।। 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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