ADIKAVI NANNAYAUNIVERSITY

RAJAHMAHENDRAVARAM

UNIVERSITY COLLEGE OF ENGINEERING

Regulations, Course Structure, Syllabus & Model Question Papers

MASTER OF COMPUTER APPLICATIONS
2 Years Course w.e.f. 2020-2021 A.B.

Department of Computer Science and Engineering

Board of Studies
University College of Engineering

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
UNIVERSITY COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Name of the Program: **Master of Computer Applications (MCA)**

Year of Establishment: **2006**

(1).Curriculum developed and implemented have relevance to the local, national, regional and global developmental needs which is reflected in Programme outcomes (POs), Programme Specific Outcomes(PSOs) and Course Outcomes(COs) of the Programmes offered by the University.

Adikavi Nannaya University has started Master of Computer Applications (MCA)programme in the year 2006 with an intake of 30 seats and is being successfully running, which was subsequently increased to 45 seats in the year 2017. This program gives exposure to its students, not only the regular curriculum but also to the aspirations of today's corporate world by inculcating a professional attitude.

This program has well-defined learning objectives including program outcomes, program specific outcomes and course outcomes. Curriculum development and delivery guidelines and norms relating to Choice Based Credit System (CBCS) are as per AICTE and UGC guidelines and norms. The course has been enriched by offering additional value-added courses and flexibility in choosing elective courses. The final semester students pursue dissertation/project work/internships in National Institutes, R&D Laboratories and Industries.

As a result, the program is well diversified and regularly upgraded to fulfill the needs of the local/ national/regional and global developments. This program is focused towards enhancing employability of the students.

The department has excellent research facilities in the core and emerging areas of Computer Science like Data Structures, Computer Networks, Advanced algorithms, Advanced architectures, Advanced Operating Systems, Advanced Database System, Microprocessors etc. Program outcomes are focused on proactive learning leading to enhanced communication skills, team building and nurturing cross breeding of ideas. All the programs are designed and implemented to use ICT enabled learning across departments.

The curriculum is also designed with Skill Development Courses, MOOCS, Summer Internship Programs for the effective outcome of the Student Community.

PROGRAM OUT COMES:

PO1: Computational Knowledge: Apply the knowledge of computing fundamentals to various real life applications to any given requirement.

PO2 Problem Analysis: Identify, formulate and solve complex computing problems reaching substantiated conclusions.

PO3 Development of Solutions: Design and evaluate solutions for complex computing problems with appropriate consideration.

PO4 Investigations of complex Computing problems: Use research-based knowledge and research methods for analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 Modern Tool Usage: Create, identify and apply appropriate techniques, resources, and modern computing tools to complex computing activities.

PO6 Professional Ethics: Understand and commit to professional ethics and cyber regulations for professional computing practices.

PO7 Life-long Learning: Identify the need and have the ability, to engage in independent learning as a computing professional.

PO8 Project management and finance: Understand and apply computing, management principles to manage multidisciplinary projects.

PO9 Communication Efficiency: Communicate effectively with the computing community and with society.

PO10 Societal and Environmental Concern: Understand and assess societal, environmental, health, safety, legal, and cultural issues.

PO11 Individual and Team Work: Function effectively in diverse teams and in multidisciplinary environments.

PO12 Innovation and Entrepreneurship: Identify a timely opportunity and using innovation to pursue that opportunity.

PROGRAM SPECIFIC OUTCOMES

PSO1: Apply the knowledge of computer application to find solutions for real-life application

PSO2: Ability to analyze, design, develop and maintain the software application with latest technologies

PSO3: Utilize skills and knowledge for computing practice with commitment on social, ethical, cyber and legal values.

PSO4: Inculcate employability and entrepreneur skills among students who can develop customized solutions for small to large Enterprises.

MASTER OF COMPUTER APPLICATIONS
2 Years Course w.e.f. 2020-2021
Department of Computer Science and Engineering

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UNIVERSITY COLLEGE OF ENGINEERING

ACADEMIC REGULATIONS

For

MASTER OF COMPUTER APPLICATIONS

2 years course with effect from 2020-2021 A.B.

Department of Computer Science and Engineering

BOARD OF STUDIES

University College of Engineering

UNIVERSITY COLLEGE OF ENGINEERING

As per GO MS No 44, course duration for MCA has been reduced from 3 years to 2 years and as per norms, Bridge course is mandatory for General B.Sc/B.Com/B.A Students.

I. ACADEMIC REGULATIONS

Applicable for the students of Master of Computer Applications-MCA, 2 years PG Programme admitted from the Academic Year 2020-21 onwards. The MCA Degree of Adikavi Nannaya University, Rajamahendravaram, shall be conferred on candidates who are admitted to the program and who fulfill all the requirements for the award of the Degree.

II.ELIGIBILITY FOR ADMISSIONS

The University College of Engineering offering MCA course since the inception of the University i.e., from 2006, As per Gov G.O MS No 44, the duration of the course is reduced from 3 years to 2 years and should be implemented for 2020-2021 AB.

Admission to the above program shall be made subject to eligibility, qualification and specialization as prescribed by the University from time to time. Admissions shall be made on the basis of merit rank obtained by the candidates at ICET examination, subject to reservations as laid down by the Govt. from time to time.

III.AWARD OF MCA DEGREE

A student shall be declared eligible for the award of the MCA Degree, if he/she pursues a course of study and completes it successfully in not less than Two academic years and not more than four academic years.

III.1The student shall register for all 100 credits and has to secure all the 100 credits.

III.2 The minimum instruction days in each semester are minimum of 16 weeks.

III.3 A Student, who fails to fulfill all the academic requirements for the award of the degree within 4 academic years from the year of their admission, shall forfeit his/her seat in MCA course.

IV.ATTENDANCE

A Student shall be deemed to have eligibility to write End Semester examinations if the student has put in a minimum of 75% of attendance in aggregate of all the subjects.

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IV.1 Condonation of shortage of attendance up to 10% i.e. 65% and above, and below 75% may be granted only on genuine and valid reasons on representations by the candidate with supporting evidence.

IV.2 Shortage of attendance below 65 % in aggregate shall in NO case be condoned and not eligible to write their end semester examination of that class.

IV.3 A candidate shall not be promoted to the next semester unless he/she fulfills the attendance requirements of the semester. A stipulated fee shall be payable towards condonation of shortage of attendance.

IV.4 A student shall not be promoted to the next semester unless he/she satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he/she shall not be eligible for readmission into the same class.

V.EVALUATION

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practical's, on the basis of Internal Exams and Semester End Examination.

V.1 For the theory subjects 75 marks shall be awarded based on the performance in the End Semester Examination and 25 marks shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the average of the marks secured in the two Mid Term-Examinations conducted as per academic calender released by Dean Academic Affairs of the University.

V.2 For practical subjects,50 marks shall be awarded based on the performance in the End Semester Examinations and 50 marks shall be awarded as internal marks, based on the day to day work-15 marks, Record-10 marks and the remaining 25 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the examiners, with a breakup marks of Procedure-10, Experimentation-20, Results-10 , Vivavoce-10

V.3 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he/she secures a minimum of 40% of marks in the End semester Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

V.4 In case the candidate does not secure the minimum academic requirement in any subject he/she has to reappear for the End semester Examination in that subject.

V.5 Laboratory examination for MCA courses must be conducted with two Examiners, Internal Examiner is,Laboratory Class Teacher or teacher of the respective college and the External Examiner shall be appointed by the university BOS.

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VI. *Mandatory*

For students of General BA, B.Com, BSc, the students has to complete Bridge course as a part of their curriculum in the Ist semester Itself.

Students *has to complete two skill development courses as the part of their curriculum designed by the Board of Studies*

In the First semester students were given choice through MOOCs to complete the Skill Development course.

In the second semester Python programming was introduced as a Skill Development course.

Students as a part of their curriculum should complete one Summer Internship Program at the end of second semester,the evaluation of this will be done in IIIrd semester.

VII. EVALUATION OF PROJECT/DISSERTATION WORK

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Concerned guide.

VII. 1Registration of Project Work

A candidate is permitted to take the project work in the IVth semester .candidate has to submit, in consultation with his/her project supervisor, the title, objective and plan of action of his project work to the Department with the concern of Guide allotted to them.

VII.2 The student can initiate the Project work, only after obtaining the approval from the concerned guide after the IIIrd semester end examinations. The duration of the project is for one semester.

VII.3 The work on the project shall be initiated at the beginning of the IVth semester and the duration of the project is one semester. A candidate is permitted to submit Project Thesis only after the approval of Guide not earlier than 16 weeks from the date of registration of the project work.

VIII. Award of Grades

The Marks thus obtained will be converted to grades on a 10.0 point scale and then to semester grade point average (SGPA) and subsequently cumulative grade point average (CGPA) is awarded at the end of the course.

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S.No.	Range of Marks (%)		Grade	Grade Points	Description
01	≥ 90	≤100	O	10	Outstanding
02	≥80	< 90	A+	9	Excellent
03	≥ 70	< 80	A	8	Very Good
04	≥ 60	< 70	B+	7	Good
05	≥ 55	< 60	B	6	Average
06	≥ 50	< 55	C	5	Pass
08	< 50		F	0	Fail
09	Not Appeared for Exam				(Ab)Absent

Cumulative Grade Point Average (CGPA) will be calculated from I semester onwards up to the final semester. CGPA multiplied by "10" gives aggregate percentage of marks obtained by a candidate.

The performance of a student at the end of the each semester is indicated in terms of Semester Grade Point Average (SGPA). The SGPA is calculated as below:

Calculation of SGPA(Semester Grade Point Average)

$$SGPA = \frac{\text{Sum of Products of Grade Points and Credits of all the concerned subjects}}{\text{Sum of credits of all the subjects in the semester}}$$

$$= \frac{\sum_{1}^{n} (GP * Credits)}{\sum_{1}^{n} (Credits)}$$

Where 'n' is the total number of subjects, GP is Grade Points

Calculation of CGPA(Cumulative Grade Point Average)

$$CGPA = \frac{\text{Sum of Products of Grade Points and Credits of all the concerned subjects of all Semesters}}{\text{Sum of credits of all the subjects in all the Semesters}}$$

$$= \frac{\sum_{1}^{s} \sum_{1}^{n} (GP * Credits)}{\sum_{1}^{s} \sum_{1}^{n} Credits}$$

SGPA is calculated for the candidates who have passed in all the subjects in that semester. CGPA is calculated for those who clear all the subjects in all the previous semesters.

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IX. Award of Degree

A candidate shall be declared to have passed in a subject / paper, if the candidate secures a minimum of "C" grade in theory examination and the practical examination / Project / Field Work / Viva-Voce / Industrial Training / Seminar.

Further, a candidate has to secure a minimum of 40% in theory examination (excluding sessional marks) and a minimum of 50% (excluding sessional marks) in the practical examination / Project / Field Work / Viva-Voce / Industrial Training / Seminar in Semester-end examinations, and a total of 50% of both internal and External examinations.

X. Award of Class

A candidate, who becomes eligible for the award of MCA Degree, shall be placed in one of the following classes.

S.No	Class	CGPA
1	First Class with Distinction	CGPA ≥ 7.0 *
2	First Class	$6.0 \leq CGPA < 7.0$
3	Second Class/Pass	$5.0 \leq CGPA < 6.0$

*First class with Distinction will be awarded only to those students who clear all the subjects of the program in first attempt of regular examinations.

XI. Eligibility for Award of MCA Degree

A student shall be eligible for the award of the MCA degree if he/she fulfills all the following conditions:

XI.1 The student is declared to have passed all the subjects (theory and practical subjects) included in the Scheme of Examination of 4 Semestersand should secure a minimum CGPA of 5.0.

XI.2 Registered and successfully completed all the components prescribed for eligibility in the Programme of study to which candidate is admitted within the stipulated period.

XI.3 No disciplinary action is pending against him/her.

_XI.4_ Has no dues to the University including hostels.

XI.5 Students, who fail to complete their MCAProgramme within***Four***academic years from the year of their admission or fail to acquire the credits stipulated for the programme shall forfeit their seat in MCAProgramme and their admission shall stand cancelled.

XII. _WITHHOLDING OF RESULTS_

If the student has not paid the dues, if any, to the university or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

XIII. _TRANSITORY REGULATIONS_

Discontinued or detained candidates are eligible for readmission within the duration of one year as and when next offered.

The readmitted students will be governed by the regulations under which the candidate has been admitted.

XIV. _Malpractices_

The Controller of Examinations shall refer the cases of suspected malpractices in mid examinations and semester-end examinations to Malpractice Enquiry Committee constituted by the University. Such committee shall follow the approved scales of punishment. The Principal shall take necessary action against the erring students based on the recommendations of the committee.

XV. Amendments to Regulations:

The University may, from time to time, revise, amend, or change the Regulations, Schemes of Examinations, and / or Syllabi and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

XVI. Guidelines for mandatory internships

XVI.1. One summer internship of eight weeks / two months duration at the end of second semester is mandatory. The internship can be done by the students at local industries, Govt. Organizations, software MNCs, in the depart itself /through MOOCS basing on the decision of the guide allotted to the student.

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XVI.2

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a detailed project report to the concerned department with the concern of the guide and appear for an oral presentation before the departmental committee. The report will carry 40% and presentation will carry 60% weightage towards the final evaluation. Evaluation of summer Internship will be done at the end of IIIrd semester.

Completion of internship is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student has to repeat the internship.

XVII Guidelines for Skill oriented

For skill oriented course, one theory and 2 practical hours may be allotted or two theory hours may be adopted as per the decision of concerned BOS.

A pool of interdisciplinary job-oriented skill courses shall be prepared by Board of studies and the syllabus along with the pre requisites shall be prepared for each of the requirements of laboratory infrastructure.

The credits assigned to the skill course shall be awarded to the student upon producing the certificate of skill from the agency/professional bodies as approved by the Board of studies.

If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the concerned board of studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.

MOOC Guidelines

1. A student shall select any one course of his/her choice and should be approved by the BOS.
2. A student can complete the course at his/her own place, under the guidance of a faculty member (Internal Guide for the Project).
3. The assessment of MOOC will follow the same rule for lab practical examination.
4. The minimum hours should not be less than 30 to 40 hours and course completion certificate is mandatory.
   Students can register in any of the MOOC s Platform (NPTEL, Swayam, EdX, Course era, Udemy or any other MOOC Platform-preferably Sway am)

5. As MOOC aligns closer with Practical Exam, Pass or Fail status in the MOOC will be on par with Practical Exam Guidelines of PG as approved by the Joint Board.

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6. It is not mandatory to specify in the marks memo the course in which certification is obtained as the courses change from year to year.
7. The above guidelines are subject to change from time to time to comply with the UGC/AICTE guidelines, any other academic regulatory body at the state/center and academic body of the University.

XVIII.Bridge Course: As per GO MS No 44,course duration for MCA has been reduced from 3 years to 2 years and as per norms, Bridge course is mandatory.

All the General B.A, B.Com, B.Sc Students joined in the 2 year MCA course should complete the bridge course which is mandatory in the Ist semester. The credits allotted for Bridge course will not be considered for SGPA calculation, but the student has to pass with a minimum of 50% marks.

XXV. MCA Project Guidelines

Every Student has to do the project work as the part of the curriculum in their IVth semester.

Every student is required to carry out Project work under the supervision of a project Guide allotted to them.

The student should be under continuous assessment of the project guide.

The student is required to present the progress of the Project work during the semester as per the schedule provided by the department.

The students who were willing to do their project in any Company/Industry, they are required to submit the letter given by the concerned Company/Industry and should be under continuous assessment of the guide allotted to them in the Company/Industry and also the internal guide allotted to them in the department.

All the students are encouraged to publish at least 1 paper on their work in the journals approved by UGC preferably.

All the students should strictly follow the attendance maintained by their respective guides.

All the students should follow the schedule given by the department and should compulsory attend the reviews without fail.

In case of any misconduct or irregularity Guide and HOD's decision is final whether to allow the student for final viva or not.

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ORGANIZATION OF PROJECT REPORT IN IVTH SEMESTER

1. Title page
2. Certificate
3. Certificate issued by outside organization if any
4. Acknowledgements
5. Abstract
6. Index
7. List of Figures
8. List of Tables
9. Body of the Project Report as follows:

   1. Introduction to the problem
   2. State of the Art/Literature Survey
   3. Requirement Analysis and Design
   4. Implementation
   5. Results along with test cases
   6. Conclusions and Future Work
   7. Bibliography

Every copy should be accompanied by a softcopy in CD along with required software and tools. No. of copies are **1 for Guide, 1 for Library and 1 copy for student (Total 3 copies)**

Persian blue cover should be used for binding.

Page No's should be in the centre 11 font Times New Roman.

All the Page Headings 16 Bold Times New Roman.

- o Side Headings 14 Times New Roman
- o Side Sub-Headings 12 Times New Roman
- o Any body text content is 11 font Times New Roman 1.5 Paragraph spacing

General

The academic regulations should be read as a whole for the purpose of any interpretation. He or She will be interpreted for the student.

In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice Chancellor is final.

Branch/Course: Master of Computer Applications(w.e.f. 2020)

Course Structure
Semester I (First Year) Curriculum

Code	Course Title	Max Marks		Total Marks	Hours per week		Credits
		External	Internal		Theory	Practical	
MCA-20101	Discrete Mathematical Structures	75	25	100	4	-	4
MCA-20102	Management Accountancy	75	25	100	4	-	4
MCA-20103	C Programming & Data Structures	75	25	100	4	-	4
MCA-20104	Computer Organization	75	25	100	4	-	4
MCA-20105	Operating Systems	75	25	100	4	-	4
MCA-20106	Design & Analysis of Algorithms	75	25	100	4	-	4
MCA-20107	C Programming & Data Structures Lab	50	50	100	-	3	2
MCA-20108	Operating Systems and Computer OrganizationLab	50	50	100	-	3	2
MCA-20109	Skill Development Course/ MOOCS	50	50	100	-	3	2
MCA-20110	**Bridge Course*** Fundamentals of Computers (For General B.Sc/B.A./B.Com Students)	75	25	100	4	-	4
MCA-20111	**Bridge Course Lab*** Fundamentals of Computers Lab (For General B.Sc/B.A./B.Com Students)	50	50	100	-	3	2
	Total Credits						30

Note: All the General B.Sc/B.A./B.Com Students must pass the **Bridge Course(MCA-20110) and Bridge Course Lab (MCA-20111)** with minimum 50% marks, but the credits allotted for that courses will not be considered for SGPA calculation.

Semester II (First Year) Curriculum

Code	Course Title	Max Marks		Total Marks	Hours per week		Credits
		External	Internal		Theory	Practical	
MCA-20201	Computer Networks	75	25	100	4	-	4
MCA-20202	Object Oriented Programming through JAVA	75	25	100	4	-	4
MCA-20203	Database Management Systems	75	25	100	4	-	4
MCA-20204	Formal Languages and Automata Theory	75	25	100	4	-	4
MCA-20205	Data Mining Concepts and Techniques	75	25	100	4	-	4
MCA-20206	Elective-I 1.Artificial Intelligence and Expert Systems 2.Internet of Things 3.Image Processing	75	25	100	4	-	4
MCA-20207	Object Oriented Programming through JAVA Lab	50	50	100	-	3	2
MCA-20208	Database Management Systems Lab	50	50	100	-	3	2
MCA-20209	Skill Development Course with Python	50	50	100	1	2	2
	Total Credits						30

Note:2 lab Hrs and 1 Theory Hrs/Week or 2 Theory Hrs/ Week for Skill Development Course and only Lab Exam will be conducted

Summer Internship (Mandatory) after First Year (to be evaluated during IIIsemester).

Semester III (Second Year) Curriculum

Code	Course Title	Max Marks		Total Marks	Hours Per Week		Credits
		External	Internal		Theory	Practical	
MCA-20301	Information Security and Cryptography	75	25	100	4	-	4
MCA-20302	Big Data Analytics	75	25	100	4	-	4
MCA-20303	Object Oriented Software Engineering	75	25	100	4	-	4
MCA-20304	Web Technologies	75	25	100	4	-	4
MCA-20305	Elective II 1. Blockchain Technology 2. Cloud Computing 3. Machine Learning and Deep Learning	75	25	100	4	-	4
MCA-20306	Elective-III 1.Business Intelligence and Visualization 2. Robotics 3.Foundations of Data Science	75	25	100	4	-	4
MCA-20307	Web Technologies and Object Oriented Software Engineering Lab	50	50	100	-	3	2
MCA-20308	Big Data Analytics lab	50	50	100	-	3	2
MCA-20309	Innovation, Entrepreneurship and Intellectual Property Rights	-	50	50	2	-	0
MCA-20310	Summer Internship	50	50	100	-	-	2
	Total Credits						30

Note: Summer Internship 2 Months (Mandatory) after First Year (to be evaluated during IIIsemester).

Semester IV (Second Year) Curriculum

Code	Course Title	Max Marks		Total Marks	Hours Per Week		Credits
		Internal	External		Theory	Practical	
MCA-20401	Project	150	200	350	-	-	10
	Total Credits						10

Semester I (First Year) Curriculum

Code	Course Title	Max Marks		Total Marks	Hours per week		Credits
		External	Internal		Theory	Practical	
MCA-20101	Discrete Mathematical Structures	75	25	100	4	-	4
MCA-20102	Management Accountancy	75	25	100	4	-	4
MCA-20103	C Programming & Data Structures	75	25	100	4	-	4
MCA-20104	Computer Organization	75	25	100	4	-	4
MCA-20105	Operating Systems	75	25	100	4	-	4
MCA-20106	Design & Analysis of Algorithms	75	25	100	4	-	4
MCA-20107	C Programming & Data Structures Lab	50	50	100	-	3	2
MCA-20108	Operating Systems and Computer OrganizationLab	50	50	100	-	3	2
MCA-20109	Skill Development Course/ MOOCS	50	50	100	-	3	2
MCA-20110	**Bridge Course*** Fundamentals of Computers (For General B.Sc/B.A./B.Com Students)	75	25	100	4	-	4
MCA-20111	**Bridge Course Lab*** Fundamentals of Computers Lab (For General B.Sc/B.A./B.Com Students)	50	50	100	-	3	2
	Total Credits						30

Note: All the General B.Sc/B.A./B.Com Students must pass the **Bridge Course (MCA-20110) and Bridge Course Lab (MCA-20111)** with minimum 50% marks, but the credits allotted for that courses will not be considered for SGPA calculation.

Course Code &Title: MCA-20101 DISCRETE MATHEMATICAL STRUCTURES Semester: I Course Index: C101

Course Objectives:
The learning objectives of this course are:

Course Objectives
Learn about introduction of discrete mathematical structures.
Learn the Counting Techniques and Recurrence relations.
Learn about in detail about Graphs and Trees.
Learn about Boolean Algebra and Models of Computation.

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C101.1	Understand about introduction of discrete mathematical structures.
C101.2	Understand the Counting Techniques and Recurrence relations.
C101.3	Understand about in detail about Graphs and Trees.
C101.4	Understand about Boolean Algebra and Models of Computation.

MCA-20101 DISCRETE MATHEMATICAL STRUCTURES

Instruction: 4 Periods/week	**Time: 3 Hours**	**Credits: 4**
Internal: 25 Marks	**External: 75 Marks**	**Total: 100 Marks**

UNIT I

Introduction: Logic-Prepositional Equivalences-Truth tables-Tautologies-Predicates and Quantifiers-Sets-Operations on sets-Sequences and Summations -Growth functions - relations and their properties- binary relations and their applications - Representation of relations-Closures of relations-Equivalence relations-Partial Orderings.

UNIT II

Counting Techniques: Basics of Counting- Pigeonhole Principle- Combinations and Permutations-Generalized Permutations and Combinations

Recurrence relations: Solving Recurrence Relations-Divide and Conquer relations-Inclusion and Exclusion-Applications of Inclusion-Exclusion.

UNIT III

Graphs: Introduction to Graphs-Terminology-Relations and Directed Graphs Representations of Graphs- Isomorphism-Connectivity- Euler and Hamiltonian Paths- Shortest Path problems- Planar Graphs- Graph Coloring.

Trees: Introduction to trees- Applications of trees- Traversals-Trees and sorting Spanning Trees-Minimum Spanning Trees.

UNIT IV

Boolean Algebra and Models of Computation: Boolean Functions- Representing Boolean Functions -Logic Gates-Minimizations of Circuits-Languages and Grammars- Finite State Machines with and with no output.

Text Book:

1. Discrete Mathematics and its applications*,* Keneth. H. Rosen, Tata McGraw-Hill Publishing Company, New Delhi

Reference Books:

1. Discrete Mathematics for Computer Scientists & Mathematicians, Joe L.Mott, Abraham Kandel& T. P. Baker,Prentice Hall of India Ltd, New Delhi

2. Discrete mathematics*,* Richard Johnsonbaug, Pearson Education, New Delhi

Course Code &Title: MCA-20102 MANAGEMENT ACCOUNTANCY Semester: I Course Index: C102

Course Objectives: The learning objectives of this course are:

Course Objectives
Learn the basic concept of Principles Of Accounting and Final Accounts.
Learn about in detail about Ratio Analysis.
Learn about the concepts of Costing, Budget and Budgetary Control, Marginal Costing.
Learning the Introduction To Computerized Accounting System.

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C102.1	Understand the basic concept of Principles Of Accounting and Final Accounts.
C102.2	Understand about in detail about Ratio Analysis.
C102.3	Understand about the concepts of Costing, Budget and Budgetary Control, Marginal Costing.
C102.4	Understanding the Introduction To Computerized Accounting System.

MCA-20102 MANAGEMENT ACCOUNTANCY

Instruction: 4 Periods/week **Time: 3 Hours** **Credits: 4**
Internal: 25 Marks **External: 75 Marks** **Total: 100 Marks**

UNIT I

Principles of Accounting: Nature and Scope of Accounting, Double Entry System of accounting introduction to Basic Books of Accounts of Sole Proprietary Concern, closing of books of accounts and Preparation of Trial Balance.

Final Accounts: Trading, Profit and Loss Accounts and Balance Sheet of Sole Proprietary Concern with Normal Closing Entries (With numerical problems).

UNIT II

Ratio Analysis: Meaning, Advantages, Limitations, Types of Ratio and their usefulness. (Theory only)Fund Flow Statement: Meaning of the Term Fund, Flow of Fund, Working Capital Cycle, Preparation and Inter-preparation of Statement.

UNIT III

Costing: Nature, Importance and Basic Principles. Budget and Budgetary Control: Nature and Scope, Importance, Method of Finalization and Master Budget, Functional Budgets.

Marginal Costing: Nature, Scope, Importance, Construction of Break Even Chart, Limitations and uses of Break Even Chart, practical applications of marginal costing(with numerical problems).

UNIT IV

Introduction to Computerized Accounting System: Coding Logic and Codes Required, Master Files, Transaction Files, Introduction to documents used for data collection, processing of different files and outputs obtained.

TEXTBOOKS:

1.Introduction to Accountancy.T.S. Grewal.

2.Management Accountancy, S.P.Jain.

REFERENCE BOOK:

1. Introduction to Accounting,G.Agarwal.

Course Code &Title: MCA-20103 C PROGRAMMING AND DATA STRUCTURES
Semester: I
Course Index: C103

Course Objectives:
The learning objectives of this course are:

Course Objectives
Learn the Fundamentals and Basic concepts of C Programming.
Learn about in detail about Arrays, Functions and Pointers.
Learn the concepts of Derived Data Types and Data Structures.
Learn the concepts of Linked Lists, Trees, Graphs, Searching and Sorting.

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C103.1	Understand the Fundamentals and Basic concepts of C Programming.
C103.2	Understand about in detail about Arrays, Functions and Pointers.
C103.3	Understand the concepts of Derived Data Types and Data Structures.
C103.4	Understand the concepts of Linked Lists, Trees, Graphs, Searching and Sorting.

MCA-20103: C PROGRAMMING AND DATA STRUCTURES

Instruction: 4 Periods/week	**Time: 3 Hours**	**Credits: 4**
Internal: 25 Marks	**External: 75 Marks**	**Total: 100 Marks**

UNIT-I

Introduction to Computers, Algorithm, flowchart, program development steps, Structure of C program, A Simple C program, identifiers, basic data types and sizes, Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation. Control structures such as if, go to, labels, and switch statements. Loops- while, do-while and for statements, break, continue.

UNIT-II

Arrays: Arrays - declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1- D arrays, 2-D arrays – 2-D and character arrays – Multidimensional arrays. **Functions:** basics, parameter passing, storage classes- scope rules, user defined functions, standard library functions, recursive functions, header files, C pre-processor.

Pointers: Concepts, initialization of pointer variables, pointers and Function arguments, passing by address –dangling memory, Character pointer s and functions, pointer s to pointer s, pointer s and multidimensional arrays, dynamic memory management functions, command line arguments.

UNIT-III

Derived types: structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typed of, bit-fields, Input and output – concept of a file, text files and binary files, Formatted I/o, file I/o operations.

Data Structures: Introduction to Data Structures – Stacks: Definition, Stack implementation one application; Queues: Definition, Queue implementation and types of Queues.

UNIT-IV

Linked Lists: Single Linked List- Definition, implementation; Double Linked List- Definition, implementation. **Trees:** Binary Trees- representation, traversals. **Graphs:** Introduction, representation, traversals. **Searching:** Linear Searching and Binary Searching. **Sorting:** Bubble Sort, Quick Sort and Merge Sort.

TEXT BOOKS:

1. C and Data Structures: A snapshot oriented treatise using live engineering examples, N B Venkateswarlu, E. V Prasad, S Chand &Co.
2. Let Us C, YashwantKanetkar, BPB Publications, 5th Edition.
3. Computer science, A structured programming approach using C, B.A. Forouzan and R.F.Gilberg, Third edition, Thomson.

REFERENCE BOOKS:

1. Fundamentals of Data Structures in C, Horowitz, Sahni, Anderson-Freed, 2nd ed,2008.

2. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson.

Course Code &Title: MCA-20104 COMPUTER ORGANIZATION Semester: I Course Index: C104

Course Objectives:
The learning objectives of this course are:

Course Objectives
Learn the basics of Digital Logic Circuits and Digital Components.
Learn about the Concepts of Data Representation, Register Transfer and Micro Operations.
Learn the concept of Basic Computer Organization and Design and Central Processing Unit.
Learn about the concept of Input /Output Organization and Memory Organization.

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C104.1	Understand the basics of Digital Logic Circuits and Digital Components.
C104.2	Understand about the Concepts of Data Representation, Register Transfer and Micro Operations.
C104.3	Understand the concept of Basic Computer Organization and Design and Central Processing Unit.
C104.4	Understand about the concept of Input /Output Organization and Memory Organization.

MCA-20104 COMPUTER ORGANIZATION

Instruction: 4 Periods/week	**Time: 3 Hours**	**Credits: 4**
Internal: 25 Marks	**External: 75 Marks**	**Total: 100 Marks**

UNIT-I

Digital Logic Circuits:

Digital Computers, Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuit, Flip-flops Sequential Circuits.

Digital Components:

Integrated Circuits, Decoders, Multiplexes, Registers, Shift Registers, Counters, Memory Unit.

UNIT-II

Data Representation:

Data Types, Complements, Fixed-point Representation, Floating point Representation.

Register Transfer and Micro Operations:

Register Transfer Language, Register Transfer, Bus and Memory Transfer, Arithmetic Micro Operations, Assembly language Instructions, 8085 Microprocessor Instruction Set,8085 Architecture.

UNIT-III

Basic Computer Organization and Design:

Instruction Codes, Computer Register, Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input-Output, Interrupt.

Central Processing Unit:

Introduction, General Register Organization, Stack Organization, Instruction formats, addressing modes.

UNIT-IV

Input /Output Organization:

Peripherals Devices, I/O Interface, Asynchronous Data Transfer, Mode of Transfer, Priority Interrupt, Direct memory access, Input – Output Processor(IOP).

Memory Organization:

Memory Hierarchy, Main memory, Auxiliary Memory, Associate Memory, Cache Memory and Virtual Memory.

Text Books:
1.Computer System Architecture, M.Morris Mano, Prentice Hall of India Pvt.ltd. Third Edition, Sept. 2008.
2. B. Ram, "Fundamentals of Microprocessors and Microcomputers", Dhanpat Rai Publications.
Reference Books:
1.Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd. Eastern Economy Edition, Sixth Edition, 2003.
2.Computer System Architecture John P. Hayes.

Course Code &Title: MCA-20105 OPERATING SYSTEMS Semester: I Course Index: C105	
Course Objectives: The learning objectives of this course are:	
Course Objectives	
Learn the concept of Introduction to Operating Systems and Process Management.	
Learn about Process Synchronization and Deadlocks in detail.	
Learn about the concept of Memory Management, File System Implementation, Mass-storage structure.	
Learn the concept of Protection and Case Study.	

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C105.1	Understand the concept of Introduction to Operating Systems and Process Management.
C105.2	Understand about Process Synchronization and Deadlocks in detail.
C105.3	Understand about the concept of Memory Management, File System Implementation, Mass-storage structure.
C105.4	Understand the concept of Protection and Case Study.

MCA-20105 OPERATING SYSTEMS

Instruction: 4 Periods/week **Time: 3 Hours** **Credits: 4**
Internal: 25 Marks **External: 75 Marks** **Total: 100 Marks**

UNIT I

Introduction: Definition of Operating System, Types of Operating Systems, Operating System Structures, Operating-System Services, System Calls, Virtual Machines, Operating System Design and Implementation.

Process Management: Process Concepts, Operations on Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple - Processor Scheduling. Thread Scheduling.

UNIT II

Process Synchronization: The Critical Section Problem, Semaphores, And Classical Problems of Synchronization, Critical Regions, Monitors, Synchronization examples.

Deadlocks: Principles of Deadlocks, System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance, Detection & Recovery from Deadlocks.

UNIT III

Memory Management: Logical Versus Physical Address, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing

File System Implementation: Concept of a file, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers.

Mass-storage structure: overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.

UNIT IV

Protection: Goals and Principles of Protection, Access matrix implementation, Access control, Revocation of access rights.

Case study: LINUX, Windows Operating Systems.

Text Book:
1. Operating System Principles by Abraham Silberschatz, Peter Galvin, Greg Gagne.
Seventh Edition, Wiley Publication
Reference Books:
1. Operating Systems, William Stallings 5th Edition - PHI
2. Modern Operating Systems, Andrew S.Tanenbaum, 2nd edition, 1995, PHI.
3. Operating Systems - A concept based approach, Dhamdhere, 2nd Edition, TMH, 2006.
4. Understanding the Linux Kernel, Daniel P Bovet and Marco Cesati, 3rd Edition,' Reilly, 2005.

Course Code &Title: MCA-20106 DESIGN AND ANALYSIS OF ALGORITHMS	
Semester: I	
Course Index: C106	
Course Objectives:	
The learning objectives of this course are:	
Course Objectives	
To learn about the Asymptotic Notations, Mathematical Analysis of Non-recursive and recursive Algorithms and sorting techniques.	
To learn about the Divide-and-Conquer technique, Decrease-and-Conquer and Transform-and-Conquer techniques.	
To learn about the Dynamic Programming and Greedy Technique	
To learn about the Decision Trees, P, NP and NP- complete problems, Backtracking, Branch-and-Bound, Approximation Algorithms for NP-hard Problems.	
Course Outcomes:	
By the end of the course, the student will be	
C106.1	Understand about the Asymptotic Notations, Mathematical Analysis of Non-recursive and recursive Algorithms and Selection Sort and Bubble sort, Sequential Search and Exhaustive Search.
C106.2	Understand about the Divide-and-Conquer technique, Decrease-and-Conquer and Transform-and-Conquer techniques.
C106.3	Understand the Optimal Binary Search Trees, The Knapsack Problem Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm.
C106.4	Understand about the Decision Trees, P, NP and NP- complete problems, Backtracking, Branch-and-Bound, Approximation Algorithms for NP-hard Problems.

MCA-20106 DESIGN AND ANALYSIS OF ALGORITHMS

Instruction: 4Periods/week **Time: 3Hours** **Credits: 4**
Internal: 25Marks **External: 75Marks** **Total: 100Marks**

UNIT I

Introduction: Fundamentals of algorithmic problem solving, important problem types.

Fundamentals of analysis of algorithms and efficiency: Analysis framework, Asymptotic Notations and Basic Efficiency classes, Mathematical Analysis of Non-recursive Algorithms, Mathematical Analysis of recursive Algorithms, Empirical Analysis of Algorithms, Algorithm Visualization.

Brute Force: Selection Sort and Bubble sort, Sequential Search and Exhaustive Search.

UNIT II

Divide-and-Conquer: Merge Sort, Quick sort, Binary Search, Binary Tree Traversals and Related Properties.

Decrease-and-Conquer: Insertion Sort, Depth-First Search and Breadth-First Search-Topological Sorting, Decrease-by-a-Constant-Factor Algorithms.

Transform-and-Conquer: Balanced Search Trees, Heaps and Heap sort, Problem Reduction.

UNIT III

Dynamic Programming: Warshall's and Floyd's Algorithm, Optimal Binary Search Trees, The 0/1 Knapsack Problem and Memory Functions.

Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm

UNIT IV

Limitations of Algorithm Power: Decision Trees, P, NP and NP- complete problems.

Coping with the Limitations of Algorithms Power: Backtracking-n-queens problem, Hamiltonian circuit problem, Subset-sum problem. Branch-and-Bound- The Knapsack Problem, Travelling salesperson problem, Approximation Algorithms for NP-hard Problems.

Text Book:

1. Introduction to Design & Analysis of Algorithms by Anany Levitin, Pearson Education, New Delhi, 2003

Reference Books:

1. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ron ald R. Rivest& Clifford Stein, Prentice Hall of India, NewDelhi.
2. The Design and Analysis of computer Algorithms, Aho, Hopcroft & Ullman, Pearson Education, New Delhi, 2003
3. Fundamentals of algorithmics, Gilles Brassard & Paul Bratley, Prentice Hall of India, NewDelhi

Course Code &Title: MCA-20107 C PROGRAMMING AND DATA STRUCTURES LAB
Semester: I
Course Index: C107

Course Objectives:

The learning objectives of this course are:

Course Objectives
Learn how to write code for different types of programs using C Programming.
Learn how to write code programs of Data Structures.
Learn how to write/code and own programs using C Programming.

Course Outcomes:

By the end of the course, the student will be

Course Index	Course Outcomes
C107.1	Able to write code for different types of programs using C Programming.
C107.2	Able to write code programs of Data Structures.
C107.3	The students are able to write/code and own programs using C Programming.

MCA-20107: C PROGRAMMING AND DATA STRUCTURES LAB

Instruction: 3Hrs/week	**Time: 3Hours**	**Credits: 2**
Internal: 50 Marks	**External: 50 Marks**	**Total: 100Marks**

1. Write a C program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What is the output from your program if the three given points are in a straight line?

2. Write a C program which generates 100 random numbers in the range of 1 to 100. Store them in an array and then print the array. Write 3 versions of the program using different loop constructs (eg. for, while and do-while).

3. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int, long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?

4. Write a C program which generates 100 random real numbers in the range of 10.0 to 20.0and sort them in descending order.

5. Write a C function for transporting a square matrix in place (in place means that you are not allowed to have full temporary matrix).

6. Write a C function, which will invert a matrix.

7. Write a set of string manipulation functions eg. for getting a sub-string from a given position, copying one string to another, reversing a string and adding one string to another.

8. Write a C program for sorting a list using Bubble sort and then apply binary search.

9. Write a C program to implement the operations on stacks.

10.Write a C program to implement the operations on circular queues.

11.Write a C program for the representation of polynomials using circular linked list and for the addition of two such polynomials.

12.Write a C program for quick sort.

13.Write a C program for Merge sort.

14.Write a C program to create a binary search tree and for implementing the in order, preorder, Post order traversal using recursion.

15.Write a C program for finding the Depth First Search of a graph.

16.Write a C program for finding the Breadth First Search of a graph.

REFERENCE BOOKS:
1. Let Us C,Yashwant Kanetkar, BPB Publications, 5th Edition.
2.Computer Science, A structured programming approach using C", B.A.ForouzanandR.F.Gilberg, 3rd Edition, Thomson, 2007.
3. The C –Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI
4. Data Structures and Algorithms, 2008,G.A.V.Pai, TMH
5. Classic Data Structures, 2/e, Debasis,Samanta,PHI,2009

Course Code &Title: MCA-20108 OPERATING SYSTEMS AND COMPUTER ORGANIZATION LAB **Semester: I** **Course Index: C108**	
Course Objectives: The learning objectives of this course are:	

Course Objectives
Learn how to write code in UNIX operating system using some basic commands.
Learn how to write code some basic programs using Shell Programming.
Learn how to write/code different types of algorithms using C/C++/JAVA.
Learn how to do Digital Logic Design Experiments
Learn how to do 8085/86AssemblyLanguage Programs

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C108.1	The students able to write code in UNIX operating system using some basic commands.
C108.2	The students able to write code some basic programs using Shell Programming.
C108.3	The students are able to write/code different types of algorithms using C/C++/JAVA.
C108.4	The students able to do Digital Logic Design Experiments
C108.5	The students able to write 8085/86AssemblyLanguage Programs

MCA-20108 OPERATING SYSTEMS AND COMPUTER ORGANIZATION LAB

Practical: 3 Periods /week   **Time: 3 Hours**   **Credits: 2**
Internal: 50 Marks   **External: 50 Marks**   **Total: 100 Marks**

OPERATING SYSTEMS LAB

1. Basic UNIX commands
Implement the following using Shell Programming
2. Input number even or odd.
3. Count the number of lines in the input text.
Implement the following using C/C++/JAVA
4. FCFS CPU scheduling algorithm.
5. SJF CPU scheduling algorithm.
6. Round Robin CPU scheduling algorithm.
7. Priority CPU scheduling algorithm.
8. Implement Semaphores.
9. Bankers Algorithm for Dead Lock Avoidance
10. FIFO Page Replacement Algorithm

REFERENCE BOOKS:

1. Operating System Principles by Abraham Silberschatz, Peter Galvin, Greg Gagne. Seventh Edition, Wiley Publication
2. Understanding the Linux Kernel, Daniel P Bovet and Marco Cesati, 3rd Edition,Reilly, 2005.
3. Unix programming, Stevens, Pearson Education.
4. Shell programming, YashwanthKanetkar.

COMPUTER ORGANIZATION LAB

Digital Logic Design Experiments
1. TTL Characteristics and TTL IC Gates
2. Multiplexers & Decoders
3. Flip-Flops
4. Counters
5. Binary Adders &Subtractors

8085/86AssemblyLanguageProgramming:
1. Addition of two 8 bit numbers.
2. Addition of two 16 bit numbers.
3. Sum of series of 8 bit numbers.
4. Subtraction of two 8 bit numbers.
5. Largest number in an array.

REFERENCE BOOKS:

1. Computer System Architecture: Morris Mano.
2. Advanced Micro Processor and Peripherals - Hall/ A K Ray.
3. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
4. Structured Computer Organization and Design - Andrew S. Tanenbaum, 4th Edition PHI/Pearson.

Course &Title: MCA-20110 BRIDGE COURSE (FUNDAMENTALS OF COMPUTERS) (For General B.Sc/B.A./B.Com Students) Course Index: C110

Course Objectives:
The learning objectives of this course are:

Course Objectives
Explain the concepts of computers and classify based on type and generation
Demonstrate the techniques of writing algorithms pseudo codes & schematic flow of logic in software development process.
Teach about Operating Systems and its concepts.
Teach about the purpose of networks and types of networks and media to connect the computers and learn about introduction to internet and email

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C110.1	Explain the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming
C110.2	Able to develop techniques of writing algorithms pseudo codes and logic
C110.3	Summarize the concepts of Operating Systems
C110.4	Recognize the Computer networks, types of networks and topologies, network devices and get introduction to internet and email.

MCA-20110 - BRIDGE COURSE
(For General B.Sc/B.A./B.Com Students)
FUNDAMENTALS OF COMPUTERS

Theory: 3Hrs/Week	**Credits: 4**
Internal: 25 Marks **External: 75 Marks**	**Total: 100 Marks**

UNIT I

Introduction to Computers: History of Computers, Central processing unit, Characteristics and limitations of computer, Types of Computers, Types of memories. Block diagram of Computer, Peripheral Devices: Input, Output and storage, Input devices, Output devices, Secondary devices, Communication between the CPU and Input/ Output devices. Software: Types of software. Number Systems (Binary, Octal, Hexadecimal).

UNIT-II

Operating System: Introduction to OS, Types of OS, Functions of OS, Evolution of Operating Systems - Simple Batch, Multi programmed, time-shared, Parallel, Distributed Systems, Real-Time Systems. MSDOS Internal Commands: chdir, cls, path, prompt, label, ver, vol, echo, set. External Commands: scandisk, discopy, diskcomp, format, backup, restore, Operating System installation steps.

MS-Office Tools (Word, Excel & PowerPoint): Introduction of Word Processing, MSWord: Creating, Editing, printing, page formatting, inserting tables, pictures, Mail Merge. MS Excel: Introduction to spreadsheet, creating, formatting, printing, usage of formulae, Graphs of worksheets. MS PowerPoint: Creating a presentation with designs and animations.

UNIT III

Computer Networks: Introduction to computer Networks, Network topologies -Bus topology, star topology, Ring topology, Mesh topology, Hybrid topology. Types of Networks:Local area Network, Wide Area Networks, Metropolitan Networks, Campus/ Corporate Area Network, Personal Area Network. Network Devices: Hub, Repeater, Switch, Bridge, Router, Gateway, Network interface Card.

Introduction to Internet: Web Browsers, Searching and Surfing, Creating an E-Mail account, sending and receiving E-Mails. Web Browsers, Searching and Surfing, Creating an E-Mail account, sending and receiving E-Mails.

UNIT IV

Problem Solving and Programming: Algorithm development, Flowcharts, Looping, some programming features, Pseudo code, Structured Programming concepts.

Programming Languages: Machine Language and assembly language, high-level and low level languages, Assemblers, Compilers and Interpreters.

TEXT BOOKS:

1. An Introduction to Computer studies –Noel Kalicharan-Cambridge.
2. Fundamentals of Computers –ReemaThareja-Oxford higher education.
3. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley.
4. Computer Networks: Tannenbaum.

REFERENCE BOOKS:

1. Peter Norton_s, Introduction to Computers, Tata McGraw Hill.
2. Computer Fundamentals, Anita Goel, Pearson Education, 2017.

Course & Title: MCA-20111BRIDGE COURSE LAB (FUNDAMENTALS OF COMPUTERS LAB) (For General B.Sc/B.A./B.Com Students)
Course Index: C111

Course Objectives:

The learning objectives of this course are:

Course Objectives
Learn about the internal parts of a computer, peripherals, I/O ports, connecting cables
Learn how to install Operating System, Demonstrate basic command line interface commands on MSDOS
Learn about Internet, Browsing, Email
Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools
Writing Algorithms, Flow Charts for simple programs in C

Course Outcomes:

By the end of the course, the student will be

Course Index	Course Outcomes
C111.1	Understand about the internal parts of a computer, peripherals, I/O ports, connecting cables
C111.2	Able to install Operating System, able to write basic command line interface commands on MSDOS
C111.3	Know about Internet, Browsing, Email
C111.4	Able to work on Office Tools such as Word processors, Spreadsheets and Presentation tools
C111.5	Able to Write Algorithms, Flow Charts for simple programs in C

MCA-20111-BRIDGE COURSE LAB
(For General B.Sc/B.A./B.Com Students)
FUNDAMENTALS OF COMPUTERS LAB

Lab: 3Hrs/Week   **Credits: 4**
Internal: 50 Marks   **External: 50 Marks**   **Total: 100 Marks**

Computer Hardware:

Experiment 1: Identification of peripherals of a PC, Laptop, Server and Smart Phones

Experiment 2: Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Operating Systems:

Experiment 3: Operating System installation: Installing an Operating System such as Windows on Computer hardware.

Experiment 4: MSDOS Operating System Internal Commands: chdir, cls, path, prompt, label, ver, vol, echo, set.

Experiment 5: MSDOS Operating System External Commands: scandisk, discopy, diskcomp, format, backup, restore

Introduction of Internet:

Experiment 6: Web Browsers, Searching and Surfing, Creating an E-Mail account, sending and receiving E-Mails.

Office Tools:

Experiment 7: Office Tools: Demonstration and practice on Microsoft Word.

Experiment 8: Demonstration and practice on Microsoft Excel.

Experiment 9: Demonstration and practice on Power Point.

Introduction to Programming:

Experiment 10: Write simple C Programs with Algorithms and Flow Charts.

TEXT BOOKS:
1. Computer Fundamentals, Anita Goel, Pearson Education, 2017
2. PC Hardware Trouble Shooting Made Easy, TMH
3. C & Data Structures (A practical approach) - by G.S. Baluja and G.K.baluja, Dhanapatrai& Co publishers.

Semester II (First Year) Curriculum

Code	Course Title	Max Marks		Total Marks	Hours per week		Credits
		External	Internal		Theory	Practical	
MCA-20201	Computer Networks	75	25	100	4	-	4
MCA-20202	Object Oriented Programming through JAVA	75	25	100	4	-	4
MCA-20203	Database Management Systems	75	25	100	4	-	4
MCA-20204	Formal Languages and Automata Theory	75	25	100	4	-	4
MCA-20205	Data Mining Concepts and Techniques	75	25	100	4	-	4
MCA-20206	Elective-I 1.Artificial Intelligence and Expert Systems 2.Internet of Things 3.Image Processing	75	25	100	4	-	4
MCA-20207	Object Oriented Programming through JAVA Lab	50	50	100	-	3	2
MCA-20208	Database Management Systems Lab	50	50	100	-	3	2
MCA-20209	Skill Development Course with Python	50	50	100	1	2	2
	Total Credits						30

Note:2 lab Hrs and 1 Theory Hrs/Week or 2 Theory Hrs/ Week for Skill Development Course and only Lab Lab Exam will be conducted

Summer Internship (Mandatory) after First Year (to be evaluated during IIIsemester).

Course Code &Title: MCA-20201 COMPUTER NETWORKS	
Semester: II	
Course Index: C201	
Course Objectives:	
The learning objectives of this course are:	
Course Objectives	
To learn about the basics of computer networks and Data Communication.	
To learn about Data Link Layer, IEEE Standards, design issues in networks.	
To learn about Internet Transport Protocols and different types of protocols.	
To learn about various types of Network Devices and different types of Networks	
Course Outcomes:	
By the end of the course, the student will be	
C201.1	Understand the basics of computer networks and Data Communication.
C201.2	Understand about Data Link Layer, IEEE Standards, design issues in networks.
C201.3	Understand Internet Transport Protocols and different types of protocols.
C201.4	Overview of various types of Network Devices and different types of Networks

MCA-20201 COMPUTER NETWORKS

Instruction:4Hrs/week   **Time:3 Hours**   **Credits:4**
Internal:25Marks   **External:75Marks**   **Total: 100Marks**

UNIT I

Introduction to Computer Networks: Introduction, Network Hardware, Network Software, Reference Models, Data Communication Services & Network Examples, Internet Based Applications.

Data Communications: Transmission Media, Wireless Transmission, Multiplexing, Switching, Transmission in ISDN, Broad Band ISDN, ATM Networks

UNIT II

Data Link Control, Error Detection & Correction, Sliding Window Protocols, LANs & MANs: IEEE Standards for LANs & MANs-IEEE Standards 802.2, 802.3, 802.4, 802.5, 802.6, High Speed LANs.

Design Issues in Networks: Routing Algorithms, Congestion Control Algorithms, Network Layer in the Internet, IP Protocol, IP Address, Subnets, and Internetworking.

UNIT III

Internet Transport Protocols: Transport Service, Elements of Transport Protocols, TCP and UDP Protocols, Quality of Service Model, Best Effort Model, Network Performance Issues.

Over View of DNS, SNMP, Electronic Mail, FTP, TFTP, BOOTP, HTTP Protocols, World Wide Web, Firewalls.

UNIT IV

Network Devices: Over View of Repeaters, Bridges, Routers, Gateways, Multiprotocol Routers, Brouters, Hubs, Switches, Modems, Channel Service Unit CSU, Data Service Units DSU, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies.

Overview of Cellular Networks, Ad-hoc Networks, Mobile Ad-hoc Networks, Sensor Networks

Text Books:
1. Computer Networks, Andrews S Tanenbaum, Edition 5, PHI, ISBN: -81-203- 1165-5
2. Data Communications and Networking, Behrouz A Forouzan, Tata McGraw- Hill Co Ltd, Second Edition

Reference Books:
1. Computer Networks, Mayank Dave, Cengage.
2. Computer Networks, A System Approach, 5thed, Larry L Peterson and Bruce S Davie, Elsevier.
3. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
4. Understanding Communications and Networks, 3rd Edition, W.A. Shay, Thomson.

Course Code & Title: MCA-20202 Object Oriented Programming through JAVA
Semester: II
Course Index: C202

Course Objectives:
The learning objectives of this course are:

Course Objectives
Learn Introduction to OOP and concept of Inheritance.
Learn about Interfaces, Packages and Enumeration, Exceptions & Assertions.
Learn about MultiThreading and Applets.
Learn the concept of Event Handling and Abstract Window Toolkit.

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C202.1	Understand Introduction to OOP and concept of Inheritance.
C202.2	Understand about Interfaces, Packages and Enumeration, Exceptions & Assertions.
C202.3	Understand about MultiThreading and Applets.
C202.4	Understand the concept of Event Handling and Abstract Window Toolkit.

MCA-20202 Object Oriented Programming through JAVA

Instruction: 4 Periods/week   **Time: 3 Hours**   **Credits: 4**
Internal: 25 Marks   **External: 75 Marks**   **Total:100 Marks**

UNIT I

Introduction to OOP: Introduction, Principles of Object Oriented Languages, Applications of OOP, Programming Constructs: Variables, Primitive Datatypes, Identifiers- Naming Conventions, Keywords, Literals, Operators-Binary, Unary and ternary, Expressions, Precedence rules and Associativity, Primitive Type Conversion and Casting, Flow of control- Branching, Conditional, loops. Classes and Objects- classes, Objects, Creating Objects, Methods, constructors-Constructor overloading, cleaning up unused objects-Garbage collector, Class variable and Methods-Static keyword, this keyword, Arrays, Command line arguments.

Inheritance: Types of Inheritance, Deriving classes using extends keyword, Method overloading, super keyword, final keyword, Abstract class.

UNIT II

Interfaces, Packages and Enumeration: Interface-Extending interface, Interface Vs Abstract classes, Packages-Creating packages, using Packages, Access protection, java.lang package.

Exceptions & Assertions – Introduction, Exception handling techniques- try… catch, throw, throws, finally block, user defined exception, Exception Encapsulation and Enrichment, Assertions.

UNIT III

MultiThreading: java.lang.Thread, The main Thread, Creation of new threads, Thread priority, Multithreading- Using isAlive () and join (), Synchronization, suspending and Resuming threads, Communication between Threads Input/Output: reading and writing data, java.io package, **Applets**– Applet class, Applet structure, An Example Applet Program, Applet : Life Cycle, paint(), update() and repaint().

UNIT IV

Event Handling -Introduction, Event Delegation Model, java.awt.event Description, Sources of Events, Event Listeners, Adapter classes, Inner classes.

Abstract Window Toolkit:Why AWT?, java.awt package, Components and Containers, Button, Label, Checkbox, Radio buttons, List boxes, Choice boxes, Text field and Text area, container classes, Layouts, Menu, Scroll bar, **Swing**: Introduction, JFrame, JApplet, JPanel, Components in swings, Layout Managers, JList and JScroll Pane, Split Pane, JTabbedPane, Dialog Box Pluggable Look and Feel.

Text Books:
1. The Complete Reference Java, 8ed, Herbert Schildt, TMH
2. Programming in JAVA, Sachin Malhotra, Saurabhchoudhary, Oxford.

References:
1. JAVA for Beginners, 4e, Joyce Farrell, Ankit R. Bhavsar, Cengage Learning.
2. Introduction to Java programming, 7th ed, Y Daniel Liang, Pearson.

Course Code &Title: MCA-20203 DATABASE MANAGEMENT SYSTEMS Semester: II Course Index: C203	
Course Objectives:	
The learning objectives of this course are:	
Course Objectives	
To learn about the Introduction of Database System, Data Modeling Using the Entity-Relationship Model	
To learn about Relational Data Model and Relational Database Constraints, Relational Algebra and Relational Calculus, Schema Definition, Basic Constraints and Queries	
To learn about Relational Database Design, Indexing Structures for files	
To learn about Transaction Processing, Concurrency Control Techniques	
Course Outcomes:	
By the end of the course, the student will be	
C203.1	Able to understand the Introduction of Database System, Data Modeling Using the Entity-Relationship Model
C203.2	Able to understand Relational Data Model and Relational Database Constraints, Relational Algebra and Relational Calculus, Schema Definition, Basic Constraints and Queries
C203.3	Able to understand Relational Database Design, Indexing Structures for files
C203.4	Able to understand Transaction Processing, Concurrency Control Techniques

MCA-20203 DATABASE MANAGEMENT SYSTEMS

Instruction:4Periods/week	Time:3 Hours	Credits:4
Internal:25Marks	External:75Marks	Total: 100Marks

UNIT I

Database and Database Users: Data models, schemas, and instances, three-schemas architecture and data independence, database languages and interfaces, the database system environment, Centralized and client/server architectures for DBMSs, Classification of database management system.

Data Modeling Using the Entity-Relationship Model: Using High—Level Conceptual data model,Entitytypes,entitysetsAttributesandkeys,Relationshipstypes,relationshipsets,roles and structural constraints, Weak Entity types, ER diagrams Meaning conventions and design issues, Enhance Entity Relationship model,

Relational data model and relational database constraints: Relational model constraints and relational schemas, update operations.

UNIT II

Relational Algebra and Relational Calculus: Unary Relational operations, Relational Algebra operations, Binary Relational operation, Additional Relational operation, Examples of Queries in Relational Algebra, Domain Relational Calculus.

Relational database design by ER and EER Relational Mapping: Relational database design using ER to Relational Mapping, Mapping EER Model Construct to Relations, **Schema Definition, Basic Constraints and Queries:** SQL Data definition, Specifying basic constraints in SQL, Schema change Statements in SQL, Basic queries in SQL, More complex SQL queries, INSERT DELETE UPDATE queries in SQL, Views in SQL, Data base stored Procedures.

UNIT III

Relational Database Design: Informal design Guide lines for Relation Schema, Functional Dependences, Normal forms based on Primary keys, General definitions of Second and Third Normal form, BOYCE-CODE Normal form, Algorithm for Relational database schema design, Multi-valued dependencies and fourth Normal forms,

File Organization and Indexes: Introduction, Secondary Storage Devices, Buffering Blocks, placing file records on disk, Operations on Files, Hashing Techniques, Parallelizing Disk Access using RAID Technology, Indexing Structures for files.

UNIT IV

Algorithm for query processing and Optimization: Translating SQL Queries into Relational Algebra, Algorithms for SELECT and JOIN Operations, Algorithms for PROJECT and SET Operations,

Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Process, Transaction and System Concepts, Characterizing Schedules, Concurrency Control Techniques, Database Recovery Concepts, Recovery Techniques.

Text Book:
1. Fundamentals of Database System, Elmasri, Navathe, Pearson Education.
References Books:
1. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw- Hill.
2. Database Concepts, Abraham Silberschatz, Henry F Korth, S Sudarshan, McGraw-Hill

Course Code & Title: MCA-20204 FORMAL LANGUAGES & AUTOMATA THEORY
Semester: II
Course Index: C204

Course Objectives:

The learning objectives of this course are:

Course Objectives
Learn the concept of Finite Automata and Regular Expressions, Regular sets &Regular Grammars.
Learn the concept of Context Free Grammars and Languages, Push down Automata
Learn about Turing Machines, Universal Turing Machines and Undecidability in detail.
Learn the concept of The Propositional calculus and The Predicate calculus.

Course Outcomes:

By the end of the course, the student will be

Course Index	Course Outcomes
C204.1	Understand the concept of Finite Automata and Regular Expressions, Regular sets &Regular Grammars.
C204.2	Understand the concept of Context Free Grammars and Languages, Push down Automata
C204.3	Understand about Turing Machines, Universal Turing Machines and Undecidability in detail.
C204.4	Understand the concept of The Propositional calculus and The Predicate calculus.

MCA-20204 FORMAL LANGUAGES & AUTOMATA THEORY

Instruction: 4 Periods/week   Time: 3 Hours   Credits: 4
Internal: 25 Marks   External: 75 Marks   Total: 100 Marks

UNIT-I

Finite Automata and Regular Expressions: Basic Concepts of Finite State Systems, Chomsky Hierarchy of Languages, Deterministic and Non-Deterministic Finite Automata, Finite Automata with ϵ-moves, Regular Expressions.

Regular sets &Regular Grammars: Basic Definitions of Formal Languages and Grammars, Regular Sets and Regular Grammars, Closure Properties of Regular Sets, Pumping Lemma for Regular Sets, Decision Algorithm for Regular Sets, Minimization of Finite Automata.

UNIT-II

Context Free Grammars and Languages: Context Free Grammars and Languages, Derivation Trees, simplification of Context Free Grammars, Normal Forms, Pumping Lemma for CFL, Closure properties of CFL's.

Push down Automata: Informal Description, Definitions, Push-Down Automata and Context free Languages, Parsing and Push-Down Automata.

UNIT-III

Turing Machines: The Definition of Turing Machine, Design and Techniques for Construction of Turing Machines, Combining Turing Machines.

Universal Turing Machines and Undecidability: Universal Turing Machines. The Halting Problem, Decidable & Undecidable Problems - Post Correspondence Problem.

UNIT-IV

The Propositional calculus: The Prepositional Calculus : Introduction – Syntax of the Prepositional Calculus – Truth-Assignments – Validity and Satisfiability – Equivalence and Normal Forms – resolution in Prepositional Calculus.

The Predicate calculus: Syntax of the Predicate Calculate Calculus – Structures and Satisfiability – Equivalence – Un-solvability and NP-Completeness.

TEXT BOOKS:
1. Introduction to Automata Theory, Languages and Computations – J.E. Hopcroft, & J.D. Ullman , Pearson Education Asia.
2. Elements of The Theory Of Computation, Harry R Lewis, Cristos h. Papadimitriou, Pearson Education / Prentice-Hall of India Private Limited.

REFERENCE BOOKS:
1. Introduction to languages and theory of computation – John C. Martin (MGH)
2. Theory of Computation, KLP Mishra and N. Chandra Sekhar, IV th Edition, PHI
3. Introduction to Theory of Computation – Michael Sipser (Thomson Nrools/Cole)

Course Code &Title: MCA-20205 DATA MINING CONCEPTS AND TECHNIQUES
Semester: II
Course Index: C205

Course Objectives:

The learning objectives of this course are:

Course Objectives
To learn about the overview of Data Warehouse Basic Concepts, Data Warehouse Modelling, Pre-processing
To learn about the Introduction to Data Mining , Basic Statistical Descriptions of Data, Data Visualization, Measuring data Similarity and Dissimilarity
To learn about the Concept Description, Generalization by AOI , Mining Frequent Patterns, Associations and Correlations, Mining Frequent Itemset
To learn about the Basic Concepts of Classification ,Different Methods of Classification

Course Outcomes:

By the end of the course, the student will be

Course Index	Course Outcomes
C205.1	Able to understand about the overview of Data Warehouse Basic Concepts, Data Warehouse Modelling, Pre-processing
C205.2	Able to understand about the Introduction to Data Mining , Basic Statistical Descriptions of Data, Data Visualization, Measuring data Similarity and Dissimilarity
C205.3	Able to understand about the Concept Description, Generalization by AOI , Mining Frequent Patterns, Associations and Correlations, Mining Frequent Item set
C205.4	Able to understand about the Basic Concepts of Classification ,Different Methods of Classification

MCA-20205 DATA MINING CONCEPTS AND TECHNIQUES

Instruction:4Periods/week	Time:3Hours	Credits: 4
Internal:25Marks	External:75Marks	Total: 100Marks

UNIT I

Data Warehouse and OLAP Technology: An overview Data Warehouse Basic Concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Implementation Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization, From Data Warehousing to Data Mining

UNIT II

Introduction to Data Mining: Motivation and importance, what is Data Mining, Data Mining on what kind of data, what kinds of patterns can be mined, which technologies are used, which kinds of applications are targeted, Major issues in Data Mining. Getting to know your Data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring data Similarity and Dissimilarity

UNIT III

Concept Description: Characterization and comparison What is Concept Description, Data Generalization by Attribute-Oriented Induction(AOI), AOI for Data Characterization, Efficient Implementation of AOI, AOI for Class comparisons. Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Frequent Itemset Mining Methods: Apriori method, generating Association Rules, Improving the Efficiency of Apriori, Pattern-Growth Approach for mining Frequent Item sets, Mining Frequent Itemsets using vertical data format, Mining Closed and Max Patterns.

UNIT IV

Classification Basic Concepts: Basic Concepts, Decision Tree Induction: Decision Tree Induction, Attribute Selection Measures, Tree Pruning, Bayes Classification Methods, Classification by Back Propagation, Support Vector Machines. Cluster Analysis: Cluster Analysis, Partitioning Methods, Hierarchal methods, Density based methods-DBSCAN and OPTICS.

Text Book:

1. Data Mining Concepts and Techniques—JiaweiHan, MichelineKamber and Jian Pei,Morgan Kaufman Publications 3rd edition.

Reference Books:

1. Introduction to Data Mining –Pang-Ning Tan, Michael Steinbach, Vipin Kumar
2. Introduction to Data Mining, Adriaan, Addison Wesley Publication
3. Data Mining Techniques, A.K.Pujari, University Press.

Course Code &Title: MCA-20206 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS (Elective-I)
Semester: II
Course Index: C206

Course Objectives:

The learning objectives of this course are:

Course Objectives
To learn about the basic concept of Artificial Intelligence.
To learn about the algorithms and logics in Artificial Intelligence.
To learn about the theories and functions related to Artificial Intelligence.
To learn about the concept, characteristics and applications of Expert Systems.

Course Outcomes:

By the end of the course, the student will be

C206.1	Understand the basic concept of Artificial Intelligence.
C206.2	Understand the algorithms and logics in Artificial Intelligence.
C206.3	Understand about the theories and functions related to Artificial Intelligence.
C206.4	Understanding the concept, characteristics and applications of Expert Systems.

MCA-20206 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS (Elective-I)
Instruction:4Periods/week   Time:3Hours   Credits: 4
Internal:25Marks   External:75Marks   Total: 100Marks

UNIT- I

Problems and Search: What is Artificial Intelligence, The AI Problems, and Underlying Assumption, what is an AI Technique?

Problems, Problems Spaces, and Search: Defining the problem as a state space search, production systems, problems characteristics, issues in the design of search programs.

UNIT- II

Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Means-Ends Analysis, Genetic Algorithms; Constraint Satisfaction Problems, Backtracking Search for CSPs, Games, Optimal Decisions in Games.

Knowledge Representation Issues: Representations and Mapping, Approaches to Knowledge Representation, The frame problem, The Wumpus World.

UNIT- III

Representing Knowledge using Rules: Procedural Vs Declarative knowledge, Logic Programming, Forward Vs Backward Reasoning, Matching, Control Knowledge

Symbolic Reasoning under Uncertainty: Introduction to Nonmonotonic Reasoning, Logics for Non-monotonic Reasoning, Implementation issues, Augmenting a Problem solver, implementation: DFS, BFS.

Statistical Reasoning: Probability and Bayes Theorem, Certainty Factors and Rule-Based Systems. Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic.

UNIT- IV

Expert System, Concepts and Characteristics, Applications and Domains of Expert System, Elements of an Expert System, Stages in the Development of an Expert System, Semantic Nets, Frames.

Speech Recognition, Forms of Learning, Inductive learning, Learning Decision Trees, Single Layer Feed Forward, Multi-Layer Feed Forward Neural Networks.

TEXT BOOKS
1. Artificial Intelligence, Second Edition, Elaine Rich, Kevin Knight, Tata McGraw-Hill Edition.
2. Expert Systems: Principles and Programming, Joseph C Giarratano, Gary D Riley Thomson Publication, 4th Edition.

Reference Books:
1. Artificial Intelligence: A Modern Approach, Stuart Russell, Peter Norvig, Pearson Education 2nd Ediction.

Course Code &Title: MCA-20206 INTERNET OF THINGS (Elective-I)
Semester: II
Course Index: C206

Course Objectives:
The learning objectives of this course are:

Course Objectives
To learn about the Introduction to Internet of Things, IoT Enabling Technologies, IoT Levels & Deployment Templates Domain Specific IoTs
To learn about the IOT & M2M, SNMP
To learn about the IoT Platforms Design Methodology
To learn about the IoT Physical Devices & Endpoints

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C206.1	Able to understand about the Introduction to Internet of Things, IoT Enabling Technologies, IoT Levels & Deployment Templates Domain Specific IoTs
C206.2	Able to understand about the IOT & M2M, SNMP
C206.3	Able to understand about the IoT Platforms Design Methodology
C206.4	Able to understand about the IoT Physical Devices & Endpoints

MCA-20206 INTERNET OF THINGS(Elective-I)

Instruction:4Periods/week	Time:3Hours	Credits: 4
Internal:25Marks	External:75Marks	Total: 100Marks

UNIT-I

Introduction to Internet of Things: Definition & Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates Domain Specific IoTs: Home, Cities, Environment, Energy systems, Logistics, Agriculture, Health & Lifestyle.

UNIT-II

IOT & M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, Need for IoT Systems Management, Simple Network Management Protocol (SNMP), Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG, NETOPEER

UNIT-III

IoT Platforms Design Methodology: IoT Design Methodology, Case Study on IoT System for Weather Monitoring, Motivation for Using Python, IoT Systems - Logical Design using Python, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/Time Operations, Classes, Python Packages of Interest for IoT.

UNIT-IV

IoT Physical Devices & Endpoints: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, Other IoT Devices, IoT Physical Servers & Cloud Offerings, Introduction to Cloud Storage Models & Communication APIs, WAMP - AutoBahn for IoT, Xively Cloud for IoT, Python Web Application Framework - Django, Designing a RESTful Web API, Amazon Web Services for, SkyNet IoT Messaging Platform.

Text Book:
1.Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

Reference Book:
1. Fundamentals of Python, K.A.Lambert and B.L.Juneja, Cengage Learning, 2012

Course Code &Title: MCA-20206 IMAGE PROCESSING (Elective-I)
Semester: II
Course Index: C206

Course Objectives:
The learning objectives of this course are:

Course Objectives
To learn about the Fundamentals of Image Processing, Basics of Histogram , Definition and Algorithm of Histogram Equalization
To learn about the Image Transforms**:** A Detail Discussion On Fourier Transform, DFT,FFT, Image Enhancement
To learn about the EDGE Enhancement, Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters, Image Compression
To learn about the Image Segmentation, Morphology

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C206.1	Able to understand about the Fundamentals of Image Processing, Basics of Histogram , Definition and Algorithm of Histogram Equalization
C206.2	Able to understand about the Image Transforms**:** A Detail Discussion On Fourier Transform, DFT,FFT, Image Enhancement
C206.3	Able to understand about the EDGE Enhancement, Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters, Image Compression
C206.4	Able to understand about the Image Segmentation, Morphology

MCA-20206 IMAGE PROCESSING (Elective-I)

Instruction:4Periods/week	Time:3Hours	Credits: 4
Internal:25Marks	External:75Marks	Total: 100Marks

UNIT I

Fundamentals of Image Processing: Image Acquisition, Image Model, Sampling, Quantization, Relationship between Pixels, Distance Measures, Connectivity, Image Geometry, Photographic Film.

Histogram: Definition, Decision of Contrast Basing On Histogram, Operations Basing on Histograms Like Image Stretching, Image Sliding, Image Classification. Definition and Algorithm of Histogram Equalization.

UNIT II

Image Transforms: A Detail Discussion On Fourier Transform, DFT, FFT.

Image Enhancement:
a) Arithmetic and Logical Operations, Pixel or Point Operations, Size Operations.
b) Smoothing Filters-Mean, Median, Mode Filters – Comparative Study.
c) Edge Enhancement Filters – Directorial Filters, Sobel, Laplacian, Robert, KIRSCH Homogeneity.
d) Low Pass Filters, High Pass Filters, Sharpening Filters. – Comparative Study.

UNIT III

Image Enhancement: Design of Low Pass, High Pass, EDGE Enhancement, Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters in Frequency Domain Advantages of Filters in Frequency Domain, Comparative Study of Filters in Frequency, Domain and Spatial Domain.

Image Compression: Run Length Encoding, Contour Coding, Huffman Code, Compression Due to Change in Domain, Compression Due to Quantization Compression at the Time of Image Transmission. Brief Discussion on:-Image Compression Standards.

UNIT IV

Image Segmentation: Characteristics of Segmentation, Detection of Discontinuities, Thresholding Pixel Based Segmentation Method. Region Based Segmentation Methods, Segmentation by Pixel Aggregation, Segmentation by Sub Region Aggregation, Histogram Based Segmentation, Spilt and Merge Technique, Motion in Segmentation.

Morphology: Dilation, Erosion, Opening, Closing, Hit-And-Miss Transform, Boundary Extraction, Region Filling, Connected Components, Thinning, Thickening, Skeletons, Pruning Extensions to Gray – Scale Images, Application of Morphology inIP.

Text Book:
1. Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, Addison Wesley

Reference Books:
1. Fundamentals Of Electronic Image Processing By Arthyr– R – Weeks,Jr.(PHI)
2. Image Processing, Analysis and Machine Vision by Milan SonkaVaclanHalavaRoger Boyle, Vikas Publishing House.
3. Digital Image Processing, S. Jayaraman, S. Esakkirajan & T. VeeraKumar, TMH.
4. Fundamentals of Digital Image Processing, Chris Solomon, Tobi Breckon, Wiley-Blackwell.

Course Code & Title: MCA-20207 Object Oriented Programming through JAVA Lab
Course Code & Title: MCA-20207 Object Oriented Programming through JAVA Lab **Semester: II** **Course Index: C207**
Course Objectives: The learning objectives of this course are:

Course Objectives
Learn how to write programs in Java using OOP.
Learn how to write programs related to real life scenario.
Learn how to write programs in Java using Inheritance and using Adapter classes.

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C207.1	Students can able to write programs in Java using OOP.
C207.2	Students can able to code programs related to real life scenario.
C207.3	Students can able to code programs in Java using Inheritance and using Adapter classes.

MCA-20207 Object Oriented Programming through JAVA Lab

Instruction: 3 Periods/week	**Time: 3 Hours**	**Credits: 2**
Internal: 50 Marks	**External: 50 Marks**	**Total:100 Marks**

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1. Write a java program to print quadratic roots using command line arguments.

2. Write a java program to print multiplication table using arrays.

3. Write a java program to demonstrate method overloading concept.

4. Write a java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

5. Write a java program to implement hierarchical inheritance.

6. Write a java program to demonstrate multiple inheritance by using Interface.

7. Write a java package for book class and then import and display the result.

8. Write a java program to implement the concept of exception handling by creating user defined exception.

9. Write a java program to show multi-threaded application.

10. Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button is clicked.

11. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).

12. Write a java program using swing components.

TEXT BOOKS

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education Pvt. Ltd.

2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

Course Code &Title: MCA-20208 DATABASE MANAGEMENT SYSTEMS LAB
Semester: II
Course Index: C208

Course Objectives:

The learning objectives of this course are:

Course Objectives
Learn how to write SQL queries using DDL, DML, DCL commands
Learn how to write SQL queries on aggregate and conversion functions
Learn how to write PL/SQL programs on exception handling, control structures
Learn how to write PL/SQL programs on cursors, procedures, triggers.

Course Outcomes:

By the end of the course, the student will be

C208.1	Able to write SQL queries using DDL, DML, DCL commands
C208.2	Able to write SQL queries on aggregate and conversion functions
C208.3	Able to write PL/SQL programs on exception handling, control structures
C208.4	Able to write PL/SQL programs on cursors, procedures, triggers.

MCA-20208 DATABASE MANAGEMENT SYSTEMS LAB

Practical: 3Periods/week	**Time:3Hours**	**Credits: 2**
Internal:50Marks	**External:50Marks**	**Total: 100Marks**

SQL

1) Simple queries to understand DDL, DML and DCL commands
2) Creation, altering and dropping of tables and inserting rows in to a table (use constraints while creating tables) examples using SELECT command.
3) Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSECT, Constraints.
4) Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping ofViews.
5) Queries using Conversion functions like (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions like (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)

PL/SQL

1) Simple programs to understand PL/SQL
2) Write a PL/SQL program to demonstrate exception–handling
3) Demonstrate the working of COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
4) Develop a program that includes the features NESTED IF, CASE and CASE expression.
5) Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATIONERROR.
6) Programs using CURSORS
7) Programs development using creation of procedures and functions.
8) Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers

Text Books:

1. Oracle Database 11g, Jason Price, Oracle Press
2. Oracle PL/SQL for Dummies, Michael Rosenblum, Paul Dorsey, Wiley Publications.

Course Code &Title: SKILL DEVELOPMENT COURSE WITH PYTHON
Semester: II
Course Index: C209

Course Objectives:
The learning objectives of this course are:

Course Objectives
To introduce to the basics of Python Programming language
To discuss various functions and methods of Python Programming
To learn about Multithread Programming and GUI Programming
To study Web Programming and Database Programming

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C209.1	Able to understand the basics of Python Programming language
C209.2	Able to use various functions and methods of Python Programming
C209.3	Able to comprehend Multithread Programming and GUI Programming
C209.4	Able to understand Web Programming and Database Programming

MCA-20209 SKILL DEVELOPMENT COURSE WITH PYTHON

Instruction: 3Hrs/week	**Time: 3 Hours**	**Credits: 2**
Internal: 50 Marks	**External: 50 Marks**	**Total: 100 Marks**

List of Experiments:

1. Write Python a program that takes input and prints its sum, multiplication, subtraction, division and remainder values.

2. Write a Python program to find the square root of a number by Newton's Method.

3. Write a Python program biggest of three numbers.

4. Write a Python program to find the sum of digits of a given number.

5. Write a Python program to find the GCD of two numbers.

6. Write a Python program to print the following pattern.

```
      1
    2   2
  3   3   3
 4   4   4   4
5  5   5   5   5
```

7. Write a Python program to find Factorial of a given number.

8. Write a Python program to print all the prime numbers below the given number.

9. Write a Python program to count the numbers of characters in the string using loop.

10. Write a Python program to read a string from the user and print lower case character in upper case and upper case character in lower case.

11. Write a Python program to perform Linear Search.

12. Write a Python program to perform Binary Search.

13. Write a Python program to sort perform bubble sort.

14. Write a Python program to perform selection sort.

15. Write a Python program to demonstrate try with multiple exception statements.

TEXTBOOKS:
1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.
2. Mark Lutz, "Learning Python", O Reily, 4thEdition, 2009
REFERENCES:
1. Tim Hall and J-P Stacey,"Python 3 for Absolute Beginners", 2009
2. Magnus Lie Hetland, "Beginning Python: From Novice to Professional", 2nd Edition, 2009

Semester III (Second Year) Curriculum

Code	Course Title	Max Marks		Total Marks	Hours Per Week		Cred its
		External	Internal		Theory	Practical	
MCA-20301	Information Security and Cryptography	75	25	100	4	-	4
MCA-20302	Big Data Analytics	75	25	100	4	-	4
MCA-20303	Object Oriented Software Engineering	75	25	100	4	-	4
MCA-20304	Web Technologies	75	25	100	4	-	4
MCA-20305	Elective II 1. Blockchain Technology 2. Cloud Computing 3. Machine Learning and Deep Learning	75	25	100	4	-	4
MCA-20306	Elective-III 1.Business Intelligence and Visualization 2. Robotics 3.Foundations of Data Science	75	25	100	4	-	4
MCA-20307	Web Technologies and Object Oriented Software Engineering Lab	50	50	100	-	3	2
MCA-20308	Big Data Analytics lab	50	50	100	-	3	2
MCA-20309	Innovation, Entrepreneurship and Intellectual Property Rights	-	50	50	2	-	0
MCA-20310	Summer Internship	50	50	100	-	-	2
	Total Credits						30

Note: Summer Internship 2 Months (Mandatory) after First Year (to be evaluated during IIIsemester).

Course Code &Title: MCA-20301 INFORMATION SECURITY AND CRYPTOGRAPHY
Semester: III
Course Index: C301

Course Objectives:

The learning objectives of this course are:

Course Objectives
To learn about the security approaches and techniques, Introduction to number theory
To learn about Symmetric key and Asymmetric key cryptographic algorithms
To learn about User Authentication Mechanisms ,System security
To learn about Internet Security Protocols and Network Security

Course Outcomes:

By the end of the course, the student will be

Course Index	Course Outcomes
C301.1	Able to understand the security approaches and techniques, Introduction to number theory
C301.2	Able to Symmetric key and Asymmetric key cryptographic algorithms
C301.3	Able to understand the User Authentication Mechanisms ,System security
C301.4	Able to understand the Internet Security Protocols and Network Security

MCA-20301 INFORMATION SECURITY AND CRYPTOGRAPHY

Instruction: 4 Periods/week **Time: 3 Hours** **Credits:4**
Internal: 25 Marks **External: 75 Marks** **Total: 100 Marks**

UNITI

Introduction: The need for security-security approaches-principles of security-Plain Text and Cipher Text-substitution and Transposition Techniques-Encryption and Decryption-Symmetric and Asymmetric Cryptography-Stenography-key range and key size-types of attacks.

Number Theory: Introduction to number theory- Modular Arithmetic, Euclidean algorithm, Euler theorem, Fermat Theorem, Totient Function, Multiplicative and Additive Inverse.

UNIT II

Symmetric Key Cryptographic Algorithms: Algorithm types and modes-overview of symmetric key cryptography – DES – IDEA – Blowfish – AES-Differential and Linear Cryptanalysis.

Asymmetric Key Cryptographic Algorithms: Overview of asymmetric key cryptography-RSA algorithm-symmetric and asymmetric key cryptography together-digital signatures.

UNIT III

User Authentication Mechanisms: Introduction-Authentication basics – passwords-authentication tokens-certificate based authentication-biometrics Authentication-Hash functions-SHA1.

System Security: Intruders, Viruses, Related Threats, Trusted Systems.

UNIT IV

Internet Security Protocols: Basic concepts-SSL-SHTTP-TSP-SET-SSL versus SET- 3D secure Protocol-Electronic Money-Email security-WAP security-security in GSM.

Network Security: Brief Introduction to TCP/IP -Firewalls -IP Security-Virtual Private Networks.

Text Books:
1. Cryptography and Network security, AtulKahate, Tata McGraw-Hill Pub company Ltd., NewDelhi
2. Network Security Essentials Applications and Standards, William Stallings, Pearson Education, New Delhi

Reference Books:
1. Network Security Private Communication in a public world, Charlie Kaufman, Radia Perlman & Mike Speciner, Prentice Hall of India Private Ltd., NewDelhi
2. Network Security: The Complete Reference by Roberta Bragg, Mark Phodes - Ousley, Keith Strass berg TataMcGraw-Hill.

Course Code &Title: MCA-20302 BIG DATA ANALYTICS
Semester: III
Course Index: C302

Course Objectives:

The learning objectives of this course are:

Course Objectives
To learn about introduction to Big Data and Hadoop
To learn about Real Time Analytics, Map Reduce Programming
To learn about Streaming in Spark, Machine Learning, Map Reduce Advanced Programming
To learn about Graph Representation in Map Reduce, Graph Analytics in Spark, Programming with RDDs-Basics, Spark SQL overview

Course Outcomes:

By the end of the course, the student will be

Course Index	Course Outcomes
C302.1	Understand about introduction to Big Data and Hadoop
C302.2	Understand about Real Time Analytics, Map Reduce Programming
C302.3	Understand about Streaming in Spark, Machine Learning, Map Reduce Advanced Programming
C302.4	Understand about Graph Representation in Map Reduce, Graph Analytics in Spark, Programming with RDDs-Basics, Spark SQL overview

MCA-20302 BIG DATA ANALYTICS

Instruction: 4 Periods/week	Time: 3 Hours	Credits: 4
Internal: 25 Marks	External: 75 Marks	Total: 100 Marks

UNIT I

Introduction to Big Data: Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity, Veracity, Validity), Importance of Big Data, Patterns for Big Data Development, Data in the Warehouse and Data in Hadoop.

Introduction to Hadoop: Hadoop- definition, understanding distributed systems and Hadoop, Comparing SQL databases and Hadoop, Starting Hadoop - The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker.

UNIT II

Real Time Analytics- Examples, What is Apache Spark, Why Spark when Hadoop is there, Spark Features, Getting started with Spark, Spark Eco System, Architecture and its working, Data Structures of Spark, Spark components, Using Spark with Hadoop, Usecase.

MapReduce Programming: Writing basic Map Reduce programs - Getting the patent data set, constructing the basic template of a Map Reduce program, Counting things, Programming with RDDs-Baiscs.

UNIT III

Streaming in Spark, Streaming features, Streaming Fundamentals. Usecase on streaming. Machine Learning, Spark MLlib Overview, Tools, Algorithms-Classification, Regression, Clustering, Dimensionality Reduction, Feature Extraction.

MapReduce Advanced Programming- Chaining Map Reduce jobs, joining data from different sources. Usecase.

UNIT IV

Graph Representation in MapReduce: Modeling data and solving problems with graphs, Shortest Path Algorithm, Friends-of-Friends Algorithm, PageRank Algorithm, Bloom Filters. Graph Analytics in Spark, Spark GraphX, GraphX features, GraphX Examples, Usecase.

Creating RDDs, Operations, Passing Functions to Spark, Common Transformations and Actions, Persistence, Adding Schemas to RDDs, RDDs as Relations, Creating Pairs in RDDs, Transformations and actions on RDDs.

Spark SQL, Overview, Libraries, Features, Querying using Spark SQL.

TEXT BOOKS:

1. Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data by Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, 1st Edition, TMH,2012.
2. Learning Spark: Learning Big Data Analysis: Karauetc., O'reilly Publications. Hadoop in Action by Chuck Lam, MANNING Publishers.
3. Hadoop in Practice by Alex Holmes, MANNING Publishers

REFERENCE BOOKS:

1. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
2. Big Java Fourth Edition Cay Horstmann Wiley, John Wiley &Sons
3. Mining of massive datasets, Anand Rajaraman, Jeffrey D Ullman, Wiley Publications.

Course Code &Title: MCA-20303 OBJECT ORIENTED SOFTWARE ENGINEERING
Semester: III
Course Index: C303

Course Objectives:
The learning objectives of this course are:

Course Objectives
To learn about Introduction to Object Oriented Software Engineering, Object Orientation, Requirements Engineering
To learn about the Unified Modeling Language & Use Case Modeling, Class Design and Class Diagrams
To learn about the Software Design , Architecture and Design Patterns
To learn about the Software Testing, Software Project Management, Software Process Models

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C303.1	Able to understand about the Introduction to Object Oriented Software Engineering, Object Orientation, Requirements Engineering
C303.2	Able to understand about the Unified Modeling Language & Use Case Modeling, Class Design and Class Diagrams
C303.3	Able to understand about the Software Design and Architecture, Design Patterns
C303.4	Able to understand about the Software Testing, Software Project Management, Software Process Models

MCA-20303 OBJECT ORIENTED SOFTWARE ENGINEERING

Instruction:4Periods/week	Time: 3Hours	Credits:4
Internal:25Marks	External:75Marks	Total: 100Marks

UNIT I

Introduction to Object Oriented Software Engineering: Nature of the Software, Types of Software, Software Engineering Activities, and Software Quality.

Introduction to Object Orientation: Data Abstraction, Inheritance & Polymorphism, Reusability in Software Engineering, Examples: Postal Codes, Geometric Points.

Requirements Engineering: Domain Analysis, Problem Definition and Scope, Types of Requirements, Techniques for Gathering and Analyzing Requirements, Requirement Documents, Reviewing Requirements, Case Studies: GPS based Automobile Navigation System, Simple Chat Instant Messaging System.

UNIT II

Unified Modeling Language & Use Case Modeling: Introduction to UML, Modeling Concepts, Types of UML Diagrams with Examples; User-Centered Design, Characteristics of Users, Developing Use Case Models of Systems, Use Case Diagram, Use Case Descriptions, The Basics of User Interface Design, Usability Principles.

Class Design and Class Diagrams: Essentials of UML Class Diagrams, Associations and Multiplicity, Generalization, Instance Diagrams, Advanced Features of Class Diagrams, Process of Developing Class Diagrams, Interaction and Behavioural Diagrams: Interaction Diagrams, State Diagrams, Activity Diagrams, Component and Deployment Diagrams.

UNIT III

Software Design and Architecture: Design Process, Principles Leading to Good Design, Techniques for Making Good Design Decisions, Good Design Document, Software Architecture, Architectural Patterns: The Multilayer, Client-Server, Broker, Transaction Processing, Pipe & Filter And MVC Architectural Patterns.

Design Patterns: Abstraction-Occurrence, General Hierarchical, Play-Role, Singleton, Observer, Delegation, Adaptor, Façade, Immutable, Read-Only Interface and Proxy Patterns.

UNIT IV

Software Testing: Effective and Efficient Testing, Defects in Ordinary Algorithms, Numerical Algorithms, Timing and Co-ordination, Stress and Unusual Situations, Testing Strategies for Large Systems.

Software Project Management: Introduction to Software Project Management, Activities of Software Project Management, Software Engineering Teams, Software Cost Estimation, Project Scheduling, Tracking and Monitoring.

Software Process Models: Waterfall Model, The Phased Released Model, The Spiral Model, Evolutionary Model, The Concurrent Engineering Model, Rational Unified Process.

Text Book:
1. Object Oriented Software Engineering: Practical Software Development using UML and Java. Timothy C Lethbridge & Robert, Langaneire, Mc Graw Hill

Reference Books:
1. The Unified Modeling Language User Guide. Grady Booch, James Rumbaugh and Ivar Jacobson. Addison-Wesley.
2. Software Engineering; A Practitioner's Approach. Roger SPressman.
3. Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education.

Course Code & Title: MCA-20304 WEB TECHNOLOGIES Semester: III Course Index: C304

Course Objectives:
The learning objectives of this course are:

Course Objectives
Learn the concept of Networking Protocols and OSI Model, Internetworking Concepts, Devices, Basics, History and Architecture.
Learn about TCP/IP and Electronic commerce in detail.
Learn about the concept of Web Technology and types of Web Pages.
Learn the concept of Middleware and Component-based E-commerce Architectures, EDI, XML and WAP.

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C304.1	Understand the concept of Networking Protocols and OSI Model, Internetworking Concepts, Devices, Basics, History and Architecture.
C304.2	Understand about TCP/IP and Electronic commerce in detail.
C304.3	Understand about the concept of Web Technology and types of Web Pages.
C304.4	Understand the concept of Middleware and Component-based E-commerce Architectures, EDI, XML and WAP.

MCA-20304 WEB TECHNOLOGIES

Instruction: 4 Periods/week   **Time: 3 Hours**   **Credits: 4**
Internal: 25 Marks   **External: 75 Marks**   **Total: 100 Marks**

UNIT I

Networking Protocols and OSI Model: Protocols in Computer Communications, the OSI Model, OSI Layer Functions.

Internetworking Concepts, Devices, Basics, History and Architecture: Internetworking, Problems in Internetworking, Dealing with Incompatibility Issues, A Virtual Network, Internetworking Devices, Repeaters, Bridges, Routers, Gateways, A Brief History of the Internet, Growth of the Internet, Internet topology, Internal Architecture of an ISP

TCP/IP Part I (Introduction to TCP/IP, IP, ARP, RARP, ICMP):TCP/IP Basics, Why IP Addresses? Logical Addresses,TCP/IP Example, the Concept of IP Address, Address Resolution Protocol (ARP), Reverse ARP, Internet Control Message Protocol (ICMP), Datagram, Fragmentation and Reassembly.

UNIT II

TCP/IP Part II (TCP, UDP):Basics of TCP, Features of TCP, Relationship between TCP and IP, Ports and Sockets, Connections-Passive Open and Active Open, TCP connections, What Makes TCP Reliable? TCP Packet Format, Persistent TCP Connections, User Datagram Protocol, UDP Packet, Difference between UDP and TCP

TCP/IP Part III (DNS, Email, FTP, TFTP): Domain Name System (DNS), Electronic Mail (Email), File Transfer Protocol (FTP)**,** Trivial File Transfer Protocol (TFTP)

TCP/IP Part IV (WWW, HTTP, TELNET): A Brief History of WWW, Basics of WWW and Browsing, Locating Information on the Internet, HTML, Web Browser Architecture, Web Pages and Multimedia, Remote Login (TELNET).

An Introduction to Electronic Commerce: Aspects of Electronic Commerce, Types of E Commerce, Approaches for Developing E Commerce Solutions, Electronic Procurement, Phases in a Procurement Process, E-Procurement Models, E-Procurement Solutions, Trading Models, Buyer Side Purchasing, Supply Chain Management (SCM) and Customer Relationship Management (CRM)

UNIT III

Introduction to Web Technology: Features Required for Enabling e-commerce, Web pages-Types and Issues, Tiers, The Concept of a Tier, A Concept of Microsoft and Java Technologies, Web Pages, Static Web Pages, Plug-ins, Introduction to Frames and Forms.

Dynamic Web Pages: Need for Dynamic Web Pages, Magic of Dynamic Web Pages, Overview of Dynamic Web Page Technologies, Overview of Dynamic HTML (DHTML), Common Gateway Interface (CGI), Microsoft's Active Server Pages (ASP), Basics of ASP Technology, ASP Example, Modern Trends in ASP, Java and the Concept a Virtual Machine, Java Servlets and Java Sever Pages(JSP), Java Servlets, Java Sever pages (JSP).

Active Web Pages: Active Web pages is a Better Solution, Java Applets, Why are Active Web Pages Powerful? When not to use Active Web Pages, Lifecycle of Java Applets, Java Beans, Active X Controls.

UNIT IV

Middleware and Component-based E-commerce Architectures: CORBA, Java Remote Method Invocation (RMI), Microsoft's Distributed Component Object Model

Electronic Data Interchange (EDI): An Overview of EDI, the Origins of EDI, Understanding EDI, Data Exchange Standards, EDI Architecture, The Significance of EDI in International Trade, Financial EDI, EDI and the Internet.

Extensible Markup Language (XML): Standard Generalized Markup Language (SGML), Basics of XML, XML parsers, The Need for a Standard.

Wireless Application Protocol (WAP): Limitations of Mobile Devices, The emergence of WAP, WAP Architecture, The WAP Stack, Concerns about WAP and its Future, Alternatives to WAP.

Text Book:
Web Technologies: TCP/IP to Internet Application Architectures-TATA McGraw Hill Publications - Achyut S Godbole, AtulKahate.

Course Code &Title: MCA-20305 BLOCK CHAIN TECHNOLOGY(ELECTIVE II)
Course Code &Title: MCA-20305 BLOCK CHAIN TECHNOLOGY(ELECTIVE II) **Semester: III** **Course Index: C305**

Course Objectives:
The learning objectives of this course are:

Course Objectives
To learn about introduction to Block Chain, Basic Distributed System Concepts
To learn about Cryptography in Blockchain, Cryptography algorithms
To learn about Bitcoin-Cryptography, Hyperledger Fabric
To learn about Use cases of Blockchain, Financial Service, healthcare, energy markets, media, Cyber Crime, e-Governance, Tax payments, land registry trcords and blockchain in IoT

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C305.1	Understand about introduction to Block Chain, Basic Distributed System Concepts
C305.2	Understand about Cryptography in Blockchain, Cryptography algorithms
C305.3	Understand about Bitcoin-Cryptography, Hyperledger Fabric
C305.4	Understand about Use cases of Blockchain, Financial Service, healthcare, energy markets, media, Cyber Crime, e-Governance, Tax payments, land registry trcords and blockchain in IoT

Instruction: 4 Periods/week   **Time: 3 Hours**   **Credits: 4**
Internal: 25 Marks   **External: 75 Marks**   **Total: 100 Marks**

UNIT – I

CRYPTOGRAPHY IN BLOCKCHAIN: Blockchain Definitions – Blockchain versus Databases – History – Motivation – Characteristics – Types – Overview - Hashing in Blockchain – Linking blocks in blockchain – Linking blocks using SHA256 – Block structure – Blockchain functionality – Creating Blockchain – Byzantine failure problem in blockchain – Digital signatures in blockchain – Blockchain wallets

UNIT – II

BLOCKCHAIN DESIGN PRINCIPLES: Networked Integrity – Distributed Power- Value as Incentive – Security – Privacy – Rights Preserved – Inclusion – Centralized Registries versus Distributed Ledgers – Public versus Private Ledgers – Transparency as a Strategic Risk – Transparency as a Strategic Asset - Zero Knowledge Proofs

UNIT – III

CONSENSUS ALGORITHMS: Proof of Work – Pure Stake Based Consensus – Proof of Stake - Leased Proof of Stake – Delegated Proof of Stake – Hybrid Form of PoS and PoW – Practical Byzantine Fault Tolerance – Ripple –Tendermint – Proof of Elapsed Time – Proof of Activity – Proof of Burn – Hyperledger Fabric.

UNIT – IV

BLOCKCHAIN OPTIMIZATIONS AND ENHANCEMENTS: Blockchain Optimizations – Transaction Exchange – Off-chain Transactions – Block size improvements – Blockchain enhancements – Sharding – Evolution of consensus algorithm – Proof of Stake – Proof of Activity – Byzantine Fault Tolerance Consensus Models – Proof of Elapsed Time – Cross-chain Protocol – Privacy Enhancement – Blockchain Security – Transaction Security Model – Decentralized Security Model – Attacks on Blockchain

Text Books:
1. Koshik Raj, "Foundations of Blockchain", Packt Publishers, 2019.
2. S. Shukla, M. Dhawan, S. Sharma and S. Venkatesan, "Blockchain Technology: Cryptocurrency and Applications", Oxford University Press, 2019.

Reference Books:
1. Josh Thompson, "Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming", Create Space Independent Publishing Platform, 2017.
2. Andreas M. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", Oreilly Media, 1st Edition, 2014.
3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. "Bitcoin and cryptocurrency technologies: a comprehensive introduction", Princeton University Press, 2016.

Course Code &Title: MCA- 20305 CLOUD COMPUTING (ELECTIVE-II)
Course Code &Title: MCA- 20305 CLOUD COMPUTING (ELECTIVE-II)   **Semester: III**   **Course Index: C305**
Course Objectives: The learning objectives of this course are:

Course Objectives
To learn about the Cloud Computing basics, Intranet and Cloud, Services and Business Applications, Salesforce.com, Organization and Cloud Computing
To learn about the Hardware and Infrastructure , Overview of Software as a Service, Overview of Industries Software plus Services, Mobile device Integration
To learn about Developing the Applications like Google, Microsoft, Intuit QuickBase, Local Clients and thin clients
To learn about Migrating the Cloud, Cloud Services

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C305.1	Able to understand about the Cloud Computing basics, Intranet and Cloud, Services and Business Applications, Salesforce.com, Organization and Cloud Computing
C305.2	Able to understand about the Hardware and Infrastructure , Overview of Software as a Service, Overview of Industries Software plus Services, Mobile device Integration
C305.3	Able to understand about Developing the Applications like Google, Microsoft, Intuit QuickBase, Local Clients and thin clients
C305.4	Able to understand about the Migrating the Cloud, Cloud Services

Instruction:4Periods/week	Time:3Hours	Credits: 4
Internal:25Marks	External:75Marks	Total: 100Marks

UNIT I

Cloud Computing Basics - Cloud Computing Overview, Applications, Intranets and the Cloud, First Movers in the Cloud. The Business Case for Going to the Cloud - Cloud Computing Services, Business Applications, Deleting Your Datacenter, Salesforce.com, Thomson Reuters.

Organization and Cloud Computing - When You Can Use Cloud Computing, Benefits, Limitations, Security Concerns, Regulatory Issues, Cloud Computing with the Titans - Google, EMC, NetApp, Microsoft, Amazon, Salesforce.com, IBM Partnerships.

UNIT II

Hardware and Infrastructure - Clients, Security, Network, Services. Accessing the Cloud - Platforms, Web Applications, Web APIs, Web Browsers. Cloud Storage - Overview, Cloud Storage Providers, Standards - Application, Client, Infrastructure, Service.

Software as a Service - Overview, Driving Forces, Company Offerings, Industries Software plus Services - Overview, Mobile Device Integration, Providers, Microsoft Online.

UNIT III

Developing Applications - Google, Microsoft, Intuit QuickBase, Cast Iron Cloud, Bungee Connect, Development, Troubleshooting, Application Management.

Local Clouds and Thin Clients - Virtualization in Your Organization, Server Solutions, Thin Clients, Case Study: McNeilus Steel.

UNIT IV

Migrating to the Cloud - Cloud Services for Individuals, Cloud Services Aimed at the Mid- Market, Enterprise-Class Cloud Offerings, Migration, Best Practices and the Future of Cloud Computing - Analyze Your Service, Best Practices, How Cloud Computing Might Evolve.

Text Books:
1. Cloud Computing-A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. McGrawHill.

Reference Books:
1. Cloud Computing, Theory and Practice, Dan C Marinescu, MKElsevier.
2. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press

Course Code &Title: MCA-20305 MACHINE LEARNING AND DEEP LEARNING (ELECTIVE-II) Semester: III Course Index: C305

Course Objectives:
The learning objectives of this course are:

Course Objectives
To introduce students to the basic concepts and techniques of Machine Learning
To discuss Decision Tree learning, Artificial Neural Networks
To learn about Bayesian learning, Instance-Based Learning
To study various Genetic Algorithms, Learning Sets of Rules

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C305.1	Able to understand the basic concepts and techniques of Machine Learning
C305.2	Able to understand Decision Tree learning, Artificial Neural Networks
C305.3	Able to understand Bayesian learning, Instance-Based Learning
C305.4	Able to understand Genetic Algorithms, Learning Sets of Rules

UNIT – I

The Machine Learning Landscape: What Is Machine Learning, Why Use Machine Learning, Types of Machine Learning Systems, Supervised/Unsupervised Learning, Batch and Online Learning, Instance-Based Versus Model-Based Learning, Main Challenges of Machine Learning, Insufficient Quantity of Training Data, Non representative Training Data, Poor-Quality Data, Irrelevant Features, Over fitting the Training Data, Under fitting the Training Data, Stepping Back, Testing and Validating.

UNIT II

Classification: Training a Binary Classifier, Performance Measures, Measuring Accuracy Using Cross-Validation, Confusion Matrix, Precision and Recall, Precision/Recall Tradeoff, The ROC Curve, Multiclass Classification, Error Analysis, Multi label Classification, Multi output Classification.

Ensemble Learning and Random Forests: Voting Classifiers, Bagging and Pasting, Out-of-Bag Evaluation, Random Patches and Random Subspaces, Random Forests, Extra-Trees, Feature Importance, Boosting, AdaBoost, Gradient Boosting, Stacking, Exercises.

UNIT III

The Neural Network: Building Intelligent Machines, The Limits of Traditional Computer Programs, The Mechanics of Machine Learning, The Neuron, Expressing Linear Perceptrons as Neurons, Feed-Forward Neural Networks, Linear Neurons and Their Limitations, Sigmoid, Tanh, and ReLU Neurons, Softmax Output Layers

Training Feed-Forward Neural Networks: The Fast-Food Problem , Gradient Descent, The Delta Rule and Learning Rates, Gradient Descent with Sigmoidal Neurons, The Backpropagation Algorithm, Stochastic and Minibatch Gradient Descent , Test Sets, Validation Sets, and Overfitting, Preventing Overfitting in Deep Neural Networks.

UNIT IV

Implementing Neural Networks in TensorFlow: What Is TensorFlow? How Does TensorFlow Compare to Alternatives Contents Installing TensorFlow Creating and Manipulating TensorFlow Variables, TensorFlow Operations, Placeholder Tensors, Sessions in TensorFlow , Navigating Variable Scopes and Sharing Variables, Managing Models over the CPU and GPU, Specifying the Logistic Regression Model in TensorFlow, Logging and Training the Logistic Regression Model, Leveraging TensorBoard to Visualize Computation Graphs and Learning, Case Study: Building a Multilayer Model for MNIST in TensorFlow.

TEXTBOOKS:
1. Hands on machine-learning with scikit-learn and tensorflow. Concepts, tools and techniques to build Intelligent System AurelienGeron, O'reillyPublicatons.
2. Fundamentals of Deep Learning. Designing Next Generation Machine Intelligence - Algorithms. Nikhil Buduma…O'reillyPublications.

Course Code &Title:MCA-20306: BUSINESS INTELLIGENCE AND VISUALIZATION (ELECTIVE-III) Semester:III Course Index: C306
Course Objectives: The learning objectives of this course are:

Course Objectives
To learn about the Business intelligence, architecture, analysis, ethics
To learn about the Knowledge discovery, Geographic Visualization
To learn about the Efficiency measures, identification of good operating practices, Pattern matching
To learn about the Business intelligence applications, Future of business intelligence

Course Outcomes:

By the end of the course, the student will be

Course Index	Course Outcomes
C306.1	Able to understand about the Business intelligence, architecture, analysis, ethics
C306.2	Able to understand about the Knowledge discovery, Geographic Visualization
C306.3	Able to understand about the Efficiency measures, identification of good operating practices, Pattern matching
C306.4	Able to understand about the Business intelligence applications, Future of business intelligence

MCA-20306: BUSINESS INTELLIGENCE AND VISUALIZATION (ELECTIVE-III)

Instruction:4Periods/week	Time:3Hours	Credits: 4
Internal:25Marks	External:75Marks	Total: 100Marks

UNIT I

BUSINESS INTELLIGENCE: Effective and timely decisions–Data, information and knowledge–Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence.

UNIT II

KNOWLEDGE DELIVERY: The business intelligence user types, Standard reports, InteractiveAnalysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.

UNIT III

EFFICIENCY: Efficiency measures–The CCR model: Definition of target objectives- Peer groups–Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis

UNIT IV

BUSINESS INTELLIGENCE APPLICATIONS: Marketing models–Logistic and Production models– Case studies.

FUTURE OF BUSINESS INTELLIGENCE: Future of business intelligence–Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology.

TEXT BOOK:
1. Efraim Turban, Ramesh Sharda, DursunDelen, "Decision Support and Business Intelligence Systems", 9th Edition, Pearson 2013.

REFERENCES:
1. Larissa T. Moss, S. Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making", Addison Wesley,2003.
2. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications, 2009.
3. David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager"sGuide", Second Edition, 2012.
4. Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a KillerApp", McGraw-Hill,2007.
5. Ralph Kimball, Margy Ross, Warren Thornthwaite, Joy Mundy, Bob Becker, "The Data Warehouse Lifecycle Toolkit", Wiley PublicationInc.,2007.

Course Code &Title: MCA-20306 ROBOTICS(ELECTIVE III)
Course Code &Title: MCA-20306 ROBOTICS(ELECTIVE III) **Semester: III** **Course Index: C306**

Course Objectives:

The learning objectives of this course are:

Course Objectives
To study the basics of control systems and components
To discuss robot end effectors its Types, Tools as End Effectors, Gripper Selection and Design Forward and Inverse Kinematics.
To learn about machine vision, Sensor Characteristics, Image processing and Analysis, Robotic Applications
To study robot programming, Motion Commands, program Control and Subroutines. Programming methods and Branching

Course Outcomes:

By the end of the course, the student will be

Course Index	Course Outcomes
C306.1	Able to understand the basic of control systems and components
C306.2	Able to understand robot end effectors its Types, Tools as End Effectors, Gripper Selection and Design Forward and Inverse Kinematics
C306.3	Able to understand machine vision, Sensor Characteristics, Image processing and Analysis, Robotic Applications
C306.4	Able to understand robot programming, Motion Commands, program Control and Subroutines. Programming methods and Branching.

Instruction: 4 Periods/week	**Time: 3 Hours**	**Credits: 4**
Internal: 25 Marks	**External: 75 Marks**	**Total: 100 Marks**

UNIT-I

CONTROL SYSTEMS AND COMPONENTS: Basic Control Systems Concepts and Models, Controllers, Control System Analysis, Classification, Components, Characteristics, Applications Robot Activation and Feedback Components, Power Transmission Systems, Robot Joint Control Design.

UNIT-II

ROBOT END EFFECTORS: Types, Mechanical Grippers and Other types, Tools as End Effectors, The Robot/End Effector Interface, Considerations in Gripper Selection and Design. Position Analysis, Robots as Mechanisms, Matrix Representation, Transformation Matrices, Forward and Inverse Kinematics.

UNIT-III

MACHINE VISION: Introduction, Sensor Characteristics, Description of Different Sensors. The Sensing and Digitizing function, Image processing and Analysis, Training and Vision Systems, Robotic Applications Characteristics of Actuating Systems, Actuating Devices and Control.

UNIT-IV

ROBOT PROGRAMMING: The Textual Robot languages, Generations of Robot programming languages, Robot language Structures, Constants, Variables, and other data Objects, Motion Commands, program Control and Subroutines. Programming methods, Robot program as a path in space, Motion Interpolation, WAIT, SGNAL, DELAY Commands, Branching.

TEXT BOOK:
1. Mikell P. Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G. Odrey Industrial Robotics: Technology, Programming, and Applications, 1st edition, McGraw-Hill International Edition, 1986.
2. Saeed B. Niku, Introduction to Robotics Analysis, Application, Pearson Education Asia, 2001.

REFERENCE BOOK:
1. K.S.Fu, R.C Gonzalez, C.S.G.Lee, ROBOTICS, Control, Sensing, Vision and Intelligence, 1st edition, McGraw-Hill International Edition, 1987.
2. R.K.Mittal and I J Nagrath, Robotics and Control, TMH, 2003.
3. Computational Intelligence, Davis Poole, Alan Mackwath, Randy Coehel, Oxford University Press 1998.

Course Code &Title: MCA-20306 FOUNDATIONS OF DATA SCIENCE(ELECTIVE III)
Semester: III
Course Index: C306

Course Objectives:
The learning objectives of this course are:

Course Objectives
To learn about Key concepts in data science, including tools, approaches, and application scenarios
To learn about Topics in data collection, sampling, quality assessment and repair
To learn about Topics in statistical analysis and machine learning
To learn about State-of-the-art tools to build data-science applications for different types of data, including text and CSV data

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C306.1	Understand about Key concepts in data science, including tools, approaches, and application scenarios
C306.2	Understand about Topics in data collection, sampling, quality assessment and repair
C306.3	Understand about Topics in statistical analysis and machine learning
C306.4	Understand about State-of-the-art tools to build data-science applications for different types of data, including text and CSV data

MCA-20306 FOUNDATIONS OF DATA SCIENCE (ELECTIVE-III)

Instruction: 4 Periods/week	**Time: 3 Hours**	**Credits: 4**
Internal: 25 Marks	**External: 75 Marks**	**Total: 100 Marks**

UNIT I

INTRODUCTION TO DATA SCIENCE: Data science process – roles, stages in data science project, setting expectations, loading data into R – working with data from files, working with relational databases. Exploring data – Using summary statistics to spot problems, spotting problems using graphics and visualization. Managing data – cleaning and sampling for modelling and validation.

UNIT II

MODELING METHODS: Choosing and evaluating models – mapping problems to machine learning tasks, evaluating models, validating models – cluster analysis – Kmeans algorithm, Naïve Bayes, Memorization Methods – KDD and KDD Cup 2009, building single variable models, building models using multi variable, Linear and logistic regression, unsupervised methods – cluster analysis, association rules.

UNIT III

INTRODUCTION TO R Language: Reading and getting data into R, viewing named objects, Types of Data items, the structure of data items, examining data structure, working with history commands, saving your work in R.

PROBABILITY DISTRIBUTIONS in R - Binomial, Poisson, Normal distributions. Manipulating objects - data distribution.

UNIT IV

DELIVERING RESULTS: Documentation and deployment–producing effective presentations –Introduction to graphical analysis – plot()function – displaying multivariate data– matrix plots – multiple plots in one window - exporting graph – using graphics parameters in R Language.

Text Books
1. Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications,2014.
2. Jure Leskovec, Anand Rajaraman, Jeffrey D.Ullman, "Mining of Massive Datasets", Cambridge University Press,2014.
3. Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley &Sons, Inc.,2012.

Reference Books
1. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R",2013.
2. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, AbhijitDasgupta, "PracticalData Science Cookbook", Packet Publishing Ltd.,2014.
3. Nathan Yau, "Visualize This: The FlowingData Guide to Design, Visualization, andStatistics", Wiley,2011.
4. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions",Wiley, ISBN: 9788126551071,2015.

Course Code & Title: MCA-20307 WEB TECHNOLOGIES AND OBJECT ORIENTED SOFTWARE ENGINEERINGLAB Semester: III Course Index: C307

Course Objectives:

The learning objectives of this course are:

Course Objectives
Learn how to create Web pages using HTML/DHTML and using CSS in it.
Learn how to write Java Script Programs to demonstrate the working of conditional, looping statements, arrays, functions, event handling, validation controls.
Learn how to develop simple applications like client server programming using Java Script, Servlets, ASP, JSP and a web application with database connectivity.

Course Outcomes:

By the end of the course, the student will be

Course Index	Course Outcomes
C307.1	Students can able to create Web pages using HTML/DHTML and using CSS in it.
C307.2	Students can able to write Java Script Programs to demonstrate the working of conditional, looping statements, arrays, functions, event handling, validation controls.
C307.3	Students can able to develop simple applications like client server programming using Java Script, Servlets, ASP, JSP and a web application with database connectivity.

MCA-20307 WEB TECHNOLOGIES AND OBJECT ORIENTED SOFTWARE ENGINEERING LAB

Instruction: 3 Periods/week	**Time: 3 Hours**	**Credits: 2**
Internal: 50 Marks	**External: 50 Marks**	**Total: 100 Marks**

Web Technologies Lab

1. Create web pages for an application demonstrating the working of different features of HTML and DHTML.

2. Demonstrate the use of CSS in organizing the layout of webpages

Implement at least two Java Script programs to demonstrate the working of

3. Conditional statements

4. Looping statements.

5. Arrays

6. Functions.

7. Event handling

8. Validation controls.

Develop simple applications for the following

9. Exercise client server programming using Java Script, Servlets, ASP, JSP.

10. Create a web application with database connectivity and work on different queries for data manipulation.

REFERENCES:

1. Web Technologies, Godbole, Kahate, 2ndEd, TMH

2. Internet & World Wide Web How to program, Dietel&Deitel Fourth Edition, PHI

Object Oriented Software Engineering Lab

Document the Software Project Management and Software Engineering activities for any two of the following projects. Any other project of interest also can be chosen.

1. Student Result Management System
2. Library Management System
3. Payroll System
4. Bank Loan System
5. Railway Reservation System
6. Automatic Teller Machine
7. Hospital Management System
8. Online Shopping System

Software Project Management and Software Engineering activities specified below can be customized according to the features of the project.

- Problem Statement
- Feasibility Study
- Software Requirements Specification Document
- Estimation of Project Metrics
- Entity Relationship Diagram
- Use Case Diagrams
- Class Diagram
- Sequence Diagrams
- Activity Diagrams
- State Chart Diagrams
- Test coverage

REFERENCES:
1. The Unified Modeling Language User Guide. Grady Booch,JamesRumbaugh and Ivar Jacobson. Addison-Wesley.
2. Object Oriented Software Engineering: Practical Software Development using UML and Java. Timothy C Lethbridge & Robert, Langaneire, Mc Graw Hill.

Course Code &Title: MCA-20308 BIG DATA ANALYTICS LAB
Semester: III
Course Index: C308

Course Objectives:
The learning objectives of this course are:

Course Objectives
Learn how to implement data structures, generic types
Learn how to setup and install Hadoop
Learn how to implement file management tasks and programs in Hadoop

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C308.1	Able to implement data structures, generic types
C308.2	Able to setup and install Hadoop
C308.3	Able to implement file management tasks and programs in Hadoop

MCA-20308 BIG DATA ANALYTICS LAB

Practical: 3Periods/week	Time:3Hours	Credits: 2
Internal:50Marks	External:50Marks	Total: 100Marks

List of Experiments:

1. Write a Java Program to implement Linked Lists, Stacks and Queues.

2. Write Java Program that implements Generic Types, which collects pair of elements of different types.

3. Write a Java Program that uses object serialization and deserialization.

4. Know about setting up and Installing Hadoop in its three operating modes and implement in Standalone.

5. Implement the following file management tasks in Hadoop: Adding, Retrieving and deleting files.

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

6. Write a Map-Reduce Program to find average of numbers.

7. Implement Matrix Multiplication with Hadoop Map Reduce

8. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

REFERENCES:

1. Big Java Fourth Edition Cay Horstmann Wiley, John Wiley & Sons

2. www.hadoop.apache.org

3. www.gist.github.com

Course Code &Title: MCA-20309 INNOVATION, ENTREPRENEURSHIP AND INTELLECTUAL PROPERTY RIGHTS Semester: III Course Index: C309

Course Objectives:
The learning objectives of this course are:

Course Objectives
To learn about Role and importance Technology developments, Innovation in Current Environment
To learn about Entrepreneurship and Its Evolution
To learn about Intellectual Property Law
To learn about Patent Law – Rights and Limitations

Course Outcomes:
By the end of the course, the student will be

Course Index	Course Outcomes
C309.1	Able to understand Role and importance Technology developments, Innovation in Current Environment
C309.2	Able to understand Entrepreneurship and Its Evolution
C309.3	Able to understand Intellectual Property Law
C309.4	Able to understand Patent Law – Rights and Limitations

MCA-20309 INNOVATION, ENTREPRENEURSHIPAND INTELLECTUAL PROPERTY RIGHTS

Instruction: 2 Periods/week   **Time: 3 Hours**   **Credits: 0**

Internal: 50 Marks   **Total: 50 Marks**

UNIT I

Introduction - Role and importance -Technology developments – TLC - Diffusion and Growth of Technologies. Innovation and Creativity: An Introduction, Innovation in Current Environment, Types of Innovation,Idea Management System, Divergent Vs Convergent Thinking, Levers of Idea Management. Experimentation in Innovation Management: Idea Championship,Participation for Innovation, Co-creation for Innovation, Proto typing to Incubation.

UNIT II

Introduction to Entrepreneurship anditsEvolution – Roles of an Entrepreneur -Idea Generation, Screening, Selection and Managing Resources -Leading and Building the team in an enterprise - Forms of Ownership - Entrepreneurship in the era of Globalization - Entrepreneurship, Creativity and Innovation - Social entrepreneurship - Start- ups, early venture issues - Family business and entrepreneurship - Women entrepreneurship: issues, challenges - Financing the entrepreneurial business - Entrepreneurship Institutions in India

Unit III

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement - Regulatory – Over use or Misuse of Intellectual Property Rights - Compliance and Liability Issues.

Unit IV

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings - Valuation of Intellectual Property: Need for IP Valuation – Approaches of IP Valuation

Text Books:

1. Sunita K. Sreedhararn , An Introduction to Intellectual Asset Management.
2. Patrick H. Sullivan, Profiting from Intellectual Capital: Extracting Value from Innovation
   3. TulikaRastogi, IP Audit: Your Way to Healthy Organisation.
3. Gordon V. Smith and Russell L. Parr, Valuation of Intellectual Property and Intangible Assets, 3rd Edition.
4. Bruce Berman, From Assets to Profits: Competing for IP Value and Return (Intellectual Property-General, Law, Accounting & Finance, Management, Licensing, Special Topics).

References:

5. Loganathan, E.T. "IPR" (IPRS), TPIPS Agreement and Indian Laws.
6. Ceserani. J &Greatwood. P: Innovation & Creativity, Kogan Page, London, 1995.
7. Ziman. J: Technological Innovation as an Evolutionary Process, Cambridge University Press, Cambridge, 2000
8. Deborah E.Bouchoux: "Intellectual Property". Cengage learning, New Delhi
9. PrabhuddhaGanguli: 'Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi

Semester IV (Second Year) Curriculum

Code	Course Title	Max Marks		Total Marks	Hours Per Week		Credits
		Internal	External		Theory	Practical	
MCA-20401	Project	150	200	350	-	-	10
	Total Credits						10

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA I Semester
MCA-20101 DISCRETE MATHEMATICAL STRUCTURES
MODEL QUESTION PAPER

Time:3 hrs.   **Max.Marks: 75**

SECTION- A (4 X 15 = 60 M)
Answer ALL Questions

1(a) Show that $p \rightarrow q$ and $\neg q \rightarrow \neg p$ are logically equivalent.   (7M)

 (b) Show that the relation ≤(less than or equal to) defined on the set of positive integers Z^+ is a partial order relation.   (8M)

(or)

(c) S.T $R \wedge (P \vee Q)$ is a valid conclusion from the premises $P \vee Q$, $Q \Rightarrow R$, $P \Rightarrow M$ and $\neg M$.   (7M)

(d) If R be a relation in the set of integers z defined by R = {(x,y)/:x∈ $z, y \in z$, (x-y) is divisible by 6}.

(8M)

2(a) Solve the recurrence relation $a_n = a_{n-1} + 2$, $n \geq 2$ subject to initial condition $a_1 = 3$ (7M)

(b)How many ways are there to assign five different jobs to four different employees if every employee is assigned atleast one job?   (8M)

(or)

(c) Applyingpegion hole principle show that of any 14 integers are selected from the set

S= {1,2,3,….,25} there are atleast two whose seem is 26.Also write a statement that generalizes this result.   (7M)

(d) In a class of 25 students, 12 have taken mathematics. 8 have taken mathematics but not biology.Find the number of students who have taken mathematics and biology and those who have taken biology but not mathematics.   (8M)

3(a) If G= (V,E) be a directed graph with e edges , then $\sum_{v \epsilon V} deg_G^+ (V) = \sum_{v \epsilon V} deg_G^- (V)$ = e   (7M)

(b)Show that C_6 is a bipartite graph.   (8M)

(or)

(c) Show that the complete graph K_n has a Hamiltonian cycle.   (7M)

(d)Prove that a tree with n vertices has n-1 edges.   (8M)

4. (a)Find the sum of products expansion for the function $F(x, y, z) = (x + y)\bar{z}$ (7)

   (b) Construct circuits that produce the following outputs (i)$(x + y)\bar{x}$ (ii)$\bar{x}(\bar{y + \bar{z}})$ (8)

<div align="center">(or)</div>

(c) Show that distributive law $x(y + z) = xy + xz$ is valid (7)

(d)Construct the state table for the finite state machine with the state diagram shown in the following

Figure (8)

Figure

A finite state machine
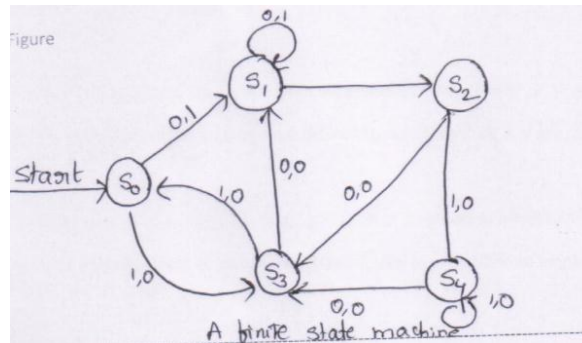
SECTION-B(5*3=15M)

5.Answer any Five Questions of the following

a.Construct the truth table for $p \wedge (\sim q \vee q)$

 b.Write the following in symbolic form

     Every person is precious.

c. Compute $\frac{20!}{18!}$

d.Prove $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

e.State and prove Hand shaking theorm

f.Define Hamilton circuit Hamiltonian graph give examples to each

g.Find the duals of $x(y + 0)$ and $\bar{x}.1 + (\bar{y} + z)$

h. Let A= {1,00} , find A^n for n= 0,1,2 and 3

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA I Semester
MCA-20102 MANAGEMENT ACCOUNTANCY
MODEL QUESTION PAPER

Time:3Hrs   **Max Marks: 75**

SECTION- A(4 X 15 = 60 M)
Answer ALL Questions

1. a) Define Accounting Process? Explain various Branches of Accounting.   [15]
        (OR)
    b) Give detailed proforma for Trading A/C, P&L A/C and Balance Sheet.   [15]

2. a) What do you mean by financial statement analysis? Explain the importance ofRatio analysis in analyzing the financial strength ofanorganization?   [15]
        (OR)
    b) Distinguish between Funds flow and cash flow analysis   [15]

3. a) Explain the nature and importance of budgets and budgetary control in planningand coordinating the functional activities ofanorganization?   [15]
        (OR)
    b) Calculate P/V ratio, BEP and Margin of Safety from the following data of a manufacturing
        Enterprise.
        Selling price   10 Rs
        Variable Cost   6 Rs
        Fixed Cost   40,000 Rs
        Actual Sales   16,500 Units   [15]

4. a) What are the various types of documents used for data collection in computerized accounting system?   [15]
        (OR)
    b) Explain the importance of coding logics in computerized accounting system? [15]

SECTION – B (5×3=15 Marks)
Answer any five Questions

5. a) Double entry system
    b) Closing entities
    C) Liquidity ratios
    d) Working Capital Cycle
    e) Master Budget
    f) Assumptions of Break even analysis
    g) Transaction files
    h) Flexibility budget

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM

MCA I Semester

MCA-20103 C Programming and Data Structures
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)
Answer ALL Questions

1. a) Explain the structure of a C program with example.   [15M]

                                   (Or)
    b) List and explain loop control statements in C.   [15M]
2. a) Write a C program to find the kth smallest in the given array.   [15M]

                                   (Or)
    b) Explain in detail about Character pointers and functions   [15M]
3. a) Discuss Robin Karp Algorithm   [15M]

                                   (Or)

    b) Explain about Formatted I/o, file I/O operations   [15M]

4. a) Write an algorithm for infix to postfix conversion.   [15M]

                                   (Or)
    b) Describe operation on a stack with examples   [15M]

SECTION – B (5 X 3 = 15 M)
Answer any FIVE of the following

5.

   (a)   What are the various basic data types in C?

   (b)   Write the syntax for conditional operator.

   (c)   Differentiate between putchar( ) and puts ( ).

   (d)   Describe the steps in writing a function in a C program.

   (e)   List the four storage classes in C.

   (f)   How do you declare a two dimensional array? Give its memory representation.

   (g)   Compare structures and unions.

   (h)   What are the uses of Pointers?

ADIKAVI NANNAYA UNIVERSITY – RAJAMAHENDRAVARAM

MCA I-Semester

MCA-20104 COMPUTER ORGANIZATION

MODEL QUESTION PAPER

Time:3Hrs   **Max Marks: 75**

SECTION- A(4 X 15 = 60 M)

Answer ALL Questions

1. a) What is Flip-Flop? Explain various types of Flip-Flop.   15M

(Or)

b) Write about Decoder and Multiplixers and also Construct 8 to 1 Line   15M
multiplexers

15M

2. a) Explain Data types, Complements and fixed –point representation.

(Or)   15M

b) Draw and Explain 8085 microprocessor Architecture.

15M

3. a) Describe the mechanism of an instruction cycle and memory reference
instructions.   15M

(Or)

b) Explain instruction formats and addressing modes

15M

4. a) Write about Asynchronous data transfer methods and Explain DMA
transfer with block diagram.

(Or)   15M

b) What is the difference between main memory and Auxiliary memory and
Explain the mapping process of Cache memory.

SECTION – B(5 X 3 = 15 M)

Answer any FIVE of the following

5. a) Logic Gates.
b) Registers and memoryunit.
c) Floating point representation.
d) Arithmetic microoperations.
e) Timing andControl.
f) Stackorganization.
g) I/Ointerface.
h) Virtualmemory

ADIKAVI NANNAYA UNIVERSITY – RAJAMAHENDRAVARAM

MCA I Semester

MCA-20105 OPERATING SYSTEMS

MODEL QUESTION PAPER

Time:3Hrs   **Max marks: 75**

SECTION – A (4X15=60 Marks)
Answer ALL Questions

1. Write short note on   (5*3=15)
   a) i)Main frame Systems   ii) Multiprocessor Systems
      iii)Distributed Systems   iv) Real Time Systems
      v) Functions of OS
                          (OR)
   b) i) Write short notes on System calls.
      ii) Explain System Structure.   [8+7]
2. a) i) Explain Interprocess Communications.
      ii) Write short notes on communication in Client-Server Systems.   [9+6]
                          (OR)
   b) Compare and Construct preemptive and non-preemtive scheduling algorithms.

3. a) Write a short notes on Demand Paging and Segmentation.
                          (OR)
   b) i) Explain various Page Replacement Algorithms.
      ii) Write a short notes on Disk Management and Disk Scheduling.   [8+7]
4. a) Describe protections concepts and mechanisms provided by an operating system.
                          (OR)
   b) Explain OS Concepts with respect to LINUX.

SECTION– B (5X3=15Marks)
Answer any FIVE Questions

5. a)Threads

   b) Dining Philosophers Problem

   c) Paging

   d) File Operations

   e) Process

   f) Methods for Handling Deadlocks

   g) Directory Structure

   h) User Authentication

ADIKAVI NANNAYA UNIVERSITY – RAJAMAHENDRAVARAM
MCA-I -Semester

MCA-20106 Design and Analysis of Algorithms
MODEL QUESTION PAPER

Time:3Hrs   **Max marks: 75**

SECTION – A (4X15=60 Marks)

Answer ALL Questions

1. a) Define Algorithm. Explain fundamentals of Algorithmic problem solving.

(OR)

  b) Define space and time complexity. Explain different types of Asymptotic notations.

2. a) Explain divide and conquer solution for quick sort. Illustrate with examples.

(OR)

  b) Explain DFS and BFS search using decrease and conquer technique with examples.

3. a) Explain Floyd's algorithm for all-pairs shortest path problem with an example.

(OR)

  b) Explain Greedy method .Discuss Krushkal's algorithm for minimum spanning tree.

4. a) Explain NP-Complete and NP-Hard problems.

(OR)

  b)Explain n-queen problem using backtracking technique.

SECTION – B (5X3=15 Marks)
Answer any FIVE Questions

5.   a). Analysis of recursive algorithm.

b) Strassen's matrix multiplication

c) Binary search algorithm.

d) Horner's rule.

e) Horspool's algorithm.

f) Dijkstra's algorithm.

g) Decision tree.

h) Hamiltonian circuit problem.

ADIKAVI NANNAYA UNIVERSITY – RAJAMAHENDRAVARAM
MCA-I -Semester
MCA-20110 Bridge Course (Fundamentals of Computers)
MODEL QUESTION PAPER

Time:3Hrs   **Max marks: 75**

SECTION – A (4X15=60 Marks)

Answer ALL Questions

1. a) Draw the Block Diagram of Computer and explain the functioning of Computer units.

(OR)

   b) Convert the decimal number $(985647)_{10}$ in to Binary, Octal and Hexadecimal Systems.

2. a) Explain about different types of Operating Systems.

(OR)

   b) Explain about the process of Mail Merge in MS Word with example.

3. a) Explain about types of Network Topologies.

(OR)

   b) Explain about Email management.

4. a) Explain about algorithm and flowchart with examples.

(OR)

   b)Explain about Assemblers, Compilers and Interpreters.

SECTION – B (5X3=15 Marks)
Answer any FIVE Questions

5.   a) Types of Memories.

b) Functions of Operating System

c) Define any three network devices

d) Types of Programming Languages

e) Types of Software

f) What are the effects in Custom Animation

g) Types of networks

h) Programming Features

ADIKAVI NANNAYA UNIVERSITY – RAJAMAHENDRAVARAM

MCA-II -Semester

MCA-20201 Computer Networks

MODEL QUESTION PAPER

Time:3Hrs   **Max marks: 75**

SECTION – A (4X15=60 Marks)
Answer ALL Questions

1. a)With a neat block diagram explain the TCP/IP reference model. List out the limitations of the
model.   [15]

(OR)

(b) What are the functions of the physical layer?

(c) Give the physical description, characteristics, and uses of all the guide transmission
media.   [5+10]

2 (a) Explain Sliding Window Protocol

  (b) Differentiate Error detection and Correction Codes   [8+7]

(OR)

(c) Explain Link State Routing Protocol

(d) What are the methods of congestion control in datagram subnets   [10+5]

3 (a) what is TCP protocol? How is connection management done by TCP?

(b) Explain how TCP controls congestion   [8+7]

(OR)

(c) Explain SMTP and MIME   [15]

4(a) Compare the different network devices   [15]

(OR)

(b) Write brief notes on Mobile Adhoc Networks and Sensor networks   [15]

SECTION – B (5X3=15 Marks)
Answer any FIVE Questions

5. (a) ATM Reference Model

  (b) Explain Frequency Division Multiplexing

  (c) Give the format of IPv4 header

  (d) IPv4 Address Classes

  (e)What are the various timers used by TCP and what are their purposes?

  (f) Difference between TCP and UDP

  (g) Short Notes on Firewalls

  (h) Wireless Access Points

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-II Semester
MCA-20202 OBJECT ORIENTED PROGRAMMING THROUGH JAVA
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)

Answer ALL Questions

1. a) Explain about Principles of Object Oriented Languages.   [15M]

                                            (Or)
    a)   What is the purpose of constructor in Java programming   [15M]

2. a)   Define inheritance. What are the benefits of inheritance? What costs are associated with inheritance? How to prevent a class from inheritance?   [15M]

                                            (Or)
    b) Write a program to demonstrate hierarchical and multiple inheritance using interfaces.   [15M]

3. a) Explain in details about Thread.   [15M]

                                            (Or)
    b) Discuss about Applet Life Cycle.   [15M]

4. a) Write a program with nested try statements for handling exception.   [15M]

                                            (Or)
    b) How to move/drag a component placed in Swing Container? Explain.   [15M]

SECTION– B (5X3=15Marks)
Answer any FIVE Questions

5.

   a.   Differentiate between print() and println() methods in Java.

   b.   What are symbolic constants? Explain with examples.

   c.   What are the methods available in the character streams?

   d.   What is the significance of the CLASSPATH environment variable in creating/using a package?

   e.   What is the difference between error and an exception?

   f.   What is synchronization and why is it important?

   g.   What is the significance of Legacy class? Give example.

   h.   What is an adapter class? Explain with an example.

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-II Semester
MCA-20203 DATABASE MANAGEMENT SYSTEMS
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)
Answer ALL Questions

1. a) Write a brief note on advantages and applications of DBMS   [8M]
b) Briefly explain about Three-Schema Architecture with neat diagram   [7M]
<div align="center">Or</div>
c.) Briefly discuss about Database System Environment with neat diagram   [15M]
2. a) Explain in detail about various key constraints used in database system with examples [10M]
b) Explain about Relational Algebra Set Operations with examples   [5M]
<div align="center">Or</div>
c) Explain in detail about Tuple and Domain Relational Calculus with examples   [15M]
3. a) What is Normalization? Briefly explain the types of normal forms with an example   [15M]
<div align="center">Or</div>
b) Explain how a dynamic multi level indexes can be created using B Trees and B+Trees   [15M]
with example.
4. a) What is Serializability? Briefly explain the different types of Serializability   [15M]
<div align="center">Or</div>
b) Briefly explain the following Concurrency Control Techniques
i) Two Phase Locking Protocol   [8M]
ii) Validation Concurrency Control   [7M]

SECTION– B (5X3=15Marks)
Answer any FIVE Questions

5. a) Define DBMS, Schema, Instance. What is weak entity? Explain with example

b) What is Data Independence? Specify the classification

c) Give a brief note on Insert, Delete, and Update Queries in SQL with examples

d) What is View in SQL? Create a view and perform DML operations on it

e) What is Functional Dependency? Classify.

f) Give a brief note on Buffering Blocks

g) What is Transaction? Discuss Characteristics of Transaction

h) Give a brief note on Shadow Paging technique.

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-II Semester
MCA-20204 Formal Languages and Automata Theory
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION-A
Answer ALL Questions (4 x 15 = 60)

1. a) Let r be a regular expression. Then there exists some NFA with e-transitions that accepts $L(r)$?

(OR)

b) What is the use of Membership algorithm and construct the minimum state automaton equivalent to the transition diagram given below
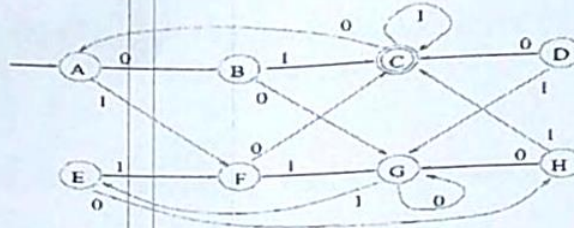
2. a) State and prove pumping lemma for CFL's?   8M
   b) Explain any five closure properties of Regular sets?   7M

(OR)

   c) Construct a PDA to accept L={WW^R/ W in (0+1)*} ?

3. a) Construct a TM to accept L={$a^n b^n c^n$/ n>=1}?
   (OR)
   b) Briefly discuss combining Turing Machines?   8M
   c) Discuss the halting problem of Turing machine?   7M

4. a) Syntax of predicate calculus?   7M
   b) Explain truth assignment?   8M
   (OR)
   c) Explain validity and Satisfiability?

SECTION-B
Answer any FIVE Questions (5 x 3 = 15)

5. a) What is transition system?
   b) What are the differences between DFA and Non-DFA?
   c) Explain any three closure properties of regular sets?
   d) Briefly discuss simplification of CFL's ?
   e) Define Turing machine?
   f) What is Post Correspondence Problem?
   g) Explain Normal forms?
   h) Discuss NP-completeness

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-II Semester
MCA-20205 Data Mining Concepts and Techniques
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)
Answer ALL Questions

1. a) Explain with a neat diagram the three-tier architecture of a Data Warehouse   7M
   b) Explain the OLAP operations in a Multidimensional data.   8M
<div align="center">Or</div>
   c) Why do we pre-process data? Explain different techniques in data cleaning, integration
      and transformation   15M

2. a) Data Mining should be applicable to any kind of data repositories, including data   10M
      streams. What are the different kinds of data on which mining can be applied?
   b) Mention different issues in Data Mining.   5M
<div align="center">Or</div>
   c) Explain in detail how the data is measured differently in statistical descriptions   8M
   d) Where can data mining be applied? Explain different domains of applications   7M

3. a) Explain FP-Growth Algorithm with an example.   8M
   b) Explain AOI Algorithm.   7M
<div align="center">Or</div>
   c) Explain Apriori property and explain the algorithm associated with it   8M
   d) How to generate Closed and Max patterns   7M

4. a) What is the difference between classification and Prediction? How a decision tree is
      Constructed   10M
   b) Explain Support Vector Machines concept   5M
<div align="center">Or</div>
   c) Explain Bayesian Classification Methods. How Classification by back propagation is
      Obtained   7M
   d) Explain k-means Clustering and compare that with k-medoids algorithm   8M

<div align="center">SECTION – B (5X3=15 Marks)</div>
<div align="center">Answer any FIVE Questions</div>

5. Write a Short note on
   a) DBSCAN Algorithm
   b) Tree Pruning
   c) Concept Description.
   d) Frequent Item sets using vertical data format
   e) Multilevel Association Rules
   f) Data Visualization
   g) Similarity and Dissimilarity of data
   h) Data Cube Technology

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-II Semester
MCA-20206 Artificial Intelligence and Expert Systems (Elective-I)
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)
Answer ALL Questions

1. a) Describe any one informed search strategy and uninformed search strategy.
   (OR)
   b) Explain four basic kinds of agents that underlie almost all intelligent systems.
2. a) Explain how optimal strategies lead to optimal decisions in games.
   (OR)
   b) Describe resolution and unification
3. a) Explain different approaches to uncertain reasoning. (OR)
   b) Describe multi attribute utility functions
4. a) Explain the stages in the development of an expert system.
   (OR)
   b)Briefly explain the concept of neural networks.

SECTION – B   (5X3=15 Marks)
Answer any FIVE Questions

5.
a) Define AI. What is Turing Test?

b) Specify the basic components of a problem.

c) Write a short notes on CSP.

d) Give the BNF of sentences in propositional logic.

e) Axioms of probability.

f) Axioms of utility theory.

g) Applications of expert systems

h) Frames

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-II Semester
MCA-20206 Internet of Things (Elective-I)
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)
Answer ALL Questions

1. **a)** What is the IoT? Explain Design guidelines for IoT **(15M)**

   Or

   b) Explain in detail application of Internet of Things in Smart Cities **(15M)**

2. **a)** Explain M2M. Distinguish between IoT and M2M **(8M)**

   b) Explain SDN and NFV for IoT **(7M)**

   Or

   c) Explain IoT System Management with NETCONF-YANG **(8M)**

   d) Explain limitations of SNMP **(7M)**

3. **a)** Explain Design Methodology for IoT **(15M)**

   Or

   b) Explain Logical Design of IoT suing Python. Explain various python packages used for IoT **(15M)**

4. a) What is Raspberry Pi. Explain Raspberry Pi Board and various interfaces in

   Raspberry pi. **(15M)**

   Or

   b) What is Cloud? Explain various Cloud Storage Models using in IoT **(15M)**

Section-B (5 X 3 =15 Marks)

5. **Write a Short Note on any FIVE of the following**

   a) Explain Wireless Sensor Networks

   b) Explain IoT in Environment

   c) Explain Need for IoT Systems Management

   d) Explain NETOPEER

   e) Explain various data types used in Python

   f) Explain basic building blocks of IoT Device

   g) Explain Amazon Web Services for IoT

   h) Explain Django Architecture.

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-II Semester
MCA-20206 Image Processing (Elective-I)
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)

Answer ALL Questions

1. a) Explain the elements of Digital Image Processing System with a neat diagram. (15M)

OR

b)Explain terms: Neighbours of a Pixel **,** Adjacency, Connectivity, Regions, and Boundaries **,** Distance measures **,** Image Operations on a Pixel Basis.   (15M)

2. **a)** Define and explain low pass filters and high pass filters in brief.   (7M)

b) Define and edge. Explain various edge enhancement filters.   (8M)

OR

c) Discuss histogram techniques for Image enhancement: Histogram specification (Matching.**,** Histogram Equalization , Local enhancement.   (15M)

3. **a)** Explain Lossy compression and Lossy predictive coding

OR

b) Explain the Morphological Algorithms: Boundary Extraction, Region Filling.   (15M)

4. **a)** Distinguish Global Processing via the Hough Transform and via the Graph-Theoretic Techniques.   (15M)

OR

b) What is Thresholding? Explain about Global Thresholding.   (15M)

SECTION-B (5 X 3 =15 MARKS)

5. Write a Short Note on any FIVE of the following

   a) How do you acquire an image? Explain in detail
   b) What is Image Sampling and Quantization?
   c) Compare one dimension and two dimension DFT
   d) Distinguish between spatial domain techniques and frequency domain techniques of Image enhancement
   e) Explain about the Dilation and Erosion
   f) Draw the relevant diagram for source encoder and source decoder
   g) Explain the Detection of Discontinuities: Point Detection, Line Detection, Edge Detection
   h) Explain about Region-Based Segmentation

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-III Semester
MCA-20301 Information Security and Cryptography
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)

Answer ALL Questions

1. a) Explain Principles of Security   7M
   b) Discuss Substitution and Transportation techniques?   8M
                                        Or
   c) What is Modulo Arithmetic and discuss its properties?   8M
d) What is Totient Function and explain how to calculate Totient Function with an   7M
example

2. a) Show that DES decryption is the inverse of DES encryption?   8M
   b) Discuss different block cipher modes of operation?   7M
                                        Or
   c) Explain RSA algorithm with an example?   8M
   d) Explain how to generate digital signatures?   7M

3. a) What is authentication and discuss different authentication mechanisms?   7M
   b) Explain SHA1?   8M
                                        Or
   c) What is Virus? And discuss different types of Viruses?   5M
   d) Write short notes on Intruders and Trusted Systems?   10M

4. a) Briefly explain SSL protocol?   7M
   b) Explain SET in detail?   8M
                                        Or
   c) Explain about IP Security architecture?   8M
   d) What is Firewall and discuss different types of Firewalls?   7M

SECTION – B (5X3=15 Marks)
Answer any FIVE Questions

5.

    a) Explain any five Security attacks?

    b) What is Key and what are different types of keys?

    c) Briefly discuss Differential cryptanalysis?

    d) Define Prime number and explain relatively prime numbers with an example?

    e) Differentiate between Symmetric and Asymmetric key cryptography?

    f) What are the requirements of Hash Functions?

    g) Explain SHTTP?

    h) Briefly discuss Virtual Private Network?

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-III Semester
MCA-20302 Big Data Analytics
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)
Answer ALL Questions

1. a) Explain the Characteristics of Big Data. How the data is different in Warehouse and in Hadoop

OR

b) Explain the building blocks of Hadoop with a neat Architecture.

2. a) What is Apache Spark and explain the Eco System of it. What are the main data structures used in Spark

OR

b) What is key-value pair. Write a Mapreduce program to count the number of words in a given text

3. a) Discuss any three machine learning algorithms which will use the features of MLlib in Spark.

OR

b) How do you join data from different sources in Mapreduce programming? Show with Matrix Multiplication example.

4. a) What are Resilient Distributed Dataset. Explain how to create pairs in RDDs and transformations that are carried in them.

OR

b) Explain Page Rank and Bloom Filter Algorithms.

SECTION B (5 X 3 = 15M)

5. ANSWER ANY FIVE

a. What is Big Data and explain is importance and applications

b. Explain Spark components

c. Explain the working of Spark Architecture

d. Explain streaming in Spark

e. Explain the concept of Dimensionality Reduction

f. Explain Friends-of-Friends Algorithm

h. Explain the features of Spark SQL

g. How to add schemas on RDD

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-III Semester
MCA-20303 Object Oriented Software Engineering
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)
Answer ALL Questions

1. a) What is software engineering? Explain software engineering activities   **15M**

Or

   b) What is requirement engineering? Explain requirements engineering activities   **15M**

2. a) Discuss how usability principles play a significant role in user interface design   **15M**

Or

   b) Explain static and dynamic elements of UML.   **15M**

3. a) What is software architecture? Explain architectural patterns with examples.   **15M**

Or

   b) What is the role of patterns in software engineering? Explain any four patterns   **15M**

4. a) Explain the types of defects that occur in the cases of ordinary algorithms, numerical
   algorithms and timing and co-ordination   **15M**

Or

   b) Explain RUP   **15M**

SECTION – B (5X3=15 Marks)
Answer any FIVE Questions

5. Write a Short note on

   a) Software quality

   b) Reusability in software engineering.

   c) Purpose of use case diagram.

   d) Specialization and generalization.

   e) Design principles.

   f) Information about a pattern.

   g) Black box testing.

   h) Spiral model

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-III Semester
MCA-20304 Web Technologies
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)
Answer ALL Questions

1. a) i) Explain the different layers and their roles in protocols of Computer Communication.
    ii) What are the types of Bridges? Explain Simple Bridge?   [10+5]
    (OR)
    b) Explain the concepts of data fragmentation and reassembly in detail.

2. a) i) How does the three way Handshake technique help in creating a TCP connection?
    ii) Explain the concept of FTP (File Transfer Protocol)?   [7+8]
    (OR)
    b) i) Describe the steps involved when a web browser request for and obtains a web page from a Web server?
    ii) What are the three approaches for e-Commerce application Development and Explain Main features of a product such as IBM's Net.Commerce   [7+8]

3. a) i) Describe how static Web pages are made dynamic?
    ii) Create web pages for MOOCs with relevant fields.   [8+7]

    (OR)
    b) i) What are the advantages of Client - side scripting?
    ii)Describe ADO and how it can be used to interact with Databases?   [7+8]

4. a) i) Describe the typical operation involving a middleware such as CORBA?
    ii) Explain the concept of EDI?   [7+8]
    (OR)
    b) i) Describe the anatomy of an XML Document?
    ii) Explain WAP Architecture?   [7+8]

SECTION– B (5X3=15Marks)
Answer any FIVE Questions

5. a) What is ICMP?
    b) Describe Spooling in brief?
    c) What is Resolver?
    d) What are JavaBeans?
    e) What is the need for XSL? Illustrate this with the help of an example?
    f) Explain GPRS and UMTS?
    g) Life cycle of JAVA applet.
    h) JAVA Remote Method Invocation.

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-III Semester
MCA-20305 Blockchain Technology (Elective-II)
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)
Answer ALL Questions

1. **a**) Explain linking blocks using SHA-256 Algorithm. **(8M)**
   b) Explain digital signatures in blockchain? **(7M)**
   #### Or
   c) Explain blockchain types with examples? **(8M)**
   d) Explain blockchain functionalities with examples? **(7M)**

2. **a**)Explain blockchain design principles with examples? **(15M)**
   #### Or
   b) Explain security and privacy in blockchain with examples? **(15M)**

3. **a**) Explain pure state based consensus with examples? **(15M)**
   #### Or
   b) Explain any three consensus algorithms with examples? **(15M)**

4. **a**) Explain blockchain optimization techniques with examples? **(15M)**
   #### Or
   b) Explain blockchain enhancement techniques with examples? **(15M)**

Section-B (5 X 3 =15 Marks)

5. **Write a Short Note on any FIVE of the following**
   a) Differentiate between blockchain and databases.
   b) Explain hashing on Block chain.
   c) Explain distributed ledgers on Blockchain.
   d) Explain public and private ledgers on blockchain.
   e) Explain delegated proof of state in blockchain.
   f) Explain hyperledger on Blockchain.
   g) Explain Attacks on Blockchain.
   h) Explain evolution of consensus algorithm.

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-III Semester
MCA-20305 Cloud Computing (Elective-II)
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)
Answer ALL Questions

1. **a)** Explain Cloud computing delivery models and Services.   **(8M)**

   b) Discuss Communication Protocols and Process Coordination in Distributed Systems.   **(7M)**

Or

   c) Briefly explain Cloud Computing at Microsoft Azure.   **(8M)**

   d) Explain Responsibility sharing between user and cloud service provider.   **(7M)**

2. **a)** What is the need of virtualization? Explain Full virtualization and Para virtualization.   **(7M)**

   b) Discuss Virtual Machine Monitors and Virtual Machines.   **(7M)**

Or

   c) Explain Start-Time Fair Queuing Scheduling Algorithm for Computing Clouds.   **(15M)**

3. **a)** Explain Network File System (NFS), Andrew File System (AFS) and Sprite Network

   File System (SFS) of Distributive File Systems.   **(8M)**

   b) Discuss Google File System.   **(7M)**

Or

   c) Explain the Security of Virtualization   **(8M)**

   d) Discuss the Xoar: Breaking the monolithic design of the TCB.   **(7M)**

4. **a)** How do we connect clients to cloud instances through Firewalls?   **(8M)**

   b) Explain the Security rules for application and transport layer protocols in EC2.   **(7M)**

Or

   c) How to install Hadoop on Eclipse on a Windows system   **(8M)**

   d) Explain the Case Study: Xen, a VMM based on para virtualization   **(7M)**

SECTION-B (5 X 3 =15 Marks)

5. Write a Short Note on any FIVE of the following

   a)   Challenges for Cloud Computing

   b)   The Zoo Keeper

   c)   Mechanisms for Resource Management

   d)   Two-Level Resource Allocation Architecture

   e)   Locks and Chubby.

   f)   VM Security

   g)   Cloud-based simulation of a distributed trust algorithm.

   h)   The GrepTheWeb Application.

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-III Semester
MCA-20305 Machine Learning and Deep Learning (Elective-II)
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)
Answer ALL Questions

1. a) Explain about Types of Machine Learning Systems.   **(15M)**

OR

   b) Explain about Over fitting the Training Data, and Under fitting the Training Data.   **(15M)**

2. a) Explain about Measuring Accuracy Using Cross-Validation.   **(15M)**

OR

   b) Explain about Random Patches and Random Subspace.   **(15M)**

3. a) Explain about Linear Neurons and Their Limitations.   **(15M)**

OR

   b) Explain about Backpropagation Algorithm.   **(15M)**

4. a) Explain the TensorFlow Operations.   **(15M)**

OR

b) Explain about Leveraging TensorBoard to Visualize Computation Graphs and Learning. **(15M)**

SECTION B (5 X 3 = 15M)

5. ANSWER ANY FIVE

a. Testing and validating

b. Error Analysis

c. Limits of Traditional Computer Programs

d. TensorFlow

e. Challenges of Machine Learning

f. Gradient Boosting.

g. Delta Rule

h. Navigating Variable Scope

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-III Semester
MCA-20306 Business Intelligence and Visualization (Elective-III)
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)
Answer ALL Questions

1. a) Explain the Business Intelligence Architecture.   (8M)
   b) Explain the Role of Mathematical Models.   (7M)
                                  (OR)
   c) Explain the development of Business Intelligence System.   (9M)
   d) Explain the Ethics and Business Intelligence.   (6M)
2. a) Explain the Visualization.   (15M)
                                  (OR)
   b) Explain the interactive analysis and Ad Hoc Querying.   (8M)
   c) Explain the Considerations of Knowledge Delivery.   (7M)
3. a) Explain the Efficiency Measures.   (15M)
                                  (OR)
   b) Explain the Pattern Matching.   (15M)
4. a) Explain the business intelligence application.   (15M)
                                  (OR)

   b) Explain the future of business intelligence.   (15M)

SECTION- B (5×3=15M)
Answer any FIVE Questions

5. a) Explain the effective and timely decisions of business intelligence?

b) Explain the Dimensional Analysis?

c) Explain the Cross efficiency analysis?

d) Explain the Production Models?

e) Explain the BI Search?

f) Explain Parameterized Reports?

g) Explain the Enabling factors in Business Intelligence Projects?

h) Describe about the Emerging Technologies?

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-III Semester
MCA-20306 Robotics (Elective-III)
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)
Answer ALL Questions

1. a) Define the term 'Robot'. Explain different Robot types.   [8M]

   b) What is meant by a manipulator having redundant degrees of freedom and write its
   advantages?   [7M]

   (or)

   c) Distinguish between servo and non-servo grippers.   [8M]

   d) What are the design considerations in the robot end effector for holding the object?   [7M]

2. a) Discuss the features of SCARA and cylindrical robot and also find the D-H
   matrix for cylindrical robot.   [15M]

   (or)

   b) What is Jacobian work envelope? Explain in brief.   [8M]

   c) Find the manipulator Jacobian matrix J(q) of the five axis spherical co- ordinate robot.   [7M]

3. a) Explain the different types of Robot languages.   [8M]

   b) Discuss the software elements of robot and different teaching methods of robot.   [7M]

   (or)

   c) Explain the applications of Robot in spot and continuous arc welding. [8M]

   d) In which type of production, robots are preferred for loading and unloading
   function? Explain.   [7M]

4. a) Name and discuss the four basic arm configurations that are used in robotic manipulators.
                                                                           [8M]

   b) Discuss advantages and disadvantages of using robot in industry.   [7M]

   (or)

   c) Discuss direct and inverse kinematics   [8M]

   d) Differentiate path planning and trajectory planning   [7M]

SECTION-B (5 X 3 =15 M)

5. Write a Short Note on any FIVE of the following

a) What are the various applications of Robots in manufacturing industries?

b) What is the function of gripper?

c) What is inverse kinematics problem?

d) What is meant by range and proximity sensor?

e) Discuss robot trajectory planning.

f) Discuss the applications of Tactile sensors.

g) what is dynamic modeling?

h) what are advantages of offline programming?

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM
MCA-III Semester
MCA-20306 Foundations of Data Science (Elective-III)
MODEL QUESTION PAPER

Time:3 Hrs.   **Max Marks:75**

SECTION- A(4 X 15 = 60 M)

Answer ALL Questions

1. a) Explain concepts of relational database in data science with examples.   **(15M)**

OR

   b) Explain the concept of managing data in data science with examples.   **(15M)**

2. a) Explain modeling methods in data science with examples.   **(15M)**

OR

   b) Explain linear and logistic regression in data science with examples?   **(15M)**

3. a) Explain R language operations with examples.   **(15M)**

OR

   b) Explain probability distribution in R language with examples.   **(15M)**

4. a) Explain concept of documentation and deployment in data science with examples.**(15M)**

OR

   b) Explain the graphical analysis in data science with examples.   **(15M)**

SECTION-B (5 X 3 =15 M)

5. Write a Short Note on any FIVE of the following

    a. Explain stages in data science with examples.

    b. Explain spotting problems in data science

    c. Explain machine learning tasks on modeling.

    d. Explain k-means algorithms.

    e. Explain types of data items in R Language

    f. Explain Normal distribution in Data Science

    g. Explain Graphics parameters in R language.

    h. Explain Matrix plots in delivering data science