॥ 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

Fax : (02462) 215572 | **Academic-1 (BOS) Section** | website: srtmun.ac.in

Phone: (02462)215542 | E-mail: bos.srtmun@gmail.com

प्रस्तुत विद्यापीठीय संकुलातील व संलग्नित महाविद्यालयातील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील द्वितीय/तृतीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक २१ सप्टेंबर २०२१ रोजी संपन्न झालेल्या ५२ व्या मा. विद्या परिषद बैठकीतील विषय क्र. ३६/५२–२०२१** च्या ठरावानुसार **प्रस्तुत विद्यापीठीय संकुलातील व संलग्नित महाविद्यालयातील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील द्वितीय/तृतीय वर्षाच्या, C.B.C.S. (Choice Based Credit System) Pattern** नुसारच्या खालील विषयाच्या अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्यात येत आहेत.

01. M.Sc. Computer Science II year (Campus & Sub-centre)
02. M.Sc. Computer Application II year (Campus School)
03. MCA (2 year Programmer) II year (III Semester Campus & Affiliated Coll.)
04. MCA (3 year Programmer) III year (Campus & Affiliated Coll.)

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

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.

जा.क्र.: शैक्षणिक–१/परिपत्रक/पी.जी.–सीबीसीएस अभ्यासक्रम/२०२१–२२/**१५७**

स्वाक्षरित
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

दिनांक :०७.१०.२०२१

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) मा. संचालक/प्राचार्य सर्व संबंधित संकुले व महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) अधीक्षक, विज्ञान विद्याशाखा परीक्षा विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. यांना देवून कळविण्यात येते की, सदरील परिपत्रकासह अभ्यासक्रम विद्यापीठ संकेतस्थळावर प्रसिध्द करावेत.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

(NAAC Re-accredited with 'A' Grade)

Affiliated Colleges conducting MCA Program

THIRD YEAR CURRICULUM FRAMEWORK AND SYLLABUS

FOR OUTCOME BASED EDUCATION IN MCA (03 Years Program)

FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2021-22 ONWARDS

www.srtmun.ac.in

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY

VISION

"Enlightened Student: A Source of Immense Power"

MISSION

"Swami Ramanand Teerth Marathwada University pledges itself to uphold zealously its mission of promoting acquisition and dissemination of knowledge through fearless and sustained pursuit of excellence aimed at molding personalities of students entering its portals to grow with an upright character filled with enlightenment and to be the value adhering members of a just and humane society".

As a Department, We are committed to

- Achieve academic excellence in Computer Applications through innovative teaching and learning processes.
- To prepare the students to be professionally competent to face the challenges in the industry.
- Promote inter-disciplinary research among the faculty and the students to create state of art research facilities.
- To promote quality and ethics among the students.
- Motivate the students to acquire entrepreneurial skills to become global leaders.

Program Educational Objectives (PEO)

Post graduates of MCA program will be

PEO1: Utilizing strong technical aptitude and domain knowledge to develop smart software solutions for the upliftment of society.

PEO2: Applying research and entrepreneurial skills augmented with a rich set of communication, teamwork and leadership skills to excel in their profession.

PEO3: Showing continuous improvement in their professional career through life-long learning, appreciating human values and ethics.

Graduate Attributes for MCA Program (GA)

1. Computational Knowledge:

Apply domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

2. Problem Analysis:

Identify, formulate, research literature, and solve *complex* computing problems reaching substantiated conclusions using fundamental principles of computing sciences.

3. Design /Development of Solutions:

Design and evaluate solutions for *complex* computing problems that meet specified needs with appropriate consideration for cultural, societal, and environmental considerations.

4. Conduct Investigations of Complex Computing Problems:

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern Tool Usage:

Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to *complex* computing activities, with an understanding of the limitations.

6. Professional Ethics:

Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

7. Life-long Learning:

Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

8. Project management and finance:

Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, to manage projects and in multidisciplinary environments.

9. Communication Efficacy:

Communicate effectively with the computing community, and with society at large, about *complex* computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

10. Societal and Environmental Concern:

Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

11. Individual and Team Work:

Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

12. Innovation and Entrepreneurship

Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

Program Outcomes (PO) for Master of Computer Applications (2019-2020)

On completion of MCA program, the students are expected to

PO1: Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

PO2: Identify, formulate, research literature, and solve complex computing problem searching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

PO3: Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

PO6: Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

PO7: Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

PO8: Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO9: Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

PO10: Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

PO11: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

PO12: Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

PEO-PO Mapping:

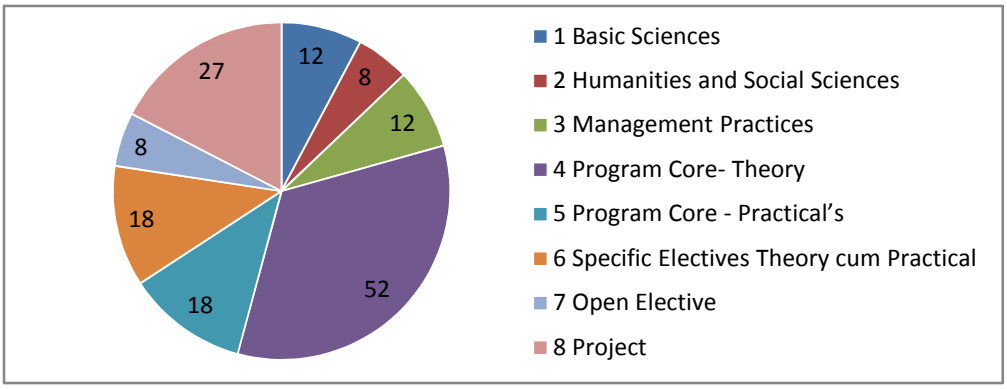
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1												
PEO2												
PEO3												

PO-GA MAPPING:

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
PO1												
PO2												
PO3												
PO4												
PO5												
PO6												
PO7												
PO8												
PO9												
PO10												
PO11												
PO12												

Credit Distribution:

Sr. No.	Category of courses	Credits	Percentage of Credits to Total Credits
1	Basic Sciences	12	7.74%
2	Humanities and Social Sciences	08	5.16%
3	Management Practices	12	7.74%
3	Program Core- Theory	52	33.55%
4	Program Core - Practical's	18	11.61%
5	Specific Electives Theory cum Practical	18	11.61%
5	Open Elective	08	5.16%
6	Project	27	17.42%
	Total Credits	155	**100%**



Basic Science (BS) & Humanities & Social Sciences Courses:

Semester	Name of the Course	Category	Credits
1	Mathematical Foundations	BS	4
2	Probability & Statistics	BS	4
3	Graph Theory	BS	4
		BS Total Credits	**12**
1	Programming Logic	HSS	4
2	Oral & Written Communication Skills	HSS	4
		HSS Total Credits	**8**

Program Core, Elective & Practical Courses:

Semester	No. of Core Theory Courses	Credits	No. of Core Practical Courses	Credits	No. of Specific Elective Courses	Credits	No. of Open Elective Courses	Credits	Total Credits
I	05	20	02	04	-	-	01	02	26
II	05	20	02	04	-	-	01	02	26
III	05	20	02	04	-	-	01	02	26
IV	03	12	02	04	02	08	01	02	26
V	03	12	03	06	02	08	-	-	26
VI	Major Project								25
								Total Credits	**155**
I to V	**Total Credits for Core Courses**	84	**Total Credits for Practical Courses**	22	**Total Credits for Specific Elective Courses**	16	**Total Credits for Open Elective Courses**	08	130
VI	**Major Project**								25
								Total Credits	**155**

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Scheduling of Courses

Semester	Theory					Practical			Credits
I	MCA 101 Programming Logic	MCA 102 Data Structure using C	MCA 103 Computer Organization & Architecture	MCA 104 Introduction to Mgt. Functions	MCA 105 Mathematical Foundation	MCA 106 Lab-1 C Programming.	MCA 107 Lab-2 COA	MCA 108 Open Elective	26
II	MCA 201 SAD	MCA 202 DA A using C++	MCA 203 Management Information System	MCA 204 Prob. & Stat.	MCA 205 Oral & Written Comm. Skills	MCA 206 Lab-3 SAD	MCA 207 Lab-4 C++ Programming.	MCA 208 Open Elective	26
III	MCA 301 Software Engineering	MCA 302 Visual Programming Tools.	MCA 303 Data Communications & Computer Networks	MCA 304 Relational Database Management System	MCA 305 Graph Theory	MCA 306 Lab-5 Visual Programming Tools.	MCA 307 Lab-6 RDBMS	MCA 308 Open Elective	26
IV	MCA 401 Compiler Designing	MCA 402 Java Programming.	MCA 403 Operating Systems	MCA 404 Elective-1	MCA 405 Elective-2	MCA 406 Lab-7 Java Programming.	MCA 407 Lab-8 Lunux OS	MCA 408 Open Elective	26
V	MCA 501 Cryptography & Net. Sec.	MCA 502 Data Mining & DW	MCA 503 Theory of Computation	MCA 504 Elective-3	MCA 505 Elective-4	MCA 506 Lab-9 DM & DW	MCA 507 Lab-10 Elective-4	MCA 508 Mini Project	26
VI	MCA 601: Project Development								25
	Synopsis Submission	Progress Report-1 System Analysis	Progress Report-2 Designing & Scheduling	Progress Report-3 Coding and modeling	Progress Report-4 Testing & Implementation	Project Dissertation Documentation	Via voice Project Presentation		
								Total Credits	155

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
Master of Computer Applications (M.C.A) Degree Program

COURSES OF STUDY
(For the candidates admitted from 2019-2020 onwards)

FIRST SEMESTER

Course Code	Name of Course	Category	No. Of Hours/Week			Credits
			L	T	P	
Theory						
MCA 101	Programming Logic	HSS	4	1	-	4
MCA 102	Data Structure using C	PC	4	1	-	4
MCA 103	Computer Organization & Architecture	PC	4	1	-	4
MCA 104	Introduction to Management Function	MP	4	1	-	4
MCA 105	Mathematical Foundation	BS	4	1	-	4
Practical						
MCA 106	Lab-1 C Programming	PCL	-	-	6	2
MCA 107	Lab-2 Computer Organization & Architecture	PCL	-	-	6	2
Open Elective						
MCA 108	Open Elective	OE	2	1	-	2
		Total	22	06	12	26

SECOND SEMESTER

Course Code	Name of Course	Category	No. Of Hours/Week			Credits
			L	T	P	
Theory						
MCA 201	System Analysis and Design	PC	4	1	-	4
MCA 202	Design Analysis & Algorithm using C++	PC	4	1	-	4
MCA 203	Management Information System	MP	4	1	-	4
MCA 204	Probability & Statistics	BS	4	1	-	4
MCA 205	Oral and Written Communication Skills	HSS	4	1	-	4
Practical						
MCA 206	Lab-3 C++ Programming	PCL	-	-	6	2
MCA 207	Lab-4 Data Communication	PCL	-	-	6	2
Open Elective						
MCA 208	Open Elective	OE	2	1	-	2
		Total	22	06	12	26

THIRD SEMESTER

Course Code	Name of Course	Category	No. Of Hours/Week			Credits
			L	T	P	
Theory						
MCA 301	Software Engineering	PC	4	1	-	4
MCA 302	Visual Programming Tools	PC	4	1	-	4
MCA 303	Data Communication and Computer Networks	PC	4	1	-	4
MCA 304	Relational Database Management System	MP	4	1	-	4
MCA 305	Graph Theory	BS	4	1	-	4
Practical						
MCA 306	Lab-5 Visual Programming	PCL	-	-	6	2
MCA 307	Lab-6 RDBMS	PCL	-	-	6	2
Open Elective						
MCA 308	Open Elective	OE	2	1	-	2
		Total	22	06	12	26

FOURTH SEMESTER

Course Code	Name of Course	Category	No. Of Hours/Week			Credits
			L	T	P	
Theory						
MCA 401	Compiler Designing	PC	4	1	-	4
MCA 402	Java Programming	PC	4	1	-	4
MCA 403	Operating System Concepts	PC	4	1	-	4
MCA 404	Elective-1	PE	4	1	-	4
MCA 405	Elective-2	PE	4	1	-	4
Practical						
MCA 406	Lab-7 Java Programming	PCL	-	-	6	2
MCA 407	Lab-8 Advance Data Structure	PCL	-	-	6	2
Open Elective						
MCA 408	Open Elective	OE	2	1	-	2
		Total	22	06	12	26

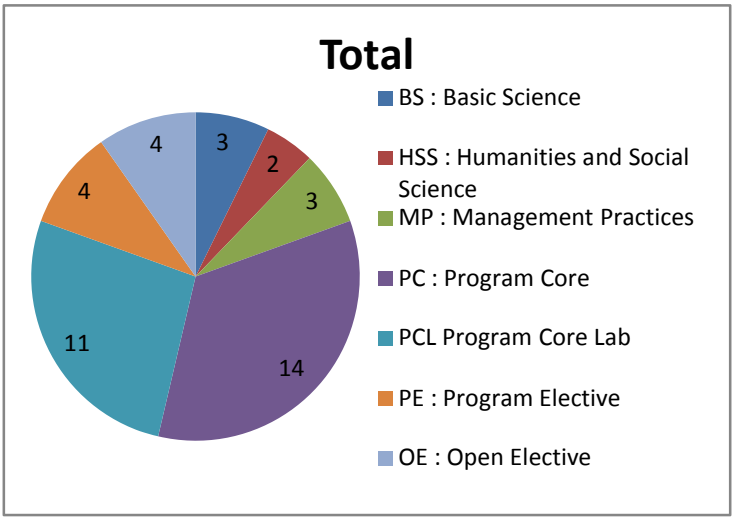
FIFTH SEMESTER

Course Code	Name of Course	Category	No. Of Hours/Week			Credits (internal 01 and External 03)
			L	T	P	
Theory						
MCA 501	Cryptography & Network Security	PC	4	1	-	4
MCA 502	Data Mining & Data Warehousing	PC	4	1	-	4
MCA 503	Theory of Computation	PC	4	1	-	4
MCA 504	Elective-3	PE	4	1	-	4
MCA 505	Elective-4	PE	4	1	-	4
Practical						
MCA 506	Lab-8 : Based on Elective -3	PCL	-	-	6	2
MCA 507	Lab-9 : Based on Elective- 4	PCL	-	-	6	2
MCA 508	Lab-10 : Mini Project	PC	-	-	6	2
		Total	20	05	18	26

SIXTH SEMESTER

Course Code	Name of Course	Category	No. Of Hours/Week			Credits
			L	T	P	
MCA 601	Major Project Activity	PC	-	-	12	25
		Total	-	-	12	25

PC	: Program Core
BS	: Basic Science
HSS	: Humanities & Social Science
MP	: Management Practices
PCL	: Program Core Lab
PE	: Program Elective
OE	: Open Elective
L	: Lecture
T	: Tutorial
P	: Practical



Notes in general

1. **For Theory, 04 credits means 01 internal credits and 03 external credits for students in affiliated colleges**
2. For Practical, 02 credits means 01 internal and 01 external credits
3. For Mini Project Development Activity, 02 credits are purely internal
4. For Major Project Development Activity, 12 Internal and 13 External Credits
5. For Open electives, 02 credits are purely internal credits
6. Student has to earn at least 02 credits in any semester from the interdisciplinary open elective course offered by other school, if any as part of syllabus.
7. Internal Assessment evaluation pattern will differ from subject to subject and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern
8. ** External Assessment Examination will be conducted for maximum marks of 75 marks for the award of end semester examination marks/ as per the policy of the university for programs in affiliated colleges

Code:	MCA-501	Cryptography and Network Security	Credits: 04

Course Objectives:

1. To compare various cryptographic techniques.
2. To understand the designs secure applications.
3. To inject secure coding in the developed applications.

Course Outcome:

CO1: Identify common network security vulnerabilities/attacks.
CO2: Understand the foundations of Cryptography and network security.
CO2: Understand encryption and decryption of messages using block ciphers.
CO3: Demonstrate detailed knowledge of the role of encryption to protect data.
CO4: Analyze Network Security Practice And System Security.

Unit-1:

Introduction: Basic objectives of cryptography, secret-key and public-key cryptography, one-way and trapdoor one-way functions, cryptanalysis, attack models, classical cryptography

Unit-2:

Block ciphers: Modes of operation, DES and its variants, RCS, IDEA, SAFER, FEAL, Blow Fish, AES, linear and differential cryptanalysis. Stream ciphers: Stream ciphers based on linear feedback shift registers, SEAL, unconditional security.

Unit-3:

Message digest: Properties of hash functions, MD2, MD5 and SHA-1, keyed hash functions, attacks on hash functions. Public-key parameters: Modular arithmetic, gcd, primality testing.

Unit-4:

Chinese remainder theorem, modular square roots, finite fields. Intractable problems: Integer factorization problem, RSA problem, modular square root problem, discrete logarithm problem, Diffie-Hellman problem, known algorithms for solving the intractable problems.

Unit-5:

Public-key encryption: RSA, Rabin and EIGamal schemes, side channel attacks. Key exchange: Diffie-Hellman and MQV algorithms. Digital signatures: RSA, DAS and NR signature schemes, blind and undeniable signatures.

Unit-6:

Entity authentication: Passwords, challenge-response algorithms, zero-knowledge protocols. Standards: IEEE, RSA and ISO standards. Network issues: Certification, public-key infrastructure (PKI), secured socket layer (SSL), Kerberos.

Text Books:

1.	Cryptography and Network Security- William Stallings, Prentice Hall of India.
2.	Cryptography and Network Security- Forouzan, Tata McGraw-Hill.

Reference Books

1.	Network Security: Private Communication in a Public World- Charlie Kaufman, Prentice Hall Series.

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	-	L	L	-	L	-	L	-	-	L
CO2	-	M	M	M	M	-	L	-	L	-	L	-
CO3	L	M	M	S	-	L	L	-	-	M	-	M
CO4	-	M	-	L	-	L	L	-	L	-	-	L

S- Strong; M-Medium; L-Low

Code:	MCA-502	Data Mining & Data Warehousing	Credits: 04

Course Objectives:

The student should be made to

1. Understand the concept of building a data warehouse and to analyze the mapping concepts.
2. Be familiar with the OLAP tools, application and its categories of application.
3. Understand the concept of data mining techniques, process and about its query languages.
4. Analyze the various mining association rules and understand the concept of classifications.
5. Be familiar with the cluster analysis and categorization of clustering methods.

Course Outcome:

CO1:Student able to design a data mart or data warehouse for any organization
CO2:Student able to asses raw input data and preprocess it to provide suitable input for range of data mining algorithms
CO3:Student able to extract association rules and classification model
CO4:Student able to identify the similar objects using clustering techniques
CO5:Student able to explore recent trends in data mining such as web mining, spatial-temporal mining

Unit-1:	Introduction

Basic Data Mining task, Data Mining Vs Knowledge discovery in databases, Data mining metrics Social Implication of Data Mining , Related Concepts

Unit-2:	Data Mining Techniques

Introduction, Statistical perspective on Data Mining, Decision Tree, Neural networks

Unit-3:	Classification

Introduction, Statistical based algorithms, Distance based algorithms, Decision tree based algorithms, Neural network based algorithm

Unit-4:	Clustering

Introduction, Hierarchical algorithms, Partitional algorithms, Clustering large databases

Unit-5:	Association Rules

Introduction, Basic algorithms, Parallel and distributed algorithms

Unit-6:	Web Mining & Introduction to Data Warehousing

Introduction, Web content mining, Web structure mining, Web usage mining

Text Books:

1.	1. Data Mining – Introductory and Advanced Topics by Margaret H. Dunham & S. Shridhar
2.	2. Data Warehousing Fundamentals by Paulraj Ponniah

Reference Books

1.	1. Raph Kimball, "Data Warehouse Toolkit", John Wiley and Sons Publications
2.	2. Michael. J. Berry, Gordon Linoff, "Data Mining Techniques: Marketing, Sales, Customer support", John Wiley and Sons.

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	-	S	-	L	-	-	S	-
CO2	S	S	M	S	S	-	L	L	-	-	-	-
CO3	S	S	-	S	S	-	-	-	-	-	M	M
CO4	S	S	-	S	-	-	-	-	-	-	M	M
CO5	S	S	-	S	-	-	-	-	-	-	M	M

S- Strong; M-Medium; L-Low

Code:	MCA-503	Theory of Computation	Credits: 04
Course Objectives:			
The learning objectives of this course are to introduce students to the mathematical foundations of computation including automata theory, the theory of formal languages and grammars, the notions of algorithm, decidability, complexity, and computability, enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms.			
Course Outcome:			
CO1: Ability to prove results using proof by induction, proof by contradiction, proof by construction, proof by case exhaustion CO2: Understanding of regular and context-free languages. CO3: Ability to describe and transform regular expressions and grammars CO4: Understanding of the key results in algorithmic complexity, computability and solvability of problems. CO5: Using the Prolog language as an experimental tool for testing properties of basic computational structures.			
Unit-1:	**Finite Automata and Regular Expressions:**		
Definition of Deterministic Finite Automata, Non Deterministic Finite Automata, Moore and Mealy Machines and their conversions, Regular Expressions, recursive definition, NFA with e -Moves, Inter conversion between NFA and DFA and DFA regular expression and FA, Pumping lemma.			
Unit-2:	**Context Free Grammars:**		
Definition, production rules, ambiguous grammar, removal of ambiguity, Chomsky hierarchy, Context Free Grammar (CFG) - definition simplification of CFG.			
Unit-3:	**Context Free Languages:**		
Definition of Context free Languages, regular grammar definition, left linear right linear grammar, Inter conversion between left linear and right linear regular grammar, Regular grammar and finite automata, CNF, GNF, derivation graphs type0 and type1 grammars.			
Unit-4:	**Pushdown automata:**		
Formal definition, Pushdown automata (PDA), deterministic pushdown automata (DPDA) – definition, non- deterministic pushdown automata (NPDA)-definition relative powers of DPDA and NPDA.			
Unit-5:	**Turing Machines:**		
The definition of a Turing machine, computing with Turing machine, Extensions of Turing machines, Random access Turing machines, Non-deterministic Turing machines, Grammars. The Church‟s Turing Hypothesis, Universal Turing Machines, the Halting problem, Unsolvable problems about Turing machines.			
Unit-6:	**Applications:**		
Applications of RE and FA - Lexical analyzer, text editor, and searching using RE. Applications of PDA - Expression conversion. Applications of CFG – syntax analysis, Language definition.			
Text Books:			
1.	Hopcroft, Ullman, Introduction to Automata Theory, Languages,and Computation, Addison Wesley Pub.		
2.	Daniel I. A. Cohen, Introduction to computer theory, Willey Pub.		

Reference Books	
1.	John C. Martin, Introduction to Languages and Theory of Computation, McGraw Hill.
2.	Papadimitriou, Elements of the Theory of Computations, PHI.
3.	E. V. Krishnmurthy, Theory of Computer Science, EWP

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S	S	S	S	-	S	-	L	-	-	S	-
CO2	S	S	M	S	S	-	L	L	-	-	-	-
CO3	S	S	-	S	S	-	-	-	-	-	M	M
CO4	S	S	-	S	-	-	-	-	-	-	M	M
CO5	S	S	-	S	-	-	-	-	-	-	M	M

S- Strong; M-Medium; L-Low

Code:	Elective-3 MCA 504 (a)	E-Commerce	Credits: 04

Course Objectives:

To prepare students competent enough to take up to employment and self employment opportunities in E-Commerce and M-Commerce fields.

Course Outcome:

Student will understand and familiar with environment and operations in the field of E-Commerce. Students training and practical approach by exposing them to modern technology.

CO1: The students are able to understand the concept of E- Commerce and about its functions.
CO2: Knowledge about the various functional areas of E-Business Strategies
CO3: Study of modern Business management concepts in 21stcentury.
CO4: Study of total quality management, electronic data interchange and just in time approach.
CO5: Study of various types of management information systems and their applications.
CO6: Study about the electronic commerce and electronic transactions and impact of electronic commerce on organizations and society.
CO7: Study of various security issues while doing electronic transactions.

Unit-1: Introduction to E-Commerce

Electronic Commerce Framework, Electronic Commerce and Media Convergence, Anatomy of E-Commerce, Electronic Commerce Applications. Network Infrastructure for Electronic Commerce: Components of I-way, Network Access Equipment, Global information Distribution Networks.

Unit-2: The Internet as a Network Infrastructure

Internet Terminology, NSFNET Architecture, National Research and Education Network, Internet Governance. The Business of Internet Commercialization: Telco/Cable/On-Line Companies, National Independent ISPs, Regional ISPs, Local ISPs, Internet Connectivity options.

Unit-3: Electronic Commerce and the World Wide Web

Architectural Framework for Electronic Commerce, Technology behind the Web, Security and the Web, Consumer-Oriented Electronic Commerce: Consumer-Oriented Applications, Mercantile Process Model.

Unit-4: Electronic Payment Systems

Types of Electronic Payment Systems, Digital Token based Electronic Payment Systems, Credit Card Based Electronic Payment Systems, Risk and Electronic Payment Systems, Designing Electronic Payment Systems. Inter Organizational Commerce and EDI: Electronic Data Interchange, EDI Applications in Business, EDI: Legal, Security and Privacy issues.

Unit-5: Advertising and the Marketing on the Internet

The New Age of Information, Advertising on Internet, Information search and retrieval, Electronic Commerce Catalogs, Information filtering.

Unit-6: On-Demand Education and Digital Copyrights

Computer Based Education and Training, Technological Components of Education on demand, Digital Copyrights. Software Agents: Characteristics and Properties of Agents, the Technology behind Software Agents, Browsers and Software Agents.

Text Books:		
1.	Frontiers of Electronic Commerce, Ravi Kalakota, Pearson Education.	
Reference Books		
1.	E-Commerce: Business, Technology, Society, Ken Laudon, Jeffrey Travis, Prentice Hall**.**	

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S	S	S	S	-	S	-	L	-	-	S	-
CO2	S	S	M	S	S	-	L	L	-	-	-	-
CO3	S	S	-	S	S	-	-	-	-	-	M	M
CO4	S	S	-	S	-	-	-	-	-	-	M	M
CO5	S	S	-	S	-	-	-	-	-	-	M	M
CO6	-	M	L	-	L	-	-	-	-	-	L	L
Co7	L	-	L	-	-	-	-	-	-	-	L	L

S- Strong; M-Medium; L-Low

Code:	Elective-3 MCA-504 (b)	Internetworking Protocols	Credits: 04

Course Objectives:

To familiarize the students with various inter-networking protocols and their functionalities. Internetworking technology allows computing devices talk to other internal and external devices, components or systems.

Course Outcome:

Use of these protocols to cater the user needs while using the internet based various applications. Student will Also try to think of modifying existing protocols to improve the performance.

CO1: Describe how networks function, identifying major components, function of network components, and the OSI reference model
CO2: Using the host-to-host packet delivery process, describe issues related to increasing traffic on an Ethernet LAN and identify switched LAN technology solutions to Ethernet networking issues
CO3: Describe the reasons for extending the reach of a LAN and the methods that can be used, with a focus on RF wireless access
CO4: Describe the reasons for connecting networks with routers and how routed networks transmit data through networks using TCP/IP
CO5: Describe the function of WANs, the major devices of WANs, and configure PPP encapsulation, static and dynamic routing, PAT, and RIP routing
CO6: Use the command-line interface to discover neighbours on the network and manage the router start-up and configuration

Unit-1: Review to foundations of Internetworking

Review of Networking Technologies and Internetworking Concepts and Architectural Model: Application level and network level interconnection, Properties of the internet, Internet architecture, Interconnection through IP routers.

Unit-2: Internet addressing and resolution

Universal identifiers, Three primary classes of IP addresses, Network and broadcast addresses, Limited broadcast, Dotted decimal notation, Weakness in internet addressing, Loopback addresses, Address resolution problem, Two types of physical addresses, Resolution through direct mapping, Resolution through dynamic binding, Address resolution cache, ARP to other protocols, Reverse address resolution protocol, Timing RARP transaction, Primary and backup RARP serve

Unit-3: IP routing mechanisms

The concepts of unreliable delivery, Connectionless delivery system, Purpose of the internet protocol, The internet datagram, Routing in an internet, Direct and indirect delivery, Table driven IP routing, Next hop routing, Default routes, Host specific routes, The IP routing algorithm, Handling incoming datagram's , Establishing routing tables

Unit-4: Error reporting and control

The internet, Control message protocols, Error reporting versus error detection, ICMP message format, Detecting and reporting various network problems through ICMP, Transparent router, Proxy ARP, Subnet addressing, Implementation of subnets with masks representation, Routing in the presence of subnets, A unified algorithm.

Unit-5:	**UDP protocol functioning**	
Format of UDP message, UDP pseudo header, UDP encapsulation and protocols layering and the UDP checksum computation, UDP multiplexing, De-multiplexing and ports.		
Unit-6:	**TCP protocol functioning**	
The transmission control protocol, Ports, Connections and endpoint, Passive and active opens, The TCP segment format, TCP implementation issues		
Text Books:		
1.	Douglas E. Comer, Internetworking with TCP/IP: Principles, Protocols and Architecture, Volume 1, 5 th edition, PHI publication, 2006.	
2.	Behrouz A. Forouzan, TCP-IP Protocol Suite, 3 rd edition, Mc-Graw Hill publication, 2005.	
3.	W. Richard Stevens, Unix Network Programming: Volume 1, 2nd edition, PHI publication, 1999.	
Reference Books		
1.	Comer, Internetworking with TCP-IP Vol. 3, 2nd edition, Pearson publication, 2001.	
2.	W. Richard Stevens, Unix Network Programming: Inter process Communications, Volume 2, 2nd edition, PHI publication, 1999.	
3.	William Stalling, SNMP SNMPv2, SNMPv3, and RMON 1 and 2, 2nd edition, Pearson Education publication, 2001.	

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S	S	S	S	-	S	-	L	-	-	S	-
CO2	S	S	M	S	S	-	L	L	-	-	-	-
CO3	S	S	-	S	S	-	-	-	-	-	M	M
CO4	S	S	-	S	-	-	-	-	-	-	M	M
CO5	S	S	-	S	-	-	-	-	-	-	M	M
CO6	-	M	L	-	L	-	-	-	-	-	L	L

S- Strong; M-Medium; L-Low

Code:	Elective-3 MCA-504 (c)	Internet of Things	Credits: 04

Course Objectives:

1. To Understand the Architectural Overview of IoT
2. To Understand the IoT Reference Architecture and Real World Design Constraints
3. To Understand the various IoT Protocols (Datalink, Network, Transport, Session, Service)

Course Outcome:

Applications based on IoT concepts and protocols need to be explored to optimize the resources.

CO1: Explain in a concise manner how the general Internet as well as Internet of Things works.
CO2: Understand constraints and opportunities of wireless and mobile networks for Internet of Things.
Co3: Use basic measurement tools to determine the real-time performance of packet based networks.
CO4: Analyze trade-offs in interconnected wireless embedded sensor networks.

Unit-1:	OVERVIEW

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

Unit-2:	REFERENCE ARCHITECTURE

IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture Introduction,

Unit-3:	Different views of IoT

Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

Unit-4:	IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS

PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART,Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP

Unit-5:	TRANSPORT & SESSION LAYER PROTOCOLS

Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT

Unit-6:	SERVICE LAYER PROTOCOLS & SECURITY

Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 , 6LoWPAN, RPL, Application Layer

Text Books:

1.	Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1 st Edition, Academic Press, 2014.
2.	Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI
3.	Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
Reference Books	
1.	Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118- 47347-4, Willy Publications

2.	Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on Approach)", 1st Edition, VPT, 2014.
3.	https://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	M	-	-	-	S	-	-	-	-	-	-	-
CO2	L	-	L	-	-	-	-	-	-	-	M	L
CO3	L	L	-	-	-	-	-	-	-	-	-	L
CO4	M	-	M	L	M	-	-	-	-	-	L	M

S- Strong; M-Medium; L-Low

Code:	Elective-3 MCA-504 (d)	Cloud Computing	Credits: 04

Course Objectives:

1. The objective of this course is establishing the definition of cloud computing,
2. Describing the various service delivery models of a cloud computing architecture
3. Explaining the ways in which clouds can be deployed as public, private, hybrid, and community clouds.

Course Outcome:

CO1: Ability to identify various cloud services.
CO2: Assess cloud characteristics and service attributes, for compliance with enterprise objectives.
CO3: Explain the four primary cloud category "types".
CO4: Evaluate various cloud delivery models.
CO5: Contrast the risks and benefits of implementing cloud computing.

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.

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	M	S	-	L	L	-	L	-	L	-	-	L
CO2	S	M	L	M	-	-	L	-	L	-	M	-
CO3	S	M	L	S	-	-	L	-	-	M	-	-
CO4	-	M	-	L	-	-	M	-	S	-	-	M
CO5	-	L	L	-	-		-	M	-	L	-	-

S- Strong; M-Medium; L-Low

Code:	Elective-4 MCA-505 (a)	Python Programming	Credits: 04

Course Objectives:

1. Basic concept of python programming language.
2. Handling string manipulations.
3. Developing Basic application using the python.
4. Understand the OOPS concepts in python.

Course Outcome:

CO1: Use and manipulate several core data structures: Lists, Dictionaries, Tuples, and Strings
CO2: Apply object-oriented programming concepts to develop dynamic interactive Python applications.
CO3: Apply python exception handling model to develop robust programs.
CO4: Create and apply regular expression for data verification.
CO5: Construct simple graphical user interfaces using Tkinter.
CO6: Build a web application using Django framework.

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

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S	-	M	S	-	-	-	-	M	-	S	L
CO2	-	S	M	S	-	-	-	-	M	-	S	-
CO3	S	S	M	S	-	-	-	-	M	-	S	-
CO4	S	S	M	S	-	-	-	-	M	-	S	M
CO5	-	S	M	S	-	-	-	M	M	-	S	-
Co6	S	-	M	S	-	-			M	-	S	-

S- Strong; M-Medium; L-Low

Code:	Elective-4 MCA-505 (b)	Biometrics Sciences	Credits: 04

Course Objectives:

In this course, students will learn to methods of biometrics, devices of biometrics, use for computer security, design and build a secure system

Course Outcome:

CO1: Use of Input-output channels.
CO2: reasoning and problem solving, Skill acquisition.
CO3: Apply Motivations for Using Biometric Systems.
CO4: Implementation of Biometrics for Dynamic Signature Analysis, Facial Imaging or Recognition, Fingerprint, Hand Geometry, Iris Recognition.

Unit-1: Introduction:

Input-output channels: Vision, Hearing, Touch, Movement, Human memory: Sensory memory, Short-term memory, Long-term memory, thinking: reasoning and problem solving, Skill acquisition, Errors and mental models. Motivations for Using Biometric Systems, Human Identity and Biometrics, Levels of Identification, Biometrics for Identity Management

Unit-2: Fundamentals of Biometrics

Biometric Technologies Work In General, Overview of Applications, Errors and Error Rates, Failure to Acquire, Personal Biometric Criteria, Biometric System-Level Criteria, Key Elements of Biometric Systems, Biometric Performance Metrics, Template Storage Considerations, Terms and Definitions Related to Biometrics

Unit-3: Types of Biometric Technologies

Dynamic Signature Analysis, Facial Imaging or Recognition, Fingerprint, Hand Geometry, Iris Recognition, Keystroke Analysis/Keystroke Dynamics, Palm print, Retinal Scan, Skin Spectroscopy/Skin Texture/Skin Contact, Speaker Verification, Vascular Biometrics, Other Biometric Technologies

Unit-4: The Biometric System Design Process

System Concept Development, Operational Considerations and Constraints, The Requirements Definition, The System Specification, Biometric Access Control, The Architectural Aspects of an Automated Access

Unit-5: Structure of Biometric Standards

Introduction, Current Work in Biometric Standards, Development, International Standards Organizations, Bio API Consortium, Common Biometric Exchange Framework Format (CBEFF), Best Practices in Standards Development

Unit-6: Testing and Evaluation

Introduction, Understanding Biometric System Performance, Comparison of Types of Testing, Technology Testing, Scenario Testing, Operational Testing

Text Books:

1.	Biometric Technology Application Manual, Volume One: Biometric Basics Compiled and Published by: National Biometric Security Project Updated Summer 2008

Reference Books	
1.	Human Computer Interaction- Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale.
2.	Biometric Recognition: Challenges and Opportunities, Joseph N. Pato and Lynette, National Research Council

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	-	M	S	-	-	-	-	M	-	S	L
CO2	-	S	M	S	-	-	-	-	M	-	S	-
CO3	S	S	M	S	-	-	-	-	M	-	S	-
CO4	S	S	M	S	-	-	-	-	M	-	S	M

S- Strong; M-Medium; L-Low

Code:	Elective-4 MCA-505(c)	Digital Image Processing	Credits: 04

Course Objectives:

1. To understand the recent trends in the field of Digital Image processing and identify its applications.
2. To appreciate the need for Digital Image processing.
3. To expose the students to the problems related to Image processing - To understand the different concepts as Image processing in spatial and frequency domain.
4. To understand the concepts of image segmentation.
5. To understand concepts of morphological image processing.

Course Outcome:

CO1: Understand the basic concepts in digital image processing.
CO2: Analyze the histogram and filtering techniques for image enhancement.
CO3: Analyze the image Degradation/Restoration process.
CO4: Synthesize the various image compression and segmentation methods.
CO5: Apply the knowledge of representation and description of images.
CO6: Analyze and interpret objects through pattern classes.

Unit-1:	Digital Image Processing Fundamentals:

Digital Image Processing Systems: Fundamental steps in DIP. Components of an Image Processing System, Elements of Visual Perception, Image sensing and acquisition, Image sampling and quantization Digital Image Representation, Data Classes and Image types and Converting between Data Classes and Image types.

Unit-2:	Intensity transformation and spatial filtering:

Background, some basic gray level transformations, Histogram processing, enhancement using arithmetic and logic operations, basic of spatial filtering, smoothing spatial filters, sharpening spatial filters.

Unit-3:	Frequency Domain Processing:

Background, Introduction to FT and frequency domain, smoothing frequency domain filters, sharpening frequency domain filters, additional properties of the 2-D FT, convolution.

Unit-4:	Image Restoration:

A Model of the Image Degradation /Restoration Process, Noise Models, Restoration in presence of Noise only –spatial filtering, Periodic Noise Reduction by Frequency domain filtering

Unit-5:	Image Segmentation:

Line detection, Edge Detection, Edge Linking and boundary detection, Global Thresholding, multiple thresholds, variable threshold, multi variant threshold, Region based Segmentation. Corner Detection.

Unit-6:	Color Image Processing:

Color Image Representation, Converting to other Color.

Text Books:

1.	Digital Image Processing- R.C. Gonsales R. E. Woods, Second Edition, Pearson Education.
2.	Fundamentals of Image Processing- Anil K. Jain, PHI Publishing.
Reference Books	
1.	Digital Image Processing using MATLAB- R.C. Gonsales R. E. Woods, Second Edition, Pearson Education.
2.	Digital Image Processing – by William K. Pratt 3rd Edition John Wiley and Sons Inc.
3.	Chanda & Majumdar, Digital image processing and analysis, PHI,

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S	S	S	S	-	S	-	L	-	-	S	-
CO2	S	S	M	S	S	-	L	L	-	-	-	-
CO3	S	S	-	S	S	-	-	-	-	-	M	M
CO4	S	S	-	S	-	-	-	-	-	-	M	M
CO5	S	S	-	S	-	-	-	-	-	-	M	M
CO6	-	M	L	-	L	-	-	-	-	-	L	L

S- Strong; M-Medium; L-Low

Code:	Elective-4 MCA-505(d)	Mobile Application Development	Credits: 04

Course Objectives:

1. To understand the recent trends in the field of Mobile programming and identify its applications.
2. To appreciate the need for Android Programming.
3. To expose the students to the real world problems related to mobile device
4. To understand the various concepts of android programming
5. To develop and implement android development projects.

Course Outcome:

CO1:Learn and understand the terminology related to mobile application development and the need for mobile web presence
CO2: Understand designing of Android user interfaces and types of mobile websites
CO3: Understand the tools needed for android installation and to manage screen orientations
CO4: Learn the various user interface views and to handle user preferences through content Providers
CO5: Learn to use Android's communication APIs for SMS and mail and to learn basics of networking
CO6: Learn to use the Location-based services offered by Android Applications

Unit-1: Introduction

Preliminary Considerations, Cost of Development, Importance of Mobile Strategies in Business World, Mobile Myths, Third-Party Frameworks Mobile Applications: Mobile Web Presence, Marketing, Web Services for Mobile Devices, Web Services Languages

Unit-2: Mobile User Interface Design:

Effective Use of Screen Real Estate, Understanding Mobile Application Users, Understanding Mobile Information Design, Understanding Mobile Platforms

Unit-3: Mobile Websites:

Choosing a Mobile Web Option, Adaptive Mobile Websites, Dedicated Mobile Websites, Mobile Web Applications with HTML5

Unit-4: Getting Started with Android:

Why Target Android? Getting the Tools You Need , Anatomy of an Android Application Android User Interface: Understanding Components of a Screen –Adapting to Display Orientation – Managing Changes to Screen Orientation–Creating User Interface Programmatically–Listening for UI Notifications

Unit-5: Types of Views:

Designing Your User interface using Views –Displaying Pictures and Menus with Views–Analog Clock and Digital Clock Views Data Persistence: Saving and loading user Preferences- Persisting data to files–Creating and using Data bases–Content Providers

Unit-6: Android Messaging and Networking:

SMS Messaging– Sending SMS– Receiving SMS- Sending E-mail Location Based Services: Displaying Maps–Obtaining Map API Key –Displaying the Map–Zoom Control–Changing

Views–Navigating –Adding Markers–Getting the Location that was Touched–Geo coding and Reverse Geo coding.	
Text Books:	
1.	Professional Mobile Application Development, Jeff Mc Wherter and Scott Gowell, 2012,WroxPublishers
2.	Beginning Android Application Development, Wei –MengLee,Wiley,2011.
Reference Books	
1.	Professional Android 4 Application Development, Reto Meier, Wrox Publications,2012.
2.	Beginning iOS 6 Development: Exploring the iOS SDK, David Mark, Jack Nutting, Jeff LaMouche, and Fredric Olsson, Apress,2013.
3.	Android in Practice, Charlie Collins, Michael Galpin and Matthias Kappler,Dream Tech,2012.

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S	S	S	S	-	S	-	L	-	-	S	-
CO2	S	S	M	S	S	-	L	L	-	-	-	-
CO3	S	S	-	S	S	-	-	-	-	-	M	M
CO4	S	S	-	S	-	-	-	-	-	-	M	M
CO5	S	S	-	S	-	-	-	-	-	-	M	M
CO6	-	M	L	-	L	-	-	-	-	-	L	L

S- Strong; M-Medium; L-Low

Code:	Lab-8 MCA -506	Lab -8 Based on Elective-3	Credits: 02
Course Objectives In this laboratory, students will implement the various Data Warehousing and Data Mining concepts using Oracle and WEKA / R tool.			

Code:	Lab-9 MCA -507	Lab -9 : Based on Elective 4	Credits: 02
Course Objectives In this laboratory, students will implement the various aspects in Elective -4			

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	S	-	M	-	-	-	-	-	-
CO2	M	M	M	M	M	-	-	-	-	-	-	-
CO3	M	S	S	M	M	L	-	-	-	-	-	-
CO4	L	S	M	M	S	L	-	-	-	-	-	-
CO5	S	L	S	S	M	L	-	-	-	-	-	-
CO6	M	M	S	M	M	L	-	-	-	-	-	-

S- Strong; M-Medium; L-Low

Code:	Lab-10 MCA -508	Mini Project	Credits: 02

General Instruction Regarding Preparation of Project Report

1] Spiral Binding of Project Report with Following Front page

Mini Project Report

On

[PROJECT TITLE]

Submitted By

[Name of the Student]

MASTER OF COMPUTER APPLICATION

School of Computational Science

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY

NANDED (M. S.) 431606

Year 2021-22

Guidelines for front page

Font : **Times New Roman**

Font Size:**14 Pt.** For- (Project Report On, Submitted By, School of Computational Science, Swami Ramanand Teerth Marathwada University, Nanded (M. S.) 431606, year 2021-22)

14 Pt. For - Name of the Student

16 Pt. For- Project Title and Master Of Computer Application (All Caps)

No Border for the pages, No header and Footer, Line spacing – Multiple at 1.5

3. Blank white thick page

5. Certificate Page

CERTIFICATE

(TNR-18/Caps/Bold/Centre)

(Certificate Text – TNR-12)

This is to certify that, the project "Title of the Project (in Bold)" submitted by

(Name of the student) (TNR-12/Bold)

Is a bonafide work completed under my supervision and guidance in partial fulfillment for award of Master of Computer Application Degree of Swami Ramanand Teerth Marathwada University, Nanded.

Place : Nanded

Date :

(Name of the Guide) (Name of Director)

(Do not prefix any Prof/Lect etc)

Guide Director

CONTENTS

(TNR-16/Bold/Centre)

(All above – if applicable and Give list only) – (TNR-12/Bold)

Chapter Titles in (TNR-14/Caps/Bold) and Subtopics (TNR-12/Bold)

4.7 Coding

4.8 Report Formats

5. PERFORMANCE ANALYSIS

5.1 Testing

5.2 Implementing Testing

6. CONCLUSION

6.1 Conclusion

6.2 Future Scope

6.3 Applications/Utility

6.4 User Manual

6.5 Operations Manual / Menu Explanation

6.6 Forms and Report Specifications

6.7 Drawbacks and Limitations

6.8 Proposed Enhancements

REFERENCES

ANNEXURES

ACKNOWLEDGEMENT

Instructions –

- For subtopics, each first letter of the word should be capital except the words such as and, of, for etc.
- For sub-sub topic only first letter of the title should be capital. for ex.

1. INTRODUCTION

1.1 Introduction of Cryptography

1.1.1 General aspect

- After the last chapter of conclusions in the contents, it may have appendix or data sheets as per the requirement.
- Text for all chapters should be in TNR-12 and topic headings should be in TNR-14/Bold.

7. About References – (This should be towards end of the report)

- References should be placed in Square Bracket [ ] at appropriate places in various chapters
- Reference Page Title should be in TNR-14/Bold

References

- References must be in the standard format such as

[1] A.S. Tanenbaum, "Computer Networks", 2nd Edition, PHI

[2] Web Site – http://www.cnn.com

These reference numbers should appear at appropriate places in the Project report.

1. **Acknowledgement -** (This should be at the end of the report and 1 page only)

Acknowledgement

(TNR-14/Bold/Centre)

(Names of the student with Signature

Roll No.)

(After Acknowledgement there should be 2 Blank pages in the report.)

9. Instructions about paper to be used.

- Page Size – A/4, Executive Bond, Super white, more than 70 GSM.
- Use front face for printing

10. Instructions about Page Numbering/Figure Numbering etc..

1) First page of first chapter should not have a printed page no.

2) From second chapter the page no should be printed at the centre-bottom top-right corner of the page.

3) The title of the **table** should be at the top …

Table 2.1 Timing Analysis

4) The title of **figure/photograph/graph** should be at the bottom.

5) The titles should start at top/bottom with no additional line spacing.

11. About Size of the Report –

Normally the Project Report would be approximately 60 pages. It may be in the range of 60 to 70 pages (including appendix, data sheets etc.). This may change in exceptional cases.

12. No. of Copies to be prepared –

1 Copy for Department

1 Copy for Guide

1 Copy for student

13. General Guidelines

- Paper size A4 , Left margin – 1.5”
- Right Margin -0.5”
- Top Margin – 1”
- Bottom Margin – 1”
- Text should be justified.
- Line Spacing 1.5

==========

Code:	MCA -601	Major Project Activity	Credits: 25

General Instruction Regarding Preparation of Project Report

1] Hard Binding with Black Color and Gold letters

Project Report

On

PROJECT TITLE

Submitted By

Name of the Student

MASTER OF COMPUTER APPLICATION

School of Computational Science

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY

NANDED (M. S.) 431606

Year 2021-2022

Guidelines for front page

Font : **Times New Roman**

Font Size:**14 Pt.** For- (Project Report On, Submitted By, School of Computational Science, Swami Ramanand Teerth Marathwada University, Nanded (M. S.) 431606, year 2018-19)

14 Pt. For - Name of the Student

16 Pt. For- Project Title and Master Of Computer Application (All Caps)

No Border for the pages, No header and Footer, Line spacing – Multiple at 1.5

2] Spine/Side view of the Report –

MCA

Project

TITLE

2021 -

2022

3. Blank white thick page

4. Next Page -

Project Report

On

PROJECT TITLE

Submitted By

Name of the Student

[Seat No.]

Guided By

Name of the Guide

In partial fulfillment for the award of

MASTER OF COMPUTER APPLICATION

School of Computational Science

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY

NANDED (M. S.) 431606

Year 2018-19

5. Certificate Page

CERTIFICATE

(TNR-18/Caps/Bold/Centre)

(Certificate Text – TNR-12)

This is to certify that, the project “Title of the Project (in Bold)” submitted by

(Name of the student) (TNR-12/Bold)

Is a bonafide work completed under my supervision and guidance in partial fulfillment for award of Master of Computer Application Degree of Swami Ramanand Teerth Marathwada University, Nanded.

Place : Nanded

Date :

(Name of the Guide) (Name of Director)

(Do not prefix any Prof/Lect etc)

Guide Director

CONTENTS

(TNR-16/Bold/Centre)

4.6 Front End Design, Menu Tree, Menu Screens, Input Screens

4.7 Coding

4.8 Report Formats

5. PERFORMANCE ANALYSIS

5.1 Testing

5.2 Implementing Testing

6. CONCLUSION

6.1 Conclusion

6.2 Future Scope

6.3 Applications/Utility

6.4 User Manual

6.5 Operations Manual / Menu Explanation

6.6 Forms and Report Specifications

6.7 Drawbacks and Limitations

6.8 Proposed Enhancements

REFERENCES

ANNEXURES

ACKNOWLEDGEMENT

Instructions –

- For subtopics, each first letter of the word should be capital except the words such as and, of, for etc.
- For sub-sub topic only first letter of the title should be capital. for ex.

1. INTRODUCTION

1.1 Introduction of Cryptography

1.1.1 General aspect

- After the last chapter of conclusions in the contents, it may have appendix or data sheets as per the requirement.
- Text for all chapters should be in TNR-12 and topic headings should be in TNR-14/Bold.

7. About References – (This should be towards end of the report)

- References should be placed in Square Bracket [ ] at appropriate places in various chapters
- Reference Page Title should be in TNR-14/Bold

References

- References must be in the standard format such as

[1] A.S. Tanenbaum, "Computer Networks", 2nd Edition, PHI

[2] Web Site – http://www.cnn.com

These reference numbers should appear at appropriate places in the Project report.

2. **Acknowledgement -** (This should be at the end of the report and 1 page only)

Acknowledgement

(TNR-14/Bold/Centre)

(Names of the student with Signature

Roll No.)

(After Acknowledgement there should be 2 Blank pages in the report.)

9. Instructions about paper to be used.

- Page Size – A/4, Executive Bond, Super white, more than 70 GSM.
- Use front face for printing

10. Instructions about Page Numbering/Figure Numbering etc..

1) First page of first chapter should not have a printed page no.

2) From second chapter the page no should be printed at the centre-bottom top-right corner of the page.

3) The title of the **table** should be at the top …

Table 2.1 Timing Analysis

4) The title of **figure/photograph/graph** should be at the bottom.

5) The titles should start at top/bottom with no additional line spacing.

11. About Size of the Report –

Normally the Project Report would be approximately 60 pages. It may be in the range of 60 to 70 pages (including appendix, data sheets etc.). This may change in exceptional cases.

12. No. of Copies to be prepared –

1 Copy for Department

1 Copy for Guide

1 Copy for student

13. General Guidelines

- Paper size A4 , Left margin – 1.5”
- Right Margin -0.5”
- Top Margin – 1”
- Bottom Margin – 1”
- Text should be justified.
- Line Spacing 1.5

==========