
Unit-1:	**Introduction**		
	Installation of Linux, System recovery, File system, system calls, internal commands of Linux: Date, Time,cp, cal, rd, md, cd		08 Lectures
Unit-2:	**Component of Process**		
	PID, PPID, UID, EUID, GID, EGID, The lifecycle of Process, The /Proc file system, The working of commands top, nice ,renice, ps, dig		08 Lectures
Unit-3:	**File system**		
	File system mounting and unmounting, File types: regular files, directories, character and block device files, names pipes. File attributes: permission bits, setuid and set gid bits,		08 Lectures
Unit-4:	**Linux administration**		
	Adding user, removing user, disable login, allocating permissions to		08 Lectures

	user, managing user with system specific tools. Software Configuration Management: diskless client, Package management, Localization and configuration, configuration management tools. Linux commands: grep, man, kill, whereis, service,df,du,passwd,lpr,ifconfig,netstat,nslookup,wall, talk,free, cat, tar,	
Unit-5:	**Domain Name System (DNS) in Linux**	
	DNS namespace, How DNS works, DNS database: Resource record, SOA record, NS record, Mx record, PTR record, Cname record, IPV6 resource record. BIND client issues, BIND server configuration,	08 Lectures needed
Prescribed Book		
1.	Evi Nemeth , Garth Snyder, Trent R. Hein, Ben Whaley "Unix and Linux administration handbook" 4th Ed. ,PHI	
Reference Books		
1.	Evi Nemeth , Garth Snyder, Trent R. Hein "Unix and Linux administration handbook" 2th Ed. ,PHI	

Course Code:	**MCA-305A**	**Course Name:** Digital Image Processing	**Credits: 4**
Unit-1:	**fundamentals of Digital Image Processing**		
	The Origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing Digital Image Fundamentals, Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization , Some Basic Relationships between Pixels, An Introduction to the Mathematical Tools Used in Digital Image Processing.	08 Lectures
Unit-2:	**Intensity Transformations and Spatial and frequency Domain**		
	Background, Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters Filtering in the Frequency Domain, Preliminary Concepts, The Discrete Fourier Transform (DFT), The Basics of Filtering in the Frequency Domain, Image Smoothing Using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters.	10 Lectures
Unit-3:	**Morphological Image Processing**		
	Erosion and Dilation, Opening and Closing, Gray-Scale Morphology, Some Basic Morphological Algorithms	08 Lectures
Unit-4:	**Image Segmentation**		
	Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation, Segmentation Using Morphological Watersheds	08 Lectures
Unit-5:	**Object Representation, Description and Recognition**		
	Representation, Boundary Descriptors, Region Descriptors, Pattern and Pattern Classes, Matching.	08 Lectures needed
Prescribed Book			
1.	A.K. Jain, PHI, New Delhi, "Fundamentals of Digital Image Processing ",2012		
Reference Books			
1.	Chanda Dutta Magundar, "Digital Image Processing and Applications", Prentice Hall of India, 2000		
2.	Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Learniy, "Image Processing Analysis and Machine Vision" (1999)		
3.	Rafael C Gonzalez, Richard E Woods 2nd Ed., "Digital Image Processing" Pearson Education2003		

4.	William K Pratt, “Digital Image Processing”, John Willey (2001)

Code:	**MCA-R305 B**	**Virtualization and Cloud Computing**	**Credits: 04**
Unit-1:	**Introduction:**		
Defining Cloud computing, essential characteristics of Cloud computing, Cloud deployment model, Cloud service models, Multi-tenancy, Cloud cube model, Cloud economics and benefits, Cloud types and service scalability over the cloud, challenges in cloud NIST guidelines.			
Unit-2:	**Virtualization:**		
Virtualization concepts, types, Server virtualization, Storage virtualization, Storage services, Network virtualization, Service virtualization, Virtualization management, Virtualization technologies and architectures, Internals of virtual machine, Measurement and profiling of virtualized applications. Hypervisors: KVM, Xen, HyperV Different hypervisors and features			
Unit-3:	**Architecture:**		
Architecture for federated cloud computing, SLA management in cloud computing: Service provider’s perspective, performance prediction for HPC on Clouds, Monitoring Tools.			
Unit-4:	**Security:**		
Cloud Security risks, Security, Privacy, Trust, Operating system security, Security of virtualization, Security risks posed by shared images, Security risk posed by a management OS, Trusted virtual machine monitor			
Unit-5:	**Cloud Platforms:**		
Cloud Platforms: Amazon EC2 and S3, Cloudstack, Intercloud, Google App Engine, Open Source cloud Eucalyptus, Open stack, Open Nebulla, etc., Applications			
Unit-6:	**Applications:**		
Basics and Vision, Applications and Requirements, Smart Devices and Services, Human Computer Interaction, Tagging, Sensing and controlling, Context-Aware Systems, Ubiquitous Communication, Management of Smart Devices, Ubiquitous System Challenge and outlook			
Text Books:			
1.	Cloud Computing Principles and Paradigms- Rajkumar Buyya, J. Broberg, A. Goscinski, Wiley Publishing		
2.	Cloud Security: Comprehensive guide to Secure Cloud Computing- Ronald Krutz, Wiley Publishing		
Reference Books			
1.	Cloud Computing: Practical Approach- Anthony T. Velte, McGraw Hill		
2.	Cloud Security and Privacy- Tim Mather, O‟REILLY Publication.		

Course Code:	MCA-R305 C	**Course Name:** Data Sciences	**Credits: 4**
Unit-1:	**Introduction**		
	Computer science, Data Science and Real Science, Properties of data : Structured Vs unstructured data, Quantitative Vs Categorical data, Big data Vs little data. Classification and regression.		08 Lectures
Unit-2:	**Mathematical Preliminaries**		
	Probability: Probability Vs Statistics, Compound event and independence, Descriptive statistics: Centrality measures, variability measures, interpreting variance, Correlation Analysis: Correlation coefficients, The power and significance of correlation. Logarithms: Logarithm and multiplying probability, Logarithms and ratios		10 Lectures
Unit-3:	**Data Munging**		
	Language for data Science, Standard data formats, Collecting data, cleaning data, exploratory Data analysis, developing a visual aesthetic, Chart types, data models: Baseline models, Evaluating models		08 Lectures
Unit-4:	**Linear Algebra**		
	Interpreting linear algebraic formulae, geometry and vectors, Matrix operations, factorizing matrix, Eigen values, Eigen vectors and Eigen value decomposition.		08 Lectures
Unit-5:	**Linear Regression**		
	Linear regression, error in Linear regression, finding the optimal fit, better regression models: removing outliers, fitting non linear functions, feature and target scaling, dealing with highly correlated features, regression as parameter fitting, Ridge regression, Lasso regression, Introduction to logistic regression		08 Lectures needed
Prescribed Book			
1.	Steven S. Skiena, "The data science design manual" springer pub. 2017, ISBN 978-3-319-55444-0 (eBook)		
Reference Books			
1.	Software Engineering Richard Fairley Tata McGraw Hill		
2.	Software Engineering David Gustafson		

Course Code:	MCA-R305D	**Course Name:** Internet of Things (IOT)	**Credits: 4**
Unit-1:	**Introduction**		
	Internet of Things Promises–Definition– Scope–Sensors for IoT Applications–Structure of IoT– IoT Map Device , IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, M2M and IoT Technology Fundamentals-Devices and gateways, Local and wide area networking, Data management, IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture.		08 Lectures
Unit-2:	**Seven generation of IOT Sensor to appear**		
	Industrial sensors – Description & Characteristics–First Generation – description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors : Description & Characteristics, Sensors' Swarm: –description & Characteristics, Printed Electronics : Description & characteristics, IoT Generation Roadmap.		10 Lectures
Unit-3:	**Technological Analysis**		
	Wireless Sensor Structure–Energy Storage, Module–Power Management, module–RF, Module–Sensing Module.		08 Lectures
Unit-4:	**IOT Development Examples**		
	ACOEM Eagle – EnOcean Push Button – NEST Sensor – Ninja Blocks -Focus on Wearable Electronics.		08 Lectures
Unit-5:	**Preparing IOT Projects**		
	Creating the sensor project - Preparing Raspberry Pi - Clayster libraries -Hardware, Internal representation of sensor values, Persisting data - External representation of sensor values, Exporting sensor data - Creating the actuator project Hardware - Interfacing the hardware - Creating a controller - Representing sensor values - Parsing sensor data - Calculating control states - Creating a camera - Hardware -Accessing the serial port on Raspberry Pi - Interfacing the hardware .		08 Lectures needed
Prescribed Book			
1.	Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024',Yole Développement Copyrights ,2014		
Reference Books			
1.	Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015		
2.	OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014		
3.	N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014		

Code:	MCA-R306	Lab -7 : Lab on Visual Programming Tools	Credits: 02
Course Objectives Minimum 15 experiments to be carefully drafted by the Teacher so as to enable the students to practice the concepts of corresponding theory course as well as to gain independent confidence / ability to develop solutions for real world problems.			

Code:	MCA-R306	Lab -8 : Lab on Mobile Application Development	Credits: 02
Course Objectives Minimum 15 experiments to be carefully drafted by the Teacher so as to enable the students to practice the concepts of corresponding theory course as well as to gain independent confidence / ability to develop solutions for real world problems.			

Code:	MCA-R306	Lab -9 : Lab on Python Programming	Credits: 02
Course Objectives Minimum 15 experiments to be carefully drafted by the Teacher so as to enable the students to practice the concepts of corresponding theory course as well as to gain independent confidence / ability to develop solutions for real world problems.			

Code:	MCA-R309A	Open Elective	Credits:01
University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses			

OR

Code:	MCA-R309B	Cyber Security	Credits:04

Unit 1: Introduction to Cyber Security

Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace.

Unit 2: Cyber Security Vulnerabilities and Cyber Security Safeguards

Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

Unit 3: Securing Web Application, Services and Servers

Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.

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