

Rajagiri College of Social Sciences (Autonomous), Kalamassery

MCA (2 year) Syllabus and Scheme 2022 Admission Onwards

BOARD OF STUDIES (COMPUTER SCIENCE) RAJAGIRI COLLEGE OF SOCIAL SCIENCES (AUTONOMOUS) KALAMASSERY, KOCHI, 683104 KERALA, INDIA



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PREFACE TO THE MCA 2022 SYLLABUS



Extract of MGU order no: 29092/AC B7-1/2022/AC B7

Based on the order received from the parent university (given above), the Board of Studies (Computer Science) of Rajagiri College of Social Sciences (Autonomous), has decided to adopt the grading scheme of the parent university for its MCA Syllabus from 2022 onwards.

The major changes are

- 1. The total credit of MCA is changed from 80 to 90 credits.
- 2. Employability and Skill development and Seminar is added to the existing curriculum to equalize it to the Parent University curriculum
- 3. The grading scheme is changed from direct grading to indirect grading

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Dr. Bindiya M Varghese

Chair, BOS(Computer Science)



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RAJAGIRI COLLEGE OF SOCIAL SCIENCES (AUTONOMOUS)

Rajagiri College of Social Sciences (Autonomous) was established as a result of the indefatigable industry and foresight of the CMI. The various axioms of the institution maintain the axiomatic spirit of Rajagiri - 'Relentlessly Towards Excellence'. Rajagiri College of Social Sciences (RCSS) is the eldest child of Rajagiri Vidyapeetham (Rajagiri group of educational institutions). It is located on two picturesque campuses- the Hill Campus at Kalamassery and the Valley campus at Kakkanad in Kochi, in the state of Kerala. RAJAGIRI literally means "The hill of the King" and derivatively it refers to the hillock where Jesus Christ is accepted as the King or the model, as the human embodiment of the virtues of love, truth and justice.

Vision

To become a centre par excellence of learning, unique in experience, value based in its approach, and pioneering in its efforts for enriching and fulfilling LIFE.

Mission

To facilitate comprehensive and integrated development of individuals imbued with righteousness and courage of conviction, to effectively function as social beings

Motto

The College has its motto: LEARN SERVE EXCEL

DEPARTMENT OF COMPUTER SCIENCE

The Department commenced its Master of Computer Applications (MCA) Programme in 2001, Affiliated to Mahatma Gandhi University, Kottayam, Kerala, India, and approved by the All-India Council for Technical Education, New Delhi. The programme is designed to meet the ever-growing demand for well qualified and trained computer programmers. The Department has been consecutively rated "Platinum" in every AICTE-CII survey, for its illustrious placement track record and distinctive industry interaction programmes. The various specialisations of the MCA programme at RCSS brings out the students as world class professionals, suitable for the software industry.

Vision

To create technically competent individuals, who are innovative and uphold human values.

Mission

To develop globally recognised competent and innovative IT professionals, committed to lifelong learning, and blended with social commitment through comprehensive programmes.

Master of Computer Applications

The MCA programme of the institute has been designed in line with the mission statement of Rajagiri. The programme adheres strictly to an academic schedule that creates a strong knowledge base in the programme. Students are given training in the current technologies and an in-depth understanding of the current environment through various activities. The activities include extracurricular pursuits and value-added programmes that foster awareness in contemporary technologies which help in the holistic development of students.

The Rajagiri Immersive Learning Experience Methodology is a pedagogical innovation of the institute. This methodology aims to evolve the Rajagiri student into a socially responsible professional. The Immersive Learning methodology is based on four dimensions – conceptual learning, experiential engagement, executive modelling and corporate competency.

The faculty keep themselves abreast with the latest trends in technology through regular online and onsite /offsite training programmes. Prominent industry professionals and academicians conduct workshops and lectures for the faculty. Faculty are regularly sent for Faculty Development Programmes and other courses to enhance their knowledge base. Rajagiri governance policy encourages a creative and flexible atmosphere where all individuals are respected and valued by the community.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO) OF THE MCA PROGRAMME

- PEO1 : Graduates of the program will be computer professionals of probity, positive attitude and scientific temper
- PEO2 : Graduates of the program will have sound theoretical knowledge and skill for software development and implementation
- PEO3 : Graduates of the program will possess good communication, technical and innovative skills
- PEO4 : Graduates of the program will have a sense of social awareness

Programme Outcome (PO)

At the end of the Programme, a student will be able to achieve the following programme outcomes:

1. Computational Knowledge:

Apply knowledge of computing fundamentals, computing specialisation, mathematics, and domain knowledge appropriate for the computing specialisation to the abstraction and conceptualisation 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 mathematics, computing sciences, and relevant domain disciplines.

3. Design /Development of Solutions:

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.

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:

Recognise 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, as a member and leader in a team, 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 Specific Objectives (PSO)

PSO1: Data Analytics: Acquire knowledge of Data pre-processing and Data quality, Modelling and design of data warehouses, Algorithms for data mining, skills to design,

analyse and develop algorithms and implement using high-level programming languages and to define and critically analyse mining approaches for various domains.

PSO2: High-Level Programming: Acquire skills to design, analyse and develop algorithms and implement those using high-level programming languages, to maintain web server services required to host a website, Install, configure, design and develop mobile application development tools.

PSO3: Practices and tools in Information Security: Acquire a practical overview of the issues involved in the field of information security and assurance; acknowledge the ethical considerations in all dimensions of information security, and utilize the software tools to explore, rectify or prevent the unauthenticated actions in the domain.

Program Educational Objectives	PEO1	PEO2	PEO3	PEO4
Program Outcomes				
P01: Computational Knowledge		\checkmark		
PO2: Problem Analysis			\checkmark	
PO3: Design /Development of Solutions	\checkmark			
PO4: Conduct Investigations of Complex Computing Problems			\checkmark	
P05: Modern Tool Usage			\checkmark	
PO6: Professional Ethics	\checkmark			\checkmark
PO7: Life-long Learning	\checkmark			
PO8: Project management and finance				\checkmark
PO9: Communication Efficacy			\checkmark	
PO10: Societal and Environmental Concern	\checkmark			\checkmark
P011: Individual and Team Work	\checkmark			\checkmark
PO12: Innovation and Entrepreneurship			\checkmark	
PSO1: Data Analytics		\checkmark	\checkmark	
PSO2: High-Level Programming		\checkmark	\checkmark	
PSO3: Practices and tools in Information Security		\checkmark	\checkmark	

Mapping of PO to PEO

ELIGIBILITY CRITERIA

A candidate seeking admission to MCA course must have

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- A pass with not less than 50% marks in any recognized Regular Bachelors Degree of minimum three years duration in any discipline with Mathematics at plus two level OR at Graduation level with Mathematical Science (Mathematics /Statistics /Computer Science / Operation Research /Quantitative Techniques) as one of the Subjects. OR
- A pass with not less than 50% marks in BCA/BSc. Computer Science/BSc. Information Technology/ B.Tech. from a recognized University. OR
 - Candidates with such degrees awarded by the parent University or any other degree recognized as equivalent to the above listed courses by the Mahatma Gandhi University also are eligible to apply.
 - Relaxation in eligibility and minimum marks of the qualifying examination are subject to the respective regulation and existing rules of parent University.
 - Candidates who have passed the qualifying examination with more than one chance will have their percentage marks de-rated at the rate of 5% for every additional appearance for the purpose of ranking

PROGRAMME STRUCTURE AND DURATION

The duration of the programme shall be 4 semesters. The duration of each semester shall be 90 working days. Odd semesters from June to October and even semesters from November to march.

A student may be permitted to complete the programme, on valid reasons, within a period of 8 continuous semesters from the date of commencement of the first semester of the programme.

The medium of instruction shall be English.

ATTENDANCE

The minimum requirement of attendance for each course during a semester for appearing at the end-semester examination shall be 75%. Condonation of shortage of attendance to a maximum of 15 days in a semester subject to a maximum of two times during the whole period of the programme may be granted by the Principal, Rajagiri College of Social Sciences (Autonomous), Kalamassery.

Those who could not register for the examination of a particular semester due to shortage of attendance may repeat the semester along with junior batches, without considering sanctioned strength, subject to the existing Rules of the institution.

A Regular student who has undergone a programme of study under earlier regulation/scheme and could not complete the Programme due to shortage of attendance may repeat the semester along with the regular batch subject to the condition that he has to undergo all the examinations of the previous semesters as per the 2021 Regulations

A student who had sufficient attendance and could not register for fourth semester examination can appear for the end semester examination in the subsequent years with the attendance and progress report from the Principal.

PROMOTION

A student who registers for a particular semester examination shall be promoted to the next semester.

A student having 75% attendance for each course and who fails to register for examination of a particular semester will be allowed to register notionally and is promoted to the next semester, provided application for notional registration shall be submitted with 15 days from the commencement of the next semester.

EVALUATION

The evaluation scheme for each credit course shall contain two parts; (a) Semester Evaluation (ESE) [External Evaluation] and (b) Continuous Evaluation (CE) [Internal Evaluation]. 25 marks shall be given to internal evaluation and the remaining 75 marks to external evaluation

Continuous Assessment Criteria

1. Theory Course

Sl No	Component		Marks
1	Continuous Assessment Examination (CAE)	CAE 1	7.5 Marks
2		CAE 2	7.5 Marks
3	Assignment/Project/Term paper (Individual)/Class Participation/Presentation/Quizzes/Seminars/Case Studies/ Group Project work/VIVA voce/ MOOC Course etc (Any two is compulsory)		(5+5) Marks
Total			25 Marks

2. Practical Course

Lab Performance	5 marks
Continuous Assessment Examination	10 marks (Lab Exercise + viva)
Lab Record	5 marks
Assignment/Project/ Test/Quiz	5 marks
Total	25 marks

3. Internship

Interim Presentation	70 marks
Guide – Prompt Communication, Clarity on the Tasks	50 marks
Interim Report	30 marks
Internal Marks	150 marks



External evaluation

1. Theory Course

There shall be a written semester examination at the end of each semester for all theory courses of duration of 3 hours with maximum 75 marks. A question paper may contain short answer type and long essay type questions. The question paper pattern is as follows.

Sections	Type of Questions	Marks	Number of questions to be answered	
A	Short answer type questions	3	10 out of 12	
В	Long essay type questions	9	5 (Either / OR questions) Each question from each module	
Total 75 Marks				

2. Practical Course

Sections	Type of Questions	Marks	Components of evaluation		
А	Program-1 (Simple)	20	Logic, Interface		
В	Program -2 (Moderate)	30	Output, Optimization		
	Lab Record	10	Clarity		
	Viva	15			
Total 75 Marks					

3. Internship

Viva	100 marks
1. Attainment of Internship objectives	
2. Skills gained during the internship	
3. Commitment towards the tasks allocated	
4. The challenges faced and the strategy to overcome	
5. Key contributions of the intern to the organization	
Final Report	50 marks
Internal Marks	150 marks

GRADING

The performance of a student in the programme is evaluated using indirect grading system.

Course Grade

The performance of a student in each course is evaluated in terms of percentage of marks with a provision for conversion to grade points. The grading system followed is that of relative grading on a ten-point scale. Letter grade corresponding to total marks in percentage, M (Internal + External) and the corresponding grade point in a ten-point scale is described in the table:

Range of Marks in %(M)	Grade Letter	Performance	GradePoint
90 - <= 100	S	Outstanding	10
80 - <90	А	Excellent	9
70 - <80	В	Very Good	8
60 - <70	С	Good	7
55 - <60	D	Average	6
50 - <55	Е	Pass	5
0 - <50	F	Fail	0

Semester Grade

The overall grade point of a student in a semester is measured as Semester Grade Point Average (SGPA). It is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student.

SGPA (S_i) = Σ (C_i x G_i) / Σ C_i

where C_i is the number of credits of the *i*th course and G_i , is the grade point scored by the student in the *i*th course.

Semester Grade = Letter Grade corresponding to SGPA from the performance grade scale. Overall grade of the programme

The overall grade point of a student in the entire MCA Programme is measured as Cumulative Grade Point Average (CGPA). The CGPA is calculated by taking into account all the courses undergone by a student for all the semesters of a programme,

$CGPA = \Sigma(C \times S_i) / \Sigma C_i$

where S_i is the SGPA of the *i*th semester and C_i is the total number of credits in that semester.

Overall Grade awarded in the Programme is the letter grade corresponding to CGPA from the performance grade scale.

Note : All grade point averages should be rounded off to 2 decimal points

Conversion of CGPA to Percentage

Percentage marks equivalent to CGPA = (CGPA Obtained x 100) / Maximum CGPA (10).

PASS REQUIREMENTS

Course

- A student who obtained Grades S to E (grade point not less than 5) shall be considered as passed. If a student secured "F" grade, he /she has to reappear for the examination. It is mandatory for a student to earn the required credits as mentioned in each semester.
- For a pass in a course with internal and external evaluation, a student shall secure minimum of 40% of the maximum marks prescribed in the end semester Examination and 50% of marks in the aggregate marks in the course including sessional marks.
- No separate minimum is required for internal evaluation /sessional marks.
- The students who do not satisfy the above condition or the student who remains absent shall be deemed to have failed in that course and may reappear for the external examination in the subsequent examinations. However, the Sessional marks awarded to the student/s at previous attempt in the concerned subject will be carried forward.
- If a student fails in a subject having only internal assessment/ evaluation, he/she has to redo the work for that subject along with the subsequent batch.

Semester

• For Successful completion of a semester, a student should pass all courses in the semester and score minimum E grade for the semester (SGPA should not be less than 5). However, a student is permitted to move to the next semester irrespective of his/ her SGPA provided they have completed all the requirements of attendance, payment of all fees due to the University and Institution and registration for the examinations in the earlier semesters.

Programme

• For successful completion of the programme, a student should successfully complete all four semesters with a minimum SGPA score of 5 and with a minimum CGPA score of 5.

AWARD OF DEGREE

The successful completion of all courses with minimum E grade within the stipulated period is the minimum requirement for the award of degree.

- A candidate who qualifies for the award of the degree securing E or above grade in all courses pertaining to all semesters in his/her first attempt within four consecutive semesters, and in addition secures SGPA of 7.5 or above for semesters I to IV shall be declared as passed the examination in FIRST CLASS WITH DISTINCTION.
- A candidate who qualifies for the award of the degree by securing E or above grade in all subjects of all the semesters within a maximum period of eight semesters, after the commencement of his/her study in the 1st semester and secures CGPA not less than 6.00 shall be declared as passed the examination in FIRST CLASS.
- All other candidates who qualify for the award of the degree by securing E or above grade in all subjects of all semesters within a maximum period of eight semesters, after the commencement of his/her study in the 1st semester and secures CGPA not less than 5.0 shall be declared as passed the examination in SECOND CLASS.

BRIDGE COURSES

#	Course Name	Hours
1	Programming concepts using C language	14
2	Basic Mathematics and Statistics	6
3	Digital Logic and Computer Organization	4
4	Basic Principles of Management	4
5	Skill and Personality Development Workshop	4 Full Working Days
	Evaluation after Bridge Course	3 Hour Lab Exam

SEMESTER COURSES

Semester I

				Hours		Exam	CAE	ESE	
Lode	Lourse Name	Гуре	Lecture	Tutorial	Practical	(hours)	Marks	Marks	Credit
MCA101	Probability, Statistics and Computational Mathematics	Core	3	1	0	3	25	75	3
MCA102	Data Structures using C	Core	3	1	0	3	25	75	3
MCA103	Database Management System with SQL/PL-SQL	Core	3	1	0	3	25	75	3
MCA104	Data Communications and Computer Networks	Core	3	1	0	3	25	75	3
MCA105	Operating Systems with Linux as Case study	Core	3	1	0	3	25	75	3
MCA106	Data Structures Lab	Lab			6	3	25	75	3
MCA107	DBMS Lab	Lab			4	3	25	75	2
	Total marks		7	00		Total Cre	20		

Semester II

Code	Course Name	Туре		Hours		Exam	CAE	ESE	Credit
			Lecture	Tutorial	Practical	(hours)	Marks	Marks	Total
MCA201	Operations Research	Core	3	1	0	3	25	75	3
MCA202	Java Programming	Core	3	1	0	3	25	75	3
MCA203	Advanced Software Engineering	Core	3	1	0	3	25	75	3
MCA204	Design and Analysis of Algorithms	Core	3	1	0	3	25	75	3
MCA205	Artificial Intelligence	Core	3	1	0	3	25	75	3
MCA206	Web Technology Lab	Lab	2		4	3	25	75	4
MCA207	Java Programming Lab	Lab			4	3	25	75	2
MCA208	Employability and Skill development -1	Lab	2		2	2	50		2
	Total marks		7	50		Тс	23		

Semester III

Code	Course Name	Туре		Hours		Exam	CAE	ESE	Credit
			Lecture	Tutorial	Practical	(hours)	Marks	Marks	Total
MCA301	Business Management and Financial Accounting	Core	3	1	0	3	25	75	3
MCA302	Theory of Computation and Compilers	Core	3	1	0	3	25	75	3
MCA303	Data Mining	Core	3	1	0	3	25	75	3
MCA304	Information Security	Core	3	1	0	3	25	75	3
MCA3XX	Elective-I	Core	3	1	0	3	25	75	4
MCA306	Data Analytics using Python	Lab			6	3	25	75	3
MCA307	Android	Lab			4	3	25	75	2
MCA308	Employability and Skill development -2	Lab	2		2	2	50		2
	Total marks		7	50		To	23		

Semester IV

Code	Course Name	Туре		Hours		Exam	CAE	ESE	Credit		
			Lecture	Tutorial	Practical	(hours)	Marks	Marks	Total		
MCA 401	Parallel Programming using OpenMP	Core	3	1		3	25	75	3		
MCA 4XX	Elective-II	Core	3		2	3	25	75	4		
MCA 403	Seminar	Core	2				100		2		
MCA 404	Comprehensive Viva-Voce							100	3		
MCA 405	Internship						100	100	12		
	Total marks	6	600Total Credits24								
	Total Credits for MC		90								
	Total Marks For MC		2800								

Elective Courses

Specialization Stream 1		Specializ	ation Stream 2	Specialization Stream 3						
Data Scie	ence	Advance	d Programming	Compute	r Security					
Code	Course Name	Code	Course Name	Code	Course Name					
Pool1 (MCA 305)										
MCA311	Deep Learning	MCA321	AngularJS framework	MCA331	Ethical Hacking					
MCA312	Big Data Analytics	MCA322	MCA322 Microsoft .NET Framework using C#		Web and Database Security					
			Pool 2 (MCA 402)							
MCA413	R Programming	MCA423	Flutter Using DART	MCA433	Cyber Forensics					
MCA414	Data Visualization	MCA424	Struts, Hibernate and Spring	MCA434	Block-Chain Technology					



BRIDGE COURSES

Programming concepts using C language

- Work with primitive types and expressions
- Understanding the basic structure of a C Program, the main function and using standard I/O
- Understand C Character Set and Tokens, Data Types, Variables and Constants
- Work with Operators and Expressions
- Control the flow of Program using Conditional statements and Loops
- Work with Built-in Functions and User Defined Functions with arguments, Passing arguments By Value and By Reference
- Work with Arrays and Strings
- Understand and Implement Pointers, Pointer to an array, Array of pointers, Pointers and functions
- Defining Structures and Union
- Data File Handling
- Debug C programs effectively

Basic Mathematics and Statistics

• Set theory

Sets and their representations; The empty set; finite and infinite sets; equal and equivalent sets; subsets; power set; universal set; Venn diagrams; complement of a set operation on sets; applications of sets.

- Mathematical Logic Basic Logical connections; Conjunction; Disjunction; Negation; Negation of Compound Statements; Truth tables. Tautologies; Logical Equivalence; Applications.
- Modern algebra Binary Operation; Addition Modulo n; Multiplication modulo n
- Matrices and Determinants Definition of a matrix; Operations on matrices; Square Matrix and its inverse; determinants; the inverse of a matrix
- Basics Statistics Measures of central Tendency; Standard Deviation; Discrete series. variance.

Digital Logic and Computer Organization

- **Computer Evolution**: Brief history of Computer, Classification of Computer, Structure of a Computer System, Arithmetic Logic Unit, Control Unit, Bus Structure, Von Neumann Architecture. Bootstrapping.
- **Number systems** Decimal, Binary, Octal, Hexadecimal conversion from one to another, Basic Arithmetic Operations: Integer Addition and Subtraction, Signed numbers, Binary Arithmetic, 1's and 2's Complement Arithmetic, Fixed and Floating point numbers, Floating point representation.,
- **Digital Logic**: Logic gates, Boolean Algebra, Basic theorem and Properties of Boolean algebra. Basic concepts on Combinational Circuits and Sequential circuits

- **Control Unit Design**: Basic Concepts Instruction execution cycle sequencing of control signals
- **Memory Organization**: Characteristics of Memory Systems, Main Memory, Types of Random-Access Memory and ROM, Organization, Static and dynamic memories. Understanding Cache Memory and Virtual Memory
- **Input / Output Organization**: Accessing I/O devices Understanding Programmed I/O, Interrupt I/O and Direct memory access (DMA)

Basic Principles of Management

- Introduction to principles of management: Planning, organising, staffing, Budgeting, Controlling.
- Scope of IT applications in management, and its benefits
- Socioeconomic environment and information systems, and its impact
- Strategic role of IT in organisations
- Critical success factors as its role in implementing IT applications
- Case studies of successful / failed IT applications

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SEMESTER I



MCA101 Probability, Statistics and Computational Mathematics

Course Code	MCA101	Course Title	Probability, Statistics and Computational Mathematics							
Course Type	Core	Contact Hours	4 Hours per Week							
Credit	3	Domain	Mathematics							
Syllabus	1									
I	Probability Theory : Sample space, Events, Different approaches to probability, Addition and multiplication theorems on probability, Independent events, Conditional probability, Bayes Theorem.									
II	Random variables Probability density Marginal density fun expectations, mom Discrete probabili distribution, Contin distribution and nor	s and Distributi functions and ctions, Joint densit ents and momen ty distributions nuous probability mal distribution.	 on: Random variables, distribution functions, y functions, mathematical t generating functions. Binomial, Poisson distributions- uniform 							
III	Basic Statistics :Me mode; Measures of o deviation and Stan Kurtosis, Linear co Correlation, Rank co	asures of central to lispersion: Range, dard deviation; M orrelation, Karl H rrelation and linea	endency: - mean, median, Mean deviation, Quartile Aoments, Skewness and Pearson's coefficient of r regression.							
IV	Mathematical Log Propositional Equiv Quantifiers, Nested (t ic : Propositional valences, Normal Quantifiers, Rules c	and Predicate Logic, Forms, Predicates and of Inference.							
V	Counting, Mathem Pigeonhole Princip Inclusion- Exclusion	natical Induction ple, Permutation Principle, Mathem	n: Basics of Counting, as and Combinations, atical Induction.							
REFERENCE BOOKS	:									
Fundamentals of stat Himalaya Publication	tistics: S. C. Gupta, 6th 1s	Revised and enlarg	ged edition April 2004,							
Fundamentals of Mar Publications.	thematical Statistics-	S.C.Gupta ,V.K.Kapo	oor. Sultan Chand							
Introduction to Math education	ematical Statistics -Re	obert V. Hogg &Alle	en T. Craig. Pearson							
Discrete Mathematic Tremblay and R. P. M	al Structures with App Ianohar, Tata McGraw	olications to Comp -Hill, 2001.	uter Science by J. P.							
C. L. Liu, Elements of	Discrete Mathematics	s, 2nd Edition, Tata	McGraw-Hill, 2000.							
COURSE PRE-REQU	ISITES:									
Bridge Course in Mat	thematics.									
COURSE OBJECTIVE	ES:									
To understand the co	oncept of probability,	statistics and comp	outational mathematics							
and it uses in compu	ter science problems.									

COURSE (COURSE OUTCOMES:														
CO. No			Co	Course Outcome description											
MCA101.1	L		Tc pr	To gain fundamental understanding of Probability, conditional probability and Bayes theorem.										onal	
MCA101.2	2		Ur	Understand and describe various probability distributions											
MCA101.3	3		Тс	o apply the concept of statistics in real life problems.											
MCA101.4	ł		Тс	To gain fundamental understanding of mathematical logic.											
MCA101.5 To have the concept of counting and mathematical induction.											on.				
CO-PO AN	CO-PO AND CO-PSO MAPPING														
	P01	PO2	P03	PO4	PO5	PO6	P07	PO8	PO9	P010	P011	P012	PSO1	PSO2	PSO3
MCA101.1	2	2	1	2									2		
MCA101.2	2	2	1										2		
MCA101.3	2	3		3									2		
MCA101.4	2	3		3											
MCA101.5	2	2	1	2											

MCA102 Data Structures using C

Course Code	MCA102	Course Title	Data Structures using C								
Course Type	Core	Contact Hours	4 Hours per Week								
Credit	3	Domain	Computing								
Syllabus											
Ι	Introduction: Data S	tructures, Data Types, S	tructure.								
	Arrays: Polynomial Representations, Polynomial addition, Polynomial										
	Multiplication and sparse matrices										
	Stack: Definition and	d concepts, Operations	on stacks. Application of								
	stacks- Infix to postfix conversion, Evaluation of Arithmetic Expression.										
II	Queue: Representation of queue, circular queue and double ended										
	queue.Priority queue: implementation by array using Heap Sort										
	Dynamic Memory A	Dynamic Memory Allocation Functions:malloc, calloc, realloc and									
	free										
	Linked List: Operat	ions – insertion, search	ning, removing, updating,								
	sorting and reversing		1								
	Polynomial: Repres	entations, Addition, Mu	iltiplication using Linked								
	List.	T · 1 1 · 1 T · 1									
111	Linear Data Structu	res: Linked stacks, Linke	ed queues, Circular Linked								
	List and Double Ende	ed Queue, Doubly Linked	List and Circular doubly								
	Non-Linear Data Str	ucturaci Trooc Crophe									
	Cranh, Danasantati	on of Cranh on Comput	or: Adjaconcy matrix and								
	adjaconcy list morits	and domorits of graph r	corresontation								
	Searching: Linear Se	arch Rinary Search	epresentation								
IV	Trees Basic termino	logy hinary trees hinar	v search tree								
1 4	Rinary search tree	Insertion Deletion sea	rching and Traversal - in-								
	order pre-order and	nost-order									
	order, pre-order and	post of def.									

	Threa Bala i	nded Bi nced	nary Free s	Tree s: A	:Ope VL T	ratio 'ree:	ns pro	pertie	s, ins	sertio	n, de	letion	and		
	rotati	ons													
V	Adva	nced D	oata S	Struc	ture	s: Re	d bla	ck tre	e: pro	pertie	es.				
	B-Tro	ees: Da	ita St	ructi	ire o	n sec	conda	ary st	orage	, Defii	nition	of B	trees,		
	Basic	Basic operations on B Irees – searching, creating an empty node, splitting a node in B Tree Inserting a key in to B Tree and Deleting a													
	splitt	Splitting a node in B Tree, Inserting a key in to B Tree and Deleting a													
	Key f	Key from a B Tree Definition and Structure: B+ Trees													
	Denn	Definition and Structure: B+ Trees Data Structure for Disioint Sets: Disioint set operation, linked list													
	Data	representation of disjoint sets, Disjoint-set forests													
REFERENCE	E BOOKS:														
Introduction to Algorithms - Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest															
Fundamentals	undamentals of data structures – Ellis Horowitz and SartajSahni (Galgotia , 1994)														
Fundamentals	idamentais of data structures – Ellis Horowitz and SartajSahni (Galgotia , 1994) idamentals of computer algorithms- Ellis Horowitz, SartajSahni,														
SanguthevarR	or computer algorithms- Ellis Horowitz, SartajSahni, ajeshekharan (Universities Press , 2007)														
Data Structure	using	using C & C++ b. Tannenbaum and Augustine.prentice hall.													
Data Structure	es – a	s - a pseudocode approach with C -Richard F Gilberg. Behrouz A													
Forouzan, Thomson Learning, 2 Edn., Cengage Learning C2005															
Data Structures and program design – R. L Kruse (Prentice Hall of India).C2001															
COURSE PRE-REOUISITES:															
Bridge Course in C															
COURSE OBJECTIVES:															
1. To intro	oduce	he con	cept	of lin	ear a	nd no	onlin	ear da	ata str	uctur	es.				
2. To impl	lement	the co	ncept	ts usi	ing ar	rays	and	linked	l list						
3. To appl	ly it to	advanc	ed da	ata st	ructu	ires.									
COURSE OUT	COMES	5:													
CO. No	Cour	se Out	come	e des	cript	ion									
MCA102.1	To di	fferenti	ate t	he lir	near a	and n	onlin	lear d	ata sti	ructur	es				
MCA102.2	Imple	ement t	he va	riou	s kind	ds of	sorti	ng an	d sear	ching	techr	niques			
MCA102.3	To im	pleme	nt the	e cono	cept o	of nor	nlinea	ar data	a stru	ctures	using	garray	/s and		
	linke	d list.			-										
MCA102.4	Fami	iarize t	he co	ncep	otofa	dvan	ced c	lata st	ructu	res lik	ke red	black	trees,		
	avl tr	ees etc													
MCA102.5	Imple	ement t	he co	ncep	ot of b	balan	cing	a tree	and t	he rot	ation	s to do	o it.		
CO-PO AND C	<u>0-PSO</u>	MAPP	ING												
PO1	PO2 PO	03 PO4	PO5	P06	P07	P08	P09	P010	P011	P012	PS01	PSO2	PSO3		
MCA102.1 3					1				2	2		2			
					1				2	2		2			
MCA102.2		5			-							~			
MCA102.2 MCA102.3 3		2			1				2	2		2			
MCA102.2 MCA102.3 3 MCA102.4		3 2 3			1				2	2		2			

MCA103 Database Management Systems with SQL/PL-SQL

Course Code	MCA103	Course Title Database Management Systems with SQL/PL- SQL									
Course Type	Core	Contact Hours	4 Hours per Week								
Credit	3	Domain	Computing								
Svllabus		1									
I	Module 1: Introductory concepts of DBMS Introduction and applications of DBMS, Purpose of data base Data, Independence, Database System architecture- levels Mappings, Database, users and DBA Relational Model Structure of relational databases, Domains, Relations, Entity- Relationship model Basic concepts, Design process, constraints, Keys, Design issues E-R diagrams, weak entity sets, extended E-R features - generalization, specialization, aggregation, reduction to E-F database schema										
II	Module 2: Relational Database designFunctional Dependency – definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FD, Normalization – 1Nf, 2NF, 3NF, Decomposition using FD- dependency preservation, BCNF, Multivalued dependency, 4NF, Join dependency and 5NF										
III	Module 3: SQL Co Basics of SQL, DE defining constrain check, IN operato functions – numer queries,correlated by, join and its typ transaction contro	DL,DML,DCL, struct oL,DML,DCL, struct or, Primary key, fo or, Functions - agg ric, date, string func l sub-queries, Use oes, Exist, Any, All, ol commands – Com	ure – creation, alteration, oreign key, unique, not null, gregate functions, Built-in ctions, set operations, sub- of group by, having, order view and its types. amit, Rollback, Savepoint								
IV	Module 4: PL/SQ Introduction to PI Composite Data T Functions, Trigge Triggers	L L/SQL, PL/SQL Ider ypes, Explicit Cursc ers, Compound, D	ntifiers, Control Structures, ors, Stored Procedures and DL, and Event Database								
V	Module 5: Transa Transaction conce of transactions, to Two- Phase Com based recovery, related problems, related problems Isolation, Intent lo	ection Managemen epts, properties of t cesting for serializ mit protocol, Reco concurrent execut Locking mechanism c, deadlock, , two ocking	nt ransactions, serializability cability, System recovery, overy and Atomicity, Log- ions of transactions and m, solution to concurrency o-phase locking protocol,								

REFERENCE BOOKS:

Database Management Systems – Raghu Ramakrishnan and Johannes Gehrke, Third Edition, McGraw Hill, 2003

Database Systems: Design , Implementaion and Management, Peter Rob, Thomson Learning, 7Edn.

Concept of Database Management, Pratt, Thomson Learning, 5Edn.

Database System Concepts – Silberchatz, Korth and Sudarsan, Fifth Edition, McGraw Hill, 2006

The Complete Reference SQL – James R Groff and Paul N Weinberg

COURSE PRE-REQUISITES:

Basic Computer Knowledge

COURSE OBJECTIVES:

- 1. Understand and successfully apply logical database design principles, including E-R diagrams and database normalization.
- 2. To introduce the basic concepts including the structure and operation of the relational data model along with integrity constraints
- 3. Construct simple and moderately advanced database queries using Structured Query Language (SQL).
- 4. To understand the design of a database system using normalization
- 5. Understand the concept of a database transaction and related database facilities, including concurrency control, backup ,recovery, locking protocols, Security and Integrity.

COURSE OU	TCO	MES	5:												
CO. No			C	Course Outcome description											
MCA103.1			U	Understand and successfully apply logical database design											
MCA103.2	Principles, E-K diagrams.											ما			
MCA103.2				ave	ain ability to write database queries using SOL										
MCA105.5			G	ama	in addity to write database queries using SQL.										
MCA103.4			T	o gai	n abi	lity i	n wri	ting l	PL/SO	QL Co	de ar	ıd pro	ocess	the da	ta.
MCA103.5				Understand the concept of database transactions, concurrence control, backup, recovery, locking protocols, Security an										rency and	
			lr	itegr	ity.										
CO-PO AND	CO-F	PSO	MA	PPIN	١G										
P	O1 PC	02 P	03	PO4	PO5	PO6	PO7	PO8	PO9	P010	POll	PO12	PSO1	PSO2	PSO3
MCA103.1		2	1											1	
MCA103.2		2	1											1	
MCA103.3		2	1											1	
MCA103.4		3			1									1	

MCA104 Data Communications and Computer Networks

Course Code	MCA104	Course Title	Data Communications and Computer Networks			
Course Type	Core	Contact Hours	4 Hours per Week			
Credit	3	Domain	Professional Core			
Syllabus	0					
I	Introduction: Data Communications, Computer Networks, Network Layering- OSI reference Model, TCP-IP Protocol Suite. Physical Layer:Data and Signals, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data rate Limits. Digital-to-Digital Conversion, Analog-to-Digital Conversion, Digital-to-Analog Conversion Analog-to-Digital Conversion					
II	Physical Layer:	Transmission and	Switching Transmission Modes,			
	Transmission media- Guided, unguided media. Multiplexing, Switching-Circuit Switching, packet switching					
III	Data Link Layer: Nodes and Links, Link-Layer Addressing, error Detection and Correction- Block coding, Cyclic Codes, Checksum, Forward Error Correction, Simple, Stop-and-wait, Go-back-N, Selective Repeat Media Access Control: Random Access-ALOHA, CSMA, CSMA/CD, CSMA/CD Controlled Access Channelization-EDMA TDMA CDMA					
IV	Network Layer: Services, Routing Algorithms: Distance Vector, Link					
V	State, Path Vector, and Unicast Kouting Algorithms. Multicasting Basics: Addresses, Delivery at Data Link Layor					
v	Multicast Forwarding, Two Approaches to Multicasting.					
	IP Addressing, Classes, Subnetting.					
REFERENCE BOOKS:						
Forouzan, "Data Communications and Networking", 5 th Edition, McGraw Hill, 2013.						
Andrews. Tanenbaum, "Computer Networks", 5 th edition. Prentice-Hall.						
William Stallings, "Data and Computer Communication", 8 th edition						
COURSE PRE-REQUISITES:						
COURSE ORIECTIVES.						
1. To give idea of basics of Data communication and Computer Networks. The first						
part of the course emphasis on fundamentals of Data and Signal and Encoding						
Standards and detail about the physical layer and transmission modes.						
2. To give an overview of communications switching and routing, types of						
communication, network congestion, network topologies, network						
configuration and management, network model components, layered network						
notocols various types of networks (I AN MAN WAN and Wireless networks)						
and their protocols.						
COURSE OUTCOMES:						
CO. No	Course Outcom	e description				

MCA104.1	Build model	Build an understanding of the fundamental concepts and reference models of data communications and Computer Networks										
MCA104.2	Train transr	Train the students in basics of Data communications and transmission media.										
MCA104.3	Familiarize the student with the basic taxonomy and protocols used in the Data Link layer of OSI reference Model						used					
MCA104.4	Introduce the student to advanced networking concepts like wired and wireless protocols, and routing algorithms						red					
MCA104.5	Build an understanding of IP addressing and multicasting											
CO-PO AND CO-PSO MAPPING												
PO1 P	02 PO3	PO4 PO	5 PO6	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
MCA104.1 3	1		3									1
MCA104.2 3	3		2									1
MCA104.3 3	3		2									1
MCA104.4 3	3		2									1
MCA104.5 3	2		2									1

MCA105 Operating Systems with Linux as Case study

Course Code	MCA105	Course Title	Operating Systems with Linux as Case study	
Course Type	Core	Contact Hours	4 Hours per Week	
Credit	3 Domain Professional Core			
Syllabus				
Ι	 File System concepts, Access methods, Allocation methods, Directory systems, File protection. Disk Management - Disk scheduling, Disk management, Disk reliability. Linux:History of Linux: Linux Operating System Layers, The Linux Shell Process: (parent and child processes), Files and Directories (File Structure and directory structure), Linux Basic commands: pwd, cd, mkdir, rm, mv, touch,man,cp,locate, echo, cat, touch, ls, cut, paste and other basis shall management as management. 			
II	Memory Manager Memory Manager Paging, Segmentat replacement algori Linux Commands tail,sort, grep, sudo memory related co	nent ment, Memory ion, Virtual memo ithms, Allocation a df, du, tar,zip, un privileges, top, fr mmands. Installa	partitioning, Swapping, ry, Demand paging, Page algorithms ame, chmod, head, ree, vmstat, and other tion of Linux OS	
111	Process Managen	ient and Concurr	rency management	

36					
		Process and Thread Management, Concept of process and threads, Process states, Process management, Context switching, Multithreading, Concurrency Control, Concurrency and Race Conditions			
		Linux: process related commands: fork, exec, ps, kill,nice, foreground process, background process			
	IV	Concurrency Management			
		Semaphores, Classical IPC problems and solutions. Deadlock, Characterization, Avoidance and Prevention, Detection, Recovery			
		Linux: Shell variables, redirection, filters Shell Scripting.			
	V	Protection and case STUDY: LINUX			
		Access matrix, Implementation of access matrix, Revocation of access rights.			
		Linux OS – Administering Users and Groups: Administering User Accounts, Working with Group Accounts, Understanding the Root Account, installing packages			
	REFERENCE BOOKS:	, , , , , , , , , , , , , , , , , , , ,			
	Silberschatz, Galvin, and Publication, 2011.	l Gagne, "Operating System Concepts", Eighth Edition, Wiley			
	Andrew S. Tanenbaum, Education, 2004.	"Modern Operating Systems", Second Edition, Pearson			
	Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2004				
	Harvey M. Deital, "Operating Systems", Third Edition, Pearson Education, 2004.				
	Milan Milenkovic, "Operating Systems: Concept and Design", 2nd Edition, 2001.				
	"Linux Command Line a Publication.	nd Shell Scripting Bible (English) 2nd Edition", Wiley			
	Richard Petersen, "Linux	x: The Complete Reference", Sixth Edition, 2007			
	COURSE PRE-REQUISIT	ΓES:			
	Basic Computer Knowle	dge			
	COURSE OBJECTIVES:				
	1. To provides a con principles, techni	mprehensive introduction to understand the underlying iques and approaches used in operating systems.			
	 To understand he schedule CPU time the underlying he schedule content of the conten	ow OS, manage resources such as memory, peripherals, and ne and learn how applications communicate with the user and ardware.			

COURSE OUTCOMES:															
CO. No	Course Outcome description														
MCA105.1	Elaborate the understanding of an operating system by giving emphasis on the file systems and Hard Disk Management.														
MCA105	.2			Со	mpre	hend	l the	prim	ary n	nemo	ry con	trol a	nd int	eracti	on of
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				an	oper	ating	syst	em.							
MCA105.	.3			Un	derst	and	the c	once	ot of	Proce	ss Ma	nagen	nent a	nd In	ter
				Pro	Process communication Component of an Operating System										
MCA105.	.4			Rea	Realize the importance and the implementation of										
				pro	protection mechanism used by an operating system										
MCA105.	.5			Lea	Learn the concepts of operating system through										
				ext	experimental practice using Linux operating system										
CO-PO AND CO-PSO MAPPING															
	PO	PO	PO	PO	PO	PO	PO	PO	PO	P01	P01	P01	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
MCA105.			3												
MCA105.	1		3												
 MCA105	2		3												
3	-														
MCA105. 4			3												
MCA105. 5			1		2										

MCA106 Data Structures Lab

Course Code	MCA1	06	Course Title	Data Structures Lab							
Course Type	Core		Contact Hours	6 Hours per Week							
Credit	3		Domain	Computing							
Syllabus											
Ι	1.	Program t	o represent Searching procedures (Linear search								
		Binary sea	arch)								
	2.	2. Program to represent sorting procedures (Selection, Bubbl									
		Insertion)									
	3.	Polynomia	al addition using array								
	4.	Polynomia	al multiplication using a	rray							
	5.	Program t	o represent sparse matr	ix manipulation using arrays.							
	6. 7	Program t	o allocate two dimensio	nal arrays dynamically.							
	/.	Program t	o demonstrate the use (of realloc().							
	0. 0	Stackusin	a array	rav							
	9. 10	Roverse a	string using stack								
	10.	Imnlemen	t Oueue using array								
	12	Circular 0	ueue using array								
	13.	Double en	ded queue using array								
II	1.	Program to	represent Singly Linke	d List.							
	2.	Program to	represent Doubly Link	ed List.							
	3.	Program to	o represent Circular Linl	xed List.							
	4.	Polynomia	nial addition using Linked List.								
	5.	Polynomia	nial multiplication using linked list.								
	6.	Implement	t a linked stack								

- 7. Program to represent Queue using linked list
- 8. Represent a graph using linked list.
- 9. Program for Conversion of infix to postfix.
- 10. Program for Evaluation of Expressions.
- 11. Program for binary search tree using recursion.
- 12. Program to represent Binary search Tree Traversals without recursion

REFERENCE BOOKS:

Fundamentals of Data Structures in C by Horowitz, Sahni and Anderson-Freed.

Data Structures Through C in Depth by S.K Srivastava, Deepali Srivastava.

Data Structures Using C Aaron M. Tenenbaum

Data Structures Using C, Reema Thareja

COURSE PRE-REQUISITES:

MCA102

COURSE OBJECTIVES:

- 1. To develop programs to implement the concept of data structures
- 2. To implement the concepts of data structures using arrays and linked list
- 3. To implement the concepts of advanced data structures

COURSE OUTCOMES:

000102																
CO. No		Co	ours	e Out	tcom	le de	scri	ptior	1							
MCA106	.1	To	o imp	leme	ent tł	ıe lin	ear o	data	struc	tures	like a	arrays	s, link	ed lis	t.	
MCA106	.2	To	'o implement the various kinds of sorting and searching techniques.													
MCA106	.3	To	o implement the concept of stacks using arrays and linked list.													
MCA106	.4	To	o imp	leme	ent tł	ie co	ncep	t of c	queu	es usi	ng ar	rays a	ınd liı	nked l	ist.	
MCA106	.5	To	o imp	leme	ent tł	ie co	ncep	t of r	nonli	near	data s	truct	ures l	ike gr	aphs	and
		tr	ees.													
СО-РО А	ND	CO-P	PSO MAPPING													
	P01	PO2	P03 P04 P05 P06 P07 P08 P09 P010 P011 P012 PS01 PS02 PS03													
											-		-			

MCA106.1 3 2 2 3 2 1 MCA106.2 3 3 1 2 2 2 MCA106.3 3 2 1 2 2 2 MCA106.4 3 2 1 2 2 2 MCA106.5 2 2 2 2 1

MCA107 DBMS Lab

Course Code	MCA107	Course Title	DBMS Lab							
Course Type	Core	Contact Hours	4 Hours per Week							
Credit	2	Computing								
Syllabus										
Ι	INTRODUCTION TO) SQL								
	Data Definition, Co	nstraints, and Sche	ema Changes,							
	Data Types									
	Create Schema									

	Craata Tabla								
	Dron Table								
	Alter Table								
	Drop a Column (An Attribute)								
11	BASIC QUERIES IN SQL								
	Aliases, * and Distinct, Empty Where-Clause								
	Unspecified Where-Clause								
	Use of Distinct								
	Set Operations								
	Nesting of Queries								
III	THE EXISTS FUNCTION								
	Explicit Sets								
	Nulls in SQL Queries								
	Aggregate Functions								
Grouping									
	The Having-Clause								
	Substring Comparison								
IV									
1 V	Order hy								
	Specifying Undates in SOL Insert Delete Undate								
V	Sol TRICCERS								
V	SQL IRIGGERS								
	views in SQL								
	Procedures, Functions,								
	Cursors								
	DB Connectivity to any Front End platform								
REFERENCE BOOKS:									
Database Management S	ystems – Raghu Ramakrishnan and Johannes Gehrke, Third								
Edition, McGraw Hill, 20	03								
Database Systems: Desig	n , Implementation and Management, Peter Rob, Thomson								
Learning, 7Edn.									
Concept of Database Mai	nagement, Pratt, Thomson Learning, 5Edn.								
Database System Concer	ots – Silberchatz, Korth and Sudarsan, Fifth Edition, McGraw								
Hill, 2006									
The Complete Reference	SOL – James R Groff and Paul N Weinberg								
COURSE PRE-REOUISIT	`ES:								
MCA 103	201								
COURSE OBJECTIVES									
• To provide hands	on expecting databases								
• To provide fiands	on exposure to creating databases								
Io develop logic a	and basic programming skills using SQL language to join								
tables and provid	e the best possible results.								
COURSE OUTCOMES:									
CO. No	Course Outcome description								
MCA107.1	To design, create and alter relational tables and include								
	integrity constraints								
MCA107.2	To insert , delete and update records in a table								
MCA107.3	Gain ability to write data retrieval queries, subqueries using								
	SQL.								
MCA107.4	To write queries for joining multiple tables.								
I									

MCA107	.5			To fur	To implement the concept of triggers, procedures and functions using PL/SQL.										
СО-РО А	ND (СО-Р9	50 M	APPI	NG										
	P0 1	P0 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	РО 9	P01 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
MCA107. 1		3	1		1									1	
MCA107. 2		3			1									1	
MCA107. 3		3	2		1									1	
MCA107. 4		3	2		1									1	
MCA107. 5		3	2											1	

Semester II

MCA201 Operations Research

Course Code	MCA201	Course Title	Operations Research									
Course Type	Core	Contact Hours	4 Hours per Week									
Credit	3	Domain	Mathematics									
Syllabus	'		·									
Ι	Linear programming problems - Mathematical formulation, graphical method of solution, simplex method											
Π	Duality in linear programming problems, dual simplex method, sensitivity analysis, transportation and assignment problems, Traveling salesman Problem.											
III	 Game theory Introduction, two-person zero-sum games, some basic terms, the maxmini-minimax principle, games without saddle points-Mixed Strategies, graphic solution of 2 * n and m*2 games, dominance property. CPM & PERT- project scheduling, critical path calculations, Crashing. 											
Ιν	Queueing theory -t roles of the Poisson classification of qu systems, extension	basic structure of o n and exponential eues basic results to multi-server qu	queuing systems, distributions, of M/M/1: FIFO ueues.									
V Simulation: simulation concepts, simulation of a queui system using event list,pseudo random numbers, multiplication congruential algorithm, inverse transformation method, basic ideas of Monte-Carlo simulation.												
REFERENCE BOOKS:												

Taha.H.A ,operation Research : An Introduction, McMilan publishing Co., 1982. 7th ed.

Ravindran A, Philips D.T & Solbery.J.J, Operations Research: Principles and practice, John Wiley & Sons, New York, 1987.

Frank S. Budnick, Dennis Mcleavey and Richard Mojena, Principles of Operations Research for Management. All India Traveler Book seller, Delhi.

Gillet.B.E., Introduction to Operations Research - A Computer oriented algorithmic approach, McGraw Hill, 1987.

Hillier.F.S&Liberman.G.J, operation Research, Second Edition, Holden Day Inc, 1974.

COURSE PRE-REQUISITES:

Familiarity with Linear Algebra , MCA 101

COURSE OBJECTIVES:

To introduce the students how to use variables for formulating complex mathematical models in management science, linear programming, game theory, queuing theory and simulation.

COURSE OUTCOMES:

CO. No	Course Outcome description
MCA201.1	Formulate a real-world problem as a mathematical programming model.
MCA201.2	Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand.
MCA201.3	Solve specialized linear programming problems like the transportation and assignment problems
MCA201.4	Understand the basic concept of game theory and queuing theory.
MCA201.5	Understand the network analysis techniques and Simulation.

CO-PO AND CO-PSO MAPPING

	PO 1	P0 2	РО 3	PO 4	PO 5	P0 6	P0 7	P0 8	РО 9	P01 0	P01 1	P01 2	PSO 1	PSO 2	PSO 3
MCA201. 1	2	1													
MCA201. 2			2												
MCA201. 3	2		1												
MCA201. 4		2	1												
MCA201. 5		2		2											

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MCA202 Java Programming

Course Code	MCA 202 Course Title Java Programming											
Course Type	Core	Contact Hours	4 Hours per Week									
Credit	3	Domain	Computing									
Syllabus	1	1	1									
Ι	Basics of Java: Java - What, W Java, Internals of Java Progra Internal Details of JVM, Va Naming Convention.	Where and Why?, H am, Difference betw riable and Data T	istory and Features of veen JDK,JRE and JVM, ype, Unicode System,									
	OOPS Concepts: Advantag Overloading, Constructor, s keyword, Inheritance (IS-A) Method Overriding, Covaria Initializer block, final keyw Dynamic binding, Abstract instanceof operator ,Packag Object class, Object Cloning Reference	OOPS Concepts: Advantage of OOPs, Object and Class, Method Overloading, Constructor, static variable, method and block, this keyword, Inheritance (IS-A), Aggregation and Composition(HAS-A), Method Overriding, Covariant Return Type, super keyword, Instance Initializer block, final keyword, Runtime Polymorphism, static and Dynamic binding, Abstract class and Interface, Downcasting with instanceof operator ,Package and Access Modifiers, Encapsulation, Object class, Object Cloning, Java Array, Call By Value and Call By Reference										
II	Core java Features: String classes, Packages and Inte synchronization, Input/Out Generics, Generic Class, Gen	Handling, Excepti erfaces. Multithrea put – Files – Dire eric methods.	ion Handling, Nested ided Programming – ctory ,Utility Classes,									
III	Serialization: Serialization & and Has-A, Transient keyw URL class, Displaying dat DatagramSocket and Datagr	& Deserialization, S ord. Networking: a of a web page amPacket, Two wa	erialization with IS-A Socket Programming, e, InetAddress class, ly communication									
Ιν	JDBC: - Overview, JDBC implementation, Connection class, Statements, Catching Database Results, handling database Queries. Error Checking and the SQLExceptionClass, The SQLWarning Class, JDBC Driver Types, ResultSetMetaData, Using a Prepared Statement, Parameterized Statements, Stored Procedures, Transaction Management. Collection: Collection Framework, ArrayList class, LinkedList class, ListIterator interface, HashSet class											
V	Introducing AWT: Working with Windows Graphics and Text. Using AWT Controls, Layout Managers, adapter classes and Menus. Swing: Basics of Swing, JButton class, JRadioButton class, JTextArea class, JComboBox class, JTable class, JColorChooser class, JProgressBar class, JSlider class, Displaying Image, JMenu for Notepad, Open Dialog Box											

Java applets- Life cycle of an applet – Adding images to an applet – Adding sound to an applet. Passing parameters to an applet. Event Handling.

REFERENCE BOOKS:

JAVA The Complete Reference- Patrick Naughton and Herbert Schidt.- fifth Edition Tata McGraw Hill.

The Complete reference J2SE - Jim Keogh – Tata McGraw Hills

Programming and Problem Solving With Java, Slack, Thomson Learning, 1Edn.

Java Programming Advanced Topics, Wigglesworth, Thomson Learning, 3Edn.

Java Programming, John P. Flynt, Thomson Learning, 2Edn.

Ken Arnold and James Gosling, The Java Programming language, Addison Wesley, 2nd Edition, 1998

Patrick Naughton and Herbert Schidt. The Complete Reference, JAVA fifth Edition Tata McGraw Hill.

Maydene Fisher, Jon Ellis, Jonathan Bruce; JDBC API Tutorial and Reference, Third Edition, Publisher: Addison-Wesley

Thinking java – Bruce Eckel – Pearson Education Association **COURSE PRE-REOUISITES:**

MCA102, MCA 106

COURSE OBJECTIVES:

- 1. To understand and comprehend object-oriented programming concepts using Java
- 2. To provide a comprehensive coverage of Internet programming using java.
- 3. To achieve the designing of platform independent applications

COURSE OUTCOMES:

CO. No	Course Outcome description
MCA202.1	Ability to solve problems using only pure object-oriented concepts
MCA202.2	Make decision to solve a problem using package, library and threads Handling Errors and Exceptions
MCA202.3	Able to develop networking applications
MCA202.4	Ability to design and develop database applications
MCA202.5	Design and develop software solutions

CO-PO AND CO-PSO MAPPING

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		P01	PO2	PO3	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
	MCA202.1	2	2	1								2			2	
	MCA202.2	2	2	1		2						2			2	
	MCA202.3	2	2	2								2			1	
	MCA202.4	2	2	2		2						2				

MCA202.5	2	2	2	2		1		2		3	

MCA203 Advanced Software Engineering

	Soleware Enginee												
Course Code	MCA203	Course Title	Advanced Software Engineering										
Course Type	Core	Contact Hours	4 Hours per Week										
Credit	3	Domain	Professional Core										
Syllabus	1	1											
I	Introduction to Understanding Agile methodo Daily Stand-up, Planning, Produ	o Software Enginee Requirements blogy- Agile – Primer Definition of Done, I act Backlog	ring , Process Models, , Manifesto, Characteristics, Release Planning, Iteration										
II	Requirements Modelling, Class	Modelling - Analysis s-Based Modelling, V	s, UML Models, Data Vebapps										
	Design Concep Design, Compor Interface Design Design	o ts - Design Model, So nent Level Design- Cl n- Interface Analysis	ftware Architecture- Styles- ass based Components, User- , Interface design, WebApp										
III	Software Qual Testing Applica	ity Assurance , Softv itions- Conventional-	vare Testing Strategies, Object-oriented- Web,										
IV	Project Manag Scheduling, Ris	ement Concepts - Pr k Management, Main	rocess Metrics, Estimation, tenance and re-engineering										
V	DevOps - JUnit Integration - Se	- git - github - Docker lenium - HTTP loadt	r - Containers - Continuous estingtool-Designpatterns.										
REFERENCE BOOK	S:												
Software Engineeri Mc-Graw Hill Publis	ng, a Practitioner shing Co. Ltd.	's Approach- Roger S	S Pressman 7th Edition, Tata										
Software Engineeri	ng – Ian Somervi	lle 9th Edition, Pears	on Education										
An Integrated Appr Publishing House	oach to Software	Engineering- Panka	j Jalote 3rd edition, Narosa										
Fundamentals of So PHI	Fundamentals of Software Engineering- Ghezzi, Jazayer's and Mandriolli 2nd Edition, PHI												
Software Engineeri Mc-Graw Hill Publis	ng principles & P shing Co. Ltd.	ractice- Waman S Jav	wadekar 2nd Edition, Tata										
Software Project Ma	anagement: Pank	aj Jalote, Pearson Ed	ucation										

Software Project Management –A Unified Framework: Walker Royce, Pearson Education.

Software Project Management –S A Kelkar .Prentice Hall India

SeleniumSimplified, secondedition. COURSE PRE-REQUISITES:

Basic Knowledge in Computer Science Programming

COURSE OBJECTIVES:

- 1. Knowledge of basic Software Engineering methods and practices, and their appropriate application
- 2. A general understanding of software process models.
- 3. An understanding of software requirements and the SRS document.
- 4. An understanding of design concepts and different software architectural styles.
- 5. An understanding of implementation issues such as modularity and coding standards.
- 6. An understanding of approaches to verification and validation including static analysis, and reviews. and software testing approaches
- 7. An understanding of software evolution and related issues such as version management.
- 8. An understanding on quality control and how to ensure good quality software.
- 9. An understanding on quality control and how to ensure good quality software.
- 10. An understanding of the role of project management including planning, scheduling, risk management, etc.
- 11. Understanding the latest tools in Software engineering

COURSE OUTCOM	ME2:
CO. No	Course Outcome description
MCA203.1	To analyse, design and manage the development of a computing- based system, using different process models
MCA203.2	To understand the design methodology available for software engineering practice
MCA203.3	To understand software testing and quality assurance techniques at the module level, and understand these techniques at the system level

COURSE OUTCOMES:

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	MCA203.4			Точ	To understand the project management concepts												
	MCA203.5			To in S	To use various Developmental platforms , testing tools etc used in SE												
	CO-PO AN	D CC)-PS() MA	MAPPING												
		PO1	PO2	PO3	PO4	PO5	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3	
	MCA203.1	2	3	2					2	3					1		
	MCA203.2	2	2			2			2						1		
	MCA203.3		2			2			2						1		

MCA204 Design and Analysis of Algorithms

MCA203.4

MCA203.5

Course Code	MCA204	Course Title	Design and Analysis of Algorithms
Course Type	Core	Contact Hours	4 Hours per Week
Credit	3	Domain	Computing
Syllabus			
Ι	Introduction: Algor	ithm, Concepts in perf	ormance analysis – space
	complexity and time	e complexity, Asympto	tic Notations
	Sorting: Analysis of	- Bubble sort, Selectio	n sort and Insertion sort
	Searching: Analysis	of - Linear Search, Bir	ary Search and
	Interpolation Search	1.	
	Hashing Technique	es : Different hashing fu	inctions, methods for
	collision handling.		
II	Divide and Conque	r Strategy: General m	ethod, Finding the
	maximum and minin	num, Analysis of Binar	y search, Quick sort and
	Merge sort		
	Branch and Bound	: Travelling Sales Man	Problem
	Backtracking: The	8 queen's problem, sui	n of subsets.
III	Dynamic Program	ming : Introduction, Dr	awback of Recursion,
	Elements of Dynami	c Programming, Matri	x Chain Multiplication and
	Longest Common su	bsequence	
	Greedy Algorithms	: Huffman Codes, Activ	vity Selection Problem,
	Elements of Greedy	Strategy, 0-1 knapsack	x problem, fractional
	knapsack problem		
IV	Graph Algorithms:	Breadth First Search,	Depth First Search.
	DFS: Strongly Conne	ected Components and	Topological Sort
	Minimum Spanning	tree: Kruskal and Prin	ıs algorithms,
	Shortest path: Single	e Source Shortest path	(Dijkstra's Algorithm) and
	all pair shortest patl	1	
V	Number Theoretic	Algorithms: Strassen	's matrix multiplication.

NP Hard and NP Complete Problems: Basic concepts, nondeterministic algorithm, class of NP- hard and NP- complete **Approximation Problems**: Basic terminology, vertex coloring problem – different approximation algorithms, travelling sales man problem.

REFERENCE BOOKS:

Introduction to Algorithms - Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest

Fundamentals of algorithms – Gilles Brassard, Paul Bratley (PHI),C1996

Introduction to the design and analysis of algorithms – AnanyLevitin (Pearson),2011 Design & Analysis of Algorithms-A A Puntambekar

COURSE PRE-REQUISITES:

MCA205

COURSE OBJECTIVES:

- 1. Learn and understand the fundamental algorithms and analyse the performance.
- 2. Understand the fundamental algorithmic design strategies.
- 3. Learn how to develop efficient algorithms for simple computational tasks and reasoning about the performance and correctness of them.

COURSE	OUT	COM	IES:														
CO. No		Co	ourse	Out	com	e des	scrip	tion									
MCA204	.1	Ur of	nders basio	tand : algo	and rithr	use a ns	sym	ptoti	c nota	ations	to an	alyse	the pe	erforn	nance		
MCA204	.2	Id an Ba	entify d sol cktra	7, ana ve Pr ackin	ilyse oble g stra	and (ms: I ategi	evalu Divid es	iate v e and	variou l Con	ıs Alg quer,	orithr Branc	n Des ch and	ign St Boun	rategi Id,	es		
MCA204	.3	Id an	lentify, analyse and evaluate various Algorithm Design Strategies nd solve Problems: Dynamic programming, Greedy Strategy														
MCA204	.4	Id Pr	dentify, analyse and evaluate various Graph Algorithm s and Solve roblems														
MCA204	.5	Ur Al Pr	Understand the basic concept of Number Theory and related Algorithms, NP Hard and NP Complete Problems and Approximation Problems														
СО-РО А	ND C	0-P	50 M	APPI	NG												
	P0 1	PO 2	P0 3	РО 4	P0 5	P0 6	PO 7	РО 8	РО 9	P01 0	P01 1	P01 2	PSO 1	PSO 2	PSO 3		
MCA204. 1		3		2										1			
MCA204. 2		3	3	2										1			
MCA204. 3		3	3	2										1			
MCA204. 4		3	1	2										1			
MCA204. 5		1		2										1			

MCA205 Artificial Intelligence

Course Code	MCA205	Course Title	Artificial Intelligence
Course Type	Core	Contact Hours	4 Hours per Week
Credit	3	Domain	Professional Core
Syllabus			·
Ι	Module 1: Introduction - Overv representation and Predicate Calculus, Predicate Calculus ex financial advisor.	iew of AI applicat search. The Pro Using Inference opressions, Applica	tions. Introduction to opositional calculus, Rules to produce ation – A Logic based
ΙΙ	Module 2: Introduction to stru search, Graph theory the State Space to Re calculus (Sate space of Graph). Heuristic Search : in Programming, Th Admissibility, Mono Heuristics in Games.	icture and Strate , Strategies for stat epresent Reasonir description of a log troduction, Hill-Cl e Best-first otonicity and in	gies for State Space te space search, Using ng with the Predicate gical system, AND/OR imbing and Dynamic Search Algorithm, nformedness, Using
ΙΠ	Module 3: Building Control A Introduction, Prod architecture for Prob Knowledge Represe representational sch to explicit Represer problem solving.	Algorithm for St uction Systems, lem solving. entation – Issu emes, Conceptual ntation, Agent ba	tatespace search – The blackboard es, History of AI Graphs, Alternatives sed and distributed
Ιν	Module 4: Strong Method Probl Expert System Techn -Based, Case-Based Model based rease Reasoning, Hybrid de Reasoning in Uncerta Adductive Inference. Introduction to PROI programming, ADTs,	em Solving – Intro ology, Rule Based and Hybrid Syste oning, Introducti esign), Introductio ain Situation – intr LOG , Syntax for pr A production syst	oduction, Overview of Expert system, Model ems (Introduction to on to Case Based n to Planning. roduction, logic based edicate Calculus rem example.
V	Module 5: Machine Learning: S work. The ID3 Decisi bias and Learna	ymbol Based – Ir ion tree Induction bility, Knowled	ntroduction, Frame – algorithm. Inductive ge and Learning,

				Ur	isup	ervise	ed le	arnin	ig, Re	einfor	cemei	nt Lea	rning	,				
				Machine Learning : Connectionist – Introduction,														
				fo	unda	tions	s, Per	cepti	con le	earnir	ıg.							
				M	achir	ie lea	rnin	g: So	cial a	ind en	nerge	nt: Mo	dels,	The G	enetic	;		
				Al	gorit	hm, A	Artifi	cial L	life a	nd So	cial b	ased L	learni	ng.				
TEXT/RI	EFER	ENC	E BO	OKS:														
Georg	e F L	uger	, Arti	ficial	Inte	lliger	ıce –	Stru	cture	es and	Strat	egies	for Co	mple	x			
probl	em so	olvin	g, 5tł	nEdn	, pea	rson.												
E. Ric	h, K. 1	Knigl	ht, S I	B Nai	ir, Ar	tificia	al int	ellige	ence,	3rdE	dn, M	cGraw	7 Hill.					
S. Rus	sel a	nd p.	Nor	vig, A	rtifi	cial in	ntelli	gence	e – A	Mode	ern Ap	proad	ch, 3rc	lEdn,				
Pears	on	1		Ú,														
DWF	atter	rson.	intro	duct	tion t	o Art	ificia	al Inte	ellige	ence a	nd Ex	pert S	vsten	ıs. PH	I.			
1990		,							8-			F	5	,	-,			
Nilsso	n N.I	[., Art	ificia	l Inte	Intelligence - A New Synthesis, Harcourt Asia Pvt. Ltd.													
COURSE	PRE-	REO	UISI	TES:	0					,								
MCA 101			•															
COURSE	OBJE	ECTIV	VES:															
• To n	rovid	leas	trong	, four	foundation of fundamental concents in Artificial Intelligence													
 Top 	rovid	loah		ovno	toundation of fundamental concepts in Artificial Intelligence													
• Top		the	asic	expo				o als a	inu n			iona	iai iiit	in real	nee			
• 10 e	nable	etne	stuae) app	ny the	ese t	ecnni	ques	s in ap	plicat	lons	NNICN	INVOI	ve			
perc	eptio	n, re	ason	ing a	na le	arnir	ıg											
LOUKSE	001	COM	E2:	0		<u> </u>												
L U. NO				LC	ourse	e Out	com	e aes	scrip	otion						_		
ACA205.	1			Ur	nders	stand	the	vario	us ui	nderly	ing c	oncep	ts in A	Artific	ial			
				In	tellig	gence												
MCA205.	2			Ac	quir	e the	knov	wledg	ge of	searc	h tecł	nnique	es use	d in				
				Ar	tifici	al Int	tellig	ence				-						
4CA205.	3			Ac	cquir	e the	cond	cepts	of kr	nowle	dge re	eprese	entati	on				
4CA205.	4			Ar	alvs	e and	l des	ign a	real-	-world	d prob	olem f	or					
			Analyse and design a real-world problem for implementation and understand the dynamic behaviour of															
				2	svste	m.		ana										
MCA205	5			IIc	se dif	feren	nt ma	chine	-]ear	rning	techn	ianec	to dee	sion A	I			
·10/120J.	0				achir		d on		ing o	nnlie	ations	for r	al we	ngii A vrld	.1			
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			O M	<u>рі</u> лорі												-		
UU-PU A	PO	D-P3	PO IVI	PO	PO	PO	ΡΩ	ΡΩ	ΡΩ	Ρ Π1	P01	PO1	PSU	PSU	PSU	1		
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3			
MCA205.1	3	2														1		
MCA205.2	3	2														1		
MCA205.3	3	2														1		
MCA205.4	3	2	2	2														
MCA205.5	3	2	2	2														

MCA206 Web Technology Lab

Course Code	MCA206	Course Title	Web Technology Lab
Course Type	Core	Contact Hours	6 Hours per Week
Credit	4	Domain	Computing
Syllabus			
Ι	HTML Basics, CSS, Ja	vascript, Ajax, Json	, XML, PhP Basics
II	Laravel- Installation Application Structu Configuration Routing Middleware Namespaces Controllers	re	
ΙΠ	Request Cookie Response Views Blade Templates Redirections Working with Datal Errors & Logging Forms Localization Session Validation File Uploading Sending Email Ajax Error Handling Event Handling	base	
IV	Facades Contracts CSRF Protection Authentication Authorization Artisan Console Encryption Hashing Artisan Commands		
V	Development of web connectivity	-based application	with Database
COUDEE OUTCOM	FC .		
COURSE OUTCOM	LJ: Course Outcome de	scription	
MCA206.1	To become familiar v develop a web applie	with client server a cation using various	rchitecture and able to s technologies.

MCA206.2	2		To frar	To understand and develop a web-based application using a framework concept												
MCA206.3	3		To g into	To gain the skills and project-based experience needed for entry into web application and development careers.												
CO-PO AN	ND C	O-PS	O MA	APPI	NG											
	PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO8	PO9	P010	PO1 1	PO12	PSO 1	PSO2	PSO3	
MCA206.1	1	2	3				2					2		1		
MCA206.2	2	2	3				2					3		1		
MCA206.3	2	2	3				3					3		1		

MCA207 Java Programming Lab

Course Code	MCA207	Course Title	Java Programming Lab
Course Type	Core	Contact Hours	4 Hours per Week
Credit	2	Domain	Computing
Syllabus			
Ι	 Program to il Program to in polymorphism 	lustrate class, obje nplement overloa m etc.	ects and constructors ding, overriding,
II	 Program to in Program to create exception Program for I Directory ma 	nplement the usag reate user defined nandling file opera nipulation in java	ge of packages and predefined ation
III	 Implement the synchronizat Program to in methods Socket program Broadcasting Program for experiment using 	ne concept of mult ion nplement Generic amming to implen program using UI downloading web g URL.	ithreading and class and generic nent communications DP protocol pages from the
IV	Program to in Application	nplement JDBC in	GUI and Console
V	 Applet progra audio file Program for e Event driven Application Program that 	am for passing par am for loading an event-driven para program for Grap	rameters image and running an digm in Java hical Drawing n Application
TEXT/REFERENCE BOOK	S:		
JAVA The Complete Referen	nce- Patrick Naugh	ton and Herbert S	chidt fifth Edition

The Complete reference J2SE - Jim Keogh – Tata McGraw Hills

Programming and Problem Solving With Java, Slack, Thomson Learning, 1Edn.

Java Programming Advanced Topics, Wigglesworth, Thomson Learning, 3Edn.

Java Programming, John P. Flynt, Thomson Learning, 2Edn.

Ken Arnold and James Gosling, The Java Programming language, Addison Wesley, 2nd Edition, 1998

Patrick Naughton and Herbert Schidt. The Complete Reference, JAVA fifth Edition Tata McGraw Hill.

Maydene Fisher, Jon Ellis, Jonathan Bruce; JDBC API Tutorial and Reference, Third Edition, Publisher: Addison-Wesley

Thinking java – Bruce Eckel – Pearson Education Association

COURSE PRE-REQUISITES:

MCA206

COURSE OBJECTIVES:

- 1. To Achieve an understanding of object-oriented programming concepts using Java
- 2. To provide a comprehensive coverage of Internet programming using java.
- 3. To achieve the designing of platform independent applications

COURSE O	UT	СОМ	IES:	0	U	•			•							
CO. No					Cou	rse O	utco	me o	lesci	riptio	n					
MCA207.1					Abili conc	ty to epts	solv	e pro	blen	is usi	ng on	ly pur	e obje	ect-ori	ented	
MCA207.2					Mak and	e dec threa	cisior Ids H	ı to s andli	olve ng E	a pro rrors	blem and E	using xcepti	; pack ions	age, li	brary	
MCA207.3					Able to develop networking applications											
MCA207.4				Ability to design and develop database applications												
MCA207.5					Desi	gn ar	nd de	velop	o soft	ware	solut	ions				
CO-PO ANI) (0-PS	50 M	APP	ING											
P(1)	PO 2	РО 3	PO 4	РО 5	РО 6	РО 7	РО 8	РО 9	P01 0	P01 1	P01 2	PSO 1	PSO 2	PSO 3	
MCA207. 1	2	2	1											2		
MCA207. 2	I I I I MCA207. 2 2 1 2 1 1 1													2		
MCA207. 3											1					
MCA207. 4	2	2	2		2											
MCA207. 5	2	2	2		2			1						3		

MCA208 Employability and Skill Development -1

Course Code	MCA208	Course Title	Employability and Skill
			Development -1
Course Type	Core	Contact Hours	4 Hours per Week
Credit	2	Domain	General Skill development

Syllabus

Synabus	
Behavioral Skills	
Personal Strength Analysis/ Strength Blindness	Self -awareness and confidence building
Perception Management	Display Professionalism at the institute and work place
Ethics, Values& Etiquette	Increased social initiations relationships and networks Acceptance of peers from different cultures and social groups and work withthem. Collaboration with team to prioritize the common goal and compromise individual priorities.
Social Etiquette	same by respecting self, others, environment, care for duty and value for time.
Role Modeling	Adopting best practices and aspire to follow success stories of individual for personal development.
English Literacy	
Functional English	Basic grammar Usage of appropriate words to express themselves Greetings & Self Introduction Asking &responding to questions Formal & Informal communication Speak and provide information about workplace Discussions on current happenings.
Written English	Formal and technical writing skills Email etiquette Report writing Comprehension passages
Quantitative Aptitude	Algebra Allegations and mixtures Area Averages, Mean, Median and Mode LCM and HCF Logarithms Number Systems Percentage Permutation and Combinations Pipes and Cisterns Probability Profit and Loss Progressions Races

	Ratio, Proportions and Partnerships
Data Interpretation and Logical Reasoning	Alphanumeric series Reasoning Analogies Artificial Language Blood Relations Calendars Cause and Effect Clocks Coding-Decoding Critical path Cubes and cuboids Data Sufficiency Decision Making Deductive Reasoning/Statement Analysis Dices Directions Embedded Images Figure Matrix



SEMESTER III

MCA301 Business Management and Financial Accounting

Course Code	MCA301	Course Title	Business Management and Financial Accounting									
Course Type	Core	Contact4 Hours per WHours										
Credit	3	Domain	Professional Core									
Syllabus												
I	Module 1: Introduction Definition - Management and the environmental Management in Global S PLANNING Nature and process - Types of pl objective (MBO) Strateg Decision Making - Typ Process - Rational Decis	a to manageme ht - Role of man factors – Trend cenario. d purpose of p ans – Objective gies - Types of s bes of decision ion Making	nt Principles agers - Organization ls and Challenges of planning - Planning es Managing by strategies - Policies - - Decision Making									
Ι	Module 2: Organizing, I Nature and purpose of a Formal and informal g authority - Departm Centralization and Dece - Staffing - Selection and Development - Career Appraisal. Creativity and Innovat Motivation Theories - theories - Communi communication - Organ of culture - Managir controlling - Types of co control.	Directing and Corganizing - Org roups organizat entation - Sp ntralization - De d Recruitment - stages – Traini ion - Motivation Leadership S cation - Bar ization Culture - ng cultural div ntrol - Budgetar	ontrolling Business anization structure - tion - Line and Staff pan of control - elegation of authority Orientation - Career ing Performance n and Satisfaction - Styles - Leadership riers to effective Elements and types versity. Process of y and non-budgetary									
III	Module 3: Introduction to Accounting Meaning and definition of Accounting, Systems of book- keeping, Objectives of accounting, Users of accounting information, Basic terminologies. Accounting Principles- Accounting Concepts and Conventions, Accounting Standards, Accounting process-											
IV	Module 4: Sub divisio Book, Sales Book, Pure Book, Journal Proper-Ba	n of Journal - C chase Returns l ank Reconciliatio	Cash Book, Purchase Book, Sales Returns on Statement									

adjustments)
Trading Account, Profit and Loss and Balance Sheet (with
Module 5: Final Accounts of Sole Proprietorship Concerns-

REFERENCE BOOKS:

MANAGEMENT: TASKS, RESPONSIBILITIES, PRACTICES By Peter Drucker

Principles Of Business Management, Arun Kumar, Rachana Sharma

Principles of management: process and behavior, Daniel A. Wren, Dan Voich

Accounting Basics: Complete Guide, Michael Celender

Basic Accounting By Rajni Sofat

Accounting Basics: The Simple Guide for Beginners, Andrew P.C.

Principles & Practice of Management -T.N.Chabra

Principles of Management, R N Gupta, S.Chand& Company Ltd.

Organizational Behavior, S.S Khanka, S.Chand& Company Ltd

Principles of Management, L M Prasad, Sultan Chand Publications

COURSE PRE-REQUISITES:

Basic Knowledge of a Business System

COURSE OBJECTIVES:

- To understand the role of a manager and the operations involved in a Business environment.
- To help the students to develop cognizance of the importance of accounting in
- organization financial statements
- To enable students to synthesize accounts related information and evaluate options for most logical and optimal solutions

COURSE OUTCOMES:	· · · · · · · · · · · · · · · · · · ·
CO. No	Course Outcome description
MCA301.1	To understand the basic principle of Management
MCA301.2	To comprehend how to organize, direct and control the various aspects of Business
MCA301.3	To understand the underlying terminologies in Accounting
MCA301.4	To know and process the trial Balance in accounting
MCA301.5	To understand the how to process the final accounts and report
CO-PO AND CO-PSO MA	PPING

	PO	PO2	PO3	PO	PO5	PO6	PO	PO8	PO9	P010	PO1	PO12	PSO	PSO2	PSO3
	1			4			7				1		1		
MCA301.1						3	3	3	3		3				
MCA301.2						3	3	3	3		3				
MCA301.3								3				2			
MCA301.4								3				2			
MCA301.5								3				2			

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V

MCA302 Theory of Computation and Compilers

Course Code	MCA 302	Course Title	Theory of									
	Computation and											
			Compilers									
Course Type	Core	Contact Hours	4 Hours per Week									
Credit	3	Domain	Professional Core									
Syllabus												
Ι	Formal Language,	Non-Computation	al Problems, Diagonal									
	Argument, Russels's	Paradox, Determi	nistic Finite Automaton									
	(DFA), Non-Deter	ministic Finite	Automaton (NDFA),									
	Equivalence of DFA	and NDFA, Regu	lar Languages, Regular									
	Grammars, Regula	r Expressions, l	Properties of Regular									
	Language, Pumping Lemma, Non Regular Languages.											
II	Pushdown Automaton (PDA), Non-Deterministic Pushdown											
	Automaton (NPDA), Context Free Grammar, Chomsky Normal											
	Form, Greibach N	lormal Form, A	mbiguity, Parse Tree									
	Representation of D	erivation Trees, E	quivalence of PDA's and									
	Context Free Gramm	nars; Properties of	Context Free Language.									
	Introduction to con	npiling:- Compiler	s, Analysis of a source									
	program, the phases	s of a compiler, L	exical analysis:-The role									
	of the lexical analyse	er, input buffering	, specification of tokens,									
117	Recognition of toker	1S.	aan Tan darum nanaina									
IV	Syntax analysis: - ti	ne role of the par	ser, 10p down parsing,									
	definition Construe	tion of Suptov Tro	islation, syntax directed									
	nrocodonco gramma	uon of Syntax The	e, LL parsers, Operator									
V	Intermediate code	gonoration postfix	v notation suntay troo									
V	three-address code	basic blocks	and flow graph Back									
	natching Code on	timization - The	and now graph, back									
	ontimization ontim	nization of hasic	blocks loops in flow									
	graphs Peenhole or	nzation of basic	Generations: - Issues in									
	the design of a code	generator										
REFERENCE BOOKS:		0										
Peter Linz. An Introdu	ction to Formal Langu	ages and Automat	a. Third Edition. Iones									
and Bartlett, 2001.	0	0	-, , ,									
Introduction to Autom	ata Theory, Language	s, and Computatio	n									
By John E. Hopcroft,Ra	jeev Motwaniand Jeff	rry D Ullman.										
Compilers Pinciples, T	echniques and Tools-	Alfred VAho, Ravi	Sethi, Jeffrry D Ullman									
Steven S Muchnik, "Ad	vanced Compiler Desi	gn and Implement	ation", Morgan									
Kaufmann	•											
COURSE PRE-REQUIS	ITES:											
Knowledge in Program	iming languages.											
COURSE OBJECTIVES												
To understand the bas	ic mathematical mode	el of computation a	and the working of a									
compiler.		-	-									
COURSE OUTCOMES:												
CO. No	Course Outcome de	escription										

$\begin{tabular}{ c c c c c c c } \label{eq:computation} \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$																
MCA302	2.2			Un fre	iders	tand amm	ing t ar.	he co	oncej	otofp	oushd	owna	auton	nata a	nd co	ntext
MCA302	.3			Un	ders	tand	the	phas	es of	a con	npile	r.				
MCA302	4			Un	ders	tand	vari	ous	parsi	ng te	chniq	ues.				
MCA302	A302.1DemonstrateknowledgeofbasicmathematicalmodelsofA302.2Understanding the concept of pushdown automata and context free grammar.Understanding the concept of pushdown automata and context free grammar.A302.3Understand the phases of a compiler.A302.4Understand the phases of a compiler.A302.4Understand various parsing techniques.A302.5To apply the design and implementation of parsers.PO															
СО-РО А	ND	CO-F	PSO I	MAP	PINC	Ĵ										
	P0 1	PO 2	РО 3	PO 4	РО 5	РО 6	РО 7	РО 8	РО 9	P01 0	P01 1	P01 2	PSO 1	PSO 2	PSO 3	PSO 4
MCA302. 1	3						1				2	2		2		
MCA302. 2			3				1				2	2		2		
MCA302. 3	3		2				1				2	2		2		
MCA302. 4			3				1				2	2		2		
MCA302. 5			2				1				2	2		2		

MCA303 Data Mining

Course Code	MCC303	Course Title	Data Mining
Course Type	Core	Contact Hours	4 Hours per Week
Credit	3	Domain	Professional Core
Syllabus			
Ι	Introduction Data Warehousin Introduction to kinds of Data, I Mining Systems. Data Preproces Data Cleaning, Da	ng, Multidimensior KDD process, Data Data mining Funct sing ata Integration and	nal Data Model, OLAP Operations, a mining, Data mining -On What cionalities, Classification of Data
II	Exploring Data General Concept Tools Association Ana Basic Concepts, Methods:Apriori Frequent Item s Association Patte A Case Study on	and Visualization s, Techniques, Visu alysis Efficient and Sca Algorithm, gene sets, Improving the sets without Cand erns, Visualization. Association using (Techniquesalizing Higher Dimensional Data,lable Frequent Item set Miningerating association Rules fromne Efficiency of Apriori. Miningidate Generation, Evaluation ofOrange Tool
III	Classification Introduction to Decision Tree Ind Measures, Tree Naïve Bayesian (Classification an duction: Decision T Pruning, Bayesiar Classification, Rule	nd Prediction, Classification by Yree induction, Attribute Selection In Classification: Bayes' theorem, Based Algorithms: Using If - Then

	rules of Classification, Rule Extraction from a Decision Tree, Rule
	Induction Using a Sequential Covering algorithm, K- Nearest
	Neighbour Classifiers, Support vector Machine. Evaluating the
	Visualization
	A Case Study on Classification using Orange Tool
IV	Prediction
1.4	Linear Regression Nonlinear Regression Other Regression-Based
	Methods
	Cluster Analysis I : Basic Concepts and Algorithms
	Cluster Analysis, Requirements of Cluster Analysis' Types of Data in
	Cluster Analysis, Categorization of Major Clustering Methods,
	Partitioning Methods: k-Means and k- Medoids, From K-Medoids to
	CLARANS
	A Case Study on Clustering using Orange Tool.
V	Cluster Analysis II: Hierarchical Method: Agglomerative and
	Divisive Hierarchical Clustering.
	Comparison of data mining methods. Applicability of data mining
	methods for different scenarios. Considerations for mining
	unstructured data.
TEXT/REFEREN	
R	Data Mining'
R	Data Mining Concepts and Techniques – Jiawei Han and
	MichelineKamber, Second Edition, Elsevier, 2006
R	G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter
	Economy Edition, Prentice Hall of India, 2006.
K	Making sense of Data: A practical guide to exploratory Data Analysis
COURSE PRE-RE	
	A
	rives.
1 Acquire kn	owledge in Data mining and warehousing
2. Learn the c	different techniques for discovery of patterns hidden in large data
sets and th	eir Visualizations
3. Learn data	mining tasks such as classification, estimation, prediction, affinity
grouping a	nd clustering.
COURSE OUTCO	MES:
CO. No	Course Outcome description
MCA303.1	To introduce the students, the basic concepts and techniques of Data
	mining and Warehousing and data pre-processing.
MCA303.2	Understand association mining algorithms for discovery of frequent
	item patterns in large data sets and their Visualizations
MCA303.3	Understand classification analysis algorithms for discovery and
	generation of rules in large data sets and their Visualizations
MCA303.4	Understand basic and advanced clustering analysis algorithms and
	Visualizations in Data Mining.
CO-PO AND CO-	PSO MAPPING

	PO	P01	P01	P01	PSO	PSO	PSO								
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
MCA303. 1	3	2		1									2		
MCA303. 2	1	1		1									1		
MCA303. 3	1	1		1									1		
MCA303. 4	1	1		1									1		

MCA304 Information Security

Course Code	MCA304	Course Title	Information Security								
Course Type	Core Contact Hours 4 Hours per Week										
Credit	3	Domain	Professional Core								
Syllabus		·									
Ι	Mathematical Foundations of Information Security - Abstract Algebra Fundamentals of Abstract Algebra : Groups, Rings, Fields, Modular Arithmetic, Euclidean Algorithm, Finite Fields of the form GF(p),Polynomial Arithmetic, Finite Fields of the form GF(2n)										
II	Mathematical Foundations of Information Security - Number Theory Introduction to Number Theory: Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms										
III	Private Crypto – Systems. Introduction to Cryptography, Classical Encryption techniques, Block Ciphers and Data Encryption Standard. Advanced Encryption Standard, Multiple Encryption and Triple DES, Block Cipher Modes of operation, Stream Ciphers and RC4, Confidentiality using Symmetric Encryption										
IV	Public Cryptosystem Public-Key Cryptog Hellman Key Excha Cryptography	ns graphy and RSA Key inge, Elliptic Curve Ar	V Management, Diffie- ithmetic, Elliptic Curve								
V	Authentication and hash functions Authentication requirements - Authentication functions - Message Authentication Codes - Hash Functions, Security of Hash Functions and MACs - MD5 message Digest algorithm - Secure Hash Algorithm - Authentication Protocols - Digital Signature Standard										
TEXT/REFERENCI	TEXT/REFERENCE BOOKS:										
K.H. Rosen," Eleme	ntary Number Theory	y", Addison-Wesley, ISI	3N 0-441-57889-1								
Elementary Numbe	er Theory William Ste	in October 2005									
Introduction to Mo	dern Cryptography M	lihir Bellare1 Phillip og	away May 11, 2005								
Handbook of appli	ed cryptography, by A	A. Menezes, P. Van Oor	schot, and S. Vanstone,								
CRC Press, 1996.											

Stallings, W., Cryptography and Network Security. Principles and Practice, 4th edition, Prentice Hall.

COURSE PRE-REQUISITES:

MCA101, MCA104

COURSE OBJECTIVES:

- 1. To understand the fundamentals of Cryptography
- 2. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- 3. To understand the various key distribution and management schemes.

COURSE OUTCOMES:																
CO. No			Cou	Course Outcome description												
MCA304.1	1		Unc	nderstand the basics of abstract algebra and modular arithmetic.												
MCA304.2	2		Unc	Understand the applications of number theory in security.												
MCA304.3	3		Enc	Encrypt and decrypt messages using block ciphers.												
MCA304.4	1		Unc	nderstand the working of RSA algorithm and Diffie-Hellman key												
			exchange.													
MCA304.5	5		To	To be familiar with authentication and hash functions.												
CO-PO AN	ND C	O-PS	0 M/	APPI	NG											
	PO 1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO8	PO9	P010	PO1	PO12	PSO 1	PSO2	PSO3	
MCA304.1	3							2			-	1	-		2	
MCA304.2	1			3 2 2												
MCA304.3				3 2 2												
MCA304.4	2										2					
MCA304.5														2		

MCA306 Data Analytics using Python

Course Code	MCA 306	Course Title	Data Analytics using Python				
Course Type	Core	Contact Hours	6 Hours per Week				
Credit	3	Domain	Computing				
Syllabus							
I	Data Types a Introduction interpreter, Expressions Python Data Dictionaries. Conditions an arguments, v	Data Types and Data Structures Introduction to Python: - using the Python interpreter, Overview of programming in Python, Expressions and Variables-String Operations. Python Data Structures: lists & Tuple –Sets - Dictionaries. Programming Fundamentals: Conditions and Branching- Loops-Functions: formal arguments variable-length arguments					
II	Classes, files Introduction attributes, ir and method i Built-in funct	Classes, files and modules Introduction to Classes and Objects: -classes, class attributes, instances, instance attributes, binding and method invocation, inheritance, polymorphism, Built-in functions for classes and instances.					

	Files and input/output, reading and writing files, methods of file objects, using standard library					
	functions, dates and times					
	Exceptions, detecting and handling exceptions.					
III	Database and web programming					
	Python database application programmer's					
	interface (DB- API), connection and cursor objects,					
	lype objects and constructors, python database					
	anapters.					
	module building CCI applications					
IV	Introduction to Data Science using Python					
10	Python libraries: Numpy- Scikit- Pandas-Mathlotlih					
	- Data Visualization					
	Importing Datasets: Importing and Exporting Data					
	in Python- Basic Insights from Datasets. Data					
	cleansing and pre-processing: Identify and Handle					
	Missing Values. Summarizing the Data Frame:					
	Descriptive Statistics- Basic of Grouping- ANOVA-					
	Correlation					
V	Model Development and Evaluation					
	Regression Models: Linear Regression (SLR & MLR)					
	- Logistic Regression-Decision Tree- Random Forest.					
Clustering Techniques: K means clustering – Api						
	fitting.					
REFERENCE BOOKS:						
Core Python Programming by We	sley J. Chun, 2nd Edition, Pearson Education					
An Introduction to Python by Gui Limited.	ido Van Russom, Fred L.Drake, Network Theory					
Beginning Python: From Novice To Professional By Magnus Lie Hetland, Second Edition Apress						
Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython ,2nd edition, Wes McKinney, O'Reilly Media (2017)						
Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and						
Techniques to Build Intelligent Sy	stems ,Aurélien Géron, O'Reilly Media (2017)					
Data Science from Scratch: First F	Principles with Python, Joel Grus, O'Reilly Media					
(2015)	-					
COURSE PRE-REQUISITES:						
Basic Knowledge in Python Progr	amming and data science, MCA101, MCA102					
COURSE OBJECTIVES:						
1. To provide an understandir	ng of programming concepts using Python					
2. To learn the underlying con	cepts of Data science and implement using python					
COURSE OUTCOMES:						
LU. NO	Course Outcome description					
MCA306.1 Understand the data types and structures in pythor						

MCA306.	2					Abi con Erro	Ability to understand object oriented programing concepts and write programs in python. Handling Errors and Exceptions								
MCA306.3					Abi	Ability to design and develop database applications									
MCA306.4				Abi	lity to	o solv	ve dat	ta ana	lysis j	proble	ems us	sing p	ython		
CO-PO AND CO-PSO MAPPING															
	PO	PO	PO	PO	PO	PO	PO	PO	PO	P01	P01	P01	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
MCA306.1	3													1	
MCA306.2			2		3	3 1									
MCA306.3			2			2									
MCA306.4		2	2		3								2		

MCA307 Android

a a 1		a						
Course Code	MCA 307	Course Title	Android					
Course Type	Core	Contact Hours	6 Hours per Week					
Credit	3	Domain	Computing					
Syllabus								
Ι	Mobile Computing & system architecture an The Android Platform: the development Fran Android Application Li and User Inte AndroidManifest.xml, u & R.java, Assets, Layout Activity lifecycle	Development d development c Android SDK Fea nework, Android fe Cycle, Activity rfaces Appli ises-permission & &Drawable Res	Introduction: Mobile hallenges itures, Introduction to Development Tools, , Service, Intent, MVC cation Structure: & uses-sdk, Resources sources, Activities and					
II	Android Graphical User Interface: Linear Layout, Relative Layout, Table Layout, Grid View, Tab Layout, List View, Custom List View Element, Fragments, Time and Date, Images and media, Composite, AlertDialogs, Toast, Popup Menus:- Option menu, Context menu, Sub menu, menu from xml, menu via code, Application Menu, ActionBar, ActionBar& Tabs, View							
III	Intents – Explicit Intents, Implicit intents, intents an broadcast receivers, intent filters, Adapters and Widgtes ArrayAdapters, BaseAdapters, ListView and ListActivit Custom listview, GridView using adapters, Gallery usin adapters Notifications: Broadcast Receivers, Services and notifications AlarmsThreads:- Threads running on UI threa (runOnUiThread), Worker thread, Handlers & Runnable AsynTask (in detail)							
IV	Databases and Content Providers:-							

V				SQL SQL Con SQL con diffe upd Adv JSO Pho serv	SQLite Queries, Adding / Updating / Deleting Contents of SQLite Content Providers:- SQLite Programming, SQLiteOpenHelper, SQLiteDatabse, Cursor, Content providers ,Defining and using content providers, Example- Sharing database among two different applications using content providers Reading and updating Contents, Reading bookmarks Advanced Features:Live Folders, Using sdcards, XML Parsing, JSON Parsing, Maps, GPS, Location based Services, Accessing Phone services (Call, SMS, MMS), Network connectivity services										
				Har Mor sen:	Hardware Sensors:- Sensors and Sensor Managers, Monitoring device movement and orientation, Environmental sensors										
REFEREN	CE E	800F	KS:												
Profession	al A	ndro	id 4 a	appli	olication development – Reto Meier										
Android V Pearson Ec	Vire duca	less tion,	Appl , 2nd	icatio ed.	tion Development By Lauren Darcey and Shane Conder,										
Beginning	And	lroid	Appl	licatio	tion Development By Wei-Meng Lee, Wrox Publication										
Unlocking Sen, Mann	Anc ing 1	lroid Publi	Dev catio	Developer's Guide By Frank Ableson and Charlie Collins and Robi cation Co.											
COURSE P	RE-	REQ	UISI	ΓES:											
MCA104, N	ИСА	304													
COURSE O	BJE	CTI	/ES:												
1. To	crea	te ap	ps b	ased	on ar	ndroi	d pla	tforn	IS						
2. To	crea	te ap	ps b	ased	on m	ultim	iedia	and	inter	net aj	oplica	ation			
3. 10a	achi	eve t	the de	esign	ing of	f plat	form	inde	penc	lent a		ation	S	atom	
4. 103		com	10 WC	DIK W	itin a	ataba	ises i	inde	the	Anur		perati	ing sy	stem	
COURSE O			ЕЭ.	Cou	rse (Dutce	nme	desc	rinti	on					
MCA207 1						lovol		nnlo	anne						
MCA307.1 MCA307.2				Abl	e to d		op sii on ar	inple	apps asod i	on dif	foror	nt two	es of i	noniic	•
MCA307.3				Mał	ce de	cisio	1 to s	olve	a pro	blem	usin	g nacl	kage.	librar	, v and
				threads Handling Errors and Exceptions											
MCA307.4				Ability to design and develop database applications											
MCA307.5				Able inte	e to d rnet	lesigr appli	n and catic	deve ns	elop 1	mobil	e app	olicati	ons w	vorks v	with
CO-PO AN	DC	O-PS	0 M/	APPI	NG										
	P0 1	P02	P03	PO4	P05	P06	P0 7	P08	P09	P01 0	PO1 1	P01 2	PSO 1	PSO2	PSO3
MCA307.1	-		1		3		-			-	2			2	
MCA307.2			1		3						2			2	
MCA307.3			2								2			1	
MCA307.4			2		3						2			3	
			2		3						2			2	<u> </u>



MCA308 Employability and Skill Development -2

Course Code	MCA208	Course Title	Employability and Skill				
0 m	0	<u> </u>	Development -2				
Course Type	Core	Contact Hours	4 Hours per Week				
Credit	2	Domain	General Skill development				
Syllabus							
Behavioral Skills							
Quantitative Aptitude	Sets Sim Sim Spee Tim Trai Trig Pipe Tim Prol Peru Peru Spee Ave	ple and Compoun plification and Ap ed, Distance and T e and Work ins, boats and stre onometry, Height es and Cisterns e and Work bability mutation and Com centage ed and Distance rages metry	d Interest proximation 'ime ams s and Distances ibination				
Data Interpretation and Logical Reasoning	Inpu Mirr Odd Pict Pap Puzz Patt Ord Seat Stat Stat Syllo	at-Output for and Water Ima One Out ure Series and Sec er Folding zles fern Series and Sec er & Ranking ting Arrangements pe Construction ement and Assum ement and Conclu- ogism	ages quences quences s ptions isions				
Interview Skills	Reso Prep Pun Prof Com Liste Ask Con Show Foll	Bynogasin Research Preparation Punctuality Professionalism Communication Listening Ask questions Confidence Showing interest Follow-up					
Grooming	Attir Body	⁻ e v language					



SEMESTER IV

MCA401 Parallel Programming using OpenMP

Course Code	MCA401	Course Title	Parallel Programming using						
			OpenMP						
Course Type	Core	re Contact 4 Hours per Week Hours							
Credit	3	Domain	Professional Core						
Syllabus									
Ι	Parallel Architect Interconnection M Tree-Butterfly N Exchange Netwo Symmetrical, Fly MIMD. Pipelining	ures Vetworks- 2D Me etwork-Hyper C ork, Multicompu nn's Taxonomy Multi Core Archi	esh-Binary Tree-Hyper ube Network-Shuffle- uters- Asymmetrical- - SISD, SIMD, MISD, itectures.						
II	Parallel Algorithm Design Task/Channel Model, Foster's Design Methodology, Boundary Value Problem, Finding the maximum, n-body problem, Parallelism- Data Level, Instruction level, Thread Level, Cache Coherence-Directory based Protocol.								
III	Shared Memory Model in parallel Programming, Fork- Join Concept, OpenMP- Pragma- Parallel for-private- firstprivate-lastprivate-critical-reduction-inverting loop- conditionally executing loop-scheduling loop- single- nowait-section, omp_get_thread_num, omp_get_num_threads Sieve of Fratesthones, Matrix vector multiplication								
Ιν	Message passing Model, MPI, MPI_Init, MPI_Finalize, MPI_comm_rank, MPI_comm_Size, MPI_reduce, MPI_Wtime, MPI_Circuit satisfiability. Performance Analysis- Speedup and efficiency, Amdahl's Law, Gustafson-Barsis's Law, Karp-Flat Metric,								
V	Basics of CUDA-	introduction to	GPU, heterogeneous						
REFERENCE BOOKS:	computing, introt		1 111 Caus.						
Shameem Akhter and Jason Roberts, "Multi-core Programming". Intel Press. 2006.									
Michael J Quinn, Parallel programming in C with MPI and OpenMP, Tata Macgraw Hill, 2003.									
John L. Hennessey and David approach", Morgan Kaufman	d A. Patterson, " Co nn/Elsevier Publish	mputer architect lers, 4th. Edition,	ure – A quantitative 2007.						
David E. Culler, Jaswinder P software approach" , Morga	al Singh, "Parallel c n Kaufmann/Elsevi	omputing archite er Publishers, 19	cture: A hardware/ 99.						
Parallel Programming with	MPI By Peter S. Pa	checo							
Using MPI: Portable Parallel Programming with the Message-Passing Interface, By William Gropp, Ewing Lusk, Anthony Skiellum									

Web R					https	s://w	ww.	tutor	ialsp	oint.c	om/o	cuda/	index	.htm		
Web R					http: c-bas	s://w sics.p	vww. odf	nvidi	a.con	n/doo	cs/IO	/1162	711/s	sc11-c	uda-	
COURSE	PRE	REQ	UISI	ΓES:		_										
MCA102,	MCA	103														
COURSE	OBJE	ECTIV	/ES:													
To giv	e an	overv	view	of												
1. m	oder	n par	allel	com	outer	arch	itect	ures	and p	oarall	el pro	ocessi	ng teo	chniqu	ies	
an	d th	eir ap	oplica	tions	s fron	n bas	ic co	ncept	ts to s	state-	of-th	e-art (comp	uter		
sy	stem	1S.														
2. fu	ndar	nenta	als, de	esign	com	plexi	ty, po	ower,	and	reliat	oility	atall	levels	5		
3. ba	isic p	arall	el pro	ograr	nmin	g cor	icept	s usii	ng Op	benM	P, MP	I and	CUD	A		
COURSE	OUT	СОМ	ES:													
CO. No					Course Outcome description											
MCA401.	1				Тос	ompr	eher	nd the	e wor	king	of the	e para	llel ai	rchited	cture	S
MCA401.2	2				To p mod	aralle el	el sol	ve co	mple	ex pro	blem	is usir	ng tas	k/cha	nnel	
MCA401.	3				To in prog	npleı rams	ment S	shar	ed m	emor	y mo	del in	para	llel		
MCA401.4	4				To ir	nplei	ment	Mess	sage	passii	ng mo	odel ir	n para	allel		
					prog	rams	5.			-	-		-			
MCA401.	5				To le	earn a	and i	mple	ment	Basi	c pro	grams	s in Cl	JDA		
CO-PO Al	ND C	O-PS	O M A	APPI	NG											
	PO	PO2	PO3	PO	PO5	PO6	PO	PO8	PO9	P010	PO1	PO12	PSO	PSO2	PSO3	Τ
MCA401.1	1		1	4 2			1				1		1			-
MCA401.2	2		1	3												-
MCA4013	2		1													_
MC44014	_		1	2	2											_
MCA401.4			1	د -	د 											_
MCA401.5				3												

MCA403 Seminar

Course Code	MCA403	Course Name	Seminar		
Course Type	Presentation	Contact Hours Nil			
Credit	3	Domain	Core		
Each student has to choo approved, the student can page report) and submit it the librarian. The maximum presentation is to be made	ose a topic of relevar prepare a seminar re to the panel along wit um allowed plagiarism by the student which	nce and submit it for port on the topic (a m th the plagiarism report n is 10%. Subsequent is followed by viva.	approval. Once inimum of a 10- rt obtained from tly, a 15-minute		

Evaluation Criteria								
Cominar	Clarity and Novelty on the theme	10						
Presentation	Organization and infographics of the slides	20						

Presentation Style	20
Engaging the Audience	10
Viva	20
Report	20
Total Marks	100

Since the evaluation is done internally the class average marks collectively should not exceed 80%.

MCA404 Comprehensive Viva Voce

Course Code	MCA404	Course Name	Comprehensive Viva Voce			
Course Type	Viva Voce	Contact Hours	Nil			
Credit	3	Domain	Core			
Will be conducted at the end of Semester. A comprehensive Viva based on subjects learned during the course, by Internal Examiner for internal Evaluation and by an external Examiner						

MCA405 Internship

Course Code	MCA405	Course Name	Internship
Course Type	Core	Contact Hours	8 Weeks (40 Working Days)
Credit	12	Domain	Professional Core/ Experiential Learning

Course Description

The MCA Internship Course allows MCA students to gain practical experience in the workplace before receiving their Graduation Degrees. The student identifies companies willing to hire him/her on a full-time basis for an 8-week period (minimum required) during their last semester.

Responsibilities of an Intern

- Work closely with teams at the workplace to facilitate the rapid development of high-quality applications which may include:
 - Develop quality software and web applications
 - Analyze and maintain existing software applications
 - o Design & implement highly scalable, testable code
 - Discover and fix programming bugs
 - Contribute to the design strategy of the UI and UX of the platform

Internship Guidelines:

- Step 1: Request Letter/ Email from Internship Coordinator of the college should go to industry to allot various slots of 8 weeks as internship periods for the students. Students request letter/profile/ interest areas may be submitted to industries for their willingness for providing the training.
- Step 2: Industry will confirm the training slots and the number of seats allocated for internships via Confirmation Letter/ Email to the Internship Coordinator
- Step 3: Students on joining Training at the concerned Industry / Organization, submit the Joining Report/Letters / Email.
- Step 4: Students undergo industrial training at the concerned Industry / Organization. In-between Faculty Member(s) evaluate(s) the performance of students once/twice by visiting the Industry/Organization/ through Online Interactions and Evaluation Report of the students is submitted in department office with the consent of Industry persons
- Step 5: Students will submit training report after completion of internship along with the Attendance Log to the Internship Coordinator.
- Step 6: Training Certificate to be obtained from industry and a copy to be submitted to the Office of the Coordinator.
- Step 7: Assessment of the Internship Outcomes through a Comprehensive Viva and extensive evaluation of the Internship Report.

INTERNSHIP REPORT GUIDELINES

Every student is required to write an Internship report upon completion of their internship and required to submit **two copies** (student copy + department copy in pdf) of the report to Internship Coordinator (along with certificate given by the company) for final evaluation and awarding of Credit Scores. Before submitting the report to the Internship Coordinator, the student required to go through multiple rounds of revision in collaboration with the department internship mentor/coordinator/supervisor.

The Internship Report serves multiple purposes:

- Help the student develop written communication skills.
- Serve as an archival record of the internship experience.
- Give the student an opportunity to reflect on the professional aspects of the internship
- experience and the skills that were learned.
- Allow the student to describe the science content of the internship.
- Have the student to reflect on the initial goals of the internship and how they were (or were not) achieved during the internship.

Text Format in the report:

- Cambria 12 or similar, with 1.5 line spacing.
- Margins 1.5" left and 1" all other side.

Binding & report length:

• Soft binding & report length of minimum 20 pages with one side printing with a designed Cover Page

General information:

• Student is eligible for internship evaluation if only if he/she completed 8 weeks of internship training. (Minimum of 40 Working days)

EACH INTERNSHIP REPORT WILL FOLLOW THE FORMAT DESCRIBED:

• Title Page
- College certificate Page
- Internship certificate provided by the internship institution
- Acknowledgement
- **Executive summary/Abstract** (2 pages) A paragraph each on:
 - The company
 - The problem or opportunity
 - Methodology
 - Key parts of the report & your findings and solutions provided in the report.
 - Benefits to the company/institution through your report.
- Index

List of the contents of the internship report and where they can be found in the report.

- Learning Objectives/Internship Objectives A single page that lists the original objectives of the internship.
- Weekly overview of internship activities
- **Introduction** (2 or 3 pages)

The introduction should include a description of the internship site and the scope of the work completed during the internship. This Section may include a detailed explanation of the Organization and their scope of Work. It may include background information necessary to understand the work completed during the internship.

• Internship Discussion

This section contains a discussion of the internship and should address the following points:

- How the objectives achieved?
- What skills (scientific and professional) were learned during the internship?
- Results/observations/work experiences get in the internship company.
- \circ $\;$ What challenges did you experience during the internship?
- Conclusion
- Bibliography

Include references to books, articles, reports referred to in the report.

Note: A handbook with the formats of Certificate and Details will be given at the start of Semester IV.

COURSE OUTCOMES:	COURSE OUTCOMES:							
CO. No	Course Outcome description							
MCA404.1	Assist the student's development of employer-valued skills such as teamwork, communications and attention to detail.							
MCA404.2	Expose the student to the environment and expectations of performance on the part of Software Analysts/developers in professional practice, private/public companies or government entities.							

MCA404.3						Enhance and/or expand the student's knowledge of a particular area(s) of Software Engineering											
MCA404.4						Expose the student to professional role models or mentors who will provide the student with support in the early stages of the internship and provide an example of the behaviours expected in the intern's workplace.											
	CO-PO AN	ND C	O-PS	0 M/	APPI	NG											
		P0 1	PO2	P03	P04	P05	P06	P0 7	P08	P09	P01 0	P01 1	PO1 2	PSO 1	PSO2	PSO3	
	MCA404.1		2	2		3	3		2			3	1				
	MCA404.2		2	2		3 3 2 3 1											
	MCA404.3		2	2		3	3					3	1				
	MCA404.4		2	2		3	3			2		3	1				

ELECTIVE COURSES

The Elective Courses are offered in specialization tracks focused on three major domains

- 1. Data Science
- 2. Advanced Programming
- 3. Computer Security

Elective courses are offered through Semester 3 and Semester 4 as MCA3XX and MCA4XX respectively. The Specializations are offered as two pools for each semester. The courses are offered through majority selection by the students in consensus with the department, approved by the Dean of Computer Science.

DATA SCIENCE

MCA311 Deep Learning

Course Code	MCA311	Course Title	Deep Learning				
Course Type	Elective	Contact Hours	6 Hours per Week				
Credit	4	Domain	Data Science				
Syllabus							
I	Introduction to Deep Le Why Deep Learning? Biological Neuron, Idea Pitts unit and Thres Perceptron Learning Convergence theorem Backpropagation, Multi-	arning What is a neural ne of computational u sholding logic, Line Algorithm, Linea for Perceptron Lear layer Perceptrons	etwork? -Basics: nits, McCulloch– ear Perceptron, ar separability. rning Algorithm.				
II	Introduction to Tensorflow, simple ML examples. Basic operations, constants, variables, Control dependencies Data pipeline, TensorBoard, Linear and Logistic Regression, Tensorflow's Optimizers, tf.data-Birth rate - life expectancy, MNIST dataset						
III	Loss Functions and Optimization, stochast Neural Networks, Co classification Solving a p	l Optimization, In ic gradient descent nvnet in Tenso problem with CNNs or	mage features, c, Convolutional rFlow- image n Tensorflow.				
IV	Recurrent Neural Netwo captioning, Soft attentio Long Short-Term Memo Solving a problem with	orks, Language model n Back propagation tl ry, LSTMs, Bidirection RNNs on Tensorflow	ling Image nrough time, nal RNNs,				
V	Practical: Introduction to T TensorFlow Basi TensorFlow Grap	'ensorFlow c Syntax bhs					

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					• (CNN I	mple	emen	tatio	n					
					CNN MNIST Code										
					• [ntro	ductio	on to	RNN	Sect	ion				
					• [Manu	al Cr	eatio	n of	RNN					
REFERENCE BOOKS:															
Goodfellow, Y. Bengio, A. Courville, Deep Learning, MIT Press, 2016. http://www.															
deeplearningbook.org.															
K. P.	Murp	ohy, I	Mach	ine L	learn	ing:	A Pro	babi	listic	Pers	pectiv	e, Ml	T Pres	ss, 20	12.
<u> </u>	Bish	op, P	atter	n Re	cogn	ition	and	Mach	nine l	Learn	ing, S	pring	er, 20	06.	
Neur	al Ne	etwoi	rks a	nd D	eep l	learn	ing b	y Mi	chae	Niels	sen, O	nline		<i>.</i>	~ /
Hand	ls-On	n Mac	chine	Lear	ning	with	Scik	it-Le	arn a	nd Te	ensor	Flow,	by At	irélie	n Géro
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MCA303	MCA303														
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MCA312 Big Data Analytics

Course Code	MCA312	Course Title	Big Data Analytics			
Course Type	Elective	Contact Hours	6 Hours per Week			
Credit	4	Domain	Data Science			
Syllabus						
I	INTRODUCTION TO BIG DATA					

	Introduction to BigData Platform – Traits of Big data - Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions – ReSampling - Statistical Inference - Prediction Error.
II	DATA ANALYSIS Regression Modelling - Multivariate Analysis - Bayesian
	Vector and Kernel Methods - Analysis of Time Series:
	Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization
	- Competitive Learning - Principal Component Analysis
	Models from Data - Fuzzy Decision Trees - Stochastic
	Search Methods.
111	MINING DATA STREAMS
	Introduction To Streams Concepts – Stream Data Model
	Stream – Filtering Streams – Counting Distinct Flements in
	a Stream – Estimating Moments – Counting Oneness in a
	Window – Decaying Window - Real time Analytics
	Platform(RTAP) Applications - Case Studies - Real Time
	Sentiment Analysis, Stock Market Predictions.
IV	FREQUENT ITEMSETS AND CLUSTERING
	Mining Frequent Itemsets - Market Based Model - Apriori
	Limited Pass Algorithm – Counting Frequent Itemsets in a
	Stream – Clustering Techniques – Hierarchical – K-Means
	- Clustering High Dimensional Data - CLIQUE And
	PROCLUS – Frequent Pattern based Clustering Methods –
	Clustering in Non Euclidean Space – Clustering for Streams
V	FRAMEWORKS AND VISUALIZATION
V	MapReduce – Hadoop, Hive, MapR, Hadoop Distributed
	File Systems – Visualizations - Visual Data Analysis
	Techniques - Interaction Techniques; Systems and
	Analytics Applications - Analytics using Statistical
	packages-Approaches to modeling in Analytics –
	association intelligence from unstructured information-
	Text analytics
REFERENCE BOOKS:	-
Michael Berthold, David J. I	Hand, "Intelligent Data Analysis", Springer, 2007.
Anand Rajaraman and Jeffr	ey David Ullman, "Mining of Massive Datasets", Cambridge
University Press, 2012. Bill Franks, "Taming the Bi	g Data Tidal Wayo, Finding Opportunities in Uugo Data
Streams with Advanced An	g Data Tuai wave: Filiuling Opportunities in fluge Data

Streams with Advanced Analytics", John Wiley & sons, 2012. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007

Pete Warden, "Big Data Glossary", O'Reilly, 2011. COURSE PRE-REQUISITES:

MCA303

COURSE OBJECTIVES:

- 1. To introduce students, the concept and challenge of big data (3 V's: volume, velocity, and variety).
- 2. To teach students in applying skills and tools to manage and analyse the big data.

	COURSE	OUT	'COM	ES:												
	CO. No					Cour	se 0	utco	me d	lescr	iptio	n				
MCA312.1						Unde whye data;	ersta existi	nd th ng te	ne co echno	oncep ology	ot and is in	l chal adequ	lenge iate to	of bi o anal	g dat yse tł	a and 1e big
MCA312.2						Colle bigda	ect, m ata	anag	ge, sto	ore, q	luery,	and a	inalys	e vari	ous fo	orm of
MCA312.3						Gain solve mini	han som ng da	ids-oi e ope ata st	n ex en big ream	perie g dat Is	ence a prol	on la blems	rge-so by ui	cale a nderst	nalyti andin	cs to g and
	MCA312	.4				Unde ands	ersta trate	nd th gy us	ie im sing a	pact Idvar	of big nced c	g data luster	for b ring te	usines echniq	s dec ues	isions
	MCA312	.5				Understand the concepts of frameworks and techniques to										
						visualize the output										
	СО-РО А	ND C	:О-РS	50 M	APP	ING			-							
		PO	PO	РО	PO	PO	PO	PO	PO	PO	P01	P01	P01	PSO	PSO	PSO
		1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
	MCA312. 1	1	2		3	3								3		
	MCA312. 2	1	2		3	3								3		
	MCA312. 3	1	2		3	3 3										
	MCA312.	1	2		3	3								3		

MCA413 R Programming

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4 MCA312.

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Course Code	MCA413	Course Title	R Programming						
Course Type	Elective	Contact Hours	6 Hours per Week						
Credit	4	Domain	Data Science						
Syllabus									
Ι	Introduction to R	Introduction to R							
	components in F	Studio.	tion of K Studio, Dasic						
	R Syntax and p	orogramming - V	ariables & Operators,						
	Vectors, List, Ma	trices & Arrays, I	Factors, Data Frames &						
	Functions Read	Functions Reading data using R - Basic read write							
	operations.	operations.							
	Exploratory fun	Exploratory functions to cover Summary & Structure of							

	data, Measures of central tendency and measures of
	dispersion.
II	Data Handling and Visualization
	Functions used for cleaning data - handling messy data
	and missing data –
	Basic charts and their purpose - pie, bar and histogram.
	Boxplot, Scatterplot. Understanding ggplot2 package,
	Functions in ggplot2
	Quickplot
III	Supervised Learning & Unsupervised Learning
	Supervised modelling technique. Family of Regressions
	SLR, BLR, MLR Modelling, Decision Tree- Random Forest.
	Unsupervised modelling techniques
	Clustering Concept – K Means Clustering, Association
	Rules- ARM Concept – Apriori.
IV	Applied Analytics - HR & Operation
	HR Analytics: Understanding role of analytics in HR
	Function, Understanding KPI's that needs to be
	modelled. Case Study
	Operations Analytics: Understanding role of analytics in
	Operations Analytics – Introduction- Distribution
	channel development Case Study
V	Applied Analytics - Finance & Marketing
	Finance Analytics: Understanding role of analytics in
	finance. Customer profiling using clustering techniques
	Case Study
	marketing Analytics: Understanding analytics in
REFERENCE BOOKS	marketing. Case Study
1 Hands-On Program	nming with R by Crolemund and Carrett
2 Reginning R. The	Statistical Programming Language by Mark Cardener
2 Deginning K. The C	lyanced Analytics and Granhics by Jared P. Lander
4 Applied Predictive	Analytics: Principles and Techniques for The Professional Data
Analyst by Dean A	hhatt
5 Predictive Market	ing: Fasy Ways Every Marketer Can Use Customer Analytics and
Big Data by Omer	Artun and Dominique Levin
6 HR Analytics: IInd	erstanding Theories and Applications by Dinak Kumar
Bhattacharwya	erstanding Theories and Applications by Dipak Rumai
COURSE PRE-REOUI	SITES
MCA303	
COURSE OBJECTIVES	<u>.</u>
To Implement the	e Algorithms and predictive analytics using R
COURSE OUTCOMES	
CO. No	Course Outcome description
MCA413.1	To get a basic understanding of R and the various ways to
	create scripts and programs in R
	er cate berip to ana programo miti

	MCA413.	.2			To understand some of the key constructs in R for data handling										1	
-	MCA413.	.3			To understand and appreciate how to summarize large volumes of data effectively by appropriate use of charts different types										e s of	
	MCA413.	.4			Uı do	nders omaii	stand ns lik	l how ce HR	, to u , Ope	se R ratio	for rea ns, Fi	al-life nance	applie and N	cation Marke	s, in n ting	najor
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		1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
	MCA413. 1	1	2		3	3								3		
	MCA413. 2	1	2		3	3								3		
	MCA413. 3	1	2		3	3								3		
	MCA413. 4	1	2		3	3								3		

MCA414 Data Visualization

Course Code	MCA414	Course Title	Data Visualization				
Course Type	Elective	Contact Hours	6 Hours per Week				
Credit	4	Domain	Data Science				
Syllabus							
Ι	Computational Stat Visualization and T Graphics, Graphic Historiography	istics and Data heory, Presentatic cs and Comp	Visualization, Data on and Exploratory outing, Statistical				
	Good Graphics –Introduction, Content, Context Construction, Presentation Graphics and Explore Graphics, Presentation (What to Whom, How and W Choice of Graphical Form, Graphical Display Op Higher-dimensional Displays and Special Struct Scatterplot Matrices (Sploms), Parallel Coordin Mosaic Plots, Small Multiples and Trellis Displays, Series and Maps						
II	Complete Plots, Sensible Defaults, Customization-Se Parameters, Arranging Plots, Annotation, Extensib Building Blocks, Combining Graphical Elements, 3-D Speed, Output Formats, Data Handling Data and Graphs, Graph Layout Techniques- F directed Techniques, Multidimensional Scaling, Pulling Under Constraints Model, Bipartite Graphs (

	Drawing, Hierarchical Trees, Spanning Trees, Networks,
	Directed Graphs, Treemaps.
III	High-dimensional Data Visualization Introduction, Mosaic Plots, Associations in High- dimensional Data, Response Models, Models, Trellis
	Displays, Definition, Trellis Display vs. Mosaic
	Plots, Visualization of Models, Parallel Coordinate Plots,
	Geometrical Aspects vs. Data Analysis Aspects, Limits Multidimensional Scaling
	Proximity Data, Metric MDS , Non-metric MDS , Example:
	Shakespeare Keywords, Procrustes Analysis,
	Unidimensional Scaling, INDSCAL, Correspondence
	Other Numerical Approaches
IV	Tableau.
	Introduction- Environmental setup, Design Flow, File
	Types, Data Types. Data Sources- Custom Data View, Extracting Data, Field operations, Metadata, Data Joining
	and Blending, Worksheets- Adding, renaming, reordering
	Worksheet, Pages Workbook Calculations- Operators,
	functions, Calculations, LOD Expressions.
V	Sort and Filters- Sorting, Quick filtering, Context filtering,
	tableau, Tableau – Bar Chart, Line Chart, Multiple Measure
	Line Chart, Pie Chart, Crosstab, Scatter Plot, Bubble Chart,
	Bullet Graph, Box Plot. Dashboard, Forecasting
REFERENCE BOOKS:	
Handbook of Data Visu	alization by Chun-houh Chen, Wolfgang Härdle, Antony
Unwin The Functional Art by A	lherto Cairo
The Visual Display of O	uantitative Information by Edward R. Tufte
Learning tableau by Jos	hua N. Milligan
Tableau Dashboard Coo	okbook by Jen Stirrup
Handbook of Data Visu	alization by Chun-houh Chen, Wolfgang Härdle, Antony
Unwin	
COURSE PRE-REQUISITES	
COURSE OBJECTIVES:	
To introduce students	to data visualization including both the principles and
techniques.	
To learn and use Table	eau
CO. No	Course Outcome description

l	MCA414.1					To understand the basics of data visualization and statistics used for Data Visualization											
]	MCA414.	.2				Т	o plo	t vari	ious l	Data	visual	lizatio	n tool	s			
MCA414.3						To understand high- dimensional Data visualization											
]	MCA414.4					To learn to use Tableau Software											
(СО-РО А	APPI	NG														
		PO	PO	PO	PO	PO	PO	PO	PO	PO	P01	P01	P01	PSO	PSO	PSO	
		1	2	3	4	5	6	7	8	9	0	1	2	1	2	3	
	MCA414. 1	1	2		3	3								3			
	MCA414. 2	1	2		3	3								3			
	MCA414. 3	1	2		3	3								3			
	MCA414. 4	1	2		3	3								3			

ADVANCED PROGRAMMING

Course Code MCA321 Course Angular S Framework Title **Course Type** Elective Contact 6 Hours per Week Hours Credit 4 Domain Advanced Programming **Syllabus** Introduction: Angular JS, MVC Architecture, Conceptual Ι Overview, setting up the Environment, First Application and Understanding ng attributes. Structure of the Application. Introduction to Angular Concepts - Modules, Components, Services and Routing Expressions and Data Biding: Number and String Expressions, Object Binding and Expressions, Working with Arrays, Forgiving Behaviour and Understanding Data binding Π Working with Directives: Conditional Directives, Styles **Directives, Mouse and Keyboard Events Directives** Controllers: Understanding Controllers, Programming Controllers & \$scope object, Adding Behaviour to a Scope Object, Passing Parameters to the Methods, Having Array as members in Controller Scope, Nested Controllers and Scope Inheritance, Multiple Controllers and their scopes Ш Filters: Built-In Filters, Uppercase and Lowercase Filters, Currency and Number Formatting Filters, OrderBy Filter, Filter Filter, Creating Custom Filter Forms: Using Simple Form, Working with Select and Options, Input Validations, Using CSS classes, Form Events, Custom Model update triggers, Custom Validations. Reactive Forms, **Template Driven Forms and Dynamic Forms** IV Modules: Introduction, Module Loading and Dependencies, **Recommended Setup of Application and Creation vs Retrieval** Services: Understanding Services, Developing Creating Services, Using a Service, Injecting Dependencies in a Service Ajax in AngularJS: \$http Service, \$q Service, Ajax Impl using \$http and \$q Service V Angular and Database Connectivity: MySql and MongoDB. CRUD Operations.

MCA321 AngularJS Framework

Routing: Introduction to SPA, Creating HTML Templates and Configuring Route Provider.

Animation: ngAnimate Module, CSS transforms, CSS transitions, Applying animations, and Directives supporting animation

REFERENCE BOOKS:

AngularJS By Brad Green, Shyam Seshadri Publisher: O'Reilly Media

Professional Angularis : A Concise Approach (Valeri Karpov, Diego Netto)

AngularJS Directives (Alex Vanston)

Ng-Book - The Complete Book on Angularis (Ari Lerner)

Web R	https://www.w3schools.com/angular/
Web R	https://www.tutorialspoint.com/angularjs/index.htm
Web R	https://angular.io/

COURSE PRE-REQUISITES:

Please write the Java Course No

COURSE OBJECTIVES:

To give an overview of

- 1. Reduce the amount of code you write to build rich user interface applications.
- 2. Increase the reliability and maintainability of UI by using data binding.
- 3. Retrieve data from back end server, manipulate it and display it with ease.
- 4. Modularize your code with the custom services and directives.
- 5. Providing two ways binding of data.
- 6. Create Single Page Applications (SPA).

COURSE OUTCOMES:

CO. No	Course Outcome description								
MCA321.1	To implement applications using AngularJS frame Work								
MCA321.2	Applying the frame work in real applications								
MCA321.3	To implement filters in applications								
MCA321.4	To apply the services and modules in applications								
MCA321.5	Applying the framework to solve complex problems								
CO-PO AND CO-PSO MAPPING									

	P0 1	P0 2	РО 3	РО 4	РО 5	РО 6	РО 7	РО 8	РО 9	P01 0	P01 1	PO1 2	PSO 1	PSO 2	PSO 3
MCA321. 1	2	2									2			3	
MCA321. 2	2	2									2			3	

MCA321.	2	2					2		3	
3										
MCA321.	2	2					2		3	
4										
MCA321.	2	2					2		3	
5										

MCA322 Microsoft .NET Framework using C#

Course Code	MCA322	Course Title	Microsoft .NET Framework using C#						
Course Type	Core	Contact Hours	6 Hours per Week						
Credit	4	Domain	Advanced Programming						
Syllabus	,	'	·						
I	.NET Framework: MSIL, The .NET Fra of a c# program, da looping, arrays. Inheritance, Polyr Structures, Enume classes, Partial m Reflection.	Introduction, Commor mework Class Library ta types, operators, de Object oriented pro norphism, Properties ration, Namespaces an nethods, Delegates an	h Language Runtime (CLR), Introduction to C#: structure cision making branching and ogramming: Encapsulation, and indexers, Interfaces, nd Access specifiers, Partial nd Events, Attributes and						
Π	Advanced .NET: S methods, Assembli handling, Multithu Output – Files –re Base Connectivity ConnectionObject, CommandObject, DataSets and Da Differences betwe Understanding the Using DataReaders Stored Procedures	tring Handling. Gener es –private and shared readed Programming, ading and writing– D y: ADO.NET Archite Building the Connectio Understanding Dat taAdapters, DataTab een DataReader Mo DataViewObject, Work s, Using DataSets, Wo	rics, Generic Class, Generic Assemblies, GAC, exception synchronization, Input / irectory manipulation. Data cture, Understanding the on String, Understanding the taReaders, Understanding le, DataColumn, DataRow, odel and DataSet Model, sing with System.Data.OleDb, orking with SQL.NET, Using						
III	IO, Object serializat TextReader, Bin Persistence and Remoting- Distrib Environment, Drav environment, Adva Remoting Client programming, TCP	tion and Remoting: Sys aryWirter, BinaryRe formatters, binary f outed Applications, C vbacks of DCOM, .NET antages & Disadvantag and Server. Netwo /IP, UDP	tem.IO, Streams, TextWriter, eader, Serialized Object Formatter, soap formatter, COM/DCOM in Distributed Remoting – New distributed ges, . Implementing a Simple ork programming: Socket						
IV Windows Programming: Using Textbox, Button, Check RadioButtons, ComboBox, GroupBox etc., Event handling, Hand mouse and keyboard events, Using menus and multiple wind Adding a Tab-Control, Anchoring Controls, ListView and Treev controls, Building an ImageList and add them to the ListView, U details inside the ListView, Attaching a Context Menu, Addin TreeView, Creating window services. DataBae: Windows Data Connectivity									

Web Applications: Introduction to Web Applications, Understanding architecture ASP.NET, Creating ASP.NET Pages – Web Forms, Working
with web controls - Button, Textbox etc. , Postback and ViewState
concepts, State Management - Cookies, Sessions and Applications,
Validation controls, FileUpload, AdRotator, MultiView, Calendar etc.
Web Database Connectivity: sqldatasoruce-insert, delete, update,
report generation. Concept of Master pages and web services.

REFERENCE BOOKS:

C# 2012 Programming, Covers .Net 4.5, Black Book

Professional .NET programming - wrox publication

Professional ASP.NET 4.5 in C# - Jason N. Gaylord (Author), Christian Wenz (Author), Pranav Rastogi (Author), Todd Miranda (Author),

Professional C# Web Services: Building .NET Web Services with ASP .NET and • .NET Remoting - Zach Greenvoss and Christian Nagel

COURSE PRE-REQUISITES:

MCA102, MCA105

COURSE OBJECTIVES:

- 1. To Achieve an understanding of the goals and objectives of the .NET Framework
- 2. To provide a working knowledge of the C# programming language
- 3. To achieve an understanding of how to use forms to develop GUI programs under .NET

	COURSE OUTCOMES:															
	CO. No		Coι	ırse	Outco	ome	desci	riptio	on							
	MCA322.1	-	Abi and	Ability to solve problems using only pure object oriented concepts and frameworks												
	MCA322.2)	Abi	Ability to design and develop database applications												
MCA322.3 Able to develop networking and distributed applications																
	MCA322.4	ł	Abi	Ability to design GUI applications												
	MCA322.5	;	Des	Design and develop Web applications												
	CO-PO AN	ID CO)-PS() MA	PPIN	G										
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	PO11	PO12	PSO1	PSO2	PSO3
	MCA322.1			1											2	
	MCA322.2			1		2									2	
	MCA322.3			2											1	
	MCA322.4			2		2										
	MCA322.5			2		2			1						3	

MCA423 Flutter Using DART

Course Code	MCA423	Course Title	Flutter Using DART					
Course Type	Elective	Contact Hours	6 Hours per Week					
Credit	4	Domain	Advanced Programming					
Syllabus								
Ι	DART programming – Introduction, Setting up the Environment, structure of the program and execution.							

V

	Introduction: Variables, Data Types, Operators, Decision								
	Making, Loops, Numbers, Strings, Boolean and functions.								
	List , Map, Symbol, Rune, Enumerations and Functions								
II	Object oriented Programming using DART – class, object,								
	Constructor, Interface and Inheritance. Getters and Setters.								
	Advanced DART Concepts: Collection, Generics, Packages,								
	Exceptions, Debugging, Libraries, Asynchronous operation								
	and Concurrency.								
III	Flutter – Introduction, Features, Advantages and								
	disadvantages of flutter.								
	Installation – Windows platform								
	Application – Creation of Simple Application in Android								
	Studio.								
	Architecture of Flutter Application – Widgets, Concept of								
	States, and layers								
IV	Widgets - Material widgets , Cupertino widgets, Layout								
	widgets and State maintenance widgets								
	Layouts – Single Child Layout Widgets, Multiple Child Widgets								
	Advanced Layout Application and Introduction to Gestures,								
V	Flutter State management and Flutter Animation								
Flutter Database Concepts.									
	Eluttor Internationalization								
REFERENCE BOOKS:									
Beginning App Develop	oment with Flutter by Rap Payne								
Beginning Flutter: A Ha	ands On Guide to App Development by Marco L. Napoli								
Flutter for Beginners b	y Alessandro Biessek								
Flutter in Action by Eri	c Windmill								
Programming Flutter b	y Carmine Zaccagnino								
Web R	https://dart.dev/								
Web R	https://flutter.dev/								
Web R	https://www.tutorialspoint.com/flutter/index.htm								
COURSE PRE-REQUIS	ITES:								
MCA307									
COURSE OBJECTIVES:									
To create apps based of	on android or ios platforms								
To create apps based o	n multimedia and internet application								
To make a platform inc	lependent app.								
COURSE OUTCOMES:									
CO. No	Course Outcome description								
MCA423.1	Able to understand the DART programming langugae								
MCA423.2	Able to develop simple apps								
MCA423.3	Make decision to solve a problem using package, library and threads Handling Errors and Exceptions								

MCA423.	4			Abi	Ability to design and develop database applications											
MCA423.	5			Abl	Able to design and develop mobile applications works with											
		inte	internet applications													
CO-PO A	ND (Ю-Р	SO M	IAPP	PPING											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3	
MCA423.1			1		3									2		
MCA423.2			1		3									2		
MCA423.3			2											1		
MCA423.4			2		3									3		
MCA423.5			2		3									3		

MCA424 Struts, Hibernate and Spring

Course Code	MCA424	Course Title	Struts, Hibernate							
			and Spring							
Course Type	Elective	Contact Hours	6 Hours per Week							
Credit	4	Domain	Advanced							
			Programming							
Syllabus										
Ι	Application Flow, Components Model, View and Contro Building a simple web application using struts. Struts Validator - Introduction to validator plugin, U different types of validators, Configuring the applica Applying validators, Building custom validators, Declarative exception handling Framework - Struts Tiles Framework, Introduction to framework, Building tiles configuring struts-config.xm creating the template page									
	Struts2 Action - Actio	on Interface, ActionS	Support class							
	Basics of Hibernate - Hibernate Introduction, Hibern Architecture, Understanding First Hibernate application Hibernate Application - Hibernate with annotation, Hibern Web application, Hibernate Generator classes, Hibern Dialects Hibernate Logging - Hibernate with Log4j 1, Hibernate v Log4j 2 Inheritance Mapping - Table per Hierarchy, Table per Hierarchy using Annotation, Table Per Concrete, Table Per Concrete using Annotation, Table Per Subclass, Table Per									
III	 Collection Mapping - Mapping List, One-to-many by List using XML, Many to Many by List using XML, One To Many by List using Annotation, Mapping Bag, One-to-many by Bag, Mapping Set, One-to-many by Set, Mapping Map, Many-to-many by Map, Bidirectional Lazy Collection Component Mapping, Association Mapping - One-to-one using Primary Key, One-to-one using Foreign Key 									
IV	Transaction Manager	ment	-							

				HQL	, HCC	L, N	amed	l Que	ery									
				Hibe	HQL, HCQL, Named Query Hibernate Caching - First Level Cache, Second Level Cache Integration - Hibernate and Struts, Hibernate and spring													
				Integ	Internate Caching - First Level Cache, Second Level Cache ntegration - Hibernate and Struts, Hibernate and spring Basics of Spring - What is Spring, Spring Modules, Sprin Application OC container													
V				Basi	cs of	Spr	ing -	Wh	at is	Spri	ng. Si	oring	Modi	iles. S	Spring			
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				IOC	conta	iner												
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				Ohio	ect, CI with collection, CI with Map. CI Inheriting Bear													
				Sotte	er Injection SI Dependent Object SI with Collection SI with													
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Beginnin	ig Ap	ache	Stru	ts - A	rnolc	Dor	ay											
Struts: T	he Co	ompl	ete R	efere	nce I	Book												
Masterin	ıg Jak	arta	Stru	ts														
Struts in	Actio	on - 7	Fed H	luste	d, Ceo	dric I	Dumo	oulin,	Geoi	rge Fr	anciso	cus, D	avid V	Vinter	feld			
Just Spri	ng In	tegra	ation	- Ma	dhus	udha	n Ko	nda										
Spring D	ata -	Marl	c Poll	lack, (Olive	r Gie	rke											
COURSE	PRE	-REQ	UIS	TES:														
MCA202	, MCA	A 203	3															
COURSE	OBI	ECTI	VES:															
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To Famil	ior w	rith F	lihor	note	and T	ronc	actic	nc ir		K3								
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				aesi	gn p	atter	n ar	ia n	OW 1	IT IS	best	appile	ea to	Java	web			
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MCA424	.2			Abili	ty to	map	enti	ties a	and a	ttribu	ites u	sing n	noder	n tool	S			
MCA424	.3			Crea	te d	iffere	ent t	ypes	of	persis	tent (classe	s and	i Mar) java			
				inhe	ritan	ce h	ierar	chy	with	data	abase	table	es usi	ng v	arious			
				map	ping	techi	nique	es										
MCA424	.4			Fetc	h dat	a eff	ectiv	ely fr	om d	lataba	ise usi	ing tra	aditio	nal SQ	L and			
				Hibe	ernate	e Que	ery La	angu	age									
MCA424	.5			Abili	ty t	o pi	ovid	e co	ompu	tatior	nal so	olutio	ns fo	r rea	ıl life			
				prob	lems	;												
СО-РО А	AND CO-PSO MAPPING																	
	PO	PO	PO	PO	PO	PO	PO 7	PO C	PO	P01	P01	P01	PSO 1	PSO	PSO			
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5																		



COMPUTER SECURITY

MCA331 Ethical Hacking

Course Code	MCA331	Course Title	Ethical Hacking
Course Type	Specialization	Contact Hours	6 Hours per Week
Credit	4	Domain	Computer Security
Syllabus			
I	Hacking Concepts Hacking vs. Ethical Hacking, E Hacker? Hacker Classes, Ha Attacks-Types of Attacks on Misconfiguration Attacks, Ap Application-Level Attacks, Sh Concepts-Footprinting Term What is Footprinting?, Why Fo WHOIS Footprinting- WHO Analysis, WHOIS Lookup Too WHOIS Lookup Online Tool Information, DNS Interrogatio the Network Range, Determin Traceroute Analysis, Traceroo	ffects of Hacking a System, Oper oplication-Level rink Wrap Code ninology, ootprinting?, Ob IS Lookup, W I: SmartWhois, s. DNS Footpri on Tools, Netwo ne the Operatir ute Tools.	g on Business, Who is a ing Phases. Types of rating System Attacks, Attacks, Examples of e Attacks. Footprinting jectives of footprinting, 'HOIS Lookup Result WHOIS Lookup Tools, nting, Extracting DNS rk Footprinting, Locate ng System. Traceroute-
II	Enumerations and System H Enumeration Concepts- Wh Enumeration, Services and Enumeration-NetBIOS Enum SuperScan, Hyena, Enumerati Using Default Passwords System Hacking: Goals-CEH System Hacking Steps, Crack Password Complexity, Passw Password Attacks, Passive O Eavesdropping, Passive Onl Replay Attack	lacking at is Enumera d Ports to eration, NetBIO ng User Accoun Hacking Met king Passwords vord Cracking Online Attack: H ine Attacks: M	ation? Techniques for Enumerate. NetBIOS OS Enumeration Tool: ts, Enumerate Systems thodology (CHM),CEH s- Password Cracking, Techniques, Types of Passive Online Attack: Man-in-the-Middle and
III	Trojan, Virus and Worms Trojan Concepts- What is a Tr Covert Channels Purpose of For? Indications of a Trojan Tool: Windows Service Ma Registry Entries, Startup Prog Programs Monitoring Tool: Monitoring Tools Virus Concepts- Introduction Stages of Virus Life, Working Viruses: Attack Phase, Why Indications of Virus Attack, W	ojan? Communi Trojans, What I Attack, Window nager (SrvMan rams Monitorin Security AutoR to Viruses, Viru of Viruses: Infec Do People Cr /irus Analysis:	cation Paths: Overt and DTrojan Creators Look vs Services Monitoring), Windows8 Startup g Tool: Starter, Startup un, Startup Programs as and Worm Statistics, ction Phase, Working of reate Computer Virus, DNSChanger, Types of

	Computer Worms-How Is a Worm Different from a Virus?, Worm Analysis: Stuxnet, Worm Maker: Internet Worm Maker Thing
IV	Web Application hackingIntroduction to Web Applications, Web Application Components,How Web Applications Work?, Web Application Architecture,Analyze Web Applications, Analyze Web Applications: Identify EntryPoints for User Input, Analyze Web Applications: Identify Server-Side Technologies, Analyze Web Applications: Identify Server-SideFunctionality, Session Attacks: Session ID Prediction/ Brute-forcing,Cookie Exploitation: Cookie Poisoning, Authorization AttackSchemes, Authorization Attack, HTTP Request Tampering,Authorization Attack: Cookie Parameter Tampering
V	SQL Injection and Android HackingSQL Injection Concepts-SQL Injection, SQL Injection Threats, What isSQL Injection?, SQL Injection Attacks SQL Injection Tools:BSQLHacker,SQL Injection Tools: Marathon ToolAndroid Vulnerabilities, Android Rooting, Rooting Android Phonesusing SuperOneClick, Rooting Android Phones Using Superboot,Android Rooting Tools, Session Hijacking Using DroidSheep,Android-based Sniffer: FaceNiff, Securing Android Devices, GoogleApps Device Policy
REFERENCE	BOOKS:
ABCD OF HA	CKING: The Beginner's guide by Shashank Pai K
Computer Ha and Penetrat	acking Beginners Guide: How to Hack Wireless Network, Basic Security ion Testing, Kali Linux, by Alan T. Norman
Hacking: The	e Art of Exploitation, by Jon Erickson
The Hacker I Hash Crack:	Playbook 2: Practical Guide To Penetration Testing by Peter Kim Password Cracking Manual (v2.0) 2nd Edition, by Joshua Picolet
The Web App Edition by D	plication Hacker's Handbook: Finding and Exploiting Security Flaws 2nd afydd Stuttard , Marcus Pinto
COURSE PR	E-REQUISITES:
MCA 304	
COURSE OB	IECTIVES:
1.	Identify and analyse the stages an ethical hacker requires to take in
2	Identify tools and techniques to carry out a Hacking
3.	Critically evaluate security techniques used to protect system and user data.
4.	Demonstrate systematic understanding of the concepts of security at the level of policy and strategy in a computer system.
COURSE OU	TCOMES:
CO. No	Course Outcome description
MCA331.1	Understand and apply concepts of Ethical hacking and footprinting
MCA331.2	To know the basics of System hacking and enumerations
MCA331.3	Differentiate the concepts of Trojans, viruses and worms
MCA331.4	To understand the vulnerabilities of web applications and monitor the hacks

]	MCA331.	5	T	'o unc	derst	and S	QL ir	ijecti	ons a	nd A	ndroi	d Hac	king			
(CO-PO A	ND C	0-PS	50 M/	APPI	NG										
		P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
	MCA331.1	1			1											2
	MCA331.2	1			2											2
	MCA331.3			1	2		1									3
	MCA331.4			1	2											3
	MCA331.5			1	2											3

MCA332 Web and Database Security

Course Code	MCA 332	Course Title	Web and Database Security									
Course Type	Elective	Contact Hours	6 Hours per Week									
Credit	4	Domain	Computer Security									
Syllabus												
I	I Introduction to Web Applications and Security, Profiling, Hacking Web Servers, the Threats – Classes of threats, the Hacker's Workbench, Cryptography and the Web, Digital Identifications.											
II	Privacy- protecting techniques, privacy- prot and antitheft. Web Server Security – Host sec	ecting techno urity for serv	ologies, Backups vers									
III	Securing web applications. Protecting an org safe hosts in a hostile environment, Intrusion	anization – detection.	Network layout,									
IV	Introduction to Database, Levels of Databa network/user interface, database application operating system, and physical level, Au Security, Application Security – SQL Injection	use Security n program, d thentication	- Human level, atabase system, and Password									
V	Securing Database-to-Database Communicati Passwords in scripts, insider/outsider attack super users, information leakage.	on, Trojans, s, users, proį	Encryption, grammers,									
REFERENC	E BOOKS:											
Joel Scambr Edition	ay, Mike Shema, Caleb Sima, Hacking Exposed	Web Applica	ations, Second									
Simson Gar	finkel, Gene Spafford, Web Security, Privacy &	Commerce, S	Second Edition									
Mike Shema	a, HackNotes(tm) Web Security Pocket Referer	nce										
Matt Bishop	o, "Computer Security: Art and Science", Pearso	on Education										
Fundament	als of Database Systems (3rd Ed.) - R.Elmasri,	S. Navathe										
An Introduc	ction to database systems (5th Ed.) - C. J. Date											
Database sy	/stem concepts – H. Kortn , A. Silberschatz	tan										
Socurity of	Data and Transaction, Vijay Atluri, Piorangela	tall Somoroti										
Computer S	Courity I ab Manual Vincent I Nestler Wm Ar	thur Conklir	Gregory B									
COURSE PE	RE-REOUISITES:		, aregory D.									
MCA104												

COURSE OBJECTIVES:

To understand the application of security concept to database technology and web technology.

COURSE OUTCOMES:

CO. No Course Outcome description

MCA332.1 Learn the Web application architecture, its components and potential security weaknesses.

MCA332.2 To impart knowledge about securing web application.

MCA332.3 Learn the levels of database security and SQL injection.

MCA332.4 Understand information leakage and securing database to database communication.

CO-PO AND CO-PSO MAPPING

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	P01	PO2	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3	PSO4	
MCA332.1																2	
MCA332.2	1									1						2	
MCA332.3	1															2	
MCA332.4										1						2	
																	-

MCA433 Cyber Forensics

Course Code	MCA 433	Course Title	Cyber Forensics
Course Type	Elective	Contact Hours	6 Hours per Week
Credit	4	Domain	Computer Security
Syllabus			
I	Over View of Computer Fo Fundamentals- Type of Comp and Computer Forensics Servi	rensics Techn uter Forensics ces	ology- Computer Forensics Technology- Type of Vendor
II	Duplication and preservation verification and Authentication	on of Digital n	Evidence-Computer image
III	Computer Forensics Analys Identification of data Reconstr	sis- Discovery ructing Past ev	y of Electronic Evidence- ents
IV	Investigating Network Intrus and Investigating logs, invest attacks. Router Forensics. Cvb	ions and Cybe igating networ er forensics to	er Crime, Network Forensics rk Traffic, Investigating Web ols and case studies
V	Counter measure: Information warfare of the Future-Advance	n warfare- Surv ed Computer F	veillance tool for Information orensics
REFERENC	E BOOKS:	-	
Computer I R. Vacca-Ch	Forensics: Computer Crime Scen narles River Media.	e Investigation	n (Networking Series) By John
Hacking Ex Solutions B	posed Computer Forensics, Sec y Aaron Philipp, David Cowen, (ond Edition : C Chris Davis- Mo	Computer Forensics Secrets & cGraw-Hill Osborne Media
Kenneth C. Group-200	Brancik "Insider Computer Frau 8.	ıd" Auerbach F	Publications Taylor & Francis
ChristofPaa Practitione	ar, Jan Pelzl, Understanding Cr rs, 2nd Edition, Springer's, 2010	yptography: A)	Textbook for Students and
Ali Jahang Counterme	iri, Live Hacking: The Ulti asures for Ethical Hackers & IT	mate Guide Security Exper	to Hacking Techniques & ts. Ali Jahangiri, 2009

Computer Forensics: Investigating Network Intrusions and Cyber Crime (EcCouncil Press Series: Computer Forensics), 2010

COURSE PRE-REQUISITES:

MCA302

COURSE OBJECTIVES:

- 1. Understand the fundamentals of computer forensics
- 2. Understand the legal aspects of forensics
- 3. Understand the relationship between IT and forensics

COURSE OUTCOMES:

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CO. No	Co	ourse Outcome description													
MCA433.1	In wi	terpr th id	et a entif	nd ap ying,	oprop acqu	oriate iiring	ely aj ;, exa:	pply minii	the l 1g an	aws d pre	and J senti	oroce ng dig	dures gital e	asso viden	ciated ce.
MCA433.2	Cr leg	eate gislat	a me tion a	ethod Ind ir	for ; dust	gathe ry tro	ering, ends	, asse spec	essing ific to	g and o the j	appl practi	ying i ice of	new a digita	nd ex Il fore	isting nsics.
MCA433.3	En foi	nploy fundamental computer theory in the context of computer rensics practices.													
MCA433.4	Ad sta	dhere to the ethical standards of the profession and apply those tandards to all aspects of the study and practice of digital forensics.													
MCA433.5	Ev	alua	te th	e effe	ctive	ness	of av	ailab	le dig	gital f	orens	sics to	ols ar	nd use	them
	in	a w	ay tl	nat o	ptim	izes	the e	efficie	ency	and	quali	ty of	digita	al for	ensics
	inv	vesti	gatio	ns	•				5		•	5	0		
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I	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	PO11	PO12	PSO1	PSO2	PSO3
MCA433.1 2	2	3	2												2
MCA433.2 2	2	2	3												2
MCA433.3	3														1
MCA433.4 1	L					3				1					3
MCA433.5 1	1	2			3										2

MCA434 Block-Chain Technology

Course Code	MCA434	Course Title	Block-Chain									
	Core Contact Hours 6 Hours no											
Course Type	Core	Contact Hours	6 Hours per Week									
Credit	4	Domain Information Sec										
Syllabus												
Ι	Basics: Distri	buted Database, 7	Гwo General Problem,									
	Byzantine Gen	eral problem and F	em and Fault Tolerance, Hadoop									
	Distributed Fi	le System, Distrib	uted Hash Table, ASIC									
	resistance, Tur	ing Complete.										
	Cryptography:	Hash function, Dig	gital Signature - ECDSA,									
	Memory Hard	Algorithm, Zero Kno	owledge Proof.									
II	Blockchain: I	ntroduction, Advan	tage over conventional									
	distributed d	latabase, Blockcha	ain Network, Mining									
	Mechanism, Di	istributed Consensu	is, Merkle Patricia Tree,									
	Gas Limit, Tr	ansactions and Fe	e, Anonymity, Reward,									

					Cha	ain P	olicy	, Lif	e of	Block	chair	ı app	licati	on, So	oft &	Hard
					For	·k, Pr	·ivat	e and	l Pub	lic bl	ockcł	nain.				
III					Dis	trib	uted	Co	nser	isus:	Hist	orv.	Distr	ibute	d Le	dger.
					Bit	coin	prot	ocols	s - Mi	ning	strate	egy an	d rev	vards	Ethe	reum
					- Co	nstr	nctio	n D		Smart	Cont	ract (GHOS	T Vu	Inerał	nility
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117					Cm	acks,	, Siuc	onar	. D oo	mlat	ion. (Stalza	halda	no D	ooto c	f Dit
IV						proo			Reg	guiat.		DIAKE		uchor		
						11, L 1	egai	ASL		-стур Баам			СУС	xchai	ige, i	
					Ma	гкет	and		Dal	Econ	omy.	Аррі	Icatio	ons: I	ntern	et or
					In	ngs,	Me	aical	Rec	cord	Mana	igeme	ent S	ysten	n, Do	main
					Na	me S	ervic	e an	d fut	ure o	t Bloc	ckchai	in.			
V	/ Practical: Naive Blockchain construction, Memory Hard algorithm - Hashcash implementation Direct Acycli															Hard
					alg	orith	m -	На	shca	sh ir	npler	nenta	tion,	Dire	ct Ad	zyclic
	Graph, Play with Go-ethereum, Smart Contrac															tract
	Construction, Toy application using Blockchain, Mining															ining
	puzzles.															
REFERE	REFERENCE BOOKS:															
Arvind N	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven															
Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction.																
Princeto	Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).															
Antonor	Princeton University Press (July 19, 2016). Antononoulos Mastering Bitcoin: Unlocking Digital Cryptocurrencies															
Satoshi	Naka	mot	o. Bit	coin	: A P	eer-t	o-Pe	er El	ectro	onic (Cash S	vster	n			
DR. Gavi	n W	ood.	"ETH	IERE	UM:	A Se	cure	Dece	entra	lized	Tran	sactio	on Lee	dger."	Yello	w
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CO. No					Co	urse	Out	com	e des	scrip	tion					
MCA434	1				То	unde	ersta	nd tł	ie ba	sics o	of has	h fun	ction	and d	ligital	
					sig	natu	re.									
MCA434	.2				То	dem	onst	rate	how	block	chair	n syste	em w	orks.		
MCA434	.3				То	unde	ersta	nd c	onse	nsus	mech	anisn	n in bl	lockcl	hain.	
MCA434	.4				То	unde	ersta	nd tł	ie wo	orkin	g of c	rypto	curre	ncy.		
MCA434	5				Int	eract	: witl	n a b	locko	chain	syste	m.		-		
CO-PO A	ND (CO-P	SO M	IAPP	ING											
	P01	PO2	P03	PO4	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3	
MCA434.1	3		2				1				2	2			2	
MCA434.2 MCA434.3	3		2				1				2	2			2	
MCA434.4			3				1				2	2			2	
MCA434.5			2				1				2	2			2	



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