।। सा विद्या या विमुक्तये ।।

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

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संगणकशास्त्र संकुल, उपकेंद्र लातूर व संलग्नित महाविद्यालये येथील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील MCA (I Semester) या विषयाच्या अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, संगणकशास्त्र संकुल, उपकेंद्र लातूर व प्रस्तुत विद्यापीठाशी **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील MCA (I Semester) या विषयाच्या C.B.C.S. (Choise Based Credit System) Pattern नुसारच्या अभ्यासक्रमास शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्याच्या दृष्टीने मा. कुलगुरू महोदयांनी मा. विद्यापरिषदेच्या मान्यतेच्या अधीन राहून मान्यता दिलेली असून त्यानुसार MCA (I Semester) या विषयाचा अभ्यासक्रम लागू करण्यात येत आहे.**

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

जा.क्र.:शैक्षणिक–१/परिपत्रक/पदव्युत्तर–सीबीसीएस अभ्यासक्रम/
R-२०२०–२१/**२३७३**

दिनांक : १५.०२.२०२१

स्वाक्षरित
उपकुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. अधिष्ठाता विज्ञान व तंत्रज्ञान, यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.
५) अधिक्षक, परिक्षा विभाग विज्ञान विद्याशाखा प्रस्तुत विद्यापीठ.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

(NAAC Re-accredited with 'A' Grade)

Curriculum Framework and Syllabus for
Outcome Based Education in

Master of Computer Applications (M.C.A) Degree Program
(02 Years Revised Course)

For the students admitted from the Academic year 2020-2021 onwards

PREAMBLE

Now onwards, the MCA program is a two years full time AICTE approved program which is normally completed in four semesters. The AICTE always specifically draft Model Curriculum for MCA program. Since the duration of the MCA is now reduced to two years, an AIBITE – All India Board for Information Technology Education has been set up at National level for drafting the Model Curriculum for Revised MCA program. This committee has not yet come with the model curriculum. The BoS in Computer Science and Application of SRTMUN has conducted one online National Workshop for inputs regarding Revised Curriculum of the MCA program dated 28-01-2021. Eminent Experts and member of the AIBITE committee were invited to discuss. Based on their inputs, course structure for First Semester is prepared. Keeping in mind the delay in starting current academic year due to COVID-19 crisis, it is decided to float the First Semester syllabi first. This first semester is as per CBCS (Choice Based Credit System) pattern, in which core, skill oriented courses are available. The Evaluation of performance of a student for the courses under Choice based Credit System (CBCS) are based on principle of continuous assessment through internal and external evaluation mechanisms.

The detailed structure for remaining semesters along with program objectives / outcomes, course objectives / outcomes, mappings of PO-CO, elective subjects, project development, open elective, etc shall be communicated soon once the AICTE Model Syllabus is out.

2 Years Master of Computer Applications (M.C.A) Degree Program

MCA -First Year [First Semester]

Code No.	Title	Credit Pattern as per CBCS Policy*					
		Affiliated Colleges/ Institutes			Univ. Campus Schools		
		Internal Credits	External Credits	Total Credits	Internal Credits	External Credits	Total Credits
Core Courses							
MCA-R101	Programming Logic Concepts	01	03	**04**	02	02	**04**
MCA-R102	Data Structure using C	01	03	**04**	02	02	**04**
MCA-R103	Computer Organizations and Architecture	01	03	**04**	02	02	**04**
Skill Empowering Courses							
MCA-R104	Introduction to Management Functions	01	03	**04**	02	02	**04**
MCA-R105	Mathematical Foundations For Computer Science	01	03	**04**	02	02	**04**
Practical / Lab							
MCA-R106	Lab-1 : C Programming Lab covering topics in MCA-R101 and MCA-R102	01	01	**02**	01	01	**02**
MCA-R107	Lab -2: H/W- S/W Lab Covering topics in MCA-R103	01	01	**02**	01	01	**02**
MCA-R108	Lab-3 : C Programming Lab covering topics in MCA-R105	01	01	**02**	01	01	**02**
Skill Based Activity							
MCA-R109	**Survey:** Survey on Emerging Technologies in Computer Science and Information Technology	01	00	**01**	01	00	**01**
	Total Credits	**09**	**18**	**27**	**14**	**13**	**27**

*** As per the SRTMUN policy for affiliated colleges as well as for Campus**

Notes:

1. First semester has a combination of Theory (core or skill) courses and Lab courses. Each theory course has 04 credits which are split as external credits and internal credits. The university shall conduct the end semester examination for external credits. For theory internal credit, student has to appear for class tests and assignment.

2. Every lab course has 02 credits which are split as 01 external credit and 01 internal credit. For lab internal credit, the Laboratory Book and the Lab activities carried out by the student throughout the semester would be considered. For Lab external credit, 20 marks are reserved for the examinational experiment and 05 marks are for the oral / viva examinations.

3. There is a special skill based activity of 01 internal credit which shall inculcate awareness regarding the domain of computers, IT, and ICT. Students will submit a Report on this as an outcome.

4. As per the University's guidelines, One Credit = 25 marks, Two Credits = 50 Marks, Four Credits = 100 Marks. Minimum four hours teaching per week is compulsory for 04 credit courses and likewise for other variations in the credits. There must be minimum 60 lectures per semester for a theory course and 30 labs for a lab course.

5. End Semester Theory question paper pattern shall be given afterwards.

The outline of First Semester is as below,

Code:	MCA-R101	Programming Logic Concepts	Credits: 04
Course Objectives:			
This course will cover fundamental concepts of the majority programming languages: techniques for syntax and semantic analysis of programming languages and the major constructs and concepts of procedure, functional and logic languages.			
Course Outcome:			
Students will be able to demonstrate programming language design concepts in a language they learn independently Improve your ability to develop effective algorithms, Improve the use of your existing programming language, Increase your vocabulary of useful programming constructs, Allow a better choice of programming language, Make it easier to learn a new language.			
Unit-1:	**The role of Programming Languages**		
Introduction to Languages, Basic types of languages (Machine, Assembly, High level Languages),Toward Higher-Level Languages, Programming Paradigms, Language Implementation: Bridge the Gap.			
Unit-2:	**Language Description: Syntactic Structure**		
Expression Notations, Abstract Syntax Trees, Lexical Syntax : Tokens and Spellings, Context-Free Grammars, Grammars for Expressions, Handling Associativity and Precedence.			
Unit-3:	**Statements: Structured Programming**		
Need for Structured Programming, Syntax-directed Control Flow (conditional, Looping Construct, for, Selection Case) Design considerations: Syntax, Programming with Invariants.			
Unit-4:	**Types: Data Representation**		
The role of types, Basic types, Arrays: Sequence of elements, Records: Name Fields, Union and Variant Records, Sets, Pointers			
Unit-5 : Procedure Activations			
Introduction to Procedures, Parameter-Passing Methods, Scope Rules for Names, Nested Scopes in the Source Text, Activation Records, Lexical Scope.			
Unit-6 : Logic Programming			
Computing with relations, Introduction to Prolog, Data Structure in Prolog, Programming Techniques, Control in Prolog, cuts.			
Text Books:			
1.	Programming Languages Concepts and constructs- Ravi Sethi, Pearson Education		
2.	Concepts of Programming Languages- Robert .W. Sebesta, Pearson Education.		
Reference Books			
1.	Programming Languages- A. B. Tucker, R. E. Noonan, 2nd Edition, TMH.		
2.	Programming Languages- K. C. Louden, 2nd Edition, Thomson Press.		

Code:	MCA-R 102	Data Structures using C	Credits: 04
Course Objectives:			
It will demonstrate familiarity with major algorithms and data structures. It will help students to analyze performance of algorithms as well as to choose the appropriate data structure and algorithm design method for a specified application.			
Course Outcome:			
Upon successful completion of this course, students will understand the organization and operations of data structures Stack Queues, Trees, Graphs, Heaps and Hash tables. They will also be able to identify suitable algorithms with appropriate data structures for real time software requirements.			
Unit-1:	**Introduction to Algorithm**		
Data, Variables (Local and Global), Data types, arrays Introduction to Algorithm, The efficiency of Algorithms, Analysis of Algorithms, overview of Space and Time Complexities, some fundamental algorithms for exchange , counting , summation			
Unit-2:	**Introduction to data structures**		
Introduction to data structures, Basic terminology, Primitive data structure operations Overview of STACKS, QUEUES, LINKED LISTS, BINARY TREES and GRAPHS (Basic Definition , Representations, Characteristics , Types, Applications)			
Unit-3:	**Tree and Graph**		
Minimum Spanning Trees, Growing a minimum spanning tree, The algorithms of Kruskal and Prim Graphs : DFS and BFS algorithms associated with Graphs, Single-source shortest Paths, The Bellman-ford algorithm			
Unit-4:	**Sorting and Searching**		
Introduction to searching and sorting problems, Linear search , Binary search, Selection sort , Bubble sort , Insertion sort , Merge sort, Complexities of searching and sorting algorithms			
Unit-5:	**Divide and Conquer Techniques**		
Divide and conquer, General method, Binary search, Merge sort, Strassen‟s matrix multiplication			
Unit-6:	**Advanced Data Structures**		
Introduction to Greedy method, The general method, Container loading knapsack problem, Introduction to Dynamic Programming, General method, Introduction to NP Theory			
Text Books:			
1.	Fundamentals of Computer Algorithms- Ellis Horowitz, Satraj Sahani, University Press		
2.	Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.		
Reference Books			
1.	How to solve it by Computers- R.G. Dromey , 8th Edition , Pearson Education		
2.	Data Structures, Lipschutz , Tata McGraw Hills		

Code:	MCA-R103	Computer Organizations and Architecture	Credits: 04

Course Objectives:

This is hardware knowledge course with a view to have a thorough understanding of the basic structure and operation of a digital computer. Similarly to study the different ways of communicating with I/O devices and standard I/O interfaces.

Course Outcome:

Upon successful completion of this course, students will be able to explain about computer architecture, components, hardware level processing, interfacing of components, etc

Unit-1:	**Number System**

Number system :Introduction to Number system, BCD, ASCII, Conversion of Numbers from one Number system to the other, Binary arithmetic, Signed numbers , 1‟s and 2‟s complement method.

Unit-2:	**Digital Gates**

Logic Gates: Basic Logic Gates , Basic Theorems and Properties of Boolean Algebra , NAND, NOR implementation, Sum of Products, Product of Sums, Karnaugh map, Don't Care Conditions.

Unit-3:	**Basic Organization-1**

Processor Organization :General Register Organization, Stack Organization, Addressing modes, Instruction codes, Instruction Formats.

Unit-4:	**Basic Organisation-2**

Control Unit :Register transfer and micro operations, Timing and Control, Control Memory, Micro programming, Hard wired control

Unit-5:	**Microprocessor Architecture**

Introduction to Microprocessor : Internal Architecture, Instruction Set

Unit-6:	**Peripherals**

Input – Output organization :Peripheral Devices, Input /Output interface, Asynchronous Data Transfer (Strobe & Handshaking Method), Modes of Transfer,

Text Books:

1.	Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Fifth Edition, Tata McGraw-Hill.
2.	John P. Hayes, “Computer Architecture and Organization”, Third Edition.
3.	B. Govindarajulu, “Computer Architecture and Organization: Design Principles and Applications”, Second Edition, Tata McGraw-Hill.

Reference Books

1.	M. Morrris Mano, “Digital Logic and Computer Design”, PHI.
2.	M. Morrris Mano, “ Computer system architecture ” 3rd Edition, PHI/ Pearson Education.
3.	Albert Paul Malvino, Donald P. Leach, “ Digital Principles and Applications ” , Tata Mc GrawHill Pub. Company Ltd.
4.	J.P.Hayes, “ Computer Architecture and Organization” Tata Mc Graw Hill Pub. Company Ltd.

Code:	MCA -R104	Introduction to Management Functions	Credits: 04
Course Objectives			
This is a Management side course intentionally planned so that students will get basics of administrative level management of the companies where they will get placed. This course overviews all functional areas of management namely, HRD, Marketing, Finance, Manufacturing, and Strategy.			
Course Outcomes			
Upon successful completion of this course, the students will have understanding of various management concepts including management hierarchy, understanding the importance of planning and controlling and how to implement it, study the motivation theories and use it in real world problems, etc.			
Unit-1:	**Introduction to Management**		
Definition, Characteristics of management, Importance of Management, Administration , Management thoughts: Contribution of F.W. Taylor , Henry Fayol , Peter Drucker, etc Management process school, Systems Management School,			
Unit-2:	**Planning and Controlling**		
Planning: Definition, Characteristics, Nature, Importance, Types of Plans:(Standing and Single Use Plans),Planning Process Controlling: Concept, Definition, Principles of Controlling, Objectives of controlling, Importance of Controlling			
Unit-3:	**Organizing**		
Concept, Definition, Process of organization, Principles of organization, Authority, Responsibility and Delegation, Forms of organization. Centralization and Decentralization			
Unit-4:	**Leadership and Motivation**		
Concept of Leadership, Definition, Qualities of Leadership, Leadership Styles Motivation: Meaning and Definition, Theories of Motivation1. Maslow‟s Need Hierarchy McGregor‟s Theory “X‟ and Theory „Y”			
Unit-5:	**Staffing**		
Human Resource Planning, Recruitment, Selection, Training, Training and development, Performance appraisal methods			
Unit-6:	**Quality Concepts and Social responsibility of Business**		
Total Quality Management, ISO, Quality Circle Social Responsibility of Business: Definition, Responsibilities towards owners, workers, consumers, suppliers, state, society etc.			
Text Books:			
1.	Essentials Of Management: Harold Koontz , Heinz Weihrich, Tata Mcgraw Hill.		
2.	Principles And Practice Of Management: Dr. S. C. Saxena, Sahitya Bhavan Publications.		
Reference Books			
1.	Principles Of Management: R. N. Gupta, S. Chand & Company		

Code:	MCA -R105	Mathematical Foundations for Computer Science	Credits: 04
Course Objectives			
Mathematical skills are extremely necessary developing clear thinking and creative problem solving. For developing analytical mind, we need to thoroughly train students in the construction and understanding of mathematical proofs as well as exercise common mathematical arguments and proof strategies.			
Course Outcomes			
At the end of the course student will be able to understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving. They will have ability to apply discrete structures into computing problems, formal specification, artificial intelligence, cryptography, Data Analysis.			
Unit-1:	**Set Theory**		
Sets, Venn diagrams, Operations on Sets, Laws of set theory, Power set and Products, Partitions of sets, The Principle of Inclusion and Exclusion			
Unit-2:	**Prepositional Calculus**		
Propositions and logical operations, Truth tables , Equivalence, Implications ,Laws of logic, Normal Forms, Predicates and Quantifiers, Mathematical Induction			
Unit-3:	**Relations and Functions**		
Relations, Paths and Digraphs, Properties and types of binary relations , Operations on relations, Closures, Warshalls algorithm, Equivalence and partial ordered relations, Poset, Hasse diagram and Lattice ,Functions: Types of functions - Injective, Surjective and Bijective Composition of functions , Identity and Inverse function, Pigeon-hole principle			
Unit-4:	**Permutations and Combinations**		
Permutations, Combinations, Elements of Probability, Discrete Probability and Conditional Probability, Generating Functions and Recurrence Relations, Recursive Functions, Introduction to Functional Programming			
Unit-5:	**Graph Theory**		
Graphs Definitions, Paths and circuits: Eulerian and Hamiltonian, Types of graphs, Sub Graphs Isomorphism of graphs			
Unit-6:	**Algebraic Structures**		
Algebraic structures with one binary operation: semigroup, monoid and group, Abelian group Isomorphism, Homomorphism and Automorphism, Cyclic groups, Normal subgroups, Codes and group codes			
Text Books:			
1.	Discrete Mathematics and applications- K. H. Rosen, Tata McGraw Hill		
2.	Discrete Mathematical Structures- C. L. Liu, Second Edition, McGraw-Hill		
3.	Discrete Mathematical Structures- BernadKolman, Robert Busby, Pearson Education.		
Reference Books			
1.	Discrete Mathematical Structures- Y N Singh, Wiley-India Press.		
2.	Discrete Mathematics for Computer Scientists and Mathematicians- J. L. Mott, A.Kandel, Prentice Hall of India.		
3.	Discrete Mathematical Structures with Applications to Computer Science- Discrete Mathematics for Computer Scientists and Mathematicians, Tata Mcgraw-Hill.		

Code:	MCA -R106	Lab -1 C Programming Lab covering topics in MCA-R101 and MCA-R102	Credits: 02

Course Objectives

This Laboratory course will enable students to learn C programming language and then use C language to identify, formulate and solve real world problems. The course serves as a foundation laboratory for improving the problem solving skills of students related with theory courses MCA-R101, MCA-R102

Course Outcomes

At the end of the course student will be able to understand the notion of programming for solving a problem. They will be conversant with writing elementary programs in C. Further, they will be able to apply their skills in programming to implement data structures as well as to implement logics of the algorithms.

Scope

1. Basic program writing in C as per the theory of PLC in the scope MCA-R101
2. Writing C program for Data Structures as per MCA-R102

Minimum 10 programs for each scope 1 and 2. The program specifications shall be designed by the course instructor and assigned to the students.

Reference Books

1.	Brian W Kernighan & Dennis Ritchie, "The C programming language", 2nd Ed, Prentice Hall
2.	Yashavant Kanetkar," Let us C", BPB Publications 8th Edition
3.	Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Printice hall International
4.	Mark Allen Weiss,"Data Structures and Algorithm Analysis in C", Pearson Education
5.	Robert Kruse & Clovis L. Tondo " Data Structures and Program Design in C",Prentice Hall

Code:	MCA -R107	Lab -2 H/W – S/W lab covering topics in MCA-R103	Credits: 02

Course Objectives

This Laboratory course will enable students to learn various logic gates / logic circuits and perform the logical operations like flip-flops; Encoder, Decoder, etc. The course serves as a foundation laboratory for improving the logic building and performs electronic operations.

Course Outcomes

At the end of the course student will be able to understand working of basic hardware part, machine level processing, functions of microprocessors.

Scope

1. Minimum 15 experiments shall be designed by the course instructor related to basic gates, digital kits, assembly programming and assigned to the students.

Reference Books

1.	M. Morrris Mano, " Computer system architecture " 3rd Edition, PHI/ Pearson Education.
2.	Albert Paul Malvino, Donald P. Leach, " Digital Principles and Applications " , Tata Mc GrawHill Pub. Company Ltd.

Code:	MCA -R108	Lab -3 C Programming Lab covering topics in MCA-R105	Credits: 02

Course Objectives

This Laboratory course will enable students to learn various ways to program for mathematical equations and for proving some mathematical theorems computationally.

Course Outcomes

At the end of the course student will be able to understand working of basic C language constructs, libraries for mathematical theorem proving

Scope

1. Minimum 15 experiments shall be designed by the course instructor related to basic mathematical proofs and equations to be assigned to the students.

Reference Books

1.	Discrete Mathematical Structures- Y N Singh, Wiley-India Press.
2.	Discrete Mathematics for Computer Scientists and Mathematicians- J. L. Mott, A.Kandel, Prentice Hall of India.

Code:	MCA -R109	Survey : Survey on Emerging Technologies in Computer Science and Information Technology	Credits: 02

Course Objectives

This course will enable students to undertake Survey on Emerging Technologies in Computer Science and Information Technology It will motivate them to understand scope and trends in It Industry

Course Outcome:

Understanding of current trends in IT Industry / Research for their after MCA progression

Scope

1. Students need to prepare a standard Survey Report and give Presentation (With PPT) to the audience.

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।। सा विद्या या विमुक्तये ।।

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"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

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प्रस्तुत विद्यापीठातील संगणकशास्त्र संकुल, उपकेंद्र लातूर व संलग्नित महाविद्यालयातील येथील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील MCA I Year (II Semester) या विषयाच्या अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, प्रस्तुत विद्यापीठातील संगणकशास्त्र संकुल, उपकेंद्र लातूर व संलग्नित महाविद्यालयातील **विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील MCA I Year (II Semester) या विषयाच्या C.B.C.S. (Choise Based Credit System) Pattern नुसारच्या अभ्यासक्रमास शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्याच्या दृष्टीने मा. कुलगुरू महोदयांनी मा. विद्यापरिषदेच्या मान्यतेच्या अधीन राहून मान्यता दिलेली असून त्यानुसार MCA I Year (II Semester) या विषयाचा अभ्यासक्रम लागू करण्यात येत आहे.**

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

जा.क्र.:शैक्षणिक–१/परिपत्रक/पदव्युत्तर–सीबीसीएस अभ्यासक्रम/
R-२०२०–२१/३८

दिनांक : २९.०५.२०२१

स्वाक्षरित
उपकुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. अधिष्ठाता विज्ञान व तंत्रज्ञान, यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.
५) अधिक्षक, परिक्षा विभाग विज्ञान विद्याशाखा प्रस्तुत विद्यापीठ.

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

Master of Computer Applications (M.C.A) Degree Program
(02 Years Revised Course)
Second Semester

For the students admitted from the Academic year 2020-2021 onwards

PREAMBLE

Now onwards, the MCA program is a two years full time AICTE approved program which is normally completed in four semesters. The AICTE always specifically draft Model Curriculum for MCA program. Since the duration of the MCA is now reduced to two years, an AIBITE – All India Board for Information Technology Education has been set up at National level for drafting the Model Curriculum for Revised MCA program. This committee has not yet come with the model curriculum. The BoS in Computer Science and Application of SRTMUN has conducted one online National Workshop for inputs regarding Revised Curriculum of the MCA program dated 28-01-2021. Eminent Experts and member of the AIBITE committee were invited to discuss. Based on their inputs, course structure for first two semesters is prepared. Keeping in mind the delay in starting current academic year due to COVID-19 crisis, it is decided to float the First Semester syllabi first and then second semester. This first year syllabi is as per CBCS (Choice Based Credit System) pattern, in which core, skill oriented courses are available. The Evaluation of performance of a student for the courses under Choice based Credit System (CBCS) are based on principle of continuous assessment through internal and external evaluation mechanisms.

The detailed structure for remaining semesters along with program objectives / outcomes, course objectives / outcomes, mappings of PO-CO, elective subjects, project development, open elective, etc shall be communicated soon once the AICTE Model Syllabus is out.

2 Years Master of Computer Applications (M.C.A) Degree Program

MCA -First Year [Second Semester]

Code No.	Title	Credit Pattern as per CBCS Policy*					
		Affiliated Colleges/ Institutes			Univ. Campus Schools		
		Internal Credits	External Credits	Total Credits	Internal Credits	External Credits	Total Credits
Core Courses							
MCA-R201	Understanding Operating Systems	01	03	04	02	02	04
MCA-R202	Introduction to Theory of Computations	01	03	04	02	02	04
MCA-R203	Software Engineering and Software Testing	01	03	04	02	02	04
Skill Empowering Courses							
MCA-R204	OOPs with Java	01	03	04	02	02	04
Elective Courses (Chose any one)							
MCA-R205 A	Design and Analysis of Algorithms	01	03	04	02	02	04
MCA-R205 B	Advanced Database Management System						
Practical / Lab							
MCA-R206	Lab -4: Based on MCA-R203	01	01	02	01	01	02
MCA-R207	Lab-5: Based on MCA-R204	01	01	02	01	01	02
MCA-R208	Lab-6: Based on Elective Course 205 A or 205 B	01	01	02	01	01	02
Open Elective Course (Chose any one)							
MCA-R209 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-R209 B	Professional Communication Skills (In-house Open Elective)						
Total Credits		09	18	27	14	13	27

*** As per the SRTMUN policy for affiliated colleges as well as for Campus**

The detailing of second semester is as below,

MCA-R201	Understanding Operating Systems

UNIT 1: Overview of Operating System

Operating System as an Extended Machine, as a Resource Manager, OPERATING SYSTEM CONCEPTS-Processes, Address Spaces, Files, Input/Output, Protection, Shell, SYSTEM CALLS-System Calls for Process Management, System Calls for File Management, System Calls for Directory Management, OPERATING SYSTEM STRUCTURE-Monolithic Systems, Layered Systems, Microkernels, Client-Server Model, Virtual Machines, Exokernels

UNIT 2: Process management and Threads

Process Model ,Process Creation, Process Termination, Process Hierarchies, Process States, Implementation of Processes, THREADS- Thread Usage, Classical Thread Model, POSIX Threads, Implementing Threads in User Space, Implementing Threads in the Kernel, Hybrid Implementations SCHEDULING-Introduction, Scheduling in Batch Systems, Scheduling in Interactive Systems, Scheduling in Real-Time Systems

UNIT 3: Memory management

MEMORY ABSTRACTION: ADDRESS SPACES, Notion of an Address Space, Swapping Managing Free Memory, VIRTUAL MEMORY- Paging, Page Tables, PAGE REPLACEMENT ALGORITHMS-Optimal Page Replacement, Not Recently Used Page Replacement, First-In First-Out (FIFO) Page Replacement, Least Recently Used (LRU) Page Replacement, SEGMENTATION

UNIT 4: File Systems

FILES-File Naming, File Structure, File Types, File Access, File Attributes, File Operations DIRECTORIES-Single-Level Directory Systems, Hierarchical Directory Systems, Path Names Directory Operations, FILE-SYSTEM IMPLEMENTATION-File-System Layout, Implementing Files, Implementing Directories, Shared Files

UNIT 5: Virtualization and the Clouds

History, Requirements For Virtualization, Type 1 And Type 2 Hypervisors, Techniques For Efficient Virtualization-Virtualizing the unvirtualizable , Cost Of Virtualization, Memory Virtualization, I/O Virtualization, Virtual Appliances Virtual Machines On Multicore Cpus, Licensing Issues, Clouds-Clouds As A Service, Virtual Machine Migration, Check Pointing

Reference Books

1. Operating Systems Concepts- Silberschatz A., Galvin P., Gagne G, Wiley Publication.
2. Modern Operating Systems, Andrew S. Tanenbaum, III rd Edition, PHI Publication.
3. Operating System-Internal and Design Principles, William Stallings, Pearson Education.
4. Principles of Operating Systems-Naresh Chauhan, First Edition, Oxford University press.
5. Operating Systems in Depth- Thomas W. Doeppner, Wiley Publications

MCA-R202	Introduction to Theory of Computations

UNIT 1: Fundamentals

Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non deterministic finite automaton, transition diagrams and Language recognizers.

UNIT 2: Finite Automata

NFA- Significance, acceptance of languages. Conversions and Equivalence : NFA to DFA conversion, minimisation of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Melay machines.

UNIT 3: Regular Languages

Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Closure properties of regular sets. (proofs not required).

UNIT 4: Context Free Grammars

Ambiguity in context free grammars. Minimisation of Context Free Grammars. Chomsky normal form, Greiback normal form. Enumeration of properties of CFL .

UNIT 5: Push Down Automata and Turing Machines

Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL and DPDA, Turing Machine, definition, model, representation of TM.

TEXT BOOKS:

1. "Introduction to Automata Theory Languages and Computation". Hopcroft H.E. and Ullman J.
2. Introduction to Theory of Computation –Sipser 2nd edition Thomson

REFERENCE BOOKS:

1. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
2. Introduction to languages and the Theory of Computation ,John C Martin, TMH
3. "Elements of Theory of Computation", Lewis H.P. & Papadimition C.H. Pearson /PHI.
4 Theory of Computer Science – Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI

MCA-R203	Software Engineering and Software Testing

UNIT 1: Software and Software Engineering
The nature of Software, The unique nature of Web Applications, Software engineering-A layered technology, General principles of software engineering practice, Software myths, Agile development: What is an Agile Process, Capability Maturity Model Integration (CMMI).

UNIT 2: Process models
A Generic process model (framework), Process assessment and improvement, Prescriptive process models: The waterfall model, Incremental process models, Evolutionary process models, The Unified process,

UNIT 3: Requirements Engineering
Understanding the Requirement, Requirement Modeling, Requirement Specification (SRS), Requirement Analysis and Requirement Elicitation, Requirement Engineering.

UNIT 4: Software Design concepts
Design Concepts and Design Principal, Software Architectural Design, Component Level Design, Function Oriented Design, Object Oriented Design, User Interface Design, Web Application Design

UNIT 5: Software Testing Strategies
Software Testing ,Software Testing fundamentals, Taxonomy of Software testing, Testing levels, Test case design , White box testing, boundary conditions, Control structure testing, regression testing, black box testing, Testing for specialized Environments, Architecture and applications. Approach to software testing, Strategic issues, Unit testing, Integration Testing, System Testing, Art of Debugging.

Reference Books:

1. Software Engineering –A Practitioner's approach, Sixth Edition, Roger S. Pressman, McGraw-Hill Higher Education; (1 August 2007),ISBN-10: 0077227808
2. Software Engineering –A Practitioner's approach, Fifth Edition, Roger S. Pressman, McGraw-Hill Higher Education; (1 August 2005)
3. Fundamentals of Software Engineering Second Edition, Rajib Mall, Prentic-Hall India.

MCA-R204	OOPs with Java

UNIT 1: Introduction

History, Features, How java differ from C and C++?, Java program structure, Java tokens, Java Statements, Java virtual machine, Command line arguments, Constants, Variable, Data types, Type casting.

UNIT 2: Operators and Expressions

Decision making and branching, Decision making and looping, Class, Methods, Objects, Constructors, Method overloading, Static members, nesting of methods.

UNIT 3: Inheritance

Overriding methods, Final variables, Final methods, Final Classes, Finalizer method, Abstract methods, Abstract Classes, Visibility Control, Interface, Arrays, Strings, Vectors, Wrapper Classes.

UNIT 4: System Package

Naming conventions, Creating and accessing packages, Introduction to multithreaded programming, Creating and extending threads, Life cycle of thread, Thread exception, Thread priority, Synchronization, Implementing Runnable interface, Types of errors, Exceptions, Exception handling code, Multiple catch statements, finally statement, Throwing our own exceptions, Exception for debugging.

UNIT 5: Applets

How applet differ from application?, Applet code, Applet life cycle, Creating an executable applet, designing a web page, Applet tag, Passing parameter to applet.

Reference books

1. Programming with Java A Primer – E.Balaguruswamy, McGraw Hill.
2. Java 7 Programming Black Book -Kogent Learning Solutions Inc,DreamTech press.
3. Java Fundamentals A comprehensive introduction- Herbert Schildt, Dale Skrien,
4. The Complete Reference, Java 2 -, Herbert Schild, (Fourth Edition) - TMH.
5. Core Java Volume-I Fundamentals- Horstmannand Cornell, - Pearson Education.

MCA-R205 A	Design and Analysis of Algorithms

UNIT 1: Introduction

What is an Algorithm? Fundamentals of Algorithmic Problem Solving, Review of Elementary Data Structures-Heaps and Heap Sort, Hashing, Sets Representation

UNIT 2: Divide-and-conquer

Introduction to Algorithms, Growth of functions, Solving recurrence equations: Substitution method, Iteration method and Master method , Finding Maximum and Minimum, Selection Strassen's Matrix Multiplication – Convex Hull.

UNIT 3: **Greedy & dynamic programming**

Greedy Approach: General Method, Knapsack problem, Minimum cost spanning trees, Single source shortest path problem. Dynamic Programming: Principle of optimality, All pairs shortest path problem, Longest common subsequence, Traveling salesperson problem.

UNIT 4: Backtracking & branch-and-bound

Backtracking: General method, 8 Queens Problem, Graph coloring, Sum of subset problem , Hamiltonian cycle. Branch and Bound, Knapsack problem, Traveling salesman problem.

UNIT 5: **NP problems& approximation algorithms**

NP-completeness, Polynomial time verification, Theory of reducibility, Circuit satisfiability NP-completeness proofs, NP-complete problems: Vertex cover, Hamiltonian cycle and Traveling Salesman problems

TEXTBOOKS:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Second Edition, Universities Press, Hyderabad, 2008.
2. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Second Edition, Prentice Hall of India, New Delhi, 2007

REFERENCES:

3. Kenneth A. Berman and Jerome L. Paul, Algorithms, Cengage learning India Edition,
4. Sara Baase and Allen Van Gelder, Computer Algorithms – Introduction to Design & Analysis, Third Edition, Pearson Education, New Delhi, 2000.

MCA-R205 B	Advanced Database Management System

UNIT 1 : Introduction

Review of the fundamental principles of database management systems, relational databases and SQL.

UNIT 2 : Query Processing

Steps in Query processing, basics of cost optimization, cost estimations for selection operation using liner and binary search, nested loop join and basics of query optimization

UNIT 3 : Transaction Management

Review of the fundamental principles of database management systems, relational databases and SQL, Transaction management: ACID properties, schedules, Concurrency control, Recovery.

UNIT 4 : Advanced Databases

Distributed databases data fragmentation and replication, distributed query processing, distributed transaction management, Parallel databases, components, performance issues, standard architectures, Data Warehouse technology

UNIT 5 : Advanced Database Operations

Basic SQL operations, functions, Advanced database operations using indices, constraints, partitions, backup recovery, PL/SQL Programming : understanding PL/SQL structure, variable declaration, loops, control structures, triggers, exceptions

Text Books

1. Database Management Systems- R. Ramakrishnan and J.Gehrke, 3rd Edition, McGraw Hill
2. Database System Concepts- A.Silberschatz, H.F.Korth and S.Sudarshan, 6th Edition, McGraw-Hill
3. PL/SQL Programming by Oracle Press

Reference Books

1. Principles of Distributed Database Systems - M.T.Oszu and P.Valduriez, Springer,
2. Management of Heterogeneous and Autonomous Database Systems- A.Elmagarmid,
3. M.Rusinkiewicz and A.Sheth (eds), Morgan Kaufmann, Oracle Press Books.

MCA-R206	Second semester	Lab -4: Based on MCA-R203	Credits: 02
Minimum 15 experiments covering all theory aspects as per the lab manual designed by the concerned teacher			

MCA-R207	Second semester	Lab -5: Based on MCA-R204	Credits: 02
Minimum 15 experiments covering all theory aspects as per the lab manual designed by the concerned teacher			

MCA-R206	Second semester	Lab-6: Based on Elective Course 205 A or 205 B	Credits: 02
Minimum 15 experiments covering all theory aspects as per the lab manual designed by the concerned teacher			

MCA-R209 A	Second semester	**Open Elective**	Credits: 01
Open Elective : University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses			

MCA-R209 B	Second semester	**Professional Communication Skills** **(In-house Open Elective)**	Credits: 01
As per following syllabus			

UNIT 1 : Grammar- it's Usage

1. Basics English Grammer
2. Tenses: Present, Past, Future
3. Voice: Active & Passive
4. Speech: Direct & Indirect
5. Common Errors in English
6. Transformation of Sentences

UNIT 2: Communication Skill & Soft Skills

1. Communication Skills: Definition & Concept
2. Process /cycle of Communication,
3. Types/Methods of Communication,
4. Barriers of Communication
5. Soft Skills: Concept, Negotiation skills, Empathy, Manners & Etiquettes.

Unit 3: Language Skills

1. Language: Definition & its Characteristics.
2. Listening Skill: Process and types.
3. Speaking Skill: Process, style.
4. Reading skill : Process , Reading comprehension passage.
5. Writing Skill : Process & importance

UNIT 4 : Presentation skills

1. Seminars
2. Conference
3. Anchoring & Vote of Thanks
4. Narrating Incidents
5. Story Telling

Reference Books:

1. Practical English Grammar by – A.J. Thomson
2. Mac Millan Foundation English by - R. K. Dwivedi, A. Kumar.
3. Soft Skills by - K Alex.
4. Group Discussion for Admissions & Jobs by - AnandGanguly
5. Effective Telephone Skills by - Thomas J. Farrell
6. Written & Spoken English by - V. H. Savant & S. R. Madan
7. Modern English Grammar: An Introduction by - L.S. Deshpande, P.H. Dharamsi.

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SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

(NAAC Re-accredited with 'A' Grade)

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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॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with'B++' grade

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प्रस्तुत विद्यापीठातील संगणकशास्त्र संकुल, उपकेंद्र लातूर व संलग्नित महाविद्यालयातील येथील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील MCA II Year (IV Semester) या विषयाच्या अभ्यासक्रमाचे Structure शैक्षणिक वर्ष २०२१.२२ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, प्रस्तुत विद्यापीठातील संगणकशास्त्र संकुल, उपकेंद्र लातूर व संलग्नित महाविद्यालयातील **विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील MCA II Year (IV Semester) या अभ्यासक्रमाचे Structure शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्याच्या दृष्टीने मा. कुलगुरू महोदयांनी मा. विद्यापरिषदेच्या मान्यतेच्या अधीन राहून मान्यता दिलेली असून त्यानुसार MCA II Year (VI Semester) या अभ्यासक्रमाचे Structure लागू करण्यात येत आहे.**

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

जा.क्र.:शैक्षणिक–१/परिपत्रक/पदव्युत्तर–सीबीसीएस अभ्यासक्रम/ - २०२१–२२/**३६०**

दिनांक : १८.०४.२०२२

स्वाक्षरित

सहा.कुलसचिव

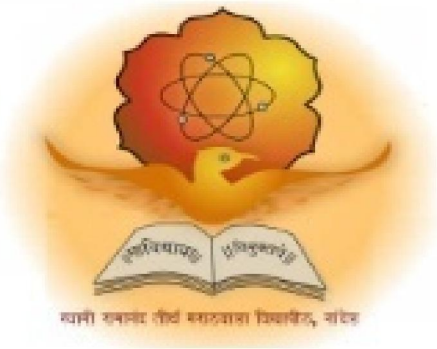
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. अधिष्ठाता विज्ञान व तंत्रज्ञान, यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) अधिक्षक, परिक्षा विभाग विज्ञान विद्याशाखा प्रस्तुत विद्यापीठ.
५) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. यांना देवून कळविण्यात येते की, सदरील परिपत्रक विद्यापीठ संकेतस्थळावर प्रसिध्द करण्यात यावे.

Swami Ramanand Teerth Marathwada University, Nanded

(NAAC Re-accredited with 'B++' Grade)



MCA –Second Year Syllabus Structure

IV Semester

[Fourth 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**
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	**02**
MCA-R409	Seminar	01	--	**01**	01	--	**01**
Total Credits		**11**	**16**	**27**	**13**	**14**	**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 E-Mail, 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 Blockchain Bitcoin Overview. 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 , Backpropogation 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;

- Marks awarded by guide/supervisor based on log book : 25
- 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