Course structure, Guidelines for Syllabus framing, scheme of Question paper and break-up of marks
UG Program (4 years Honors)
(2020-21 onwards)
(Draft: 21jan21)

Date of Joint BOS held:

ADIKAVI NANNAYA UNIVERSITY
RAJAHMAHENDRAVARAM, A.P., INDIA
UG- BLUE PRINT (2020-21 onwards)

BLUE PRINT
(2020-21 onwards)

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1. Program Structure for UG program (4 years Honors)*

(3rd and 4th year detailed design will be followed as per APSCHE GUIDELINES)

CBCS CURRICULAR FRAMEWORK (2020 - 2021 ONWARDS) - BACHELOR OF ARTS/commerce/BBA/BCA															
Subjects/Semesters	I		II		III		IV		V		VI			
	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	THIRD PHASE of APPRENTICESHIP Entire 5th / 6th Semester	FIRST and SECOND PHASES (2 spells) of APPRENTICESHIP between 1st and 2nd year and between 2nd and 3rd year (two
Languages														
English	4	3	4	3	4	3								
Language (H/T/S)	4	3	4	3	4	3								
Life Skill Courses	2	2	2	2	2+2	2+2								
Skill Development Courses	2	2	2+2	2+2	2	2								
Core Papers														
M - 1 C1 to C5	5	4	5	4	5	4	5 5	4 4						
M - 2 C1 to C5	5	4	5	4	5	4	5 5	4 4						
M - 3 C1 to C5	5	4	5	4	5	4	5 5	4 4						
M - 1 SEC (C6,C7)									5 5	4 4				
M - 2 SEC (C6,C7)									5 5	4 4				
M - 3 SEC (C6,C7)									5 5	4 4				
Hrs/W (Academic Credits)	27	22	29	24	29	24	30	24	30	24	0	12	4	4
Project Work														
Extension Activities (Non Academic Credits)														
NCC/NSS/Sports/Extra Curricular								2						
Yoga						1		1						
Extra Credits														
Hrs/W (Total Credits)	27	22	29	24	29	25	30	27	30	24	0	12	4	4

UG Sciences

CBCS CURRICULAR FRAMEWORK (2020 - 2021 ONWARDS) – BACHELOR OF Science														
Subjects/ Semesters		I		II		III		IV		V		VI		
		H/W	C	H/W	C	H/W	C	H/W	C	H/W	C	H/W	C	
Languages														THIRD PHASE of APPRENTICESHIP Entire 5th / 6th Semester
English		4	3	4	3	4	3							
Language (H/T/S)		4	3	4	3	4	3							
Life Skill Courses		2	2	2	2	2+2	2+2							
Skill Development Courses		2	2	2+2	2+2	2	2							
Core Papers														
M-1	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1					FIRST and SECOND PHASES (2 spells) of APPRENTICESHIP between 1st and 2nd year and between 2nd and 3rd year (two summer vacations).
M-2	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1					
M-3	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1					
M-1	SEC (C6,C7)									4+2 4+2	4+1 4+1			
M-2	SEC (C6,C7)									4+2 4+2	4+1 4+1			
M-3	SEC (C6,C7)									4+2 4+2	4+1 4+1			
Hrs/ W (Academic Credits)		30	25	32	27	32	27	36	30	36	30	0	12	4 4
Project Work														
Extension Activities (Non Academic Credits)														
NCC/NSS/Sports/Extra Curricular									2					
Yoga							1		1					
Extra Credits														
Hrs/W (Total Credits)		30	25	32	27	32	28	36	33	36	30	0	12	4 4

Marks & Credits distribution

Arts/Commerce/BBA/BCA:

Sl. No	Course type	No. of courses	Each course teaching Hrs/wk	Credit for each course	Total credits	Each course evaluation			Total marks
						Conti-exam	Univ-exam	Total	
1	English	3	4	3	9	25	75	100	300
2	S.Lang	3	4	3	9	25	75	100	300
3	LS	4	2	2	8	0	50	50	200
4	SD	4	2	2	8	0	50	50	200
5	Core/SE -I	5+2	5	4	28	25	75	100	700
	Core/SE -II	5+2	5	4	28	25	75	100	700
	Core/SE -III	5+2	5	4	28	25	75	100	700
6	Summer-Intern	2		4	8		100	200	200
7	Internship/ Apprentice/ on the job training	1		12	12		200	200	200
		38			138				3500
8	**Extension Activities (Non Academic Credits)**								
	NCC/NSS/Sports/Extra Curricular			2	2				
	Yoga	2		1	2				
	Extra Credits								
	Total	**40**			**142**				

Marks & Credits distribution

Sciences

Sl. No	Course type	No. of courses	Each course teaching Hrs/wk	Credit for each course	Total credits	Each course evaluation			Total marks
						Conti-Assess	Univ-exam	Total	
1	English	3	4	3	9	25	75	100	300
2	S.Lang	3	4	3	9	25	75	100	300
3	LS	4	2	2	8	0	50	50	200
4	SD	4	2	2	8	0	50	50	200
5	Core/SE -I	5+2	4+2	4+1	35	25	75+50	150	1050
	Core/SE -II	5+2	4+2	4+1	35	25	75+50	150	1050
	Core/SE -III	5+2	4+2	4+1	35	25	75+50	150	1050
6	Summer-Intern	2		4	8		100	200	200
7	Internship/ Apprentice/ on the job training	1		12	12		200	200	200
		38			159				4550
8	**Extension Activities (Non Academic Credits)**								
	NCC/NSS/Sports/ Extra Curricular			2	2				
	Yoga	2		1	2				
	Extra Credits								
	Total	**40**			**142**				

2. Syllabus framing guidelines
   Each course (ie., paper) will have:
   - Aim,
   - Learning outcome objectives,
   - Continuous assessment methodologies,
   - Co-curricular activities (i.e., measurable and general)

2.1 Languages (First/Second): English 3 courses + second language 3 courses (each with 4 hrs/ 4credits)
   - Each course will have 4hrs of teaching/week with 4 credits (i.e., 60hrs per semester teacher-student interactive sessions) per semester
   - From 1st semester to 3rd semester, Each semester one first language and one second language course would be present (i.e., 3 first language and 3 second language courses).
   - Each course consisting of Five units with 10 to 12 hrs of teachable syllabus in each unit.

2.2 Life skill courses and skill development courses: 4 courses of LS and 4 courses of SD (each with 2hrs/w and 2 credits)
   - Each course will have 2hrs of teaching/week with 2 credits (i.e., 25 - 30hrs per semester teacher-student interactive sessions) per semester
   - Four Life skill courses and four skill development courses are to be studied from 1st to 3rd semester (i.e., Life skill courses to be 1 + 1 + 2 and Skill development courses to be 1 + 2 + 1). In the 3rd semester, Environmental Education is a mandatory course in Life skill courses.
   - Each course consisting of three units with 10 to 15 hrs of teachable syllabus in each unit.

2.3 Core & Skill enhancement courses: 5 + 2 courses (each course with 4 hrs/w theory and 2 hrs/w lab for 4 + 1 credits)
   - Each course will have 4hrs of teaching/week with 4 credits (i.e., 50 - 60hrs per semester teacher-student interactive sessions) and 2hrs lab/practical/ problem solving with 1 credits (i.e., 10 – 12 lab/practical/problem solving experiments) per semester
   - From 1st semester to 4th semester, in Each semester 3 courses (i.e., combination) from different disciplines (i.e., one from each core) would be present
   - Each course consisting of five units with 10 to 12 hrs of teachable syllabus in each unit and 10 to 12 lab/practical/problems.

2.4 Community service/training during two summer breaks: 8 credits (i.e. each summer break with 4 credits for 100 marks)

2.5 Project/ Internship/Apprenticeship: 12 credits with 300 marks (in 5/6 semester)

3 Blue print for Question paper preparation

3.1 Languages (First/Second):   English 3 courses and second language 3 courses.

- Each course of 4 hrs/ week containing 5 units of syllabi for 50 hrs teaching with 3 credits based on 100 marks evaluation. Continuous assessment: 25 marks and University sem-end exam: 75 marks (3hrs)
- Question paper would be in two sections (Section A and Section B) for 75 marks
- Section A consisting of 8 questions covering all units i.e., from each unit one question is to be given and remaining from any unit. Student has to write 5 questions and each question carries 5 marks (i.e., 5 X 5M = 25M).
- Section B consisting of 10 questions (i.e., from each unit two questions to be given with either or choice). Student has to write 5 questions and each question carries 10 marks (i.e., 10 X 5 = 50 marks). Each question to be answered with 10 to 15 points or 20 to 35 lines alongwith diagrams/equations/ figure/flow charts, if necessary.

3.2 Life /Skill development courses: 4 courses of LSC and 4 courses of SDC
- Each course of 2 hrs/ week containing 3 units of syllabi for 30 hrs teaching with 2 credits based on 50 marks evaluation. No internal/Continuous assessment. University sem-end exam: 50 marks (90 minutes)
- Question paper would be in two sections (Section A and Section B) for 50 marks
- **Section A** consisting of 8 questions covering all units (i.e., two questions from each unit and the remaining to be from any unit). Student has to write 4 questions and each question carries 5 marks (i.e., 4 X 5M = 20M). Each question to be answered with 5-7 points/10-15 lines of answer with necessary diagram/equations/ figure/flow charts, if necessary.
- **Section B** consisting of 6 questions covering all units (i.e., from each unit two questions to be given with either or choice). Student has to write 3 questions and Each question carries 10 marks. (i.e., 3 X 10M = 30M). Each question to be answered with 10 to 15 points or 20 to 35 lines alongwith diagrams/equations/ figure/flow charts, if necessary.

3.3 Core/Skill enhancement courses (each course with 5 credits): 5 core courses and 2 skill enhance courses of the subject.

a. Theory paper (4 credits) : Each course of 4 hrs/ week of theory with 5 units of syllabi for 60 hrs of teaching with 4 credits based on 100 marks evaluation/Examination i.e, continuous assessment for 25 marks and university sem end exam for 75 marks (3hrs).
  - Question paper would be in two sections (Section A and Section B) for 75 marks
  - **Section A** consisting of 8 questions covering all units i.e., from each unit one question to be given and remaining from any unit. Student has to

write 5 questions and each question carries 5 marks (i.e., 5 X 5M = 25M). Each question to be answered with 5-7 points/10-15 lines of answer with necessary diagram/equations/ figure/flow charts, if necessary.

- **Section B** consisting of 10 questions covering all units (i.e., from each unit two questions to be given with either or choice). Student has to write 5 questions and each question carries 10 marks (i.e., 5 X 10M = 50M). Each question to be answered with 10 to 15 points or 20 to 35 lines alongwith diagrams/equations/ figure/flow charts, if necessary.

b. Lab/Practical paper (1 credit): 50 marks - 3hrs exam
- Each course of 2 hrs/ week (i.e., 30 hrs of lab) with 10 to 12 lab experiments/practicals/problem solving/exercises with 1 credit. Examination for 50 marks
- Odd semesters lab/practical exams are internal only.
- Even semesters lab/practical exams are externals.
- Break-up of lab/practical exam:
  - Experiment/problem solving: 40 marks
  - Record/report submission: 5 marks
  - Viva/inter-active questioning in lab exam: 5 marks

3.4 Community service Project/ Internship/on the job training/Apprentice-ship: as per th APSCHE GUIDELINES
- 1st and 2nd year summer vacation: each break period work with 4 credits (100 marks each)

Assessment Component	Max Marks
1. Project Log	20
2. Project Implementation	30
3. Project Report	25
4. Presentation	25
TOTAL	100

- 5th / 6th semesters: 12 credits for 200 marks

Internal Assessment Component	Max. Marks
1. Project Log	10
2. Project Implementation	20
3. Project Report	10
4. Presentation	10
TOTAL	50
External Assessment Component	Max. Marks
Performance Assessment by the Evaluation Committee, converting the grades awarded by the industry, enterprise, etc.	100
External Viva Voce	50
GRAND TOTAL	200

4   Model Question papers for first or Second language

MODEL QUESTION PAPER
All UG program: first or Second Language course
Semester:
Paper:…..,Title of the paper

Time: 3 hours   Max Marks: 75
SECTION – A
Answer any 5 questions. Each question carries 5 marks   (5 X 5M = 25M)
(Total 8 questions and at least TWO questions should be given from each unit)

1.
2.
3.
4.
5.
6.
7.
8.

SECTION – B

Answer all the questions. Each question carries 10 marks   (5 X 10M = 50M)

9. from Unit I
(OR)
10. from Unit I

11. from Unit II
(OR)
12. from Unit II

13. from Unit III
(OR)
14. from Unit III

15. from Unit IV
(OR)
 16. from Unit IV

 17. from Unit V
 (OR)
 18. from Unit V

5 Model Question papers for Life/Skill development courses

MODEL QUESTION PAPER
All UG Life/Skill development courses
Semester:
Paper:…..,Title of the paper

Time: 1 hr.30 min.   Max Marks: 50
SECTION – A
Answer any 4 questions. Each question carries 5 marks   (4 X 5M = 20M)
(Total 8 questions and at least two questions should be given from each unit)
1.
2.
3.
4.
5.
6.
7.
8.

SECTION – B

Answer all the questions. Each question carries 10 marks   (3 X 10 = 30M)

9. from Unit I
(OR)
10. from Unit I

11. from Unit II
(OR)
12. from Unit II

13. from Unit III
(OR)
14. from Unit III

6 Model Question papers for Core/Skill enhancement courses

MODEL QUESTION PAPER
All UG program: Core courses
Semester: ………..
Paper:…..,Title of the paper

Time: 3 hours   Max Marks: 75M
SECTION – A
Answer any 5 questions. Each question carries 5 marks   (5 X 5M = 25M)
(Total 8 questions and at least two questions should be given from each unit)

1.
2.
3.
4.
5.
6.
7.
8.
SECTION – B

Answer all the questions. Each question carries 10 marks   (5 X 10M = 50M)

9. from Unit I
(OR)
10. from Unit I

11. from Unit II
(OR)
12. from Unit II

13. from Unit III
(OR)
14. from Unit III

15. from Unit IV
(OR)
16. from Unit IV

17. from Unit V
(OR)
18. from Unit V

No. ANUR/ LS/UG-CBCS Guidelines/2017   October 24, 2017

PROCEEDINGS OF THE VICE-CHANCELLOR

Sub: - ANUR – LS- Undergraduate Courses – CBCS Guidelines for Project work in III year B.Com and BBA Course – Approved - Orders – . Issued.

Ref: - (i) Minutes of the Meeting of the Undergraduate Board of Studies in Commerce

    (ii) Minutes of the Meeting of the Undergraduate Board of Studies in BBA

    (iii) Note orders of the Vice-Chancellor dated : 24.10.2017

***

ORDER:

Having considered the resolutions of the meetings of the Undergraduate Board of Studies in Commerce and BBA, the Vice-Chancellor has ordered that the evaluation system in III year(V & VI Semester) courses of B.Com and BBA be approved, as follows:

1. Project work in Elective subjects in **the V Semester of B.Com course and BBA course** under **Internal Evaluation**, the marks will be awarded in the following pattern

   - **50 marks for Project Work**
   - **50 marks for Viva-voce**

2. Project work in Elective subjects in **the VI Semester of B. Com and BBA** under External **Evaluation,** the marks will be awarded in the following pattern

   - **50 marks for Project Work**
   - **50 marks for Viva-voce**

        (By Order)

(S. Teki)
Dean, Academic Affairs

To
1. The Convener/Members of the UG BoS in Commerce and BBA
2. All the Principals of Undergraduate Affiliated colleges through Website/SMS
3. The Controller of Examinations
4. The System Manager cum Programmer
5. The Superintendent, UG Examinations

Copies to:
7. PS to VC
8. PA to Registrar,
9. OOF

UG PROGRAM (4 Years Honors)

CBCS-2020-21

B.Sc.
Computer Science

Syllabus and Model Question Papers

TABLE OF CONTENTS

Note: BOS is to provide final soft copy in PDF and word formats and four copies of hard copies in bounded form to the office of Dean Academic affairs.

1. RESOLUTIONS OF THE BOARD OF STUDIES

Meeting held on: 22.01.2021.Time:10 A.MAt: Adikavi Nannaya University, RJY

Agenda:

1. Adoption of revised-common program structure and revising/updating course - wise syllabi (in the prescribed format) as per the guidelines issued by APSCHE.
2. Adoption of regulations on scheme of examination and marks/grading system of the University UG programs.
3. Preparation of Model question papers in prescribed format.
4. List of equipment/software requirement for each lab/practical
5. Eligibility of student for joining the course
6. Eligibility of faculty for teaching the course
7. List of paper-setters/paper evaluators with phone, email-id in the prescribed format

Members present:

Dr. P.Venkateshwara Rao	Chairman, Dept. of CSE, ANUR.
Sri.D.V.S.Suryanarayana	Member, MVNJS & RVRCollege of A&S, Malkipuram
Mr.D.Dasu	Coordinator, Dept. of CSE,ANUR

Resolutions:

2. Resolved to adopt the revised-common program structure and revising/updating course-wise syllabi (in the prescribed format) as per the guidelines issued by APSCHE.
3. Resolved to adopt the regulations on scheme of examination and marks/gradingsystem of the University UG programs.
4. Resolved to prepare the Model question papers in prescribed format.
5. Resolved to give the list of equipment/software requirement for each lab/practical
6. Resolved the eligibility of student for joining the course
7. Resolved the eligibility of faculty for teaching the course
8. Resolved to give the list of paper-setters/paper evaluators with phone, email-id in the prescribed format

2. DETAILS OF PAPER TITLES & CREDITS

Sem	Course no.	Course Name	Coursee type (T/L/ P)	Hrs/Week (Science:4+2)	Credits (Science:4+1)	Max. Marks Cont/ Internal /Mid Assessment	Max. Marks Sem- end Exam
I	1	Problem Solving in C	T	4	4	25	75
		Problem Solvingin C Lab	L	2	1	-	50
II	2	Data Structuresusing C	T	4	4	25	75
		Data Structuresusing C Lab	L	2	1	-	50
III	3	Database Management System	T	4	4	25	75
		Database Management System Lab	L	2	1	-	50
IV	4	Object Oriented Programmingusing Java	T	4	4	25	75
		Object Oriented Programming using Java Lab	L	2	1	-	50
	5	Operating Systems	T	4	4	25	75
		Operating Systems Lab using C/Java	L	2	1	-	50

Note: *Course type code: T: Theory, L: Lab, P: Problem solving

a. Proposed combination subjects: Computer Applications, Information Technology

b. Student eligibility for joining in the course:

c. Faculty eligibility for teaching the course:

d. List of Proposed Skill enhancement courses with syllabus, if any:

e. Any newly proposed Skill development/Life skill courses with draft syllabus and required resources

f. Required instruments/software/ computers for the course (Lab/Practical course-wiserequired i.e., for a batch of 15 students)

Sem.No.	Lab/Practical Name	Names of Instruments/Software/ computers required with specifications	Brand Name	Qty Required
1	Problem Solving in C Lab	Intel desktop PC(80GB HDD,512MB DDR), Windows OS, C compiler with supportingeditors		15
2	Data Structures usingC Lab	Intel desktop PC(80GB HDD,512MB DDR), Windows OS, C compiler with supportingeditors		15
3	Database Management System Lab	Intel desktop PC(80GB HDD,512MB DDR), Windows OS,Oracle 8i/9i or SQL Server,MY SQL		15
4	Object Oriented Programming using Java Lab	Intel desktop PC(80GB HDD,512MB DDR), Windows OS, JDK		15
5	Operating SystemsLab using C/Java	Intel desktop PC(80GB HDD,512MB DDR), Windows OS, C compiler with supporting editors, JDK		15

g. List of Suitable levels of positions eligible in the Govt/Pvt organizations Suitable levels of positions for these graduates either in industry/govt organization like, technical assistants/ scientists/school teachers, clearly define them, with reliable justification

S.No	Position	Company/ Govt organization	Remarks	Additional skills required, if any
	Software Programmer	IT Industry		
	Software Developer	IT Industry		
	Software Engineer	IT Industry		
	Program Manager	IT Industry		
	Clerk/PO	Banking Industry		
	IT Specialist	Banking Industry		
	Teacher/Lecturer/Asst.Prof	Education Institutes		
	DB Admin	IT Industry/Medical		

h. List of Govt. organizations / Pvt companies for employment opportunities or internshipsor projects

S.No	Company/ Govt organization	Position type	Level of Position			
	Software Development Industry					
	E-Commerce Industry					
	Medical Industry					
	IT Industry					
	Banking Industry					
	Education Industry					

i. Any specific instructions to the teacher /paper setters/Exam-Chief Superintendent

3. PROGRAM OBJECTIVES, OUTCOMES, CO-CURRICULAR ANDASSESSMENT METHODS

B.Sc.	Computer Science

1. Aim and objectives of UG program in Subject: Computer Science

   The Objectives of this Program describes what students are expected to know and be able to do by the time of graduation. The Computer Science Department's Bachelor of Science program must enable students to attain, by the time of graduation:

   - An ability to identify, formulate and develop solutions to computational challenges.
   - An ability to design, implement and evaluate a computational system to meet desiredneeds within realistic constraints.
   - An ability to function effectively on teams to accomplish shared computing design, evaluation, or implementation goals.
   - An understanding of professional, ethical, legal, security, and social issues and responsibilities for the computing profession.
   - An ability to communicate and engage effectively with diverse stakeholders.
   - An ability to analyze impacts of computing on individuals, organizations, and society.
   - Recognition of the need for and ability to engage in continuing professional development.
   - An ability to use appropriate techniques, skills, and tools necessary for computing practice.
   - Effectively utilizing their knowledge of computing principles and mathematical theory to develop sustainable solutions to current and future computing problems.
   - Developing and implementing solution based systems and/or processes that addressissues and/or improve existing systems within in a computing based industry.

2. Learning outcomes of Subject Computer Science:
   - Students will be able to communicate in written and oral forms in such a way as to demonstrate their ability to present information clearly, logically, and critically.
   - Students will be able to apply mathematical and computing theoretical concepts in solution of common computing applications, such as computing the order of an algorithm.
   - Students will be able to complete successfully be able to program small-to-mid- size programs on their own. Sufficient programming skills will require use of good practice, e.g., good variable names, good use of computational units, appropriate commenting strategies.
   - Students will be able to use appropriately system design notations and apply system design engineering process in order to design, plan, and implement software systems
   - In a self-selected area of depth in Computing, students will demonstrate a depth of knowledge appropriate to graduate study and/or lifelong learning in that area. Students should be able to read for understanding materials in that area beyond those assigned in coursework.
   - Students will be prepared for a career in an information technology oriented business or industry, or for graduate study in computer science or other scientific or technical fields.
   - Use systems development, word-processing, spreadsheet, and presentation software to solve basic information systems problems

3. Recommended Skill enhancement courses: (Titles of the courses given below and details of the syllabus for 4 credits (i.e., 2 units for theory and Lab/Practical) for 5 hrs class-cum-lab work.

4. Recommended Co-curricular activities: (Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)

   A. Measurable:
     1. Assignments
     2. Student seminars (Individual presentation of papers)
     3. Quiz Programmers
     4. Individual Field Studies/projects
     5. Group discussion
     6. Group/Team Projects

   B General:
     1. Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
     2. Group Discussions
     3. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
     4. Any similar activities with imaginative thinking.

5. Recommended Continuous Assessment methods:

   Some of the following suggested assessment methodologies could be adopted;
   • The oral and written examinations (Scheduled and surprise tests).
   • Closed-book and open-book tests.
   • Coding exercises.
   • Practical assignments and laboratory reports.
   • Observation of practical skills.
   • Individual and group project reports.
   • Efficient delivery using seminar presentations.
   • Viva voce interviews.
   • Computerized adaptive testing, literature surveys and evaluations.
   • Peers and self-assessment, outputs form individual and collaborative work
.

4. DETAILS OF COURSE-WISE SYLLABUS

B Sc	Semester: I	Credits: 4
Course: 1	**PROBLEM SOLVING IN C**	Hrs/Wk: 4

Aim and objectives of Course:
- This course aims to provide exposure to problem-solving through programming.
- It introduces the concepts of the C Programming language.

Learning outcomes of Course:
Upon successful completion of the course, a student will be able to:
- Understand the evolution and functionality of a Digital Computer.
- Apply logical skills to analyse a given problem
- Develop an algorithm for solving a given problem.
- Understand 'C' language constructs like Iterative statements, Arrayprocessing, Pointers.
- Apply 'C' language constructs to the algorithms to write a 'C' languageprogram.
3. Detailed Syllabus: (Five units with each unit having 12 hours of class work)

UNIT I:
General Fundamentals: Introduction to computers: Block diagram of a computer, characteristics and limitations of computers, applications of computers, types of computers, computer generations.
Introduction to Algorithms and Programming Languages: Algorithm – Key features of Algorithms, Flow Charts, Programming Languages – Generations of Programming Languages – Structured Programming Language- Design and Implementation of Correct, Efficient and Maintainable Programs.

UNIT II:
Introduction to C: Introduction – Structure of C Program – Writing the first C Program – File used in C Program – Compiling and Executing C Programs – Using Comments – Keywords – Identifiers – Basic Data Types in C – Variables – Constants – I/O Statements in C- Operators in C- Programming Examples.
Decision Control and Looping Statements: Introduction to Decision Control Statements– Conditional Branching Statements – Iterative Statements – Nested Loops – Break and Continue Statement – Goto Statement

UNIT III:
Arrays: Introduction – Declaration of Arrays – Accessing elements of the Array – Storing Values in Array– Operations on Arrays – one dimensional, two dimensional and multi dimensional arrays, character handling and strings.

UNIT IV:
Functions: Introduction – using functions – Function declaration/ prototype – Functiondefinition – function call – return statement – Passing parameters – Scope of variables – Storage Classes – Recursive functions.
Structure, Union, and Enumerated Data Types: Introduction – Nested Structures – Arrays of Structures – Structures and Functions– Union – Arrays of Unions Variables – Unions inside Structures – Enumerated Data Types.

UNIT V:
Pointers: Understanding Computer Memory – Introduction to Pointers – declaring Pointer Variables – Pointer Expressions and Pointer Arithmetic – Null Pointers - Passing Arguments to Functions using Pointer – Pointer and Arrays – Memory Allocation in C Programs – Memory Usage – Dynamic Memory Allocation – Drawbacks of Pointers
Files: Introduction to Files – Using Files in C – Reading Data from Files – Writing Data to Files – Detecting the End-of-file – Error Handling during File Operations – Accepting Command Line Arguments.

TEXT BOOKS:
1. E Balagurusamy – Programming in ANSIC – Tata McGraw-Hill publications.
2. Brain W Kernighan and Dennis M Ritchie - The 'C' Programming language" - Pearson publications.

REFERENCES:

1. Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson EditionPublications.

2. YashavantKanetkar - Let Us 'C' – BPB Publications.

B Sc	Semester: I	Credits: 1
Course: 1(L)	**PROBLEM SOLVING IN C Lab**	Hrs/Wk: 2

1. Details of Lab Syllabus: **Problem solving in C LAB**

1. Write a program to check whether the given number is Armstrong or not.

2. Write a program to find the sum of individual digits of a positive integer..

3. Write a program to generate the first n terms of the Fibonacci sequence.

4. Write a program to find both the largest and smallest number in a list of integer values

5. Write a program to demonstrate refection of parameters in swapping of two integervalues using Call by Value & Call by Address

6. Write a program that uses functions to add two matrices.

7. Write a program to calculate factorial of given integer value using recursive functions

8. Write a program for multiplication of two N X N matrices.

9. Write a program to perform various string operations.

10. Write a program to search an element in a given list of values.

11. Write a program to sort a given list of integers in ascending order.

12. Write a program to calculate the salaries of all employees using *Employee (ID, Name, Designation, Basic Pay, DA, HRA, Gross Salary, Deduction, Net Salary)* structure.

    a. DA is 30 % of Basic Pay

    b. HRA is 15% of Basic Pay

    c. Deduction is 10% of (Basic Pay + DA)

    d. Gross Salary = Basic Pay + DA+ HRA

    e. Net Salary = Gross Salary – Deduction

13. Write a program to illustrate pointer arithmetic.

14. Write a program to read the data character by character from a file.

15. Write a program to create *Book (ISBN, Title, Author, Price, Pages, Publisher)* structure and store book details in a file and perform the following operations

    a. Add book details

    b. Search a book details for a given ISBN and display book details, if available

    c. Update a book details using ISBN

    d. Delete book details for a given ISBN and display list of remaining Books

5. RECOMMENDED CO-CURRICULAR ACTIVITIES:
   (Co-curricular activities shall not promote copying from textbook or from otherswork and shall encourage self/independent and group learning)

A. Measurable
1. Assignments (in writing and doing forms on the aspects of syllabuscontent and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individualactivity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real- time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity

B. General
1. Group Discussion
2. Try to solve MCQ's available online.
3. Others

6. RECOMMENDED CONTINUOUS ASSESSMENT METHODS:
   Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Problem-solving exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports like "Creating Text Editor in C".
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work.

5. MODEL QUESTION PAPER (Sem-end. Exam)
B.Sc DEGREE EXAMINATIONS
Semester - I
Course : PROBLEM SOLVING IN C

Time: 3Hrs   Max.marks:75

Section - A

Answer any 5 question   5X5 = 25M

1. Explain Block diagram of Computer.

2. Define an Algorithm. What are the key features of an algorithm?

3. Write about go to statement with syntax and example.

4. Dynamic memory allocation.

5. Explain pointers in arrays.

6. How to write data from files with example?

7. Write about enumerated data types.

8. Briefly explain various types of recursions.

Section - B

Answer following question   5X10 = 50M

9. a) Briefly explain about generations of computers.

(OR)

b) What is a Flowchart? Explain significance with an example.

10. a) Explain basic data types in C?

(OR)

b) Explain about iterative statements available in C.

11. a) What is an Array? Explain different types of arrays with examples.

(OR)

b) What is a string? Explain various string handling functions available in C.

12. a) Define a function. Explain the passing parameter mechanism.

(OR)

b) Explain about Structure with syntax and example in detail.

13. a) Define and use of a pointer and write a 'C' program on swapping of two

numbersusing pointers.

(OR)

b) Explain file modes in detail.

B Sc	Semester: II	Credits: 4
Course: 2	DATA STRUCTURES USING C	Hrs/Wk: 4

Aim and objectives of Course:
- To introduce the fundamental concept of data structures and to emphasize the importance of various data structures in developing and implementing efficient algorithms.

Learning outcomes of Course:
Upon successful completion of the course, a student will be able to:
- Understand available Data Structures for data storage and processing.
- Comprehend Data Structure and their real-time applications - Stack,Queue, Linked List, Trees and Graph
- Choose a suitable Data Structures for an application
- Develop ability to implement different Sorting and Search methods
- Have knowledge onData Structures basic operations like insert, delete,search,update and traversal
- Design and develop programs using various data structures
- Implement the applications of algorithms for sorting, pattern matching etc

Detailed Syllabus: (Five units with each unit having 12 hours of class work)

UNIT I:
Introduction to Data Structures: Introduction to the Theory of Data Structures, Data Representation, Abstract Data Types, Data Types, Primitive Data Types, Data Structure and Structured Type, Atomic Type, Difference between Abstract Data Types, Data Types, and Data Structures, Refinement Stages.
Principles of Programming and Analysis of Algorithms: Software Engineering, Program Design, Algorithms, Different Approaches to Designing an Algorithm, Complexity, Big 'O' Notation, Algorithm Analysis, Structured Approach to Programming, Recursion, Tips and Techniques for Writing Programs in 'C'.

UNIT II:
Arrays: Introduction to Linear and Non- Linear Data Structures, One- Dimensional Arrays, Array Operations, Two- Dimensional arrays, Multidimensional Arrays, Pointers and Arrays, an Overview of Pointers.
Linked Lists: Introduction to Lists and Linked Lists, Dynamic Memory Allocation, Basic Linked List Operations, Doubly Linked List, Circular Linked List, Atomic Linked List, Linked List in Arrays, Linked List versus Arrays.

UNIT III:
Stacks: Introduction to Stacks, Stack as an Abstract Data Type, Representation of Stacks through Arrays, Representation of Stacks through Linked Lists, Applications of Stacks,Stacks and Recursion.
Queues: Introduction, Queue as an Abstract data Type, Representation of Queues, Circular Queues, Double Ended Queues- Deques, Priority Queues, Application of Queues.

UNIT IV:
Binary Trees: Introduction to Non- Linear Data Structures, Introduction Binary Trees, Types of Trees, Basic Definition of Binary Trees, Properties of Binary Trees, Representation of Binary Trees, Operations on a Binary Search Tree, Binary Tree Traversal, Counting Number of Binary Trees, Applications of Binary Tree.

UNIT V:
Searching and sorting: Sorting – An Introduction, Bubble Sort, Insertion Sort, Merge Sort, Searching – An Introduction, Linear or Sequential Search, Binary Search, Indexed Sequential Search

Graphs: Introduction to Graphs, Terms Associated with Graphs, Sequential Representation of Graphs, Linked Representation of Graphs, Traversal of Graphs, Spanning Trees, Shortest Path, Application of Graphs.

TEXT BOOKS:

1. "Data Structures using C", ISRD group Second Edition, TMH

2. "Data Structures through C", Yashavant Kanetkar, BPB Publications

REFERENCES:

1. "Data Structures Using C" Balagurusamy E. TMH

B Sc	**Semester: II**	**Credits: 1**
Course: 2(L)	**DATA STRUCTURES USING C Lab**	**Hrs/Wk: 2**

Details of Lab Syllabus: **Data Structures Using C Lab**

a. Write a program to read 'N' numbers of elements into an array and also perform thefollowing operation on an array

    i. Add an element at the begging of an array

    ii. Insert an element at given index of array

    iii. Update a element using a values and index

    iv. Delete an existing element

b. Write a program using stacks to convert a given

    i. postfix expression to prefix

    ii. prefix expression to postfix

    iii. infix expression to postfix

c. Write Programs to implement the Stack operations using an array

d. Write Programs to implement the Stack operations using Liked List.

e. Write Programs to implement the Queue operations using an array.

f. Write Programs to implement the Queue operations using Liked List.

g. Write a program for arithmetic expression evaluation.

h. Write a program for Binary Search Tree Traversals

i. Write a program to implement dequeue using a doubly linked list.

j. Write a program to search an item in a given list using the following SearchingAlgorithms

    i. Linear Search

    ii. Binary Search.

k. Write a program for implementation of the following Sorting Algorithms

    i. Bubble Sort

    ii. Insertion Sort

    iii. Quick Sort

l. Write a program for polynomial addition using single linked list

m. Write a program to find out shortest path between given Source Node and DestinationNode in a given graph using Dijkstrar's algorithm.

n. Write a program to implement Depth First Search graph traversals algorithm

o. Write a program to implement Breadth First Search graph traversals algorithm

RECOMMENDED CO-CURRICULAR ACTIVITIES:

(Co-curricular activities shall not promote copying from textbook or from otherswork and shall encourage self/independent and group learning)

A. Measurable
1. Assignments (in writing and doing forms on the aspects of syllabuscontent and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individualactivity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real- time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity

B. General
1. Group Discussion
2. Try to solve MCQ's available online.
3. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

p. The oral and written examinations (Scheduled and surprise tests),

q. Closed-book and open-book tests,

r. Problem-solving exercises,

s. Practical assignments and laboratory reports,

t. Observation of practical skills,

u. Individual and group project reports like "Creating Text Editor in C".

v. Efficient delivery using seminar presentations,

w. Viva voce interviews.

x. Computerized adaptive testing, literature surveys and evaluations,

y. Peers and self-assessment, outputs form individual and collaborative work.

MODEL QUESTION PAPER (Sem-end. Exam)
B.Sc DEGREE EXAMINATIONS
Semester - II
Course : DATA STRUCTURES USING C

Time: 3Hrs   Max.marks:75

Section - A

Answer any 5 question   **5X5 = 25M**

1. Explain about Abstract Data Types.

2. Define linear and non-linear data structures.

3. Explain Atomic Linked List.

4. What are the applications of stacks?

5. What is priority queue?

6. Explain about binary search tree.

7. Define sorting. What are the advantages and disadvantages of merge sort?

8. Briefly explain various representations of Graphics.

Section - B

Answer following question   **5X10 = 50M**

9. a) What are primitive and non-primitive data structures with an example?

(OR)

b) Explain different approaches to designing an algorithm.

10. a) Explain different types of arrays.

(OR)

b) What is linked list? Explain different types of linked lists in data structures.

11. a) What is stack? Write ADT. Explain various operations of stack.

(OR)

b) What is a Deque? What are the different techniques used to represent Deque? Explain.

12. a) Write about different tree traveling techniques and write an algorithm for traveling techniques.

(OR)

b) Explain different applications and properties of binary tree.

13. a) Write about various Graph Travelling techniques.

(OR)

b) What is searching? Explain Linear Search Algorithm with example.

B Sc	Semester: III	Credits: 4
Course: 3	**DATABASE MANAGEMENTSYSTEM**	Hrs/Wk: 4

Aim and objectives of Course:
- The objective of the course is to introduce the design and development ofdatabases with special emphasis on relational databases.

Learning outcomes of Course: Upon successful completion of the course, a student will be able to:
- Gain knowledge of Database and DBMS.
- Understand the fundamental concepts of DBMS with special emphasis onrelational data model.
- Demonstrate an understanding of normalization theory and apply suchknowledge to the normalization of a database
- Model data base using ER Diagrams and design database schemas based on themodel.
- Create a small database using SQL.
- Store, Retrieve data in database.

Detailed Syllabus: (Five units with each unit having 12 hours of class work)

UNIT I:

Overview of Database Management System: Introduction to data, information, database, database management systems, file-based system, Drawbacks of file-Based System, database approach, Classification of Database Management Systems, advantages of database approach, Various Data Models, Components of Database Management System, three schema architecture of data base, costs and risks of database approach**.**

UNIT II:

Entity-Relationship Model: Introduction, the building blocks of an entity relationship diagram, classification of entity sets, attribute classification, relationship degree, relationship classification, reducing ER diagram to tables, enhanced entity-relationship model (EER model), generalization and specialization, IS A relationship and attribute inheritance, multiple inheritance, constraints on specialization and generalization, advantages of ER modeling.

UNIT III:

Relational Model: Introduction, CODD Rules, relational data model, concept of key, relational integrity, relational algebra, relational algebra operations, advantages of relational algebra, limitations of relational algebra, relational calculus, tuple relational calculus, domain relational Calculus (DRC), Functional dependencies and normal forms upto 3rd normal form.

UNIT IV:

Structured Query Language: Introduction, History of SQL Standard, Commands in SQL, Data Types in SQL, Data Definition Language, Selection Operation, Projection Operation, Aggregate functions, Data Manipulation Language, Table Modification Commands, Join Operation, Set Operations, View, Sub Query.

UNIT V

PL/SQL: Introduction, Shortcomings of SQL, Structure of PL/SQL, PL/SQL Language Elements, Data Types, Operators Precedence, Control Structure, Steps to Create a PL/SQL, Program, Iterative Control, Procedure, Function, Database Triggers, Types of Triggers.

TEXT BOOKS:
1. Database System Concepts by Abraham Silberschatz, Henry Korth, and S. Sudarshan, McGrawhill
2. Database Management Systems by Raghu Ramakrishnan, McGrawhill

REFERENCES:
1. Principles of Database Systems by J. D. Ullman
2. Fundamentals of Database Systems by R. Elmasri and S. Navathe
3. SQL: The Ultimate Beginners Guide by Steve Tale.

B Sc	Semester: III	Credits: 1
Course: 3(L)	DATABASE MANAGEMENT SYSTEM LAB	Hrs/Wk: 2

Details of Lab Syllabus: DATABASE MANAGEMENT SYSTEM LAB

1. Draw ER diagram for hospital administration

2. Creation of college database and establish relationships between tables

3. Relational database schema of a company is given in the following figure.

   Relational Database Schema - COMPANY
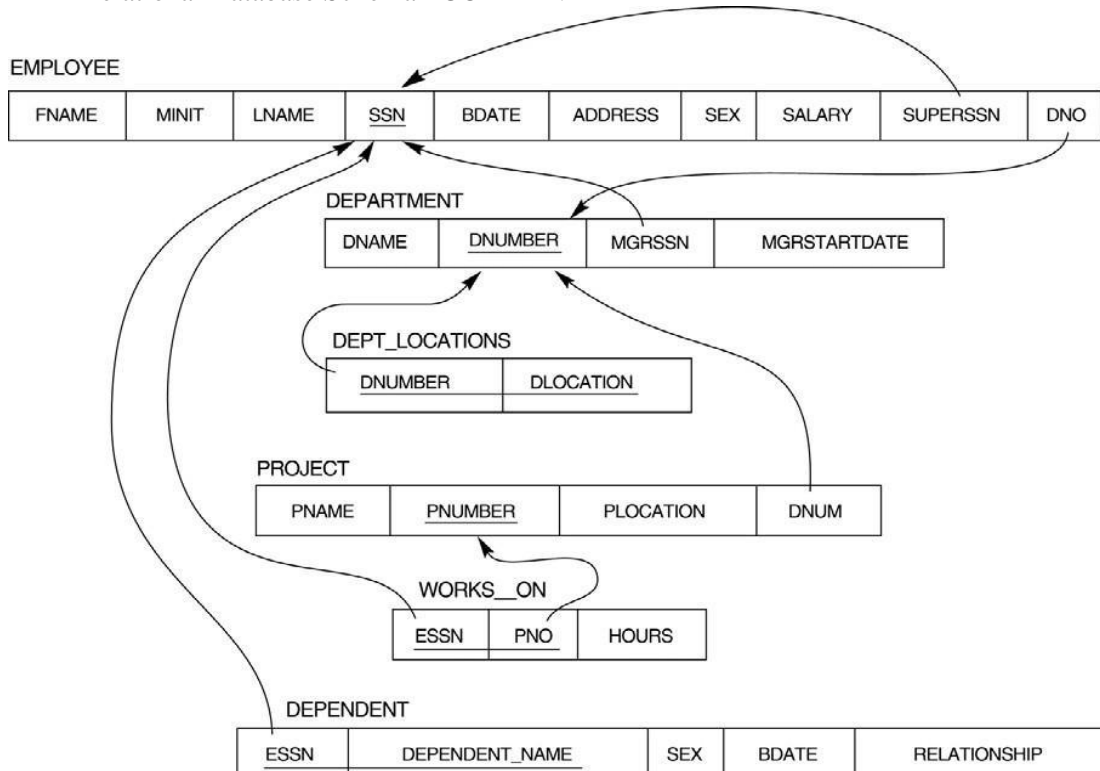
Questions to be performed on above schema

1. Create above tables with relevant *Primary Key, Foreign Key and other constraints*

2. Populate the tables with data

3. Display all the details of all employees working in the company.

4. Display *ssn, lname, fname, address* of employees who work in department no 7.

5. Retrieve the *Birthdate and Address* of the employee whose name is 'Franklin T.Wong'

6. Retrieve the name and salary of every employee.

7. Retrieve all distinct salary values

8. Retrieve all employee names whose address is in 'Bellaire'

9. Retrieve all employees who were born during the 1950s

10. Retrieve all employees in department 5 whose salary is between 50,000 and 60,000 (inclusive)

11. Retrieve the names of all employees who do not have supervisors

12. Retrieve SSN and department name for all employees

13. Retrieve the name and address of all employees who work for the 'Research'department

14. For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birth date.

15. For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.

16. Retrieve all combinations of Employee Name and Department Name

17. Make a list of all project numbers for projects that involve an employee whose last name is 'Narayan' either as a worker or as a manager of the department that controls the project.

18. Increase the salary of all employees working on the 'ProductX' project by 15%. Retrieve employee name and increased salary of these employees.

19. Retrieve a list of employees and the project name each works in, ordered by the employee's department, and within each department ordered alphabetically by employee first name.

20. Select the names of employees whose salary does not match with salary of any employee in department.

21. Retrieve the employee numbers of all employees who work on project located in Bellaire, Houston, or Stafford.

22. Find the sum of the salaries of all employees, the maximum salary, the minimum salary, and the average salary. Display with proper headings

23. Find the sum of the salaries and number of employees of all employees of the 'Marketing' department, as well as the maximum salary, the minimum salary, and the average salary in this department.

24. Select the names of employees whose salary is greater than the average salary of all employees in department 10.

25. Delete all dependents of employee whose *ssn is '123456789'*.

26. Perform a query using alter command to drop/add field and a constraint in Employeetable.

RECOMMENDED CO-CURRICULAR ACTIVITIES:

(Co-curricular activities shall not promote copying from textbook or from otherswork and shall encourage self/independent and group learning)

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)

2. Student seminars (on topics of the syllabus and related aspects (individualactivity))

3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))

4. Study projects (by very small groups of students on selected local real- time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity

B. General

1. Group Discussion

2. Try to solve MCQ's available online.

3. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),

2. Closed-book and open-book tests,

3. Problem-solving exercises,

4. Practical assignments and laboratory reports,

5. Observation of practical skills,

6. Individual and group project reports like "Creating Text Editor in C".

7. Efficient delivery using seminar presentations,

8. Viva voce interviews.

9. Computerized adaptive testing, literature surveys and evaluations,

10. Peers and self-assessment, outputs form individual and collaborative work.

MODEL QUESTION PAPER (Sem-end. Exam)
B.Sc DEGREE EXAMINATIONS
Semester - III
Course : DATABASE MANAGEMENT SYSTEM

Time: 3Hrs   Max.marks:75

Section - A

Answer any 5 question   **5X5 = 25M**

1. Explain disadvantages of file processing system?

2. Explain the concept of entity and entity set with suitable example.

3. Explain about various attribute classification.

4. What are the advantages of Relational algebra? Explain.

5. Explain various types of keys.

6. Explain the selection command with an example.

7. Explain sub queries.

8. Explain structure of PL/SQL.

Section - B

Answer following question   **5X10 = 50M**

9. a) With a neat diagram, explain the architecture of a DBMS.

(OR)

b) Explain about Data Models.

10. a) Explain about Specialization and Generalization in EER model.

(OR)

b) What is ER-Modeling? Write advantages and disadvantages of ER-Modelling.

11. a) What is Functional Dependency? Explain difference between 3NF and BCNF?

(OR)

b) What is relational model? Write about key features of relational model.

12. a) What is SQL? Explain different types of commands in SQL.

(OR)

b) What is Nested Queries? How to create them? Discuss it with relevant example.

13. a) Explain steps in creating a PL/SQL Program.

(OR)

b) Explain about Triggers and types of triggers.

B Sc	Semester: IV	Credits: 4
Course: 4	**OBJECT ORIENTED PROGRAMMING USING JAVA**	Hrs/Wk: 4

Aim and objectives of Course:
- To introduce the fundamental concepts of Object-Oriented programming and todesign & implement object oriented programming concepts in Java.

Learning outcomes of Course:
- Understand the benefits of a well-structured program
- Understand different computer programming paradigms
- Understand underlying principles of Object-Oriented Programming in Java
- Develop problem-solving and programming skills using OOP concepts
- Develop the ability to solve real-world problems through software developmentin high-level programming language like Java

Detailed Syllabus: (Five units with each unit having 12 hours of class work)

UNIT I:
Introduction to Java: Features of Java, The Java virtual Machine, Parts of Java
Naming Conventions and Data Types: Naming Conventions in Java, Data Types in Java, Literals
Operators in Java: Operators, Priority of Operators. **Control Statements in Java**: if... else Statement, do... while Statement, while Loop, for Loop, switch Statement, break Statement, continue Statement, return Statement. **Input and Output:** Accepting Input from the Keyboard, Reading Input with Java.util.Scanner Class, Displaying Output with System.out.printf(), Displaying Formatted Output with String.format(). **Arrays:** Types of Arrays, Three Dimensional Arrays (3D array), array name. length, Command Line Arguments

UNIT II:
Strings: Creating Strings, String Class Methods, String Comparison, Immutability of Strings. **Introduction to OOPs**: Problems in Procedure Oriented Approach, Features of Object- Oriented Programming System (OOPS). **Classes and Objects**: Object Creation, Initializing the Instance Variables, Access Specifiers,Constructors.
Methods in Java: Method Header or Method Prototype, Method Body, Understanding Methods, Static Methods, Static Block, The keyword 'this', Instance Methods, Passing Primitive Data Types to Methods, Passing Objects to Methods, Passing Arrays to Methods, Recursion, Factory Methods.
Inheritance: Inheritance, The keyword 'super', The Protected Specifier, Types ofInheritance.

UNIT III:
Polymorphism: Polymorphism with Variables, Polymorphism using Methods, Polymorphism with Static Methods, Polymorphism with Private Methods, Polymorphism with Final Methods, final Class.
Type Casting: Types of Data Types, Casting Primitive Data Types, Casting Referenced DataTypes, The Object Class. **Abstract Classes**: Abstract Method and Abstract Class.
Interfaces: Interface, Multiple Inheritance using Interfaces. **Packages:** Package, Different Types of Packages, The JAR Files, Interfaces in a Package, Creating Sub Package in a Package, Access Specifiers in Java, Creating API Document. **Exception Handling:** Errors in Java Program, Exceptions, throws Clause, throw Clause, Types of Exceptions, Re – throwing an Exception.

UNIT – IV
Streams: Stream, Creating a File using FileOutputStream, Reading Data from a File uingFileInputStream, Creating a File using FileWriter, Reading a File using FileReader, Zipping and Unzipping Files, Serialization of Objects, Counting Number of Characters in a File, File Copy, File Class

Threads: Single Tasking, Multi Tasking, Uses of Threads, Creating a Thread and Running it, Terminating the Thread, Single Tasking Using a Thread, Multi Tasking Using Threads, Multiple Threads Acting on Single Object, Thread Class Methods, Deadlock of Threads, Thread Communication, Thread Priorities, thread Group, Daemon Threads, Applications of Threads, Thread Life Cycle.

UNIT V:
Applets: Creating an Applet, Uses of Applets, <APPLET> tag, A Simple Applet, An Applet with Swing Components, Animation in Applets, A Simple Game with an Applet, Applet Parameters.
Java Database Connectivity: Database Servers, Database Clients, JDBC (Java Database Connectivity), Working with Oracle Database, Working with MySQL Database, Stages in a JDBC Program, Registering the Driver, Connecting to a Database, Preparing SQL Statements, Using jdbc–odbc Bridge Driver to Connect to Oracle Database, Retrieving Data from MySQL Database, Retrieving Data from MS Access Database, Stored Procedures and CallableStatements, Types of Result Sets.

TEXT BOOKS:

1. Core Java: An Integrated Approach, Authored by Dr. R. Nageswara Rao &Kogent Learning Solutions Inc.

2. E.Balaguruswamy, Programming with JAVA, A primer, 3e, TATA McGraw- HillCompany.

REFERENCES:

1. John R. Hubbard, Programming with Java, Second Edition, Schaum's outlineSeries, TMH.

2. Deitel&Deitel. Java TM: How to Program, PHI (2007)

B Sc	Semester: IV	Credits: 1
Course: 4(L)	Object Oriented Programming using Java Lab	Hrs/Wk: 2

Details of Lab Syllabus: Object Oriented Programming using Java Lab

1. Write a program to read *Student Name, Reg.No, Marks[5]* and calculate *Total*,*Percentage, Result*. Display all the details of students

2. Write a program to perform the following String Operations
   a. Read a string
   b. Find out whether there is a given substring or not
   c. Compare existing string by another string and display status
   d. Replace existing string character with another character
   e. Count number of works in a string

3. Java program to implements Addition and Multiplication of two N X N matrices.

4. Java program to demonstrate the use of Constructor.

5. Calculate area of the following shapes using method overloading.
   a. Triangle
   b. Rectangle
   c. Circle
   d. Square

6. Implement inheritance between *Person (Aadhar, Surname, Name, DOB, and Age)* and *Student (Admission Number, College, Course, Year)*classes where ReadData(),DisplayData() are overriding methods.

7. Java program for implementing Interfaces

8. Java program on Multiple Inheritance.

9. Java program for to display *Serial Number from 1 to N* by creating two Threads

10. Java program to demonstrate the following exception handlings
    e. Divided by Zero
    f. Array Index Out of Bound
    g. File Not Found
    h. Arithmetic Exception
    i. User Defined Exception

11. Create an Applet to display different shapes such as Circle, Oval, Rectangle, Square and Triangle.

12. Write a program to create *Book (ISBN,Title, Author, Price, Pages, Publisher)*structure and store book details in a file and perform the following operations
    j. Add book details
    k. Search a book details for a given ISBN and display book details, if available
    l. Update a book details using ISBN
    m. Delete book details for a given ISBN and display list of remaining Books

RECOMMENDED CO-CURRICULAR ACTIVITIES:

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)

2. Student seminars (on topics of the syllabus and related aspects (individual activity))

3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))

4. Study projects (by very small groups of students on selected local real- time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)

B. General

1. Group Discussion

2. Try to solve MCQ's available online.

3. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),

2. Closed-book and open-book tests,

3. Problem-solving exercises,

4. Practical assignments and laboratory reports,

5. Observation of practical skills,

6. Individual and group project reports like "Creating Text Editor in C".

7. Efficient delivery using seminar presentations,

8. Viva voce interviews.

9. Computerized adaptive testing, literature surveys and evaluations,

10. Peers and self-assessment, outputs form individual and collaborative work.

MODEL QUESTION PAPER (Sem-end. Exam)
B.Sc DEGREE EXAMINATIONS
Semester - IV
Course : OBJECT ORIENTED PROGRAMMING USING JAVA

Time: 3Hrs   Max.marks:75

Section - A

Answer any 5 question   **5X5 = 25M**

1. Explain about JVM.

2. Explain about factory methods.

3. Explain about 'this' keyword with example.

4. Explain about Type casting.

5. Define Abstract class and Abstract method.

6. Explain Zipping and Unzipping files.

7. How to terminate a thread.

8. Explain JDBC.

Section - B

Answer following question   **5X10 = 50M**

9. a) Explain Looping statements in JAVA.

(OR)

b) Explain operators and types of operators.

10. a) Explain Inheritance and types of Inheritance.

(OR)

b) Explain constructors and types of constructors with an example.

11. a) Describe Interface? Critically explain and define Accessing Interface variable.

(OR)

b) Explain concept of Exception handling.

12. a) Explain the concept of Creating a file using File Writer using an example program.

(OR)

b) Discuss Thread Life Cycle.

13. a) Define Applet. Explain how to create an Applet.

(OR)

b) Explain the procedure to connect Oracle Database using jdbc-odbc driver.

B Sc	Semester: IV	Credits: 4
Course: 5	OPERATING SYSTEMS	Hrs/Wk: 4

Aim and objectives of Course:

- This course aims to introduce the structure and organization of a file system. It emphasizes various functions of an operating system like memory management, process management, device management, etc.

Learning outcomes of Course:

Upon successful completion of the course, a student will be able to:

- Know Computer system resources and the role of operating system in resource management with algorithms
- Understand Operating System Architectural design and its services.
- Gain knowledge of various types of operating systems including Unix and Android.
- Understand various process management concepts including scheduling, synchronization, and deadlocks.
- Have a basic knowledge about multithreading.
- Comprehend different approaches for memory management.
- Understand and identify potential threats to operating systems and the security features design to guard against them.
- Specify objectives of modern operating systems and describe how operating systems have evolved over time.
- Describe the functions of a contemporary operating system

Detailed Syllabus: (Five units with each unit having 12 hours of class work)

UNIT I:

What is Operating System? History and Evolution of OS, Basic OS functions, Resource Abstraction, Types of Operating Systems– Multiprogramming Systems, Batch Systems, Time Sharing Systems; Operating Systems for Personal Computers, Workstations and Hand-held Devices, Process Control & Real time Systems.

UNIT II:

Processor and User Modes, Kernels, System Calls and System Programs, System View of the Process and Resources, Process Abstraction, Process Hierarchy, Threads, Threading Issues, Thread Libraries; Process Scheduling, Non-Preemptive and Preemptive Scheduling Algorithms.

UNIT III:

Process Management: Deadlock, Deadlock Characterization, Necessary and Sufficient Conditions for Deadlock, Deadlock Handling Approaches: Deadlock Prevention, Deadlock Avoidance and Deadlock Detection and Recovery. Concurrent and Dependent Processes, Critical Section, Semaphores, Methods for Inter- process Communication; Process Synchronization, Classical Process Synchronization Problems: Producer-Consumer, Reader-Writer.

UNIT IV:

Memory Management: Physical and Virtual Address Space; Memory Allocation Strategies– Fixed and -Variable Partitions, Paging, Segmentation, Virtual Memory.

UNIT V:

File and I/O Management, OS security : Directory Structure, File Operations, File Allocation Methods, Device Management, Pipes, Buffer, Shared Memory, Security Policy Mechanism, Protection, Authentication and Internal Access Authorization Introduction to Android Operating System, Android Development Framework, Android Application Architecture, Android Process Management and File System, Small Application Development using Android Development Framework.

TEXT BOOKS:
1. Operating System Principles by Abraham Silberschatz, Peter Baer Galvin and GregGagne

   (7thEdition) Wiley India Edition.

2. Operating Systems: Internals and Design Principles by Stallings (Pearson)

REFERENCES:
1. Operating Systems by J. Archer Harris (Author), Jyoti Singh (Author) (TMH)
2. Online Resources for UNIT V

B Sc	Semester: IV	Credits: 1
Course: 5(L)	Operating Systems Lab using C/Java	Hrs/Wk: 2

Details of Lab Syllabus: **Operating Systems Lab using C/Java**

1. Write a program to implement Round Robin CPU Scheduling algorithm

2. Simulate SJF CPU Scheduling algorithm

3. Write a program the FCFS CPU Scheduling algorithm

4. Write a program to Priority CPU Scheduling algorithm

5. Simulate Sequential file allocation strategies

6. Simulate Indexed file allocation strategies

7. Simulate Linked file allocation strategies

8. Simulate MVT and MFT memory management techniques

9. Simulate Single level directory File organization techniques

10. Simulate Two level File organization techniques

11. Simulate Hierarchical File organization techniques

12. Write a program for Bankers Algorithm for Dead Lock Avoidance

13. Implement Bankers Algorithm Dead Lock Prevention.

14. Simulate all Page replacement algorithms.

    a) FIFO

    b) LRU

    c) LFU

15. Simulate Paging Techniques of memory management

RECOMMENDED CO-CURRICULAR ACTIVITIES:

(Co-curricular activities shall not promote copying from textbook or from otherswork and shall encourage self/independent and group learning)

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)

2. Student seminars (on topics of the syllabus and related aspects (individual activity))

3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))

4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity

B. General

1. Group Discussion
2. Try to solve MCQ's available online.
3. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Problem-solving exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports like "Creating Text Editor in C".
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work.

MODEL QUESTION PAPER (Sem-end. Exam)
B.Sc DEGREE EXAMINATIONS
Semester - IV
Course : OPERATING SYSTEMS

Time: 3Hrs   Max.marks:75

Section - A

Answer any 5 question   5X5 = 25M

1. Write about Resource Abstraction.

2. Write about the process and the process state.

3. Explain threading issues.

4. Explain about process Synchronization.

5. Discuss some necessary and sufficient conditions for deadlock.

6. Explain about Virtual memory.

7. Explain about shared memory.

8. Write about file types.

Section - B

Answer following question   5X10 = 50M

9. a) Explain various types of Operating Systems.

(OR)
   b) What is Operating System? Explain functions of Operating System.

10. a) Explain in detail about Process Scheduling.

(OR)
   b) Explain system view of the process and resources.

11. a) Explain about deadlock Detection and recovery.

(OR)
   b) Discuss classical process synchronization problems.

12. a) Explain the following

   i) Segmentation

   ii) Fixed and variable partitions.
(OR)

   b) Explain in detail about Demand-paging.

13. a) Explain Authentication and Internal Access Authorization.

(OR)
   b) Explain Android Development Framework.

UG Program (4 Years Honors)
CBCS-2020-21

B. Com
COMPUTER APPLICATIONS

Syllabus and Model Question Papers

TABLE OF CONTENTS

1. Resolutions of the Board of Studies:

Meeting held on:22/01/2021Time: 10.00 Am

At: NTR Convention Centre, Adikavi Nannaya University Campus, Rajamahendravaram

Agenda: As per the directions and guidelines/modalities issued by the APSCHE for revising the curriculum framework and updating the syllabus as out-come based B. Com programme to be effect from 2020-21 academic year under CBCS for implementing in all affiliated colleges of AKNU

Members present:

Dr. N. Udaya Bhaskar	Chairman, Dept. of Commerce and Management Studies, Adikavi Nannaya University, Rajamahednravaram, East Godavari District
Dr.J.Sanath Kumar	Member, RRDS Govt Degree College, Bhimavaram, West Godavari District
Dr. Kopparthi Ammaji	Member, BGBS Women's College, Narsapur, West Godavari District
Dr. K. Ratna Manikyam	, Member, Dept. of Commerce, Govt. College (A), Rajahmundry
Dr. M. Ramesh	Member, Dept. of Commerce and Management, Adikavi Nannaya University, Rajamahednravaram, East Godavari District

Resolutions: The UG board of Studies for B. Com (Computer applications) is resolved the following implementation subject to approval.

1. Adoption of revised-common programme structure and updating course-wise syllabi as per the guidelines issued by APSCHE.

2. Adoption of regulations on scheme of examination and marks/grading system of the University UG programme.

3. Preparation of Model question Courses in prescribed format.

4. Eligibility of student for joining the course.

5. List of Course-setters/Course evaluators with phone, email id in the prescribed format.

DETAILS OF COURSES TITLES AND CREDITS

Sem	Course No	Course Name	Course Type (T/P/L)	Hrs/Week Commerce :5	Credits Commerce :4	Max. Marks Count/Internal/ Mid Assessment	Max. Marks Sem- End Exam
I	1A	Fundamentals of Accounting	T	5	4	25	75
	1B	Business Organization and Management	T	5	4	25	75
	1C	Information Technology	T+L	3+2	3+1	25	75
II	2A	Financial Accounting	T	5	4	25	75
	2B	Business Economics	T	5	4	25	75
	2C	E-Commerce and Web Designing	T+L	3+2	3+1	25	75
III	3A	Advanced Accounting	T	5	4	25	75
	3B	Business Statistics	T	5	4	25	75
	3C	Programming with C &C++	T+L	3+2	3+1	25	75
IV	4A	Corporate Accounting	T	5	4	25	75
	4B	Cost and Management Accounting	T	5	4	25	75
	4C	Income Tax	T	5	4	25	75
	4D	Business Laws	T	5	4	25	75
	4E	Auditing	T	5	4	25	75
	4F	Data Base Management System	T+L	3+2	3+1	25	75

Note: * Course Type Code : T-Theory, L - Lab, P: Problem solving

a) **Proposed combination subjects:** Accounting and Commerce.

b) **Student eligibility for joining in the course**: 10+2 (any discipline), Open Inter School and its equivalent.

c) **Faculty eligibility for teaching the course**: Passed Post Graduation Degree with relevant specialization and also having higher qualification like SET/NET/Ph. D.

d) List of Proposed Skill enhancement courses with syllabus, if any.

e) Any newly proposed Skill development/Life skill courses with draft syllabus and required resources.

f) Required instruments/software/ computers for the course (Lab/Practical course-wise required i.e., for a batch of 15 students).

g) List of Suitable levels of positions eligible in the Govt/Pvt organizations . Suitable levels of positions for these graduates either in industry/govt organization like., technical assistants/ scientists/ school teachers., clearly define them, with reliable justification.

S.No.	Position	Company/ Govt organization	Remarks	Additional skills required, if any
01	Accountant	Any Govt./Private Organization		
02	Supporting Staff	Any Govt./Private Organization		
03	Clerk	Banking Industry		
04	Entrepreneur	Own Business		

h) List of Govt. organizations / Pvt companies for employment opportunities or internships or projects.

S.No	Position	Company/ Govt organization	Remarks	Additional skills required, if any
01	Service Industry	Junior Assistant/Senior Assistant/LDC/UDC/Clerck		
02	Manufacturing Industry	Accountant/Cashier/Clerck		
03	Hotel Industry	Accountant/Cashier		
04	Banking Sector	Cashier/Asst. Cader/Clerical		

i) Any specific instructions to the teacher /Course setters/Exam-Chief Superintendent.

3. Program objectives, outcomes, co-curricular and assessment methods.

B. Com	Computer applications

1. Aim and objectives of B. Com program:
   The B. Com programme aims to make the students employable and self employment oriented (Self employable). It aims to make the students learn the writing and interpretation of books of accounts, be conversant with the financial and economic environment and acquire the management skills required to manage the business.

2. Learning outcomes of B. Com:
   ❖ This program could provide Industries, Banking Sectors, Insurance Companies, Financing companies, Transport Agencies, Warehousing etc., well trained professionals to meet the requirements.
   ❖ After completing graduation, students can get skills regarding various aspects like Marketing Manager, Selling Manager, over all Administration abilities of the Company.
   ❖ Capability of the students to make decisions at personal & professional level will increase after completion of this course. Students can independently start up their own Business.
   ❖ Students can get thorough knowledge of finance and commerce.

❖ The knowledge of different specializations in Accounting, costing, banking and finance with the practical exposure helps the students to stand in organization.

3. Recommended Skill enhancement courses: (Titles of the courses given below and details of the syllabus for 4 credits (i.e., 2 units for theory and Lab/Practical) for 5 hrs class-cum-lab work.

4. Recommended Co-curricular activities:(Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)

   A. Measurable:

      1. Assignments on:

      2. Student seminars (Individual presentation of Courses) on topics relating to:

      3. Quiz Programmes on:

      4. Individual Field Studies/projects:

      5. Group discussion on:

      6. Group/Team Projects on:

   B Computer applications

      1. Collection of news reports and maintaining a record of Course-cuttings relating to topics covered in syllabus .

      2. Group Discussions on: Subject related matters.

      3. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers.

      4. Any similar activities with imaginative thinking.

5. Recommended Continuous Assessment methods:

Some of the following suggested assessment methodologies could be adopted;

      1. The oral and written examinations (Scheduled and surprise tests).

      2. Closed-book and open-book tests.

      3. Coding exercises.

      4. Practical assignments and laboratory reports.

      5. Observation of practical skills.

      6. Individual and group project reports.

      7. Efficient delivery using seminar presentations.

      8. Viva voce interviews.

      9. Computerized adaptive testing, literature surveys and evaluations.

     10. Peers and self-assessment, outputs form individual and collaborative work.

4.Details of course-wise Syllabus:

DETAILS OF COURSE WISE SYLLABUS FOR THEORY & MODEL QUESTION COURSES

B.Com	Semester: I	Credits: 4
Course: 1A	**FUNDAMENTALS OF ACCOUNTING**	Hrs/Wk: 5

Learning Outcomes:
At the end of the course, the student will able to
- Identify transactions and events that need to be recorded in the books of accounts.
- Equip with the knowledge of accounting process and preparation of final accounts of sole trader.
- Develop the skill of recording financial transactions and preparation of reports in accordance with GAAP.
- Analyze the difference between cash book and pass book in terms of balance and make reconciliation.
- Critically examine the balance sheets of a sole trader for different accounting periods.
- Design new accounting formulas & principles for business organisations.

UNIT I:
Introduction : Need for Accounting – Definition – Objectives, – Accounting Concepts and Conventions – GAAP - Accounting Cycle - Classification of Accounts and its Rules – BookKeeping and Accounting - Double Entry Book-Keeping - Journalizing - Posting to Ledgers, Balancing of Ledger Accounts (including Problems).

UNIT II:
Subsidiary Books: Types of Subsidiary Books - Cash Book, Three-column Cash Book- Petty Cash Book (including Problems).

UNIT III:
Trial Balance and Rectification of Errors: Preparation of Trial balance - Errors – Meaning – Types of Errors – Rectification of Errors – Suspense Account (including Problems)

UNIT IV:
Bank Reconciliation Statement: Need for Bank Reconciliation - Reasons for Difference between Cash Book and Pass Book Balances- Preparation of Bank Reconciliation Statement - Problems on both Favourable and Unfavourable Balance (including Problems).

UNIT V:
Final Accounts: Preparation of Final Accounts: Trading account – Profit and Loss account – Balance Sheet – Final Accounts with Adjustments (including Problems).

TEXT BOOKS:
1. Ranganatham G and Venkataramanaiah, Fundamentals of Accounting, S Chand Publications.
2. T.S.Reddy& A. Murthy, Financial Accounting, Margham Publications.
3. S N Maheswari and SK Maheswari, Financial Accounting, Vikas Publications.
4. R L Gupta & V K Gupta, Principles and Practice of Accounting, Sultan Chand & Sons.
5. S.P. Jain & K.L Narang, Accountancy-I, Kalyani Publishers.
6. Tulasian, Accountancy -I, Tata McGraw Hill Co.

7. V.K.Goyal, Financial Accounting, Excel Books .
8. K. Arunjothi, Fundamentals of Accounting; Maruthi Publications.
9. Prof EChandraiah : Financial Accounting Seven Hills International Publishers.

Suggested Co-Curricular Activities:
- Bridge Course for Non-commerce Students.
- Practice of Terminology of Accounting .
- Quiz, Word Scramble.
- Co-operative learning.
- Seminar.
- Co-operative learning .
- Problem Solving Exercises.
- Matching, Mismatch.
- Creation of Trial Balance.
- Visit a firm (Individual and Group).
- Survey on sole proprietorship and prepare final accounts of concern.
- Group Discussions on problems relating to topics covered in syllabus.
- Examinations (Scheduled and surprise tests).
- Any similar activities with imaginative thinking beyond the prescribed syllabus.

MODEL QUESTION COURSE – THEORY

B.Com. DEGREE EXAMINATIONS
Semester: I
Course(1A): Fundamentals of Accounting

Time: 3 Hours.   Max Marks: 75

Section-A

Answer any **FIVE** of the following questions.   5X5=25M
1. Bookkeeping.
2. Petty Cash Book.
3. Suspense Account.
4. Need for Bank Reconciliation.
5. Trading Account.
6. Accounting Cycle.
7. Journal Proper.
8. Trial Balance .

Section-B

Answer **FIVE** questions   5X10=50M

9. a). What are the advantages and limitations of Double Entry System?
    (OR)
    b). Briefly explain accounting concepts and conventions.
10. a) Explain various types of subsidiary books.
    (OR)
    b) Prepare Triple Column Cash Book from the following information of Koushik.
    1st March 2020
    1. Cash in hand Rs.1532 and balance at bank Rs.18500.
    2. Received from Salman Rs.590 and allowed him discount Rs.10.
    3. Paid salaries for the month of February Rs.200.
    4. Purchased merchandise payment made by cheque Rs.3200.
    8. Paid Bilal & Co by cheque Rs.800 discount received Rs.20.
    10. Withdrew from bank for office use Rs.400. paid rent in cash Rs.300.
    14. Deposited into bank Rs.500.
    15. Cash sales Rs.2460.
    18. Purchased a motor car for Rs.6500 payment made by cheque.
    23. Received a cheque from Salman for Rs.391 discount Rs.9.
    25. Paid wages Rs.350.
    28. Salman cheque paid into bank.
    29. Paid computer applications expenses Rs.360.
    31. Bank informed that Salman's cheque has been dishonored.
    31. Cash sales Rs.6440.
11. a) Briefly explain the advantages and limitations of trial balance
    (OR)
    b).Define Error. Briefly explain various types of erros.
12. a) Write the reasons for difference between pass book and cash book for bank reconciliation.
    (OR)

(b) From the following particulars, prepare a Bank Reconciliation Statement for M/s Ramesh Traders as at 31st December, 2020.

   i. Bank Balance as per cash book 8,000
   ii. Two cheques were issued for 18,000 and 12,000 respectively, of which the cheque for 12,000 was presented on 4rd January next year.
   iii. Cheque for 6,000 deposited on 25th was collected and credited by the bank on 4th January.
   iv. Dividends collected by the bank 1,800 not recorded in the cash book.
   v. Information relating to 4,600 deposit made by a debtor directly into the bank account has not yet been received.
   vi. Bank charges 750 have been debited to the account by the bank on 31st December.

13. a) Distinguish between Profit and Loss Account and Balance Sheet.

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

   b) From the following Trial Balance of Ramesh as on 31st March 2020, prepare Trading and Profit and Loss account and Balance sheet taking into account the adjustments.

<div align="center">

Trial Balance

</div>

Debit Balances Rs.	Credit Balances Rs.
Purchases 2,00,000	Capital 3,00,000
Salaries 10,000	Sales 2,50,000
Rent 7,500	Creditors 1,05,000
Insurance premium 1,500	
Drawings 50,000	
Machinery 1,40,000	
Cash at bank 22,500	
Computers 1,25,000	
3Furniture 50,000	
Cash 10,000	
Opening Stock 26,000	
Sundry debtors 12,500	

Adjustments:

1. Closing stock as on 31.3.2015 Rs. 39,000
2. Rent outstanding Rs. 1,000
3. Provide interest on capital @ 10% and on Drawings @ 8%.
4. Depreciation on Machinery @10% and Furniture @ 5%

B.Com	Semester: I	Credits: 4
Course: 1B	**BUSINESS ORGANIZATION AND MANAGEMENT**	Hrs/Wk: 5

Learning Outcomes:

At the end of the course, the student will be able to:

- Understand different forms of business organizations.
- Comprehend the nature of Joint Stock Company and formalities to promote a Company.
- Describe the Social Responsibility of Business towards the society.
- Critically examine the various organizations of the business firms and judge the best among them.
- Design and plan to register a business firm. Prepare different documents to register a company at his own.
- Articulate new models of business organizations.

UNIT I:

Introduction Concepts of Business, Trade, Industry and Commerce: Business – Meaning, Definition, Features and Functions of Business - Trade Classification – Aids to Trade – Industry Classification and Commerce - Factors Influencing the Choice of Suitable form of Organisation.

UNIT II:

Forms of Business Organizations: Features, Merits and Demerits of Sole Proprietor Ship and Partnership Business - Features Merits and Demits of Joint Stock Companies - Public Sector Enterprises (PSEs) - Multinational Corporations (MNCs)- Differences between Private Limited Public Limited Company.

UNIT III:

C**ompany Incorporation:** Preparation of Important Documents for Incorporation of Company - Certificate of Incorporation and Certificate of Commencement of Business - Contents of Memorandum and Articles of Association - Contents of Prospectus.

UNIT IV:

Management: Meaning Characteristics - Fayol's 14 Principles of Management - Administration Vs Management - Levels of Management.

UNIT V:

Functions of Management: Different Functions of Management - Meaning – Definition – Characteristics Merits and Demits of Planning - Principles of Organisation – Line and staff of Organisation.

REFERENCE BOOKS:

1. Industrial Organization and Management,C.B.Guptha, Sultan Chand.

2. Business Organization - C.D.Balaji and G. Prasad, Margham Publications, Chennai.

3. Business Organization -R.K.Sharma and Shashi K Gupta, Kalyani Publications.

4. Business Organization & Management: Sharma Shashi K. Gupta, Kalyani Publishers

5. Business Organization & Management: C.R. Basu, Tata McGraw Hill

6. Business Organization & Management: M.C. Shukla S. Chand,

7. Business Organisation and Management, Dr.NeeruVasishth, Tax Mann Publications.

8. Business Organisation and Management, Dr B E V L Naidu, Seven Hills International Publishers, Hyderabad .

Suggested Co-Curricular Activities:

- Book Reading
- Student Seminars, Debates
- Quiz Programmes
- Assignments
- Co-operative learning
- Individual / Group Field Studies
- Group Discussions on problems relating to topics covered by syllabus
- Collecting prospectus of different companies through media
- Collection of news reports and maintaining a record of Course-cuttings relating to topics covered in syllabus.
- Talk on current affairs about business, industry etc.
- Simple project work on development of Certificate of Incorporation, Prospectus and Certificate of commencement of business.
- Biography of well-known management thinkers and managers of gigantic companies
- Examinations (Scheduled and surprise tests).

MODEL QUESTION COURSE – THEORY

B.Com. DEGREE EXAMINATIONS
Semester: I
Course(1B): Business Organization and Management

Time: 3 Hours.   Max Marks: 75

Section-A

Answer any **FIVE** of the following questions.   **5X5=25M**
1. Industry
2. Public Sector Enterprises
3. Prospectus
4. Administration
5. Organization
6. Commerce
7. MNCs
8. Line and Staff

Section-B

Answer **FIVE** questions   **5X10=50M**

9 a) Define Trade. Briefly explain classification of trade.
(OR)
b) Define Business. What are the features and functions of Business.

10 a) What are the merits and demerits of Sole Proprietorship.?
(OR)
b) Distinguish between Private Limited Company and Public Limited Company.

11 a) Define Memorandum of Association. Explain its clauses.
(OR)
b) Briefly explain Articles of Association and its contents.

12 a) Explain the functions of Management.
(OR)
b) Explain Fayol's 14 Principles of Management.

13 a) Briefly explain merits and demerits of Planning.
(OR)
b) What are the steps involved in Planning?

B Com	Semester: I(Computer Applications)	Credits: 4
Course: 1C	**INFORMATION TECHNOLOGY**	Hrs/Wk: 5

Learning Outcomes:

At the end of the course, the students is expected to DEMONSTRATE the following cognitive abilities (thinking skill) and psychomotor skills.

A. Remembers and states in a systematic way (Knowledge).

1. Describe the fundamental hardware components that make up a computer's hardware and the role of each of these components.
2. Understand the difference between an operating system and an application program, and what each is used for in a computer.
3. Use technology ethically, safely, securely, and legally.
4. Use systems development, word-processing, spreadsheet, and presentation software to solve basic information systems problems.

B. Explains (Understanding).

5. Apply standard statistical inference procedures to draw conclusions from data.
6. Retrieve information and create reports from databases.
7. Interpret, produce, and present work-related documents and information effectively and accurately

C. Critically examines, using data and figures (Analysis and Evaluation**).

8. Analyse compression techniques and file formats to determine effective ways of securing, managing, and transferring data.
9. Identify and analyse user needs and to take them into account in the selection, creation, integration, evaluation, and administration of computing based systems.
10. Analyse a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
11. Identify and analyse computer hardware, software

D. Working in 'Outside Syllabus *Area' under a Co-curricular Activity*(**Creativity**) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

E. Efficiently learn and use Microsoft Office applications.

UNIT I:

Introduction: Computer Definition - Characteristics and Limitations of Computer Hardware— Generations of Computer, Classification of Computers, Applications of Computer, Basic Components of PC, Computer Architecture - Primary and Secondary Memories- Input and Output Devices- Operating System- Function of Operating System- Types of Operating System- Languages and its Types.

UNIT II:

MS word: Word Processing – Features-Advantages and Applications- Parts of Word Window- Toolbar-Creating, Saving, Closing, Opening and Editing of a Document-Moving and Coping a Text-Formatting of Text and Paragraph- Bullets and Numbering-Find and Replace - Insertion of objects-Headers and Footers- Page Formatting- Auto Correct- Spelling and Grammar- Mail Merge- Macros.

UNIT III:

MS Excel:

Features – Spread Sheet-Workbook – Cell-Parts of a window-Saving, Closing, Opening of a Work Book – Editing – Advantages – Formulas- Types of Function- Templates – Macros – Sorting- Charts – Filtering – Consolidation – Grouping- Pivot Table.

UNIT IV:

MS Power point: Introduction – Starting – Parts-Creating of Tables- Create Presentation – Templates-Auto Content Wizard-Slide Show-Editing of Presentation-Inserting Objects and charts.

UNIT V:

MS Access: Orientation to Microsoft Access - Create a Simple Access Database - Working with Table Data - Modify Table Data - Sort and Filter Records - Querying a Database - Create Basic Queries - Sort and Filter Data in a Query - Perform Calculations in a Query - Create Basic Access Forms - Work with Data on Access Forms - Create a Report - Add Controls to a Report - Format Reports.

ONLINE RESOURCES:

https://support.office.com/en-us/office-training-center
https://www.skillshare.com/browse/microsoft-office
https://www.tutorialspoint.com/computer_fundamentals/index.htm
https://www.javatpoint.com/computer-fundamentaltutorial
https://edu.gcfglobal.org/en/subjects/office/
https://www.microsoft.com/en-us/learning/training.aspx

PRACTICAL COMPONENT: @ 2 HOURS/WEEK/BATCH .

- MS word creation of documents letters invitations etc, tables, mail merge, animations in word, formatting text.
- MS Excel performing different formulas, creating charts, macros.
- MS power point slide creation, creation of animation.
- MS Access creation of database, forms and reports

RECOMMENDED CO-CURRICULAR ACTIVITIES:

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging).
2. Student seminars (on topics of the syllabus and related aspects (individual activity).
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams)).
4. Field studies (individual observations and recordings as per syllabus content and related areas (Individual or team activity).
5. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)).

General.

1. Group Discussion.
2. Visit to Software Technology parks / industries

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted:

1. The oral and written examinations (Scheduled and surprise tests).
2. Closed-book and open-book tests.
3. Coding exercises.
4. Practical assignments and laboratory reports.
5. Observation of practical skills.
6. Individual and group project reports.
7. Efficient delivery using seminar presentations.
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations.
10. Peers and self-assessment, outputs form individual and collaborative work.

MODEL QUESTION COURSE – THEORY

B.Com. DEGREE EXAMINATIONS
Semester: I(Computer Applications)
Course(1C): Information Technology

Time: 3 Hours. Max Marks: 75

Section-A

Answer any **FIVE** of the following questions. 5X5=25M

1. What are the Applications of Computer?

2. Write about the parts of Word-Window.

3. What are the features of MS-Excel?

4. What are the features of MS-Power Point?

5. What are the basic queries in MS-Access?

6. What are the Basic Components of PC?

7. Write Types of Functions in MS-Excel.

8. What are the types of effects in Custom Animation?

Section-B

Answer **FIVE** questions. 5X10=50M

9. a) Explain about Computer Architecture.
(OR)
b) Explain about functions of Operating System and types of Operating Systems.

10. a) What are the Features, Advantages and Applications MS-Word
(OR)
b) Write the process how to prepare Progress Report of Students using Mail Merge.

11. a) How to Prepare Students Results Table with Total, Percentage and Pass/Fail using Formulas.
(OR)
b) Write the process for Sorting, Filtering, Consolidation and Grouping in MS-Excell.

12. a) Write the process of how to prepare a power point presentation and slideshow.
(OR)
b) Write about different types of animations in MS-Power Point.

13. a) Write the process how to Create a Report, Add Controls to a Report and Format Reports in MS Access.
(OR)
b) Write the process how to create a Simple Access Database, Working with Table Data and Modify Table Data.

B Com	Semester: II	Credits: 4
Course: 2A	**FINANCIAL ACCOUNTING**	Hrs/Wk: 5

Learning Outcomes:

At the end of the course the student will able to:

- Understand the concept of consignment and learn the accounting treatment of the various aspects of consignment.
- Analyze the accounting process and preparation of accounts in consignment and joint venture.
- Distinguish Joint Venture and Partnership and to learn the methods of maintaining records under Joint Venture.
- Determine the useful life and value of the depreciable assets and maintenance of Reserves in business entities.
- Design an accounting system for different models of businesses at his own using the principles of existing accounting system.

UNIT I:

Depreciation: Meaning and Causes of Depreciation - Methods of Depreciation: Straight Line – Written Down Value –Annuity and Depletion Method (including Problems).

UNIT II:

Provisions and Reserves: Meaning – Provision vs. Reserve – Preparation of Bad Debts Account – Provision for Bad and Doubtful Debts – Provision for Discount on Debtors– Provision for Discount on Creditors - Repairs and Renewals Reserve A/c (including Problems).

UNIT III:

Bills of Exchange: Meaning of Bill – Features of Bill – Parties in the Bill – Discounting of Bill – Renewal of Bill – Entries in the Books of Drawer and Drawee (including Problems).

UNIT IV:

Consignment Accounts: Consignment - Features - Proforma Invoice - Account Sales – Del-credere Commission - Accounting Treatment in the Books of Consigner and Consignee - Valuation of Closing Stock - Normal and Abnormal Losses (including Problems).

UNIT V:

Joint Venture Accounts: JointVenture - Features - Difference between Joint- Venture and Consignment – Accounting Procedure – Methods of Keeping Records–One Vendor Keeps the Accounts and Separate Set off Books Methods (including Problems).

REFERENCE BOOKS:

1. Ranganatham G and Venkataramanaiah, **Financial Accounting-II,** S Chand Publications, New Delhi.
2. T. S. Reddy and A. Murthy - **Financial Accounting**, Margham Publications.
3. R.L. Gupta & V.K. Gupta, **Principles and Practice of Accounting**, Sultan Chand.
4. SN Maheswari and SK Maheswari – **Financial Accounting**, Vikas Publications.
5. S.P. Jain & K.L Narang,**Accountancy-I**, Kalyani Publishers.
6. Tulsan, **Accountancy-I**, Tata McGraw Hill Co.
7. V.K. Goyal, **Financial Accounting**, Excel Books.
8. T.S. Grewal, **Introduction to Accountancy**, Sultan Chand & Co.
9. Haneef and Mukherjee, **Accountancy-I**, Tata McGraw Hill.
10. Arulanandam and Ramana, **Advanced Accountancy**, Himalaya Publishers.
11. S.N.Maheshwari&V.L.Maheswari, **Advanced Accountancy-I**, Vikas Publishers.
12. Prof E Chandraiah, **Financial Accounting**, Seven Hills International Publishers.

Suggested Co-Curricular Activities:
- Quiz Programs.
- Problem Solving Exercises.
- Co-operative learning.
- Seminar.
- Group Discussions on problems relating to topics covered by syllabus.
- Reports on Proforma invoice and account sales.
- Visit a consignment and joint venture firms(Individual and Group).
- Collection of proforma of bills and promissory notes.
- Examinations (Scheduled and surprise tests).
- Any similar activities with imaginative thinking beyond the prescribed syllabus

MODEL QUESTION COURSE – THEORY
B.Com. DEGREE EXAMINATIONS
Semester: II
Course(2A): Financial Accounting

Time: 3 Hours.   Max Marks: 75

SECTION-A

Answer any **FIVE** of the following questions.   **5X5=25M**

1. Depletion Method of Depreciation
2. Computer applications Reserve
3. Drawer
4. Normal Loss
5. Vendor
6. Bad debts
7. Del-credere commission
8. Consignor

SECTION- B

Answer **FIVE** questions.   **5X10=50M**

9. a) Define Depreciation. What are the causes for Depreciation?

(OR)

b) A company whose accounting year is the calendar year purchased on 1.1.2018 a machine for Rs.40,000. It purchased further machinery on 1st October 2018 for Rs. 20,000 and on 1st July for Rs. 10,000. On 1.7.2020, 1/4th of the machinery installed on 1.1.2018 became obsolete and was sold for Rs. 6,800. Show how the machinery account would appear in the books of the company for all the 3 years under diminishing balance method. Depreciation is to be provided at 10% p.a.

10. a) Define Provision and Reserve with examples and difference between provision and reserve.

(OR)

b) What are the provisions? How are they created? Give accounting treatment in case of provision for doubtful debts.

11. a) B owes C a sum of Rs 6,000. On 1st April, 2011 he gives a promissory note for the amount for 3 months to C who gets it discounted with his bankers for Rs 5,760. On the due date the bill is dishonoured, the bank paying Rs 15 as noting charges. B then pays Rs 2,000 in cash and accepts a bill of exchange drawn on him for the balance together with Rs 100 as interest. This bill of exchange is for 2 months and on the due date the bill is again dishonoured, C paying Rs 15 for noting charges draft the journal entries to be passed in C's books.

(OR)

b) What is meant by renewal of a bill of exchange? Distinguish between Promissory Note and Bills of Exchange.

12. a) Define consignment account. Briefly explain the features and objectives of consignment accounts.

(OR)

b) Raja Mills Ltd. of Ahmedabad sent 100 pieces shirting to Fancy Stores, Delhi, on consignment basis. The consignees are entitled to receive 5 per cent commission plus expenses. The cost to Raja Mills Ltd. is Rs 600 per piece.
Fancy Stores, Delhi, pay the following expenses: Railway Freight, etc. Rs 1,000 Godown Rent and Insurance Rs 1,500 Raja Mills Ltd., draw on the consignees a draft for Rs 30,000 which is duly accepted. It is discounted for Rs 28,650. Later Fancy Stores, Delhi, report that the entire consignment has been sold for Rs 78,000. Show journal entries and the important ledger accounts in the books of the consignor.

13 a) A and B were partners in a joint venture sharing profits and losses in the proportion of four-fifth and one-fifth respectively. A supplies goods to the value of Rs.5,000 and inures expenses amounting to Rs.400. B supplies goods to the value of Rs.4,000 and his expenses amounting to Rs.300. B sells goods on behalf of the joint venture and realizes Rs.12,000. B is entitled to a commission of 5 percent on sales. B settles his accounts by bank draft. Give journal entries and necessary ledger accounts in the books of both the parties.

(OR)

b) Difference between consignment and joint venture.

B Com	Semester: II	Credits: 4
Course: 2B	**BUSINESS ECONOMICS**	Hrs/Wk: 5

Learning Outcomes:

At the end of the course, the student will able to:

- Describe the nature of economics in dealing with the issues of scarcity of resources.
- Analyze supply and demand analysis and its impact on consumer behaviour.
- Evaluate the factors, such as production and costs affecting firms behaviour.
- Recognize market failure and the role of government in dealing with those failures.
- Use economic analysis to evaluate controversial issues and policies.
- Apply economic models for managerial problems, identify their relationships, and formulate the decision making tools to be applied for business.

UNIT I:
Introduction: Meaning and Definitions of Business Economics - Nature and Scope of Business Economics - Micro and Macro Economics and their Interface.

UNIT II:
Demand Analysis: Meaning and Definition of Demand – Determinants to Demand –Demand Function -Law of Demand – Demand Curve – Exceptions to Law of Demand - Elasticity of Demand – Measurements of Price Elasticity of Demand.

UNIT III:
Production, **Cost and Revenue Analysis**: Concept of Production Function – Law of Variable Proportion - Law of Returns to Scale - Classification of Costs -Break Even Analysis – Advantages.

UNIT IV:
Market Structure: Concept of Market – Classification of Markets -Perfect Competition – Characteristics – Equilibrium Price -Monopoly – Characteristics – Equilibrium Under Monopoly.

UNIT V:
National Income: Meaning – Definition – Measurements of National Income - Concepts of National Income - Components of National Income-Problems in Measuring National Income.

REFERENCES:
1. Business Economics -S.Sankaran, Margham Publications, Chennai.
2. Business Economics - Kalyani Publications.
3. Business Economics - Himalaya Publishing House.
4. Business Economics - Aryasri and Murthy, Tata McGraw Hill.
5. Business Economics -H.L Ahuja, Sultan Chand & Sons
6. Principles of Economics -Mankiw, Cengage Publications
7. Fundamentals of Business Economics -Mithani, Himalaya Publishing House
8. Business Economics -A.V. R. Chary, Kalyani Publishers, Hyderabad.
9. Business Economics -Dr K Srinivasulu, Seven Hills International Publishers.

Suggested Co-Curricular Activities:
- Assignments.
- Student Seminars.
- Quiz , JAM.
- Study Projects.
- Group Discussion.
- Graphs on Demand function and demand curves.
- Learning about markets.
- The oral and written examinations (Scheduled and surprise tests).
- Market Studies.
- Individual and Group project reports.
- Annual talk on union and state budget.
- Any similar activities with imaginative thinking beyond the prescribed syllabus.

MODEL QUESTION COURSE – THEORY
B.Com. DEGREE EXAMINATIONS
Semester: II
Course(2B): Business Economics

Time: 3 Hours.   Max Marks: 75

SECTION-A

Answer any **FIVE** of the following questions.   5X5=25M
   1. Micro Economics.
   2. Law of Demand.
   3. Cost Analysis.
   4. Monopoly.
   5. National Income.
   6. Demand Curve.
   7. BEP.
   8. Forecasting.

SECTION- B

Answer **FIVE** questions.   5X10=50M

   9. a) Define Business Economics. Explain the nature and scope of Business Economics.
                                                    (OR)
      b) Distinguish between Micro and Macro economics.

   10. a) What is meant by Demand? What are the exceptions to Law of Demand?
                                                    (OR)
       b) What do you understand by elasticity of demand ? Explain the factors which determine the
          elasticity of demand.

   11. a) Discuss the various concepts of cost curves. Why is long cost curve flatter than the short-run cost
          curve?
                                                    (OR)
       b) What are the advantages and limitations of Break Even Analysis?

   12. a) Define Market. Briefly explain the classification of markets.
                                                    (OR)
       b) Write an essay on Monopoly.

   13. a) Describe the different concepts and components in National Income.
                                                    (OR)
       b) Briefly explain problems in measuring National Income.

B Com	Semester: II(Computer Applications)	Credits: 4
Course: 2C	E-COMMERCE AND WEB DESIGNING	Hrs/Wk: 5

Learning Outcomes:

At the end of the course, the students is expected to DEMONSTRATE the following cognitive abilities (thinking skill) and psychomotor skills.

A. Remembers and states in a systematic way (Knowledge).
1. Understand the foundations and importance of E-commerce.
2. Define Internet trading relationships including Business to Consumer, Business- to-Business, Intra-organizational.
3. Describe the infrastructure for E-commerce.
4. Discuss legal issues and privacy in E-Commerce.
5. Understand the principles of creating an effective web page, including an in-depth consideration of information architecture

B. Explains (Understanding).
6. Recognize and discuss global E-commerce issues.
7. Learn the language of the web: HTML and CSS.

C. Critically examines, using data and figures (Analysis and Evaluation).
8. Analyze the impact of E-commerce on business models and strategy.
9. Assess electronic payment systems.
10. Exploring a web development framework as an implementation example and create dynamically generated web site complete with user accounts, page level security, modular design using css

D. Working in 'Outside Syllabus *Area' under a Co-curricular Activity*(Creativity) Use the Systems Design Approach to implement websites with the following steps:

- Define purpose of the site and subsections.
- Identify the audience.
- Design and/or collect site content.
- Design the website theme and navigational structure.
- Design & develop web pages including: CSS Style Rules, Typography, Hyperlinks, Lists, Tables, Frames, Forms, Images, Behaviours, CSS Layouts

E. Build a site based on the design decisions and progressively incorporate tools and techniques covered.

UNIT I:

Introduction: Meaning, Nature, Concepts, Advantages, Disadvantages and reasons for Transacting Online, Types of E-Commerce, e-commerce Business Models (Introduction , Key Elements of a Business Model And Categorizing Major E-Commerce Business Models), Forces Behind e-commerce.

Technology used in E-commerce: The dynamics of World Wide Web and Internet (Meaning, EvolutionAnd Features); Designing, Building and Launching e-commerce website (A systematic approach involving decisions regarding selection of hardware, software, outsourcing Vs. in-house development of a website).

UNIT II:

E-payment System: Models and methods of e–payments (Debit Card, Credit Card, Smart Cards, e-money), Digital Signatures (Procedure, Working And Legal Position), Payment Gateways, Online Banking (Meaning, Concepts, Importance, Electronic Fund Transfer, Automated Clearing House, Automated Ledger Posting), Risks Involved in e-payments.

UNIT III:

On-line Business Transactions: Meaning, Purpose, Advantages and Disadvantages of Transacting Online, E- Commerce Applications in Various Industries Like {Banking, Insurance, Payment of Utility Bills, Online Marketing, E-Tailing (Popularity, Benefits, Problems and Features), Online Services

(Financial, Travel and Career), Auctions, Online Portal, Online Learning, Publishing and Entertainment}
Online Shopping (Amazon, Snap Deal, Alibaba, Flipkart, etc.).

UNIT IV:

Website designing: Designing a home page, HTML document, Anchor tag Hyperlinks, Head and body section, Header Section, Title, Prologue, Links, Colorful Pages, Comment, Body Section, Heading Horizontal Ruler, Paragraph, Tabs, Images And Pictures, Lists and Their Types, Nested Lists, Table Handling. **Frames:** Frameset Definition, Frame Definition, Nested Framesets, Forms and Form Elements. DHTML and Style Sheets: Defining Styles, elements of Styles, linking a style sheet to a HTML Document, Inline Styles, External Style Sheets, Internal Style Sheets & Multiple Style Sheets.

UNIT V:

Security and Encryption: Need and Concepts, E-Commerce Security Environment: (Dimension, Definition and Scope Of E-Security), Security Threats in The E-Commerce Environment (Security Intrusions And Breaches, Attacking Methods Like Hacking, Sniffing, Cyber- Vandalism Etc.), Technology Solutions (Encryption, Security Channels Of Communication, Protecting Networks And Protecting Servers And Clients).

Learning Resources (Course 2C: E-commerce & Web Designing) References:
1. E-commerce and E-business Himalaya publishers.
2. E-Commerce by Kenneth C Laudon, PEARSON INDIA.
3. Web Design: Introductory with Mind Tap Jennifer T Campbell, Cengage India.
4. HTML & WEB DESIGN:TIPS& TECHNIQUES JAMSA, KRIS, McGraw Hill.
5. Fundamentals Of Web Development by Randy Connolly, Ricardo Hoar, Pearson.
6. HTML & CSS: COMPLETE REFERENCE POWELL,THOMAS, McGrawHill

Online Resources:

http://www.kartrocket.com http://www.e-commerceceo.com http://www.fastspring.com
https://teamtreehouse.com/tracks/web-design

PRACTICAL COMPONENT:@ 2 HOURS/WEEK/BATCH
1. Creation of simple web page using formatting tags
2. Creation of lists and tables with attributes
3. Creation of hyperlinks and including images
4. Creation of forms
5. Creation of framesets
6. Cascading style sheets – inline, internal and external

RECOMMENDED CO-CURRICULAR ACTIVITIES:

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

Measurable .
1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging).
2. Student seminars (on topics of the syllabus and related aspects (individual activity).
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams).
4. Field studies (individual observations and recordings as per syllabus content and related areas (Individual or team activity).
5. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)

General.
1. Group Discussion.
2. Visit to Software Technology parks / industries

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:
Some of the following suggested assessment methodologies could be adopted;
1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Coding exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports,
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work.

MODEL QUESTION COURSE – THEORY
B.Com. DEGREE EXAMINATIONS
Semester: II(Computer Applications)
Course(2C): E-Commerce And Web Designing

Time: 3 Hours.   Max Marks: 75

Section-A

Answer any **FIVE** of the following questions.   5X5=25M

1. Write about Types of E-Commerce.

2. What are the Risks Involved in e-payments?

3. What are the Advantages and Disadvantages of Transacting Online?

4. Write examples for Lists and their types.

5. Write the Definition and Scope of E-Security.

6. What are the features of WWW and Internet?

7. Write how to link a style sheet to a HTML Document.

8. What are the methods of e-Payments?

Section-B

Answer **FIVE** questions.   5X10=50M

9. a) Write about e-commerce Business Models.
                                (OR)
   b) Explain about Designing, Building and Launching e-commerce website.

10. a) Explain about Digital Signatures.
                                (OR)
    b) Explain about Online Banking.

11. a) Write about E-Tailing (Popularity, Benefits, Problems and Features).
                                (OR)
    b) Write about Online Learning, Publishing and Entertainment.

12. a) Write the code to design a web page with Form and form elements
                                (OR)
    b) Write about Inline, External, Internal and Multiple Style Sheets.

13. a) Write about Security Threats in the E-Commerce Environment.
                                (OR)
    b) Write about Technology Solutions for Security.

B Com	Semester: III	Credits: 4
Course: 3A	**ADVANCED ACCOUNTING**	Hrs/Wk: 5

Learning Outcomes:

At the end of the course, the student will able to:

- Understand the concept of Non-profit organisations and its accounting process.
- Comprehend the concept of single-entry system and preparation of statement of affairs.
- Familiarize with the legal formalities at the time of dissolution of the firm .
- Prepare financial statements for partnership firm on dissolution of the firm.
- Employ critical thinking skills to understand the difference between the dissolution of the firm and dissolution of partnership.

UNIT I:

Accounting for Non Profit Organizations: Non Profit Entities- Meaning - Features of Non-Profit Entities –Provisions as per Sec 8 - Accounting Process- Preparation of Accounting Records - Receipts and Payments Account- Income and Expenditure Account - Preparation of Balance Sheet (including problems).

UNIT II:

Single Entry System: Features – Differences between Single Entry and Double Entry – Disadvantages of Single Entry- Ascertainment of Profit and Preparation of Statement of Affairs (including Problems).

UNIT III:

Hire Purchase System: Features –Difference between Hire Purchase and Instalment Purchase Systems - Accounting Treatment in the Books of Hire Purchaser and Hire Vendor - Default and Repossession (including Problems).

UNIT IV:

Partnership Accounts-I: Meaning – Partnership Deed - Fixed and Fluctuating Capitals-Accounting Treatment of Goodwill - Admission and Retirement of a Partner(including problems).

UNIT V:

Partnership Accounts-II: Dissolution of a Partnership Firm – Application of Garner v/s Murray Rule in India – Insolvency of one or more Partners (including problems).

REFERENCES BOOKS:

1. Advanced Accountancy: T S Reddy and A Murthy by Margham Publications.
2. Financial Accounting: SN Maheswari& SK Maheswari by Vikas Publications.
3. Principles and Practice of Accounting: R.L. Gupta & V.K. Gupta, Sultan Chand & Sons.
4. Advanced Accountancy: R.L.Gupta&Radhaswamy, Sultan Chand &Sons..
5. Advanced Accountancy (Vol-II): S.N.Maheshwari&V.L.Maheswari, Vikas publishers.
6. Advanced Accountancy: Dr. G. Yogeshwaran, Julia Allen - PBP Publications.
7. Accountancy–III: Tulasian, Tata McGraw Hill Co.
8. Accountancy–III: S.P. Jain & K.L Narang, Kalyani Publishers.
9. Advanced Accounting (IPCC): D. G. Sharma, Tax Mann Publications.
10. Advanced Accounting: Prof B Amarnadh, Seven Hills International Publishers.
11. Advanced Accountancy: M Shrinivas& K Sreelatha Reddy, Himalaya Publishers.

Suggested Co-Curricular Activities:

- Quiz Programs and Problem Solving exercises.
- Co-operative learning.
- Seminar and Visit a single-entry firm, collect data and Creation of Trial Balance of the firm .
- Visit Non-profit organization and collect financial statements.
- Critical analysis of rate of interest on hire purchase schemes.
- Visit a partnership firm and collect partnership deed .
- Debate on Garner v/s Murray rule in India and outside India.
- Group Discussions on problems relating to topics covered by syllabus.
- Examinations (Scheduled and surprise tests) on all units.

MODEL QUESTION COURSE – THEORY
B.Com. DEGREE EXAMINATIONS
Semester: III
Course(3A): Advanced Accounting

Time: 3 Hours.   Max Marks: 75

Section-A

Answer any **FIVE** of the following questions.   5X5=25M

1. Non-profit organizations
2. Statement of Affairs
3. Hire Vendor
4. Partnership Deed
5. Garner Vs Murrey
6. Dissolution of Partnership
7. Accounting Process
8. Double Entry System

Section- B

Answer **FIVE** questions.   5X10=50M

9. a) Distinguish between Income and Expenditure and Receipts and Payment Accounts.

(OR)

   b) What are the provisions and features of Non-profit organizations?

10. a) Briefly explain advantages and limitations of single entry system.

(OR)

    b) Mr. Ramesh, who keeps his books on single entry system, tells you that his capital on 31-12-2019 is Rs.40,500 and on 1st January 2019 was Rs.25,800. He further informs you that he withdraws Rs.3,500 for personal purposes. He invested further capital of Rs.5,000. Besides this, there is no other information. You are required to prepare Statement of Profit and Loss for the year ended on 31-12-2019.

11. a) Malnad Coffee Works Ltd., bought coffee drying machine costing Rs.6,56,000 from Xavier Ltd on 1st January 2019 on hire purchase basis. Rs. 2,00,000 was paid on signing the contract and the balance in three annual instalments of Rs. 2,00,000 (each) by the end of December every year. Interest was charged at 15% per annum. Life of the machine was expected to be four years. You are required to pass the journal entries and necessary ledger accounts in the books of
   (i) Malnad Coffee Works Ltd., and (ii) Xavier Ltd.

(OR)

    b) Briefly explain the advantages and limitations of Instalment System.

12. a) Briefly explain the classification of Partners.

(OR)

    b) A and B are partners in a firm sharing profits and losses in the ratio of 3:2. A new partner C is admitted. A surrenders 1/5th of his share and B surrenders 2/5th of his share and B surrenders 2/5th of his share in favour of C. For the purpose of C's admission, goodwill of the firm is valued at Rs.75,000 and C brings in his share of goodwill in cash which is retained in the firm's books. Journalise the above transactions.

13. a) the Balance sheet of X, Y and Z as at 31 st March, 2018 was:

Liabilities	Amount Rs.		Assets	Amount Rs.
Bills Payable	2000		Cash at Bank	5,800
Employees' Provident Fund	5000		Bills Receivable	800
Workmen Compensation Reserve	6000		Stock	9,000
Computer applications Reserve	6000		Sundry Debtors	16,000
Loans	7100		Furniture	2,000
Capital A/cs:			Plant and Machinery	6,500
X	22,750		Building	30,000
Y	15,250		Advertising Suspense	6,000
Z	12,000	50,000		
		76,100		76,100

The profit-sharing ratio was 3:2:1. *Z* died on 31st July, 2018. The Partnership Deed provides that:

(i) Goodwill is to be calculated on the basis of three years' purchase of the five years' average profit. The profits were: 2017-18: Rs. 24,000; 2016-17: Rs. 16,000; 2015-16: Rs. 20,000 and 2014-15: Rs. 10,000 and 2013-14: Rs. 5,000.

(ii) The deceased partner to be given share of profits till the date of death on the basis of profits for the previous year.

(iii) The Assets have been revalued as: Stock Rs.10,000; Debtors Rs. 15,000; Furniture Rs.1,500; Plant and Machinery Rs. 5,000; Building Rs.35,000. A Bill Receivable for Rs. 600 was found worthless.

(iv) A Sum of Rs. 12,233 was paid immediately to *Z*'s Executors and the balance to be paid in two equal annual installments together with interest @ 10% p.a. on the amount outstanding.Give Journal entries and show the *Z*'s Executors' Account till it is finally settled.

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

b) How would you distinguish between dissolution of partnership and dissolution of Firm?

B Com	Semester: III	Credits: 4
Course: 3B	**BUSINESS STATISTICS**	Hrs/Wk: 5

Learning Outcomes:

At the end of the course, the student will able to:
- Understand the importance of Statistics in real life.
- Formulate complete, concise, and correct mathematical proofs.
- Frame problems using multiple mathematical and statistical tools, measuring relationships by using standard techniques.
- Build and assess data-based models.
- Learn and apply the statistical tools in day life.
- Create quantitative models to solve real world problems in appropriate contexts.

UNIT I:

Introduction to Statistics: Definition – Importance, Characteristics and Limitations of Statistics - Classification and Tabulation – Frequency Distribution Table -Diagrams and Graphic Presentation of Data (including problems)

UNIT II:

Measures of Central Tendency: Types of Averages – Qualities of Good Average - Mean, Median, Mode, and Median based Averages-Geometric Mean – Harmonic Mean(including problems)

UNIT III:

Measures of Dispersion: Meaning and Properties of Dispersion – Absolute and Relative Measures - Types of Dispersion-Range - Quartile Deviation (Semi – Inter Quartile Range) -Mean Deviation - Standard Deviation - Coefficient of Variation. (including problems)

UNIT IV:

Skewness and Kurtosis: Measures of Skewness: Absolute and Relative Measures- Co-efficient of Skewness: Karl Pearson's, Bowley's and Kelly's - Kurtosis: Meso kurtosis, Platy kurtosis and Leptokurtosis (including problems)

UNIT V:

Measures of Relation: Meaning and use of Correlation – Types of Correlation - Karlpearson's Correlation Coefficient - Probable Error-Spearman's Rank-Correlation (including problems)

TEXT BOOKS:
1. Business Statistics, Reddy C.R., Deep Publications.
2. Statistical Methods: Gupta S.P.Sultan Chand & Sons.
3. Statistics-Problems and Solutions: Kapoor V.K, Sultan Chand &Sons.
4. Fundamentals of Statistics: Elhance. D.N
5. Business Statistics, Dr.P.R.Vittal, Margham Publications
6. Business Statistics, LS Agarwal, Kalyani Publications.
7. Statistics: Dr V Murali Krishna, Seven Hills International Publishers.
8. Fundamentals of Statistics: Gupta S.C. Sultan Chand &Sons.
9. Statistics-Theory, Methods and Applications: Sancheti, D.C. & Kapoor V.K.
10. Business Statistics: J.K. Sharma, Vikas Publishers.
11. Business Statistics: Bharat Jhunjhunwala, S Chand Publishers.
12. Business Statistics: S.L.Aggarval, S.L.Bhardwaj and K.Raghuveer, Kalyani Publishers.

Suggested Co-Curricular Activities :
- Student Seminars, Quiz. and Problem Solving Exercises.
- Observe Live Population Clocks – India and world.
- Collection of statistical data of village/town, District, State, Nation.
- Participate in Crop Cutting Experiments at villages.
- Percentiles in CET exams.
- Practice Statistical Functions in MS Excel and Draw diagrams and Graphs in MS Excel.
- Use statistical tools in real life like class/college results, local production etc.
- Prepare questionnaire and schedule.
- Application of averages in everyday life and Examinations (Scheduled and surprise tests).
- Any similar activities with imaginative thinking beyond the prescribed syllabus.

MODEL QUESTION COURSE – THEORY
B.Com. DEGREE EXAMINATIONS
Semester: III
Course(3B): Business Statistics

Time: 3 Hours.   Max Marks: 75

Section-A

Answer any **FIVE** of the following questions.   **5X5=25M**
 1. Classification of Data
 2. Harmonic Mean
 3. Range
 4. Skewness
 5. Correlation
 6. Probable Error
 7. Coefficient of Variation
 8. Frequency Distribution

Section- B

Answer **FIVE** questions.   **5X10=50M**
 9. a) Highlight the role and importance of statistics in business decision making in detail.
                                                (OR)
    b) Briefly explain the nature and scope of Business Statistics.

 10. a) What are the advantages and limitations of measures of central tendency?
                                                (OR)
    b) Calculate Mean and Variance of the following Data.

Size	14	16	18	20	22	24	26
Frequency	12	13	14	15	13	12	16

 11. a) Calculate quartile deviation and its coefficient from the following data :

C.I	0-10	10-20	20-30	30-40	40-50
F	5	7	10	5	8

                                                (OR)

    b) Define standard deviation. Briefly explain advantages and limitations of standard deviation.

 12. a) Given the following information, find the number of items (n) where rxy = 0.8, x$\sum$y = 2.5,σxy

    =60, $\sum$2 = 90, where x and y are the deviations from the respective means.

                                                (OR)
    b) Briefly explain the measures of skewness.

 13. a) Calculate the co-efficient of correlation from the following data:

X	12	9	8	10	11	13	07
Y	14	8	6	9	11	12	3

    Through Karl Pearson's method.
                                                (OR)
    b) Explain various types of correlation.

B Com	Semester: III(Computer Applications)	Credits: 4
Course: 3C	PROGRAMMING WITH C &C++	Hrs/Wk: 5

Learning Outcomes:

At the end of the course, the students is expected to DEMONSTRATE the following cognitive abilities (thinking skill) and psychomotor skills.

A. *Remembers and states in a systematic way (Knowledge).*
1. Develop programming skills.
2. Declaration of variables and constants use of operators and expressions.
3. learn the syntax and semantics of programming language.
4. Be familiar with programming environment of C and C++.
5. Ability to work with textual information (characters and strings) & arrays

B. *Explains (Understanding).*
6. Understanding a functional hierarchical code organization.
7. Understanding a concept of object thinking within the framework of functional model.
8. Write program on a computer, edit, compile, debug, correct, recompile and run it

C. *Critically examines, using data and figures (Analysis and Evaluation).*
9. Choose the right data representation formats based on the requirements of the problem.
10. Analyze how C++ improves C with object-oriented features.
11. Evaluate comparisons and limitations of the various programming constructs and choose correct one for the task in hand.

D. Working in 'Outside Syllabus *Area' under a Co-curricular Activity*(Creativity) Planning of structure and content, writing, updating and modifying computer programs for user solutions

E. Exploring C programming and Design C++ classes for code reuse (Practical skills***).

UNIT I:
Introduction and Control Structures: History of 'C' - Structure of C program – C character set, Tokens, Constants, Variables, Keywords, Identifiers – C data types - C operators - Standard I/O in C - Applying if and Switch Statements.

UNIT II:
Loops And Arrays: Use of While, Do While and For Loops - Use of Break and Continue Statements - Array Notation and Representation - Manipulating Array Elements - Using Multi Dimensional Arrays.

UNIT III:
Strings and Functions: Declaration and Initialization of String Variables - String Handling Functions - Defining Functions - Function Call - Call By Value, Call By Reference – Recursion.

UNIT IV:
Principles of Object Oriented Programming: Procedure Oriented Programming, Object Oriented Programming, Basic concepts of Object Oriented Programming, Applications of C++, A simple C++ Program, An example with Class, Structure of C++ Program, Creating source file, Compiling and Linking.

UNIT V:
Classes and Objects: Tokens, Keywords, Declaration of Variables, Dynamic initialization of variables, Specifying a Class, Defining member functions, Function overloading, Operator overloading, Constructors and Destructors, Inheritance and types of Inheritance.

REFERENCES:
1. Mastering C by K R Venugopal and Sudeep R Prasad, McGraw Hill.
2. Expert C Programming: Deep Secrets Kindle Edition Peter van der Linden.
3. Let Us C YashavantKanetkar.
4. The C++ Programming Language Bjarne Stroustrup.
5. C++ Primer Stanley B. Lippman, Josée Lajoie, Barbara E. Moo

Online Resources:

https://www.tutorialspoint.com/cprogramming/index.html

https://www.learn-c.org/

https://www.programiz.com/c-programming

https://www.w3schools.in/c-tutorial/

https://www.cprogramming.com/tutorial/c-tutorial.html

https://www.tutorialspoint.com/cplusplus/index.html

https://www.programiz.com/cpp-programminghttp://www.cplusplus.com/doc/tutorial/

https://www.learn-cpp.org/

https://www.javatpoint.com/cpp-tutorial

PRACTICAL COMPONENT: @ 2 HOURS/WEEK/BATCH.

1. Write C programs for
   a. Fibonacci Series
   b. Prime number
   c. Palindrome number
   d. Armstrong number.
2. 'C' program for multiplication of two matrices
3. 'C' program to implement string functions
4. 'C' program to swap numbers
5. 'C' program to calculate factorial using recursion.
6. 'C++' program to perform addition of two complex numbers using constructor
7. Write a program to find the largest of two given numbers in two different classes using friend function.
8. Program to add two matrices using dynamic constructor.
9. Implement a class string containing the following functions
      a. Overload + operator to carry out the concatenation of strings.
      b. Overload == operator to carry out the comparison of strings.
10. Program to implement inheritance.

RECOMMENDED CO-CURRICULAR ACTIVITIES:

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

Measurable.

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging).
2. Student seminars (on topics of the syllabus and related aspects (individual activity).
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams).
4. Field studies (individual observations and recordings as per syllabus content andrelated areas (Individual or team activity).
5. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation andcontribution of students shall be ensured (team activity))

General.

1. Group Discussion.
2. Visit to Software Technology parks / industries.

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted:

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Coding exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports,
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work

MODEL QUESTION COURSE – THEORY
B.Com. DEGREE EXAMINATIONS
Semester: III(Computer Applications)
Course(3C): Programming With C&C++

Time: 3 Hours.   Max Marks: 75

Section-A

Answer any **FIVE** of the following questions.   **5X5=25M**

1. Write the Structure of C program
2. Write about Break and Continue Statement.
3. What is recursion? Write an example program for recursion.
4. Write the Structure of C++ Program.
5. What is Inheritance? What are the types of Inheritance?
6. Write the Tokens and Constants in C Language.
7. Write Declaration and Initialization of String.
8. Write about operator overloading.

Section-B

Answer **FIVE** questions.   **5X10=50M**

9. a) Write about Data Types and Operators in C Language.
                                     (OR)
    b) Write about If and Switch Statement with examples.

10. a) Write about types of Loops in C Language with Flow Charts and example syntax.
                                     (OR)
     b) Write about Array Declaration and Initialization and write a C program for Addition of
        two arrays.

11. a) Write about different types of String handling functions
                                     (OR)
     b) Explain Call by Value and Call by Reference with examples.

12. a) Explain about basic concepts of OOP.
                                     (OR)
     b) Write about Creating source file, Compiling and Linking.

13. a) Explain about types of Constructors.
                                     (OR)
    b) Explain about different types of Inheritances.

B Com	Semester: IV	Credits: 4
Course: 4A	CORPORATE ACCOUNTING	Hrs/Wk: 5

Learning Outcomes:

At the end of the course, the student will able to:

- Understand the Accounting treatment of Share Capital and aware of process of book building.
- Demonstrate the procedure for issue of bonus shares and buyback of shares.
- Comprehend the important provisions of Companies Act, 2013 and prepare final accounts of a company with Adjustments.
- Participate in the preparation of consolidated accounts for a corporate group.
- Understand analysis of complex issues, formulation of well-reasoned arguments and reaching better conclusions.
- Communicate accounting policy choices with reference to relevant laws and accounting standards.

UNIT I:

Accounting for Share Capital: Kinds of Shares – Types of Preference Shares – Issue of Shares at Par, Discount and Premium - Forfeiture and Reissue of Shares (including problems).

UNIT II:

Issue and Redemption of Debentures and Issue of Bonus Shares: Accounting Treatment for Debentures Issued and Repayable at Par, Discount and Premium -Issue of Bonus Shares - Buyback of Shares - (including problems).

UNIT III:

Valuation of Goodwill: Need and Methods - Average Profit Method, Super Profits Method – Capitalization Method and Annuity Method (Including problems).

UNIT IV:

Valuation Shares: Need for Valuation - Methods of Valuation - Net Assets Method, Yield Basis Method, Fair Value Method (including problems).

UNIT V:

Company Final Accounts: Provisions of the Companies Act, 2013 - Preparation of Final Accounts – Adjustments Relating to Preparation of Final Accounts – Profit and Loss Account and Balance Sheet – (including problems with simple adjustments).

REFERENCE BOOKS:

1. Corporate Accounting – T.S Reddy and Murthy, MarghamPublications, Chennai.
2. Advanced Accounts: M C Shukla, T S Grewal and S C Gupta, S Chand Publications
3. Corporate Accounting – Haneef & Mukherji, Tata McGraw Hill Publications.
4. Corporate Accounting – RL Gupta & Radha Swami,Sultan Chand & sons
5. Corporate Accounting – P.C. Tulsian, S.Chand Publishers
6. Advanced Accountancy: Jain and Narang,,Kalyani Publishers
7. Advanced Accountancy: R.L. Gupta and M.Radhaswamy, S Chand.
8. Advanced Accountancy :Chakraborthy, Vikas Publishers
9. Corporate Accounting: S.N. Maheswari, S.K. Maheswari, Vikas Publishing House.
10. Advanced Accounts: M.C. Shukla, T.S. Grewal, S.C. Gupta, S. Chand & Company
11. Corporate Accounting: Umamaheswara Rao, Kalyani Publishers
12. Corporate Accounting: Dr ChandaSrinivas, SevenHills International Publishers,
13. Advanced Accountancy: Arulanandam& Raman, Himalaya Publishing House.

Suggested Co-Curricular Activities:

- Assignments and Problem Solving Exercises.
- Collect and fill the share application form of a limited Company.
- Collect Prospectus of a company and identify its salient features.
- Collect annual report of a Company and List out its assets and Liabilities.
- Collect the annual reports of company and calculate the value of goodwill under different methods.
- Power point presentations on types of shares and share capital.
- Group Discussions on problems relating to topics covered by syllabus.

MODEL QUESTION COURSE – THEORY
B.Com. DEGREE EXAMINATIONS
Semester: IV
Course(4A): Corporate Accounting

Time: 3 Hours.   Max Marks: 75

Section-A

Answer any **FIVE** of the following questions.   **5X5=25M**

1. Forfeiture of Shares
2. Buyback of shares
3. Annuity Method of Goodwill
4. Fair value method
5. Companies Act, 2013
6. Equity Share Capital
7. Dividend
8. Goodwill

Section- B

Answer **FIVE** questions.   **5X10=50M**

9. a) X Ltd. Forfeited 100 equity shares of Rs. 10 each held by Rooldu Ram on 15th December, 2015
      for non-payment of First Call of Rs. 2 per share and the final call of Rs. 3 per share. These shares
      were re-issued to Mohan on 25th December 2015 at a discount of Rs. 3.50 per share. Pass journal
      entries.

(OR)

   b) What are the advantages of Equity Share Capital and Preference Share Capital?

10. a) Explain the major sources where from the debentures can be redeemed.

(OR)

    b) What is the purpose of issue of bonus shares? What are the conditions which have to be fulfilled
       while making such an issue?

11. a) RG and MK are the partners in the firm. Their capitals are 3, 00,000 and 2,00,000. During the
       year ended 31st March, 2010 the firm earned a profit of 1,50,000. Assuming that the normal rate
       of return is 20%. Calculate the value of goodwill of the firm:
    1. By capitalization method
    2. By super profit method if the goodwill is valued at 2 years purchase of super profit.

(OR)

    b) Define goodwill. When may the need for evaluating goodwill arise in the case of a joint stock
       company?

12. a) Explain need for valuation and methods of valuation.

(OR)

    b) From the following Balance Sheet of Sweetex Ltd. you are asked to-ascertain the value of each
       Equity Share of the company:

Liabilities	Amount Rs.		Assets	Amount Rs.
20,000 Equity Shares			Good Will	30,000
Rs. 10 each, fully paid		20,000	Land And Building	1,00,000
1000, 6%Preference Shares			Plant and Machinery	1,20,000
of Rs.100 each, fully paid		1,00,000	Investment(At Cost)	60,000
Reserves	60,000		Stock	50,000
Sundry Creditors	40,000		Debtors	40,000
Provision for Taxation	20,000		Cash at Bank	24,000
Other Liabilities	10,000		Preliminary Expenses	6,000
	4,30,000			**4,30,000**

For the purpose of valuing the shares of the company, the assets were revalued as: Goodwill Rs. 50,000; Land and Building at cost plus 50%, Plant and Machinery Rs. 1, 00,000; Investments at book values; Stock Rs. 80,000 and Debtors at book value, less 10%.

13.a) A limited company has an authorized capital of Rs.1,000,000 divided into 60,000 equity shares of Rs.10 each and 4,000, 10% preference shares of Rs.100 each out of which 50,000 equity share and 3,000 preference share were issued and fully paid up. The profit for the year 2019 being the first year of operation amounted to Rs.1,80,000 after income tax. The directors decided to declare a dividend of 22% on the equity share capital after.

    i. Statutory minimum requirement transfer to computer applications reserve

    ii. Provision of dividend on preference shares.

Prepare profit and loss appropriation account and show liabilities side of the balance sheet.
<p align="center">(OR)</p>
b) What are the salient features and provisions of Companies Act, 2013.

B Com	Semester: IV	Credits: 4
Course: 4B	COST AND MANAGEMENT ACCOUNTING	Hrs/Wk: 5

Learning Outcomes:

At the end of the course, the student will able to:
- Understand various costing methods and management techniques.
- Apply Cost and Management accounting methods for both manufacturing and service industry.
- Prepare cost sheet, quotations, and tenders to organization for different works.
- Analyze cost-volume-profit techniques to determine optimal managerial decisions.
- Compare and contrast the financial statements of firms and interpret the results.
- Prepare analysis of various special decisions, using relevant management techniques.

UNIT I:

Introduction: Cost Accounting: Definition – Features – Objectives – Functions – Scope – Advantages and Limitations - Management Accounting: Features – Objectives – Functions –
Elements of Cost - Preparation of Cost Sheet (including problems)

UNIT II:

Material and Labour Cost: Techniques of Inventory Control – Valuation of Material Issues: FIFO - LIFO - Simple and Weighted Average Methods. Labour: Direct and Indirect Labour Cost – Methods of Payment of Wages- Incentive Schemes -Time Rate Method, Piece Rate Method, Halsey, Rowan Methods and Taylor Methods only(including problems)

UNIT III:

Job Costing and Batch Costing: Definition and Features of Job Costing – Economic Batch Quantity (EBQ) – Preparation of Job Cost Sheet – Problems on Job Cost Sheet and Batch Costing(including problems)

UNIT IV:

Financial Statement Analysis and Interpretation:Financial Statements - Features, Limitations. Need, Meaning, Objectives, and Process of Financial Statement Analysis- Comparative Analysis – Common Size Analysis and Trend Analysis (including problems)

UNIT V:

Marginal Costing: Meaning and Features of Marginal Costing – Contribution –Profit Volume Ratio- Break Even Point – Margin of Safety – Estimation of Profit and Estimation of Sales(including problems).

REFERENCES BOOKS:
1. S.P. Jain and K.L. Narang – Advanced Cost Accounting, Kalyani Publishers.
2. M.N. Arora – A test book of Cost Accounting, Vikas Publishing House Pvt. Ltd.
3. S.P. Iyengar – Cost Accounting, Sultan Chand & Sons.
4. Nigam & Sharma – Cost Accounting Principles and Applications, S.Chand& Sons.
5. S.N. Maheswari– Principles of Management Accounting, Sultan Chand & Sons.
6. I.M.Pandey – Management Accounting, Vikas Publishing House Pvt. Ltd.
7. Sharma & Shashi Gupta – Management Accounting, Kalyani Publishers.
8. Murthy & Guruswamy – Management Accounting, Tata McGraw Hill, New Delhi.
9. S.P. Gupta – Management Accounting, S. Chand Publishing, New Delhi.
10. Umamaheswara Rao and Ranganath, Cost Accounting, Kalyani Publishers.
11. Dr V Murali Krishna – Cost Accounting, Seven Hills International Publishers.

Suggested Co-Curricular Activities:
- Debate on methods of payments of wages.
- Seminars and Problem Solving Exercises .
- Seminar on need and importance of financial statement analysis.
- Graphs showing the breakeven point analysis.
- Identification of elements of cost in services sector by Visiting any service firm
- Cost estimation for the making of a proposed product.
- Listing of industries located in your area and methods of costing adopted by them.
- Collection of financial statements of any two organization for two years and prepare a common Size Statements. Collection of cost sheet and pro-forma of quotation.

MODEL QUESTION COURSE – THEORY
B.Com. DEGREE EXAMINATIONS
Semester: IV
Course(4B): Cost And Management Accounting

Time: 3 Hours.   Max Marks: 75

Section-A

Answer any **FIVE** of the following questions.   **5X5=25M**
1. Elements of Cost
2. Time Rate Method
3. EBQ
4. Trend Analysis
5. Profit Volume Ratio
6. Job Costing
7. Cost Sheet
8. Inventory Control

Section- B

Answer **FIVE** questions.   **5X10=50M**

9. a) Define Cost Accounting. Briefly explain the objectives and functions of Cost Accounting.
(OR)
b) Distinguish between Cost Accounting and Management Accounting

10. a) From the following details write Store Ledger under simple average method:

2006			
DEC	1	Opening Balance	100Kg @ Rs. 5.00
"	5	Received	50Kg @ Rs. 5.20
"	8	Issued	120Kg
"	10	Issued	10Kg
"	15	Received	80Kg @ Rs. 5.40
"	18	Issued	50Kg
"	20	Received	100Kg @ Rs. 5.60
"	25	Issued	40Kg
"	29	Issued	60Kg

The stock verifier found a shortage of 10 kg. on 16.12.06 and another shortage of 10 kg on 26.12.06.
(OR)
b) Define 'Labour Turnover'. How is it measured? Explain.

11. a) Distinguish between Job costing and batch costing.
(OR)
b) Annual demand for a component is 30,000 units. Cost of set-up per batch is Rs.600. Inventory carrying cost per unit per annum is Rs.1. (i) Calculate the total cost assuming batch size of 4,000 units, 5,000 units, 6,000 units, 7,000 units, 8,000 units, 9,000 units and 10,000 units. Also find the economic batch quantity. (ii) Using mathematical formula calculate economic batch quantity.

12. a) Define financial statement analysis. Explain the objectives and process of financial statement analysis.
(OR)

b) Briefly explain comparative analysis and common-size analysis.

13. a) Define Marginal Costing. Explain the features and importance of marginal costing.

(OR)

b) From the following data, you are required to calculate:

(i) P/V ratio

(ii) Break-even sales with the help of P/V ratio.

(iii) Sales required to earn a profit of Rs. 4,50,000

Fixed Expenses = Rs. 90,000

Variable Cost per unit:

Direct Material = Rs. 5

Direct Labour = Rs. 2

Direct Overheads = 100% of Direct Labour

Selling Price per unit = Rs. 12.

B Com	Semester: IV	Credits: 4
Course: 4C	INCOME TAX	Hrs/Wk: 5

Learning Outcomes:

At the end of the course, the student will able to:

- Acquire the complete knowledge of the tax evasion, tax avoidance and tax planning.
- Understand the provisions and compute income tax for various sources.
- Grasp amendments made from time to time in Finance Act.
- Compute total income and define tax complicacies and structure.
- Prepare and File IT returns of individual at his own.

UNIT I:

Introduction: Income Tax Act-1961 - Basic Concepts: Income, Person, Assessee - Assessment Year, Previous Year, Rates of Tax, Agricultural Income,ResidentialStatusof Individual -Incidence of Tax – Incomes Exempt from Tax (theory only).

UNIT II:

Income from Salaries: Basis of Charge, Tax Treatment of Different Types of Salaries Allowances, Perquisites, Profits in Lieu of Salary, Deductions from Salary Income, Computation of Salary Income (including problems).

UNIT III:

Income from House Property and Profits and Gains from Business: Annual Value, Let-out/Self Occupied/Deemed to be Let-out house -Deductions from Annual Value - Computation of Income from House Property, Definition of Business and Profession – Procedure for Computation of Income from Business – Revenue and Capital Nature of Incomes and Expenses – Allowable Expenses – Expenses Expressly Disallowed – Computation (including problems).

UNIT IV:

Income from Capital Gains - Income from Other Sources: Meaning of Capital Asset – Types – Procedure for Computation of Long-term and Short-term Capital Gains/Losses

Meaning of Other Sources - Computer applications Incomes – Specific Incomes – Computation (including problems).

UNIT V: Computation of Total Income of an Individual: Deductions under Section 80 - Computation of Total Income (Simple problems).

REFERENCE BOOKS:

1. Dr. Vinod; K. Singhania; Direct Taxes – Law and Practice, Taxman Publications
2. T. S. Reddy and Dr. Y. Hari Prasad Reddy - Taxation , by Margham Publications
3. Premraj and Sreedhar, Income Tax, Hamsrala Publications
4. B.B. Lal - Direct Taxes; Konark Publications
5. Dr. Mehrotra and Dr. Goyal -Direct Taxes, Law and Practice, Sahitya Bhavan Publication.
6. Balachandran&Thothadri- Taxation Law and Practice, PHI Learning.
7. V.P. Gaur and D.B. Narang - Income Tax, Kalyani Publications
8. Dr Y Kiranmayi - Taxation, Jai Bharath Publishers
9. Income Tax, Seven Lecture Series, Himalaya Publications

Suggested Co-Curricular Activities:

- Seminar on different topics of Income tax and Quiz programs, also Problem Solving Exercises.
- Debate on Tax Evasion and Avoidance.
- Practice of provisions of Taxation.
- Talk on Finance Bill at the time of Union Budget.
- Guest lecture by Chartered Accountant.
- Presentation of tax rates and Practice of filing IT Returns online.
- Group Discussions on problems relating to topics covered by syllabus.
- Examinations (Scheduled and surprise tests)

MODEL QUESTION COURSE – THEORY
B.Com. DEGREE EXAMINATIONS
Semester: IV
Course(4C): Income Tax

Time: 3 Hours.   Max Marks: 75

Section-A

Answer any **FIVE** of the following questions.   **5X5=25M**

1. Assessee
2. Agriculture Income
3. Perquisites
4. Gratuity
5. Self-occupied Property
6. Capital Asset
7. Interest on Securities
8. Total Income

Section- B

Answer **FIVE** questions.   **5X10=50M**

9. a) What are the different categories of assesses according to their residential status? How is this status determined?

(OR)

   b) Enumerate any ten items which are exempt from charge of Income-tax U/S 10.

10. a) Balu is employed by P Ltd in Pune. During the previous year, he gets the following emoluments: Basic salary: Rs. 1,86,000; dearness allowance: Rs. 12,300 (forming part of salary); city compensatory allowance: Rs. 3,100; children's education allowance: Rs. 2,340 (for 3 children); Bonus Rs.15,000; house rent allowance: Rs. 16,200 (rent paid: Rs. 20,000). Employer's contribution towards recognized provident fund Rs.20,000; Balu's contribution towards recognized provident fund Rs.40000; Income of Balu from other sources in India 80,000; Find out the taxable income and tax liability of Balu for the assessment year 2016-2017.

(OR)

    b) Discuss various deductions available under the head salary.

11. a) What are the incomes chargeable under the head "Profits and Gains of Business or Profession?

(OR)

   b) A owns two houses, I & II. House I is let-out throughout the previous year. House II is self-occupied for nine months and let-out for three months on a monthly rent of Rs 5,000. Determine Taxable income, given the following details.

	House I	House I
Municipal Value	40000	50000
Fair Rent	50000	48000
Rent Received	48000	15000
Municipal Taxes paid	4000	5000
Insurance Premium (not yet paid)	2000	2500
Ground Rent	1000	1500
Maintenance Charges	3000	3500
Electricity Bill	5000	6000

12. a) Discuss the provisions of the IT Act, 1961 regarding: (i) Conversion of Capital Assets to Stock in Trade; (ii) Computation of Capital Gains in case of depreciable assets.

(OR)

    b) Briefly explain computer applications income and special incomes from other sources.

13. a) Briefly explain the deductions U/S 80.

(OR)

    b) What is the procedure for computation of total income with examples?

B Com	Semester: IV	Credits: 4
Course: 4D	BUSINESS LAW	Hrs/Wk: 5

Learning Outcomes:

At the end of the course, the student will able to:

- Understand the legal environment of business and laws of business.
- Highlight the security aspects in the present cyber-crime scenario.
- Apply basic legal knowledge to business transactions.
- Understand the various provisions of Company Law.
- Engage critical thinking to predict outcomes and recommend appropriate action on issues relating to business associations and legal issues.
- Integrate concept of business law with foreign trade.

UNIT I:

Contract: Meaning and Definition of Contract - Essential Elements of Valid Contract -Valid, Void and Voidable Contracts - Indian Contract Act, 1872

UNIT II:

Offer, Acceptance and Consideration: Definition of Valid Offer, Acceptance and Consideration - Essential Elements of a Valid Offer, Acceptance and Consideration.

UNIT III:

Capacity of the Parties and Contingent Contract:

Rules Regarding to Minors Contracts - Rules Relating to Contingent Contracts - Different Modes of Discharge of Contracts - Rules Relating to Remedies to Breach of Contract.

UNIT IV:

Sale of Goods Act 1930 and Consumer Protection Act 2019:

Contract of Sale - Sale and Agreement to Sell - Implied Conditions and Warranties - Rights of Unpaid Vendor- Definition of Consumer - Person - Goods - Service - Consumer Dispute - Consumer Protection Councils - Consumer Dispute Redressal Mechanism.

UNIT V:

Cyber Law: Overview and Need for Cyber Law - Contract Procedures - Digital Signature-Safety Mechanisms.

REFERENCES BOOKS:

1. J. Jaysankar, Business Laws, Margham Publication. Chennai.
2. ND Kapoor, Business Laws, S Chand Publications.
3. Balachandram V, Business law, Tata McGraw Hill.
4. Tulsian, Business Law, Tata McGraw Hill.
5. Pillai Bhagavathi, Business Law,SChand Publications.
6. Business Law, Seven Hills Publishers, Hyderabad.
7. K C Garg, Business Law, Kalyani Publishers.

Suggested Co-Curricular Activities:

- Seminar on Basics of Indian Contract Act,1872.
- Quiz programs.
- Co-operative learning.
- Seminar on Cyber Law.
- Group Discussions.
- Debate on Offer, Agreement, and Contract.
- Creation of Contract by abiding rules of Indian Contract Act,1872.
- Making a sale by abiding rules of Sale of Goods Act,1930.
- Guest lecture by a Lawyer/Police officer.
- Celebrating consumers day by creating awareness among the students.
- Examinations (Scheduled and surprise tests) .
- Any similar activities with imaginative thinking beyond the prescribed syllabus

MODEL QUESTION COURSE – THEORY
B.Com. DEGREE EXAMINATIONS
Semester: IV
Course(4D): Business Law

Time: 3 Hours.   Max Marks: 75

Section-A

Answer any **FIVE** of the following questions.   **5X5=25M**

1. Agreement
2. Acceptance
3. Minor
4. Unpaid Vendor
5. Digital Signature
6. Breach of Contract
7. Unsound Mind
8. Consumer

Section- B

Answer **FIVE** questions.   **5X10=50M**

9. a) "All contracts are agreements but all agreements are not contract"…Explain.
(OR)
   b) What are the salient features and classification of contracts under Indian Contact Act, 1872.

10. a) What are the essentials of consideration?
(OR)
    b) What is offer and Invitation to offer?

11. a) Briefly explain various modes of discharge of contract.
(OR)
    b) Explain the rules relating to contingent contracts.
.
12. a) What are the salient features and contents of Sale of Goods Act, 1930?
(OR)
    b) Explain the rights of a consumer under Consumer Protection Act, 2019.

13. a) Explain an overview and need for Cyber Law.
(OR)

    b) What is contract procedures and safety mechanism for Cyber Laws.

B Com	Semester: IV	Credits: 4
Course: 4E	AUDITING	Hrs/Wk: 5

Learning Outcomes:

At the end of the course, the student will able to:

- Understanding the meaning and necessity of audit in modern era.
- Comprehend the role of auditor in avoiding the corporate frauds.
- Identify the steps involved in performing audit process.
- Determine the appropriate audit report for a given audit situation.
- Apply auditing practices to different types of business entities.
- Plan an audit by considering concepts of evidence, risk and materiality

UNIT I:

Introduction: Meaning – Objectives – Importance of Auditing – Characteristics - Book Keeping vs Auditing - Accounting vs Auditing – Role of Auditor in Checking Corporate Frauds.

UNIT II:

Types of Audit: Based on Ownership, Time and Objective - Independent, Financial, Internal, Cost,Tax, Government, Secretarial Audits

UNIT III:

Planning of Audit: Steps to be taken at the Commencement of a New Audit – Audit Programme - Audit Note Book– Audit Working Courses - Audit Evidence - Internal Check, Internal Audit and Internal Control.

UNIT IV:

Vouching and Investigation: Definition and Importance of Vouching – Objectives of Vouching - Vouching of Cash and Trading Transactions – Investigation - Auditing vs. Investigation

UNIT V:

Company Audit and Auditors Report: Auditor's Qualifications – Appointment andReappointment – Rights, Duties, Liabilities and Disqualifications - Audit Report: Contents –Preparation - Relevant Provisions of Companies Act, 2013.

REFERENCESBOOKS:

1. S.Vengadamani, "Practical Auditing", Margham Publications, Chennai.
2. Ghatalia, "Principles of Auditing", Allied Publishers Pvt. Ltd., New Delhi.
3. Pradeesh Kumar, BaldevSachdeva&Jagwant Singh,

"Auditing Theory and Practice,Kalyani Publications
4. N.D. Kapoor, "Auditing", S Chand, New Delhi.
5. R.G. Saxena, "Principles and Practice of Auditing", Himalaya Publishing House New Delhi
6. JagadeshPrakesh, "Principles and Practices of Auditing", Kalyani Publications
7. Kamal Gupta and Ashok Gupta, "Fundamentals of Auditing", Tata McGraw Hill
8. B.N. Tondan, "Practical Auditing", S.Chand, New Delhi.
9. K J Vijaya Lakshmi & A S Roopa, Auditing, Seven Hills International Publishers, Hyderabad

Suggested Co-Curricular Activities:

- Seminars.
- Visit the audit firms.
- Visit an audit firm, write about the procedure followed by them in Auditing the books of accounts of a firm.
- Guest lecture by an auditor.
- Collect the information about types of audit conducted in any one Organization.
- Collection of audit reports and Group Discussions.
- Draft an audit program.

MODEL QUESTION COURSE – THEORY
B.Com. DEGREE EXAMINATIONS
Semester: IV
Course(4E): Auditing

Time: 3 Hours.   Max Marks: 75

Section-A

Answer any **FIVE** of the following questions.   **5X5=25M**

1. Book Keeping Vs Auditing

2. Government Audit

3. Audit Note Book

4. Investigation

5. Audit Report

6. Internal Check

7. Cost Audit

8. Vouching

Section- B

Answer **FIVE** questions.   **5X10=50M**

9. a) What are the objectives and importance of auditing?
                                           (OR)
   b) Explain the role and responsibilities of auditor in checking corporate frauds.

10. a) Briefly explain various types of audit.
                                           (OR)
    b) Explain the merits and demerits of Financial Audit and Internal Audit.

11. a) What are the steps to be taken at the commencement of a New Audit?
                                           (OR)
    b) Define Internal Control. Why to have internal control? Explain the elements of a good
       system of Internal Control.

12. a) What are the basic objectives and functions of Vouching?
                                           (OR)
    b) Distinguish between Auditing and Investigation.

13. a) Briefly explain the rights and duties of Auditors.
                                           (OR)

    b) State the provisions of the Companies Act, 2013 regarding qualification, appointment and
       removal of auditors.

B Com	Semester: IV(Computer Applications)	Credits: 4
Course: 4F	DATA BASE MANAGEMENT SYSTEMS	Hrs/Wk: 5

Learning Outcomes for Database Management System.

At the end of the course, the students is expected to DEMONSTRATE the following cognitive abilities (thinking skill) and psychomotor skills.

A. *Remembers and states in a systematic way (Knowledge.*

1. Understand the role of a database management system in an organization.
2. Understand basic database concepts, including the structure and operation of the relational data model.
3. Understand and successfully apply logical database design principles, including ER diagrams and database normalization.
4. Understand Functional Dependency and Functional Decomposition

B. *Explains (Understanding).*

5. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.
6. Perform PL/SQL programming using concept of Cursor Management, Error Handling, Packages.

C. *Critically examines, using data and figures (Analysis and Evaluation).*

7. Apply various Normalization techniques.
8. Model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model

D. Working in 'Outside Syllabus ***Area' under a Co-curricular Activity***(Creativity) Design and implement a small database project

E. Construct simple and moderately advanced database queries using Structured Query Language (SQL)(Practical skills)

UNIT I:

Overview of Database Management System: Introduction, Data and Information, Database, Database Management System, Objectives of DBMS, Evolution of Database Management System, Classification of Database Management System.

UNIT II:

File-Based System: File Based System. Drawbacks of File-Based System, DBMS Approach, Advantage of DBMS, Data Models, Components of Database System, Database Architecture,DBMS Vendors and their products.

UNIT III:

Entity-Relationship Model: Introduction, The Building Blocks of an Entity-Relationship, Classification of Entity Set, Attribute Classification, Relationship Degree, Relationship Classification, Generalization and Specialization, Aggregation and Composition, CODD's Rules, Relational Data Model, Concept of Relational Integrity.

UNIT IV:

Structured Query Language: Introduction, History of SQL Standards, Commands in SQL, Data types in SQL, Data Definition Language (DDL),Selection Operation Projection Operation, Aggregate Functions, Data Manipulation Language, Table Modification, Table Truncation, Imposition of Constraints, Set Operations.

UN IT V:
PL/SQL: Introduction, Structure of PL/SQL,PL/SQL Language Elements, Data Types, Control Structure, Steps to Create a PL/SQL Program, Iterative Control Cursors, Steps to Create a Cursor, Procedure, Functions, Packages, Exceptions Handling, Database Triggers, Types of triggers.

LEARNING RESOURCES:
REFERENCES:
1. Paneerselvam:Database Management system, PHI.
2. David Kuklinski, Osborne, Data management system McGraw Hill Publication.
3. Shgirley Neal And Kenneth LC Trunik Database management system in Business-PHI.
4. Godeon C. EVEREST, Database Management-McGraw Hill Book Company.
5. MARTIN,Database Management-Prentice Hall of India, New Delhi.
6. Bipin C.Desai ,`An Introduction to Database System`,Galgotia Publications.
7. Korth, Database Management System.
8. Navathe, Database Management System.
9. S. Sumathi, S. Esakkirajan,Fundamentals of Relational Database Management System

Online resources:
http:// www.onlinegdb.com/
http:// www.tutorialspoint.com/
http://learnsql.com
https://www.codecademy.com/learn/learn-sql/
https://www.w3schools.com/sql/default.asp

PRACTICAL COMPONENT: @ 2 HOURS/WEEK/BATCH.
1. Create tables department and employee with required constraints.
2. Initially only the few columns (essential) are to be added. Add the remaining columns separately by using appropriate SQL command.
3. Basic column should not be null.
4. Add constraint that basic should not be less than 5000.
5. Calculate HRA, DA, Gross and net by using PL/SQL program.
6. The percentage of HRA and DA are to be stored separately.
7. When the DA becomes more than 100%, a message has to be generated and
with user permission has to be merged with basic.

RECOMMENDED CO-CURRICULAR ACTIVITIES:
(Co-curricular activities shall not promote copying from textbook or from others work and
shall encourage self/independent and group learning)

Measurable.
1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging).
2. Student seminars (on topics of the syllabus and related aspects (individual activity).
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams).
4. Field studies (individual observations and recordings as per syllabus content and related areas (Individual or team activity).
5. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)

General
1. Group Discussion
2. Visit to Software Technology parks / industries

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted:

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Coding exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports,
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work

MODEL QUESTION COURSE – THEORY
B.Com. DEGREE EXAMINATIONS
Semester: IV(Computer Applications)
Course(4F): Data Base Management Systems
Time: 3 Hours.   Max Marks: 75

Section-A
Answer any **FIVE** of the following questions.   **5X5=25M**

   1. What is the difference between Data and Information?
   2. Write the advantages of DBMS.
   3. Write about classification of Entity Set?
   4. What are the Data Types in SQL?
   5. Write the steps to create PL/SQL program.
   6. What are the components of DBMS?
   7. What is the Concept of Relational Integrity?
   8. Write about Cursors.

Section-B
Answer **FIVE** questions.   **5X10=50M**

  9. a) Explain about Classification of Database Management System.
                        (OR)
    b) Explain about Objectives of Database Management System.

 10. a) Explain about Data Models.
                        (OR)
    b) Explain about Database architecture.

 11. a) Explain about Aggregation and Composition.
                        (OR)
    b) Explain about concepts of ER Model with an example.

 12. a) Explain about Data Definition Language commands with syntax.
                        (OR)
    b) Explain the aggregate functions in SQL with syntax.

 13. a) Explain about Exception Handling with example program.
                        (OR)
    b) Explain about different types of Triggers.

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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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.

UNIVERSITY COLLEGE OF ENGINEERING

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.

UNIVERSITY COLLEGE OF ENGINEERING

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. 1 Registration 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 $\geq$ 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.

UNIVERSITY COLLEGE OF ENGINEERING

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
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
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:

<table>
<tr><th colspan="2" align="center">Course Objectives</th></tr>
<tr><td colspan="2">Learn the concept of Introduction to Operating Systems and Process Management.</td></tr>
<tr><td colspan="2">Learn about Process Synchronization and Deadlocks in detail.</td></tr>
<tr><td colspan="2">Learn about the concept of Memory Management, File System Implementation, Mass-storage structure.</td></tr>
<tr><td colspan="2">Learn the concept of Protection and Case Study.</td></tr>
</table>

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

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)
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 2ndEdiction.

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.

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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
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		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).

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

| 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
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)
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

MCA-20305 BLOCKCHAIN TECHNOLOGY (ELECTIVE-II)

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)
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

MCA-20305 MACHINE LEARNING AND DEEP LEARNING (ELECTIVE-II)

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

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
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.

MCA-20306 ROBOTICS (ELECTIVE III)

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

6. Functions.

4. Looping statements.

7. Event handling

5. Arrays

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
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)

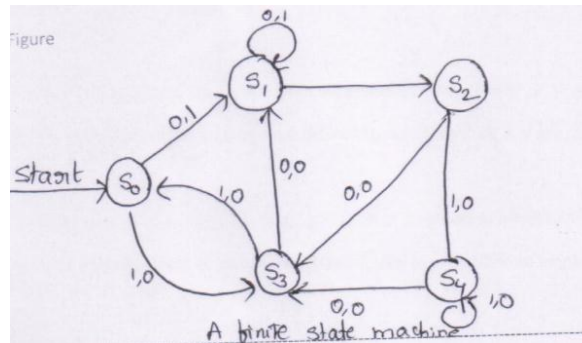4. (a)Find the sum of products expansion for the function $F(x, y, z) = (x + y)\bar{z}$ (7)

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

(or)

(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

<u>Time:3 Hrs.</u> <u>Max Marks:75</u>

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.

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]

Or

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]

Or

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]

Or

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]

Or

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**

<u>SECTION-A</u>
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
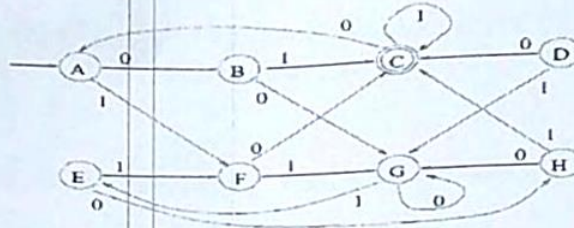
2. a) State and prove pumping lemma for CFL's?   8M
    b) Explain any five closure properties of Regular sets?   7M

(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?

<u>SECTION-B</u>
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

Or

   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 streams. What are the different kinds of data on which mining can be applied?   10M
   b) Mention different issues in Data Mining.   5M

Or

   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

Or

   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

Or

   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

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

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

Course Structure & Syllabus

for

M.Sc. Organic Chemistry

(Syllabus for Semesters I & II is common for M.Sc. Analytical Chemistry and

M.Sc Organic Chemistry and M.Sc Physical Chemistry)

2019-2020

ADIKAVI NANNAYA UNIVERSITY

Rajamahendravaram

Course Structure of M.Sc. Organic Chemistry

S. No.	Semester	Code of the paper	Title of the paper	Theory/ Practical /Viva	Internal marks	External marks	Total marks	Credits
1.	Semester-I	CHE01	General Chemistry-I	T	25	75	100	4
2.		CHE02	Inorganic Chemistry-I	T	25	75	100	4
3.		CHE03	Organic Chemistry-I	T	25	75	100	4
4.		CHE04	Physical Chemistry-I	T	25	75	100	4
5.		CHEP01	Inorganic Chemistry Practical-I	P	25	75	100	3
6.		CHEP02	Organic Chemistry Practical-I	P	25	75	100	3
7.		CHEP03	Physical Chemistry Practical-I	P	25	75	100	3
8.	Semester-II		General Chemistry-II	T	25	75	100	4
9.			Inorganic Chemistry-II	T	25	75	100	4
10.			Organic Chemistry-II	T	25	75	100	4
11.			Physical Chemistry-II	T	25	75	100	4
12.			Inorganic Chemistry Practical-II	P	25	75	100	3
13.			Organic Chemistry Practical-II	P	25	75	100	3
14.			Physical Chemistry Practical-II	P	25	75	100	3
15.	Semester-III		Organic Reaction Mechanisms-I and Pericyclic reactions-I	T	25	75	100	4
16.			Organic Spectroscopy-I	T	25	75	100	4
17.			Organic Synthesis-I	T	25	75	100	4
18.			Chemistry of Natural Products	T	25	75	100	4
19.			Multistep synthesis of Organic Compounds	P	25	75	100	4
20.			Estimations and Chromatography	P	25	75	100	4
21.	Semester-IV		Organic Reaction Mechanisms-II and Organic Photochemistry	T	25	75	100	4
22.			Organic Spectroscopy-II	T	25	75	100	4
23.			Organic Synthesis-II	T	25	75	100	4
24.			Bio-Organic Chemistry	T	25	75	100	4
25.			Chromatographic separation, Isolation and Identification of Natural Products	P	25	75	100	4
26.			Spectral Identification of Organic Compounds(UV, IR, ^{1}H-NMR,^{13}C-NMR & MASS)	P	25	75	100	4
27.			Comprehensive viva-voce	V	----	50	50	4
						Total Credits		100

Note: I & II Semesters syllabus and course structure are common for M. Sc. Organic Chemistry/Analytical Chemistry /Physical Chemistry courses.

Paper- I: GENERAL CHEMISTRY-I

UNIT-1

Basic Quantum Chemistry-I- Wave equation-interpretation of wave function-properties of wave function-normalization and orthogonalisation, Operators- linear and non-linear- commutators of operators. Postulates of quantum mechanics; setting up of operators to observables; Hermitian operator- Eigen values and Eigen functions of Hermitian operator; Expansion theorems. Eigen functions of commuting operators-significance. Simultaneous measurement of properties and the uncertainty principle.

UNIT-II

Basic Quantum Chemistry-II- Wave mechanics of simple systems with constant potential energy, particle in one-dimensional box- factors influencing color transition- dipole integral, Symmetry arguments in deriving the selection rules, the concept of tunneling- particle in three -dimensional box. Calculations using wave functions of the particle in a box-Orthogonality, measurability of energy, position and momentum, average values and probabilities. Rigid rotor, Wave mechanics of systems with variable potential energy-simple harmonic oscillator- solution of wave equation- selection rules.

UNIT-III

Fundamentals of Molecular Spectroscopy-I: Microwave and IR- Spectroscopy- Rotational spectra of diatomic molecules-Rigid rotor-Selection rules- Calculations of bond length- Isotopic effect, Second order stark effect and its applications. Infrared spectra of diatomic molecules- harmonic and anharmonic oscillators- Selection rules- Overtones- Combination bands- Calculation of force constant, anharmonicity constant and zero point energy. Fermi resonance, simultaneous vibrational-rotational spectra of diatomic molecules.

UNIT- IV

Fundamentals of Molecular Spectroscopy-II: Raman and Electronic Spectra- Classical and quantum mechanical explanations- Rotational Raman and Vibrational Raman spectra. Electronic spectra of diatomic molecules- Vibrational Coarse structure- intensities of spectral lines- Franck-Condon principle- applications, Rotational Fine structure- band head and band shading. Charge transfer spectra

References/ Text books

1. Fundamentals of Molecular spectroscopy: by C.N. Banwell
2. Molecular spectroscopy: by B.K.Sharma
3. Molecular spectroscopy: by Aruldas
4. Introductory quantum mechanics: by A.K. Chandra
5. Quantum chemistry: by R.K. Prasad

Paper- II: INORGANIC CHEMISTRY-I

UNIT-1

Structure & Bonding: Applications of VSEPR, Valence Bond and Molecular orbital theories in explaining the structures of simple molecules- role of p and d orbitals in π-bonding. Application of MO theory to Tetrahedral $[CoCl_4]^{2-}$, Square planar ($[PtCl_4]^{2-}$) and Octahedral complexes ($[CoF_6]^{3-}$, $[Co(NH_3)_6]^{3+}$). Classification of ligands based on π-bonding using MO theory. Walsh diagram for H_2O molecule.

UNIT-II

Inorganic cage and ring compounds – preparation, structure and reactions of boranes, carboranes, metallocarboranes. Electron counting in boranes – Wades rules (Polyhedral skeletal electron pair theory).

Heterocyclic inorganic ring systems: Boron–Nitrogen ($H_3B_3N_3H_3$), Phosphorus–Nitrogen ($N_3P_3Cl_6$) and Sulphur-Nitrogen (S_4N_4, $(SN)_x$) cyclic compounds.

Cage Compounds: Phosphorous oxides and Phosphorous sulphides.

Isopoly and heteropoly anions.

UNIT-III

Coordination compounds: Crystal field theory - crystal field splitting patterns in octahedral, tetrahedral, tetragonal, square planar, square pyramidal and trigonal bipyramidal geometries. Calculation of crystal field stabilization energies. Factors affecting crystal field splitting energies – Spectrochemical series – Jahn – Teller effect, nephelauxetic effect – ligand field theory.

Term symbols – Russell – Sanders coupling – derivation of term symbols for various configurations. Spectroscopic ground states.

UNIT- IV

Electronic spectra of transition metal complexes: Types of electronic transitions – d-d transitions - Selection rules, break down of selection rules – Orgel and Tanabe-Sugano diagrams for d^1 –d^9 octahedral and tetrahedral transition metal complexes of 3d series – Calculation of Dq, B and β parameters. Charge transfer spectra.

Magnetic properties of transition and inner transition metal complexes – spin and orbital moments – quenching of orbital momentum by crystal fields in complexes.

Reference books & Text books:

1. Advanced Inorganic Chemistry by F.A. Cotton and G. Wilkinson, IV Edition, John Wiley and Sons, New York, 1980.
2. Inorganic Chemistry by J.E. Huheey, III Edition, Harper International Edition, 1983.
3. Theoretical Inorganic Chemistry, II Edition by M.C. Day and J. Selbin, Affiliated East-West press pvt. Ltd., New Delhi.
4. Inorganic Chemistry by Shriver and Atkins, Oxford University Press (1999).
5. Inorganic Chemistry 5th Edition by Gary L. Miessler et al, Pearson Publications.

Paper –III: ORGANIC CHEMISTRY -I

UNIT – I

Nature of bonding in organic molecules and Aromaticity   15 Hrs

(A) *Electronic Effects and Reactive intermediates:*-Inductive effect, Mesomeric effect (Resonance), Hyperconjugation, Steric effect, Tautomerism, Generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes, nitrenes and arynes

(B) *Criteria of Aromaticity:*- Huckle`s rule and MO Theory, aromaticity in benzenoid non-benzenoid compounds, Aromaticity in Charged and Fused-Ring Systems, Hetero-aromatic Systems, Annulenes: Cyclobutadiene, Benzene,1,3,5,7-Cyclooctatetraene, [10] Annulenes- [12], [14], [16] and [18] annulenes, azulenes, fulvenes, fullerenes, ferrocene, anti-aromaticity and homo-aromaticity.

UNIT – II

Stereo Chemistry & Molecular representation of organic molecules   20 Hrs

(A) Molecular Symmetry and Chirality:-Symmetry elements, Definition and classification of Stereoisomers, Enantiomer, Diastereomer, Homomer, Epimer, Anomer, Configuration and Conformation, Configurational nomenclature: D,L and R, S nomenclature, Molecules with a single chiral center: Molecules with two or more chiral centers.

(B) Geometrical Isomerism and Conformations of Cyclic Systems:- Cis-trans, E, Z- and Syn & anti nomenclature, Methods of determining configuration of Geometrical isomers using physical, spectral and chemical methods, Stability, Cis-trans inter conversion. Conformations of cyclobutane, cyclopentane, cyclohexane, mono and disubstituted cyclohaxanes.

(C) Prochirality and Prostereoisomerism:- Homotopic ligands and faces; enantiotopic ligands and faces; diastereotopic ligands and faces; nomenclature of enantiotopic ligands and faces (Pro-R, Pro-S, Re, Si carbonyl compounds and Alkenes)

(D) Stereoisomerism in molecules without chiral Center -Axial chirality Allenes, Alkylidene cycloalkanes, spiranes, nomenclature. *Atropisomerism:* Biphenyl derivatives, nomenclature. *Planar chirality*: Ansa compounds, paracyclophanes, trans-cyclooctene and Helicity.

UNIT – III

Heterocyclic compounds   15 Hrs

Importance of heterocyclic compounds as drugs. Nomenclature of heterocyclic systems based on ring size, number and nature of hetero atoms. Chemistry of heterocyclic compounds, synthesis and reactivity of the following systems: Quinoline, Isoquinoline, Indole, Pyrazole, Imidazole, Oxazole, Isoxazole, Pyridazine, pyrimidine and Pyrazine.

UNIT - IV

Chemistry of some typical natural products (Alkaloids and Terpenoids)   10 Hrs

A study of the following compounds involving their isolation, structure elucidation, synthesis and biogenesis of

Alkaloids; Atropine, Nicotine, and Quinine.

Terpenoids: α- Terpeneol, α-Pinene and Camphor.

Books Suggested:

1. Advanced Organic Chemistry-Reactions, Mechanism and structure, Jerry March, 6th Ed. (John Wiley & Sons).
2. Organic Chemistry, Paula Yurkanis Bruice, 4th Ed. (Printice Hall)
3. Organic chemistry-Clayden J. (Oxford)
4. Organic Chemsitry, Wade, L.G. Jr. 5th Ed. (Pearson)
5. Advanced Organic Chemistry: Reactions and mechanisms, Miller Bernard & Other, 2nd Ed. (Pearson)
6. Mechanism and Theory in Organic Chemistry, Thomas H. Lowry, Kathleen S. Richardson, Harper & Row, (Publishers, Inc.).
7. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, 6th Ed., (Longman).
8. Reaction Mechanism in Organic Chemistry, P.S. Kalsi, 2nd Ed. (New Age International).
9. Organic Chemistry, R. T. Morrison and R. N. Boyd (Prentice-Hall)
10. Stereochemistry to Organic Compounds, E.L. Eliel (John Wiley).
11. Stereochemistry, P.S. Kalsi, 5th Ed. (New Age International).
12. Organic Chemistry Structure and Reactivity, Ege Seyhan, 3rd Ed. (AITBS)
13. Heterocyclic Chemistry, J.A.Joule, K. Kills and G. F. Smith, Chapman and Hall
14. Heterocyclic Chemistry, T.L.Gilchrist, Longman Scientific Technical
15. Heterocyclic Chemistry, Raj.K. Bansal.
16. An Introduction to the Heterocyclic Compounds, R. M. Acheson, John Wiley.

REFERENCE BOOKS:

1. Chemistry of Natural Products, K.W.Bentley
2. Stereochemistry of carbon compounds by E.Eliel, John Wiley & Sons, Inc.
3. Stereochemistry to Organic Compounds, D. Nasipuri, 2nd Ed. (New Age International).
4. Chemistry of Natural products by R.S. Kalsi Kalyani Publishers. 1983.

Paper – IV: PHYSICAL CHEMISTRY-I

UNIT-I:

Thermodynamics-I: Concepts of partial molar properties – partial molar volume and its significance; Determination of partial molar volume: Graphical method, intercept method and apparent molar volume method. Partial molar free energy, chemical potential, Variation of chemical potential with T and P. Gibbs-Duhem equation-derivation and significance. Phase equilibrium- Derivation of phase rule from the concept of chemical potential. *Ideal solutions* - Thermodynamic properties of ideal solutions mixing quantities; Vapour pressure-Raoult's law; Thermodynamic properties of ideally dilute solutions. Vapour pressure- Henry's law.

Non-ideal systems -Concept of fugacity, fugacity coefficient. Determination of fugacity; Non ideal solutions. Activities and activity coefficients; Standard-state conventions for non ideal solutions; Determination of activity coefficients from vapour pressure measurements. Activity coefficients of non-volatile solutes using Gibbs-Duhem equation. Chemical equilibrium-effect of temperature on equilibrium constant- Van'tHoff equation

UNIT-II:

Micelles and Macro molecules: Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micellar concentration (CMC), factors affecting the CMC of surfactants, counter ion binding to micelles, thermodynamics of micellization- phase separation and mass action models, Solubilization, micro emulsion, reverse micelles.

Polymer- definition, types of polymers, electrically conducting, fire resistant, liquid crystal polymers, kinetics of free radical polymerization. Molecular mass- Number and mass average molecular weight, molecular weight determination-End group analysis, Osmometry, viscometry, ultracentrifugation and light scattering methods.

UNIT-III:

Chemical Kinetics: Theories of reaction rates- Collision theory- Limitations, Transition state theory. Effect of ionic strength - Debye Huckel theory-Primary and secondary salt effects; Effect of dielectric constant, effect of substituent, Hammett equation-limitations, Taft equation; Prediction of rate constants- Consecutive reactions, parallel reactions, opposing reactions (Uni molecular steps only, no derivation). Specific and general acid-base catalysis; Skrabal diagram; Fast reactions- different methods of studying fast reactions- flow methods, relaxation methods- temperature jump and pressure jump methods.

UNIT-IV:

Photochemistry: Electronic transitions in molecules, Franck-Condon principle. Electronically excited molecules- singlet and triplet states, spin-orbit interaction. Quantum yield and its determination; Actinometry - ferrioxalate and uranyl oxalate actinometers-problems. Derivation of fluorescence and phosphorescence quantum yields. Quenching effect- Stern Volmer equation. Photochemical equilibrium and delayed fluorescence - E type and P type. Photochemical primary processes, types of photochemical reactions-photodissocoation, addition and isomerisation reactions with examples.

Books:

1.   Physical Chemistry by Peter Atkins and Julio de Paula, Oxford University Press.

2.   Physical Chemistry by G.W. Castellon, Narosha Publishing House

3.   Physical Chemistry by W.J.Moore, Prentice Hall

4.   Thermodynamics for Chemists, Samuel Glasstone

5.   Chemical Kinetics by K.J.Laidler, McGraw Hill Pub.

6.   Photochemistry, R.P. Kundall and A. Gilbert, Thomson Nelson.

7.   Polymer Chemistry by Billmayer

8.   Introduction to Polymer Science, V.R. Gowriker, N.V.Viswanadhan and J. Sreedhar., Wiley Easter.

9.   Micells, Theoretical and applied aspects, V.Morol, Plenum publishers.

LABORATORY WORK (6 hrs/week)

Practical-1

INORGANIC CHEMISTRY PRACTICALS - I

I. *Inorganic Synthesis: Preparation of*

  (i)   Tetraamminecopper(II) sulphate

  (ii)   Potassium tris(oxalato)ferrate(III) trihydrate

  (iii) Tris(thiourea)copper(I) sulphate

II. *Semi micro qualitative analysis of six radical mixtures*

  (One interfering anion and one less familiar cation for each mixture)

  Anions: CO_3^{2-} , S^{2-} , SO_3^{2-} , Cl^- , Br^- , I^- , NO_3^- , SO_4^{2-}, CH_3COO^-

                 $C_2O_4^{2-}$, $C_4H_4O_6^{2-}$, PO_4^{3-} , CrO_4^{2-} , AsO_4^{3-}, F^- , BO_3^{3-}

  Cations :   Ammonium (NH_4^+)

                 1st group: Hg, Ag, Pb, Tl, W

                 2nd group: Hg, Pb, Bi, Cu, Cd, As, Sb, Sn, Mo

                 3rd group: Fe, Al, Cr, Ce, Th, Ti, Zr, V, U, Be

                 4th group: Zn, Mn, Co, Ni

                 5th group: Ca, Ba, Sr

                 6th group: Mg, K, Li

Recference books:

Vogel's textbook of semimicro qualitative analysis, 5th Edition by G. Svehla.

Practical-2

ORGANIC CHEMISTRY PRACTICALS -I

Preparation, recrystallization, and determination of melting point & yield of the following compounds:

(i)	Aspirin,	(ii)	Nerolin,	(iii)	Chalcone,
(iv)	*p*-Nitro acetanilide,	(v)	2,4,6- Tribromoaniline,	(vi)	*m*-Dinitrobenzene,
(vii)	Phthalimide,	(viii)	Diels-Alder adduct.		

Books Suggested

1. Vogel's Text Book of Quantitative Chemical Analysis, J. Mendham, R. C. Denney, J. D. Barnes and M. J. Thomas, 4th & 6th Ed. (Pearson Education Asia).

2. Vogel's Text Book of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, P.W.G. Smith, A.R. Tatchell, 5 Ed. (Longman Scientific & Technical)

Practical-3

PHYSICAL CHEMSITRY PRACTICALS -I

1. Determination of critical solution temperature of phenol-water system.
2. Effect of added electrolyte on the CST of phenol-water system.
3. Conductometric titration of Strong acid versus Strong base
4. Dissociation constant of weak acid (CH_3COOH) by conductometric method.
5. Conductometric titration of Weak acid vs Strong base.
6. Determination of cell constant
7. Adsorption of acetic acid on animal charcoal or silica gel.
8. Acid-catalyzed hydrolysis of methyl acetate
9. Determination of partial molar volume of solute –H_2O system by apparent molar volume method.

Paper- I: GENERAL CHEMISTRY-II

UNIT-1

Basic Quantum Chemistry-III- Hydrogen atom- solution of $R(r)$, $\Phi(\phi)$ and $\Theta(\theta)$ equations. Probability density in orbitals- shapes of orbitals- Perturbation theory- Time independent perturbation theory(only first order perturbation is to be dealt with)- application to ground state energy of Helium atom- Variation principle- applications- calculation of zero-point energy of harmonic oscillator- many electron atom- Hartee-Fock self-consistent field method(qualitative treatment only)

UNIT-II

Molecular symmetry and Group Theory in chemistry: Basic concepts of symmetry and Group theory-Symmetry elements, symmetry operations and point groups- Schoenflies symbols- Classification of molecules into point groups- Axioms of Group theory- Group multiplication tables for C_{2v} and C_{3v} point groups- Similarity transformations- and classes- Representations- reducible and irreducible representations, Mullikan symbols, Orthogonality theorem and its implications, Character table and its anatomy.

UNIT-III

Treatment of analytical data: Accuracy and precision- Classification of errors- Determinate and Indeterminate errors- Minimization of errors- Absolute and Relative errors, propagation of errors-Distribution of Indeterminate errors- Gaussian distribution- Measures of central tendency-Measures of precision- Standard deviation- Standard error of mean- student's t- test- Confidence interval of mean- Testing for significance- Comparison of two means- F-test- Criteria of rejection of an observation- Significant figures and computation rules.

UNIT- IV

Introduction to computer programming- FORTRAN 77: Basic structures and functioning of computer with P.C. as an illustrative example- Main memory- Secondary storage memory- input/output devices- computer languages- operating systems- principles of algorithms-and flow charts-constants and variables- Arithmetic expressions- Arithmetic statements- Replacement statement- IF statement- logical IF and BLOCK IF statements- GOTO statements-subscripted variable and DIMENSION statement. DO statement- Rules for DO statement- Functions and subroutines- Development of FORTRAN statements for simple formulae in chemistry such as Vander Waals equation- pH of a solution- First order rate equation- Cell constant-Electrode potential.

Flowcharts and computer programs for

a) Program for the calculation of Cell Constant, Specific Conductance and Equivalence.

b) Rate Constant of First order reaction or Beer's law by linear least square method.

c) Hydrogen ion concentration of a strong acid solution/Quadratic equation.

d) Solution for Vander Waals equation or Hydrogen ion concentration of a monoprotic weak acid

e) Standard deviation and Variance of univariant data

References/ Text books:

1. Introductory Quantum chemistry: by A.K. Chandra

2. Group theory for Chemistry: by A.K. Bhattacharya, 3. Chemical Applications of Group Theory by FA Cotton, 3rd Edition, Wiley Interscience Newyork

3. Introductory Group theory for chemists : by George Davidson

4. Vogel's text book of quantitative analysis: by Vogel

5. Fundamentals of Analytical chemistry: by Skog and West

6. Principles of computer programming(FORTRAN 77 IBM PC): by V.Rajaraman

7. Basics of computers for chemists: by P.C. Jurs

Paper- II: INORGANIC CHEMISTRY-II

UNIT-I

Metal cluster compounds - definition – evidences for existence of M-M bonds - conditions favorable for formation of M-M bonds – preparation, structure and bonding of the following metal cluster compounds.

$Re_2Cl_8^{2-}$, $Mo_2Cl_8^{4-}$, $Re_2(RCOO)_4X_2$, $Mo_2(RCOO)_4(H_2O)_2$, $Cr_2(RCOO)_4(H_2O)_2$, $Cu_2(RCOO)_4$ $(H_2O)_2$, $Cr_2Cl_9^{3-}$, $Mo_2Cl_9^{3-}$, $W_2Cl_9^{3-}$, Re_3Cl_9, $Re_3Cl_{12}^{3-}$, $Mo_6Cl_8^{4+}$, $Nb_6X_{12}^{2+}$ and $Ta_6X_{12}^{2+}$.

Polyatomic clusters – Zintle ions, Chevrel phases.

UNIT-II

Organometallic compounds - 16 and 18 electron rules. Isoelectronic relationship - Synthesis, structure, bonding and reactions of carbon monoxide, dinitrogen and nitric oxide complexes. Isolobal relationship – H, Cl, CH_3, $Mn(CO)_5$; S, CH_2, $Fe(CO)_4$; P, CH, $Co(CO)_3$. Synthesis, structure, bonding and reactions of metallocenes with special reference to ferrocene. Catalysis by Organometallic compounds – Homogeneous Catalysis – Alkene hydrogenation – Wilkinson's catalyst, Hydroformylation.

UNIT-III

Metal Ligand equilibria in solution: Stepwise and overall formation constants and their interaction– trends in stepwise constants – factors affecting the stability of metal complexes–Pearson's theory of hard and soft acids and bases (HSAB), chelate effect and its thermodynamic origin, determination of stability constants of complexes–spectrophotometric method and pH–metric method. Reactivity of metal complexes–inert and labile complexes. Explanation of lability on the basis of VBT & CFT.

Bio-Inorganic Chemistry: Metalloporphyrins with special reference to Haemoglobin& Myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+}. Biological and abiological Nitrogen Fixation.

UNIT- IV

Inorganic Reaction Mechanisms: Substitution reactions of metal complexes – D, Id, Ia and A mechanisms – Ligand replacement reactions of octahedral complexes – Acid hydrolysis – factors affecting acid hydrolysis – Anation and Base hydrolysis of Cobalt(III) complexes. Ligand displacement reactions of square planar complexes of platinum (II). Factors affecting square planar substitution – trans effect (theories).

Electron transfer reactions of complexes – concept of complementary and non-complementary reactions with examples. Inner and outer sphere mechanisms.

Text books:

1. Advanced Inorganic Chemistry by F.A. Cotton and R.G. Wilkinson, IV Edition, John, John Wiley and Sons, New York, 1980.
2. Inorganic Chemistry by J.E. Huheey, III edition, Harper International Edition, 1983.
3. Organometallic Chemistry-A unified approach by A. Singh and R.C. Mehrotra, Wiley Eastern Ltd.
4. Inorganic Chemistry by Shriver and Atkins, Oxford University Press (1999)
5. Theoretical Inorganic Chemistry, II Edition by M.C. Day and J. Selbin, Affiliated East-West press Pvt. Ltd..
6. Mechanisms of Inorganic reactions in solution by D.Benson, MCgraw Hill, London, 1968.
7. Inorganic chemistry by K.F. Purcell and J.C.Kotz, W.B. Saunders company, New York, 1977.
8. Elements of Bioinorganic Chemistry by G.N. Mukherjee and Arabinda Das, U.N. Dhur& sons Pvt. Ltd, Calcutta.

Paper-III: ORGANIC CHEMISTRY-II

UNIT-I

Reaction Mechanism   **15Hrs**

(A) *Aliphatic Nucleophilic Substitution and Nucleophilic Aromatic substitution:* Stereochemistry of S_N2 and S_N1 mechanisms, Neighboring Group Participation (Anchimeric assistance), NGP by O, S, N: Aromatic Nucleophilic substitution: SN2 (Ar) (Addition – Elimination), SN1(Ar) and benzyne mechanisms (Elimination - Addition); evidence for the structure of benzyne. Von Richter Sommelet-Hauser rearrangements.

(B) Elimination Reactions: Type of elimination reactions, mechanisms, Stereochemistry and Orientation, Hofmann and Saytzeff rules, Syn elimination versus anti-elimination, competition between elimination and substitution, dehydration, dehydrogenation, dehalogenation, decarboxylative eliminations and pyrolytic eliminations

UNIT-II

Addition Reactions   **15 Hrs**

(A) *Addition to Carbon – Carbon Multiple Bonds:* Mechanistic and stereo chemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, region and chemo selectivity, orientation and reactivity, Hydrogenation of double and triple bonds, hydrogenation of aromatic rings, Hydroboration.

(B) *Addition to Carbon-Hetero Multiple Bonds:* Steric course of addition reactions to C=O and C=N, Aldol, Cannizzaro, Perkin, Knoevenagel, Claisen- Schmidt, Claisen, Dieckman, Benzoin and Stobbe condensations, Reformatsky reaction, Tollen's reaction, Prins reaction: Wittig, Grignard, Mannich, and Michael reaction.

UNIT-III

Molecular Rearrangements   **15 Hrs**

Types of molecular rearrangements, migratory aptitude*;* Rearrangements to electron deficient carbon: Pinacol-pinacolone, Wagner-Meerwein, Tiffeneau – Demjanov, Dienone – Phenol, Arndt-Eistert synthesis*;*

Rearrangements to electron deficient nitrogen: Beckmann, Hofmann, Curtius, Schmidt and Lossen rearrangements; *Rearrangements to electron deficient oxygen:* Baeyer-villiger, Hydro peroxide rearrangement and Dakin rearrangements; Neber rearrangement, Benzil-Benzilic acid and Favorskii rearrangements

UNIT-IV

Spectroscopy and Protecting Groups   **15 Hrs**

    A.   i) U.V. Visible absorption laws, Electronic excitations and absorption shifts

       ii) I.R. : Fundamental modes of vibrations in IR Spectroscopy, Finger Print Region and its importance.

       iii) NMR: Chemical shift and its importance, Coupling constant and its importance, Factors affecting chemical shift and coupling constant, Dueteration-deuterium exchange and Deuterium Labeling.

       iv) Mass: Some usefulterms used in Mass spectrometry: Molecular ion, Fragmentation, Cleavage, Rearrangement, Loss of small molecules, Isotope Abundance, Metastable ions, Even-electron rule, Nitrogen rule, Mc Lafferty Rearrangement.

    B.   Protection of carbonyl, Hydroxyl, carboxylic and Amine groups

Books Suggested:

1.   Advanced Organic Chemistry-Reactions, Mechanism and structure, Jerry March, 6th Ed. (John Wiley & Sons).

2.   Modern Organic Reactions, H. O. House (Benjamin)

3.   Structure and Mechanism in Organic Chemistry C. K. Inglod (Comell University Press).

4.   Organic Chemistry, Paula Yurkanis Bruice, 4th Ed. (Printice Hall)

5.   Organic chemistry-Clayden J. (Oxford)

6.   Organic Chemsitry, Wade, L.G. Jr. 5th Ed. (Pearson)

7.   Organic Chemistry, Salmons, P.W. & Others, 8th Ed. (John Wiley & Sons)

8.   Advanced Organic Chemistry: Reactions and mechanisms, Miller Bernard & Other, 2nd Ed. (Pearson)

9.   Mechanism and Theory in Organic Chemistry, Thomas H. Lowry, Kathleen S. Richardson, Harper & Row,

10.   (Publishers, Inc.).

11.   A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, 6th Ed., (Longman).

12.   Reaction Mechanism in Organic Chemistry, P.S. Kalsi, 2nd Ed. (New Age International).

13.   Stereochemistry to Organic Compounds, E.L. Eliel (John Wiley). 13. Stereochemistry to Organic Compounds, Nasipuri, 2nd Ed. (New Age International).

14.   Stereochemistry, P.S. Kalsi, 5th Ed. (New Age International).   Organic Chemistry Structure and Reactivity, Ege Seyhan, 3rd Ed. (AITBS)

15.   Spectroscopic Methods in Organic Chemistry- Forth Edition, D.H. Williams and I. Fleming Tata   - McGraw Hill, New Delhi, 1990.

16.   Organic Spectroscopy- Second Edition, W.Kemp, ELBS Macmillan, 1987.

17.   Applications of absorption spectroscopy of Organic Compounds J.R.Dyer, Prentice Hall of India, New Delhi, 1984.

18.   Spectrometric identification of Organic Compounds-Fourth Edition, R.M. Silverstein: G.C.Vassiellr and T.C. Merill, Johne Willey, Singapore, 1981.

19.   Introduction to spectroscopy-D.L.Pavia, G.M.Lampman, G.S.Kriz, 3rdEd (Harcourt college publishers).

Paper – IV: PHYSICAL CHEMISTRY-II

UNIT-I:

Physical methods of molecular structural elucidation: NMR: Principle and theory, Nature of spinning particle and its interaction with magnetic field. Chemical shift and its origin. Spin-Spin interaction, Application of NMR to structural elucidation- Structure of ethanol, dimethylformamide, styrene and acetophenone.

Electron Spin Resonance: Principle and experimental technique- g-factor, line shapes and line widths- hyperfine interactions- applications of ESR studies.

UNIT -II:

Thermodynamics-II- Brief review on entropy; entropy changes accompanying specific process – expansion, phase transition, heating, measurement of entropy. Nernst heat theorem; Third law of thermodynamics- Determination of the absolute entropy- Apparent exceptions to Third law of thermodynamics.

Statistical Thermodynamics: Objectives of statistical thermodynamics, Concept of distributions, Types of ensembles. Thermodynamic probability, Most probable distribution Law – Partition Function, (Definition and significance): Molar and molecular partitions-translational, rotational, vibrational and electronic partition functions- Relation between thermodynamic functions (E, H, S, G and C_v) and the partition functions

UNIT-III:

Electrochemistry I: Electrochemical cell- Galvanic and electrolytic cell. Concentration cell with and without transference, Effect of complexation on redox potential- ferricyanide/ ferrocyanide couple, Iron (III) phenonthroline / Iron (II) phenonthroline couple. Determination of standard potential, solubility product equilibrium constant and activity coefficients from EMF data.

Bjerrum theory of ion association (elementary treatment) Concept of activity and activity coefficients in electrolytic solutions. The mean ionic activity coefficient. Debye-Huckel theory of electrolytic solutions. Debye-Huckel limiting law (derivation not required), Calculation of mean ionic activity coefficient; Limitations of Debye-Huckel theory. Effect of dilution on equivalent conductance of electrolytes - Anomalous behavior of strong electrolytes. Debye Huckel-Onsagar equation – verification and limitations, Fuel Cells.

UNIT-IV:

Electrochemistry II: The electrode-electrolyte interface. The electric double layer. The Helmholtz-Perrin parallel-plate model, the Gouy-Chapman diffuse-charge model and the Stern model.

Electrodics: Charge transfer reactions at the electrode-electrolyte interface. Exchange current density and over-potential. Derivation of Butler-Volmer equation. High field approximation, Tafel equation, Low field equilibrium, Nernst equation. Voltametry-Concentration polarization, experimental techniques

Books:

1. Text book of Physical Chemistry by Samuel Glasstone, McMillan Pub.
2. Physical Chemistry by W.J.Moore, Prentice Hall
3. Physical Chemistry by G.W. Castellon, Narosha Publishing House
4. Physical Chemistry by Peter Atkins and Julio de Paula, Oxford University Press.
5. Modern Electrochemistry, 2A & 2B, JOM Bockris & A.K.N.Reddy, Plenum publishers
6. Introduction to Electrochemistry, S.Glasstone.
7. Fundamentals of Molecular Spectroscopy, Banwell
8. Spectroscopy by Straw & Walker.

9.   Statistical thermodynamics , M.C.Gupta

10. Statistical Thermodynamics, M.Dole

LABORATORY WORK (6 hrs/ week)

Practical-1

INORGANIC CHEMISTRY PRACTICALS –II

Quantitative analysis:

Volumetric:

1. Determination of Ferric iron by photochemical reduction
2. Determination of Nickel by EDTA
3. Determination of Calcium and Magnesium in a mixture by EDTA
4. Determination of Ferrocyanide by Ceric sulphate
5. Determination of Copper(II) in presence of iron(III)

Gravimetric:

6. Determination of Zinc as Zinc pyrophosphate
7. Determination of Nickel from a mixture of Copper and Nickel.

Reference books:

Vogel's textbook of quantitative chemical analysis, 5th edition by G.H. Jeffery et al.

Practical-2

ORGANIC CHEMISTRY PRACTICALS –II

Systematic qualitative analysis of an organic mixture containing two compounds

Identification of method of separation and the functional group(s) present in each of them and preparation of one solid derivative for the conformation of each of the functional group(s).

Practical-3

PHYSICAL CHEMISTRY PRACTICALS –II

1. Distribution of iodine between $CHCl_3$ and water
2. Distribution of I_2 between $CHCl_3$ and aq.KI solution- calculation of equilibrium constant.
3. Determination of Coordination number of cuprammonium cation.
4. Titration of mixture Strong acid and weak acid versus Strong base by conductometry.
5. Titration of Strong acid Vs Strong Base – pH – metry.
6. Titration of mixture of ($NaHCO_3$ + Na_2CO_3) Vs HCl – pH- metry.
7. Titration of Strong acid Vs Strong Base using Quinhydrone electrode.
8. Titration of Fe^{+2} Vs $K_2Cr_2O_7$ – potentiometry
9. Verification of Beer-Lambert's law by Iron-thiocyanate system –colorimetry.
10. Determination of single electrode potential of Cu^{2+}/Cu and estimate the given unknown concentration.

Paper – I : ORGANIC REACTION MECHANISMS-I & PERICYCLIC REACTIONS

UNIT – I
A) Aliphatic Nucleophilic Substitution: 15 Hrs

Neighboring group participation by Bromine, Phenyl group, Non–Classical carbocations**,** NGP by Pi bond, Sigma bond and Cyclopropyl group, S_N at Allylic carbon (allylic reaarangements), S_N at Aliphatic trigonal carbon, S_N at Vinylic carbon, Ambident nucleophiles, Hydrolysis of esters (B_{AC}^2 $_{Ac}2$,$A_{AC}1$,$A_{AL}1$,$B_{AL}1$), Mechanism of estrification of carboxylic acid with an alcohol using DCC, Mayers Synthesis of aldehydes, ketones and carboxylic acids Mitsunobu reaction, Von–Braun reaction

B) Aliphatic Electrophilic Substitution:
Mechanisms of S_E^2, $S_E^{\ 1}$, $S_E i$, *Hydrogen as electrophile*: Hydrogen exchange; Migration of double bonds, *Halogen electophiles*. Mechanism of Halogenation of aldehydes and ketones; HVZ reaction; Halogenation of Sulphoxides & Sulphones, *Nitrogen Electrophiles*: Aliphatic diazo coupling, Diazo transfer reaction, *Carbon as Leaving groups*: Decarboxyliation of Aliphatic Acids; Dakin – West reaction; Haller–Bauer reaction.

UNIT – II   15 Hrs
Principles of asymmetric synthesis:
Introduction and terminology: Topicity in molecules Homotopic, stereoheterotopic (enantiotopic and diastereotopic) groups and faces, symmetry, substitution and addition criteria. Prochirality nomenclature: Pro-R, Pro-S, Re and Si. Stereoselective reactions:
Substrate stereoselectivity, product stereoselectivity, enantioselectivity and diastereoselectivity. Conditions for stereoselectivity: Methods for inducing enantio and diastereoselectivity. Analytical methods: % Enantiomeric excess, enantiomeric ratio, optical purity,
% diastereomeric excess and diastereomeric ratio. Techniques for determination of enantiomeric excess, specific rotation, Chiral NMR; Chiral derivatizing agents, Chiral solvent, Chiral shift reagents and Chiral HPLC.

UNIT – III   15 Hrs
Pericyclic Reactions-I
Molecular orbital symmetry, frontier orbitals of ethylene, 1,3 Butadiene, 1,3,5- Hexatriene, allyl system, classfication of pericyclic reactions FMO approach, Woodwrd- Hoffman correlation diagram method and perturbation of molecular (PMO) approach for the explanation of pericyclic reactions under thermal and photochemical conditions. Electrocyclic Reactions: Conrotatory and disotatory motions (4n) and (4n+2), allyl systems
Cycloadditions: Antarafacial and suprafacial additions, notation. of cycloadditions, (4n) and (4n+2) systems with a greater emphasis on (2+2) and (4+4) - cycloadditions, (2+2) - additions of ketenes and chelotropic reactions.

UNIT-IV   15 Hrs
Pericyclic Reactions-II
FMO approach and perturbation of molecular (PMO) approach for the explanation of sigma tropic rearrgements under thermal and photochemical conditions. suprafacial and antarafacial shifts of H Sigmatropic shift involving carbon moieties, retention and inversion of configurations, (3, 3) and (5, 5) sigmatropic rearrangements detailed treatment of Claisen and Cope rearrangements, aza-Cope rearrangement and Barton reaction.

Text Books and Reference Books:

1) Advanced Organic Chemistry: Reactions Mechanisms and Structure by Jerry March, Mc.Graw Hill and Kogakush.
2) Molecular reactions and Photochemistry by Charles Dupey and O. Chapman, Prentice Hall.
3) Pericyclic reactions by S.N. Mukharji, Mcmilan.
4) Mechanisms and Theory in Organic Chemistry by T.H. Lowery and K.S. Rich gardson.
5) The modern structural theory in Organic Chemistry by L.N.Ferguson, Pretice Hall
6) Physical Organic Chemistry by jack Hine, Mc. Graw Hill
7) Advanced Organic Synthesis, Part B-Reactions and Synthesis, Francis A. Carey and Richard J. Sudenburg, Fourth edition, Kluwer academic publishers, New York
8) Organic Synthesis, Christine Willis and Martin Willis, Oxford Chemistry primers.
9) Principles of Organic Synthesis, ROC Norman and JM Coxon, third edition, CBS, Publisher, Delhi.
10) Organic Synthesis, M. B. Smith, Mc Graw Hill, International Edition.
11) Organic Chemistry, Clayden, Greeves and Stuwart Warren.
12) Modern Organic Synthesis-an introduction by George S.Zweifel and Michael H. Nantz, W. H. Freeman & company, New York.
13) Pericyclic Reactions — a problem solving approach, Lehr and Merchand
14) Conservation of Orbital Symmetry by Woodward and Hoffmann.

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Paper – II : ORGANIC SPECTROSCOPY-I

UNIT-I

15 Hrs

UV-Visible spectroscopy:

A)   Beer-Lambert˙s law-Deviations from Beers law-Instrumentation-Mechanics of measurement- Energy transitions– Simple chromophores- Auxochrome, Absorption shifts (Bathochromic, Hypsochromic, Hyper chromic and Hypo chromic shifts) UV absorption of Alkenes-Polyenes unsaturated cyclic systems.

B) UV absorption of carbonyl compounds: α,β-unsaturated carbonyl systems-UV absorption of aromatic systems-solvent effects-geometrical isomerism-acid and base effects-typical examples-calculation of λ max values using Woodward Fieser rules, applications.

UNIT-II

15 Hrs

Infrared spectroscopy:

A)   Mechanics of measurement-Fundamental modes of vibrations-stretching and bending vibrations-Factors effecting Vibrational frequency-hydrogen bonding.

B) Finger print region and its importance, typical group frequencies for –CH,-OH, N-H, CC,-CO and aromatic systems- Application in structural determination–Examples-simple problems.

UNIT-III   15 Hrs

Nuclear Magnetic Resonance Spectroscopy (^{1}HNMR):

A)   Introduction: Basic principle of- NMR Nuclear spin- nuclear resonance-saturation-Relaxation-Instrumentation.

B) Shielding and deshielding of magnetic nuclei-chemical shift and its measurements, factors influencing chemical shift – spin-spin interactions- factors influencing –coupling constant J and factors effecting J value.

C) ^{13}C NMR Spectroscopy: Similarities and Differences between PMR and CMR, general considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, hetero aromatic and carbonyl carbon), coupling constants, typical examples of CMR spectroscopy-simple systems.

UNIT-IV   15 Hrs

Mass spectrometry

•   Introduction: Ion production-E1, C1, ES, MALDI and FAB- determination of Molecular weight and formulae-Behavior of organic compounds in mass spectrometer- factors affecting fragmentation.

•   Mass spectral fragmentation of organic compounds, Common functional groups, molecular ion peak, meta stable peak, Mc Lafferty rearrangement, Nitrogen rule. Examples of mass spectral fragmentation of organic compounds with respect of their structure determination.

Suggested Books:

1. Spectroscopic Methods in Organic Chemistry- Forth Edition, D.H. Williams and I.Fleming Tata McGraw Hill, New Delhi, 1990.
2. Organic Spectroscopy- Second Edition, W.Kemp, ELBS Macmillan, 1987.
3. Applications of absorption spectroscopy of Organic Compounds J.R.Dyer, Prentice Hall of India, New Delhi, 1984.
4. Spectrometric identification of Organic Compounds-Fourth Edition, R.M. Silverstein: G.C.Vassiellr and T.C. Merill, Johne Willey, Singapore, 1981.
5. Introduction to spectroscopy-D.L.Pavia, G.M.Lampman, G.S.Kriz, 3rdEd (Harcourt college publishers).
6. Absorption spectroscopy of organic molecules-V.M.Parkih.
7. Nuclear Magnetic Resonance-Basic principles-Atta-Ur-Rehman, Springer-Verlag, 1986.

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Paper – III : MODERN ORGANIC SYNTHESIS -I

UNIT-I

Formation of C-C single bonds   **15 Hrs**

Alkylations via enolate, Thermodynamic and kinetic enolate, Asymetric Aldol reaction: a) Chiral enolate and achiral aldehyde b) Achiral enolate and chiral aldehyde – explanation by Zimmerman Traxler model; stork enamine reaction and its synthetic applications; Organosulphur chemistry: Umpolung and its synthetic applications (Corey Seebach Reaction), sulphurylides: dimethyl sulphoniummethylide, dimethyloxosulphoniummethylide preparations and their synthetic applications; Organo Palladium Chemistry: Heck Reaction, Stille coupling, Suzuki coupling, Sonogashira coupling, Negeshi coupling, Wacker Oxidation; Organo copper chemistry: Gilman's reagent and synthetic applications; Synthetic applications of carbenes and carbenoids; BaylisHilman reaction.

UNIT-II

Formation of Carbon-Carbon double bonds   **15 Hrs**

Stereochemistry of E1 and E2 reactions (Different examples of acyclic and cyclic molecules, Saytzeff rule, Hofmann rules and Bredt's rule); Pyrolytic Syn eliminations (focus should be given on stereochemistry of syn eliminations of amine oxides, xanthates and esters of acyclic and cyclic molecules); Sulphoxide-Sulphenate rearrangement (Mislow-Evans rearrangement); Wittig reaction, Wittig-Horner reaction and stereo chemistry of Wittig reaction; Shapiro reaction, Claisen rearrangement of allyl vinyl ethers, Julia Lythgoe olefination, Mc Murray coupling, Peterson Olefination, Tebbs reagent and its application, Metathesis: Grubbs 1st and 2nd generation catalysts, Olefin cross coupling (OCM), ring closing (RCM) and ring opening (ROM) metathesis, olefination by Nysted reagent.

UNIT-III

Reactions of Unactivated C-H bonds and organoboranes   **15 Hrs**

The Hoffmann Loeffler- Freytag reaction, Barton reaction and Photolysis of organic hypothalites; Organoboranes: Preparation of Organobornaesviz hydroboration with BH_3-THF, dicylohexyl borane, disiamyl borane, theryl borane, 9- BBN mono isopinocamphlyl borane (IPCBH2) and diisopinocamphenyl borane (IPC2BH) functional group transformations of Organo boranes-Oxidation, protonolysis and isomerization. Formation of carbon-carbon-bonds vizorgano boranes carbonylation and cyanidation.

UNIT-IV

Protecting groups and Synthetic applications of PTC and crown ethers   **15 Hrs**

(A)Protecting Groups 1) Protection of alcohols as ethers [methyl ether (RO-Me), Tertiary butyl ether (ROCMe₃) , Benzyl ethers (RO-Bn), as Silyl ethers [Trimethylsilylether (R-OTMS), tri ethyl silyl ethers (RO-TES), t-butyldimethylsilyl ether (ROTBDMS in the presence of imidazole), t-butyl diphenylsilyl ether (RO-TBDPS)], as acetals [tetrahydopyranyl ethers (RO-THP), 2) Protection of 1,2-diols by acetal, ketal and carbonate formation. 3) Protection of amines by acetylation, benzoylation, benzoyloxy carbonyl, FMOC and triphenyl methyl groups. 4) Protection of carbonyl by acetal, ketal and thioacetal (Umpolung) groups. 5) Protection of carboxylic acids by esters and ortho ester formation.
(B) Phase Transfer Catalysts: Synthetic applications of PTC and crown ethers

Textbooks and Books for Reference Books:
1) Some Modern Methods of Organic Synthesis W. Carruthers, Third & Fourth Edition, Cambridge University Press, Cambridge, 1988.
2) Modern Organic Synthesis-an introduction by George S.Zweifel and Michael H. Nantz, W. H. Freeman & company, New York.
3) Advanced Organic Synthesis, Part B-Reactions and Synthesis, Francis A. Carey and Richard J. Sudenburg, Fourth edition, Kluwer academic publishers, New York
4) Organic Synthesis, Christine Willis and Martin Willis, Oxford Chemistry primers.
5) Principles of Organic Synthesis, ROC Norman and JM Coxon, third edition, CBS, Publisher, Delhi. 6) Organic Synthesis, M. B. Smith, McGraw Hill, International Edition.
7) Organic Chemistry, Clayden, Greeves and Stuwart Warren.
8) Guide Book to Organic Synthesis (3rd edition), R. Mackie, D. M. Smith and Aitken. 9) Organo Boranes and Silanes, Thomson, Oxford Chemistry primers.
10) Strategic applications of named reactions in organic synthesis, Laszlo Kurti and Barbara Czako. 11) Modern Synthetic Reactions, Herbet O. House, Second Edition, W.A. Benzamine Inc. Menio Park, California, 1972.
12) Organic Synthesis viz Boranes, Herbet C. Brown Gray, W. Kramer Alan B. Levy and M. Mark Midland John Wiely &. Sons, New York, 1975.
13) Organic Synthesis: Special Techniques, V. K. Ahluwalia and Renu Agarwal.
14) Organic Synthesis, Jagadamba Singh and Dr. A. Yadav, Pragati Edition.

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Paper – IV : CHEMISTRY OF NATURAL PRODUCTS -I

UNIT–I**:**

Alkaloids   15 Hrs

Introduction, isolation, general methods of structure elucidation and physiological action, classification based on nitrogen heterocyclic ring, structure, stereochemistry, synthesis and biosynthesis of morphine, strychnine, colchicine and reserpine.

UNIT–II**:**

Terpenoids   15 Hrs

Occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, stereochemistry, biosynthesis and synthesis of Farnesol, Zingiberene, Forskolin, Taxol, Azadirachtin and β-amyrin.

UNIT–III**:**

Steroids   15 Hrs

Occurrence, nomenclature, basic skeleton, Diel's hydrocarbon and its stereochemistry. Isolation, structure determination and synthesis of cholesterol (total synthesis not expected), androsterone, testosterone and progesterone.

UNIT–IV**:**

Flavonoids and Isoflavonoids   15 Hrs

Occurrence, nomenclature and general methods of structure determination, Isolation, structure elucidation and synthesis of Kaempferol, Quercetin, Cyanidin, Genestein, Butein and Daidzein. Biosynthesis of flavonoids and Isoflavonoids.

Books Suggested:

1. Natural Products: Chemistry and Biological Significance, J. Mann, R.S.Davidson, J. B. Hobbs, D. V. Banthrope and J. B. Hatrbnome, Longman, Essex.
2. Organic Chemistry, Vol. 2, I. L. Finar, ELBS.
3. Chemistry of Organic Natural Products, O. P. Agrawal, Vols. 1 &2, Goel Pubs.
4. Natural Products Chemistry K. B. G. torssell, John Wiley, 1983
5. New Trends in Natural Products Chemistry, Atta-ur-Rahman and M.I.Choudhary, Harwood Academic Publisher.
6. Chemistry of Natural products P. S. Kalsi, Kalyani Publishers
7. Biosynthesis of steroids, terpenes and acetogenins, J. H. Richards & J. R. Hendrieson
8. The biosynthesis of secondary metabolites, R. D. Herbert, Chapman & Hall
9. The Biosynthesis of Secondary Metabolite, R. D. Herbert, Second edn, Chapman and Hall 1984
10. Chemical aspects of Biosynthesis, John Mann, Oxford University Press, Oxford, 1996.

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Paper – I : ORGANIC REACTION MECHANISMS-II & ORGANIC PHOTO CHEMISTRY

UNIT – I   15 Hrs

A) **Free Radical Reactions**:

Neighboring group assistance in free radical reactions; Reactivity for aliphatic substrates; Reactivity in aromatic substrates; Reactivity at bridge head; Allylic halogenations using NBS (Wohl – Ziegler bromination); Hydroxylation at aromatic carbon by Fentons reagent; Oxidation of aldehydes to carboxylic acids; Formation of cyclic ethers using Leadtetraacetate; Formation of hydroperoxides (autooxidation); Coupling of alkynes (Eglinton reaction and Glacer reaction);Arylation of Aromatic compounds by diazoinum salts(Gomberg – Bachman reaction); Mechanisms of Sandmeyer reaction, Hunsdiecker reaction, Reed reaction.

B) **Rearrangements:** Wagner – Meerwein Rearrangement, Demyanov Rearrangement, Wittig Rearrangement and Stevens Rearrangement

UNIT– II: 15 Hrs

Methodologies in asymmetric synthesis

Strategies in Asymmetric Synthesis: l. Chiral substrate controlled, 2. Chiral reagent controlled and 3. Chiral catalyst controlled.

1**. Chiral Substrate controlled asymmetric synthesis**: Nucleophilic additions to chiral carbonyl compounds. 1, 2-asymmetric induction, Cram's rule and Felkin-Anh model.

2. **Chiral reagent controlled asymmetric synthesis**: Asymmetric reductions using BINAL-H. Asymmetric hydroboration using IPC2 BH and IPCBH2.

3. **Chiral catalyst controlled asymmetric synthesis**: Sharpless and Jacobsen asymmetric epoxidations. Sharpless asymmetric dihydroxylation. Asymmetric hydrogenations using chiral Wilkinson biphosphine and Noyori catalys. Enzyme mediated enantioselective synthesis.

UNIT – III   15 Hrs

Photo Chemistry-I

Photochemical energy, Frank Condon Principle, Types of Electronic Excitation and Molecular orbital view of excitation, Jablonski Diagram, singlet and triplet states, photosensitization, quenching, quantum efficiency and quantum yield.

Photo Chemistry of Carbonyl Compounds: Norrish Type I reaction (alpha cleavage reaction), Norrish Type – II reaction, Paterno- Buchi reaction , Photo reduction & photo enolisation; photochemical Oxidations [Backstrom mechanism],Photo oxidation of alkenes with singlet oxygen.

UNIT – IV

Photochemistry-II

Di – Pi methane Rearrangement, Oxa di – Pi methane rearrangement; Aza di – Pi methane rearrangement; Photochemistry of Benzene and substituted benzene, 1, 2 , 1,3 ,& 1, 4-additions; Photo Fries rearrangement of Phenolic acetates and Anilides; Photochemistry of unsaturated systems, Cis- Trans Isomerisation of alkenes (Direct and sensitized) (Photoisomerisation of Stilbene), Photochemistry of Butadiene; Dimerisations of alkenes, Intramolecular dimerisation.

Photochemical rearrangement of Cyclohexadienenones; Photochemistry of alpha, beta Unsaturated ketones (dimerisations and addition across the double bond); Photochemical rearrangement reactions of Cyclohexenone, Photorearrangements of Beta, gamma unsaturated systems (Mechanism of 1,2 & 1,3 – acyl shifts); Photochemistry of Nitrite esters (Barton reaction).

Text Books and Reference Books:

1) Advanced Organic Chemistry: Reactions Mechanisms and Structure by Jerry March, Mc.Graw Hill and Kogakush.
2) Molecular reactions and Photochemistry by Charles Dupey and O. Chapman, Prentice Hall.
3) Mechanisms and Theory in Organic Chemistry by T.H. Lowery and K.S. Rich gardson.
4) The modern structural theory in Organic Chemistry by L.N.Ferguson, Pretice Hall
5) Physical Organic Chemistry by jack Hine, Mc. Graw Hill
6) Advanced Organic Synthesis, Part B-Reactions and Synthesis, Francis A. Carey and Richard J. Sudenburg, Fourth edition, Kluwer academic publishers, New York
7) Organic Synthesis, Christine Willis and Martin Willis, Oxford Chemistry primers.
8) Principles of Organic Synthesis, ROC Norman and JM Coxon, third edition, CBS, Publisher, Delhi.
9) Organic Synthesis, M. B. Smith, Mc Graw Hill, International Edition.
10) Organic Chemistry, Clayden, Greeves and Stuwart Warren.
11) Modern Organic Synthesis-an introduction by George S.Zweifel and Michael H. Nantz, W. H. Freeman & company, New York.
12) Organic Photochemistry by D Coyle
13) Molecular Photochemistry by Gilbert & Baggo
14) Organic Photochemistry by Turro
15) Photochemistry by C W J Wells

Paper – I : ORGANIC SPECTROSCOPY- II

UNIT-I:

A) **Optical Rotatory Dispersion (ORD) and CD spectroscopy**: Optical Rotation, Circular birefringence, Circular dichroism and Cotton effect. Plane curves and Anomalous curves. Empirical and Semi empirical rules – The axial halo ketone rule, the Octant rule and Helicity rule. Application of the rules to the study of absolute configuration and confirmations of organic molecules.

UNIT-II

A) Improving the PMR spectrum: Chemical and Magnetic Equvalence. Chemical exchange, First and Non-First Order Spectra and analysis of AB, AMX and ABX systems.

B) Simplification of complex spectra-: Nuclear Magnetic double resonance, Lanthanide shift reagents, solvent effects, Fourier transforms technique, Nuclear Overhauser Effect (NOE), Deuterium Exchange, spectra at higherfields. Hindered Rotations and Rate processes. Resonance of other nuclei-^{19}F and^{31} P

C) 2D NMR spectroscopy: Definitions and importance of COSY, DEPT, HOMCOR, HETCOR, INADEQUATE, INDOR INEPT, NOESY.

UNIT-III

Solution of structural problems by joint application of UV, IR, NMR (1H&13C) and mass spectrometry.

UNIT-IV

A) Separation Techniques: Solvent extraction chromatography-paper-thin layer partition-column chromatography, Electrophoresis.
B) Instrumentation – Gas Chromatography, High performance Liquid Chromatography, X – Ray diffraction (XRD)

Suggested Books:

1) Spectroscopic Methods in Organic Chemistry- Forth Edition, D.H. Williams and I. Fleming Tata – McGraw Hill, New Delhi, 1990.
2) Organic Spectroscopy- Second Edition, W.Kemp, ELBS Macmillan, 1987.
3) Spectrometric identification of Organic Compounds-Fourth Edition, R.M. Silverstein: G.C.Vassiellr and T.C. Merill, Johne Willey, Singapore, 1981.
4) Introduction to spectroscopy-D.L.Pavia, G.M.Lampman, G.S.Kriz, 3rdEd (Harcourt college publishers).
5) "Applications of Optical rotation and Circular Dichroism", G.C. Barret, in "Elucidation of Organic structures by Physical and Chemical Methods" Part I (Eds) K.W. Bentley and G.W.Rirty John Wiley, 1972, Chapter VIII (only those aspects mentioned in the syllabus).
6) Instrumental methods of chemical analysis by H.Kaur, Pragati Prakasan,meerut.
7) Separation Techniques by M.N.Sastri, Himalaya publishing House (HPH), Mumbai.

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Paper – III : MODERN ORGANIC SYNTHESIS -II

UNIT-I

Organo Silanes   **15 Hrs**

Synthetic applications of trimethylsilyl chloride dimethyl-t-butylsilyl chloride, trimetthylsilyl cyanide, trimethylsilyl iodide and trimethylsilyl triflate, synthetic applications of α-silyl carbanion and β-silyl carbonium ions. Synthetic applications of silyl enol ethers, Preparation and synthetic applications of alkynyl silanes, aryl silanes, allyl silanes and vinyl silanes, Nazarov cyclization, Synthetic conversion of α, β-epoxy silanes, Peterson Olefination, Brook rearrangement and Rubottom oxidation.

UNIT-II

Oxidation   **15 Hrs**

Synthetic applications of the following reagents in the oxidation of functional groups like alkenes, alkynes, alcohols, aldehydes and ketones: 1) $Pb(OAC)_4$ 2) HIO_4 3) SeO_2 4) Collins reagent, Jones reagent, PCC (Coreys reagent), PDC, Babler oxidation) 4) MnO_2 5) $KMnO_4$ 6) OsO_4 7) Swern oxidation, 8) Oxidations by using IBX, TEMPO 9) Bayer villager oxidation 10) Oxidation of alkenes using Woodward and Prevost rteagents 11) Oxidation by using DDQ 12) Sharpless asymmetric epoxidation and sharpless asymmetric dihydroxylation 13) Thallium nitrate

UNIT-III

Reduction   **15 Hrs**

(1) Catalytic reductions: Homogeneous (Wilkinson's Catalytic reduction) and heterogeneous catalytic reductions and their synthetic applications. (2) Reductions by using electrophilic nucleophilic metal hydrides: $LiAlH_4$ (Various examples of reductions and cram's rule), related reagents of LAH, $NaBH_4$, $NaBH_3CN$, Trialkyl Borohydrides (Super Hydride and Selectride). (3) Reductions by using electrophilic metal hydrides: BH_3, DIBAL

(4) Reductions by dissolving metals: Clemenson reduction, Acyloin condensation, Bouveault-Blanc reduction, Birch reduction (Various examples should be discussed). (5) Reductions by using Diimide and Wolf-Kishner Reduction (6) Reductions by using tri n-butyl tin hydride.

UNIT-IV

Retro Synthetic Analysis   **15 Hrs**

1. Basic definitions of the following: a) Retro synthetic analysis b) Disconnection c) Target molecule d) Synthon e) Synthetic equivalent f) Functional Group Inter Conversion (FGI) g) Functional Group Addition (FGA)

2. Guidelines for the order of events: One Group C-X disconnections (Carbonyl derivatives, ethers, sulphides and alcohols); Two group C-X disconnections (1,1-difunctionalised, 1,2-difunctionalised and 1,3-difunctionalised compounds), One group C-C disconnections (Alcohols and carbonyl compounds, 1,1- C-C, 1,2-C-C and 1,3-C-C).

Linear and convergent synthesis.

Textbooks and Books for Reference:

1) Some Modern Methods of Organic Synthesis W. Carothers, Third Edition, Cambridge University Press, Cambridge, 1988.
2) Modern Organic Synthesis-an introduction by George S.Zweifel and Michael H. Nantz, W. H. Freeman & company, New York.
3) Advanced Organic Synthesis, Part B-Reactions and Synthesis, Francis A. Carey and Richard J. Sudenburg, Fourt edition, Kluwer academic publishers, New York.
4) Organic Synthesis, Christine Willis and Martin Willis, Oxford Chemistry primers.
5) Principles of Organic Synthesis, ROC Norman and JM Coxon, third edition, CBS, Publisher, Delhi.
6) Organic Synthesis, M. B. Smith, McGraw Hill, International Edition.
7) Organic Chemistry, Clayden, Greeves and Stuwart Warren.
8) Guide Book to Organic Synthesis (3rd edition), R. Mackie, D. M. Smith and Aitken.
9) Organo Boranes and Silanes, Thomson, Oxford Chemistry primers.
10) Strategic applications of named reactions in organic synthesis, Laszlo Kurti and Barbara Czako.
11) Organic Synthesis: The disconnection approach, S. Warrant John Wiley & sons, New York, 1984.
12) Modern Synthetic Reactions, Herbet O. Horase, Second Edition, W.A. Benzamine Inc. Menio Park, California, 1972.

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Paper – IV : BIO-ORGANIC CHEMISTRY

UNIT-I   15 Hours

Biopolymers and Enzymes

Peptides: α-Amino acids, their general properties and synthesis, Synthesis of peptides by Merrified solid phase synthesis. Chemistry of oxytocin and dolastain-10
Enzymes-Oxidoreductases, hydrolases, transferases, synthesis of ATP, Baker's Yeast. Enzyme models.

UNIT-II   15 Hours
Antimalarials & Antibiotics
i. Antimalarials: Chemotherapy, synthesis and activity of antimalarial drugs- quinoline group-quinine, acridine group-quinacrine and guanidine group-paludrine.
ii. Antibiotics: General characteristics, structure- activity relationships, synthesis and activity of antibiotics: Pencillin G, Cephalosphorin-C and streptomycin.

UNIT-III   15 Hours

Vitamins
Definition, occurence, structural formulae, physiological functions and synthesis of Vitamins.

Vitamins: Structure determination and synthesis of Retinol (A), Thiamine (B_1), Riboflavin (B_2), Pyridoxine (B_6) and Biotins (H), Nicotininc acid.

UNIT-IV   15 Hours

Nucleic Acids:
Nucleic acids: Basic concepts of the structures of RNA and DNA and their hydrolysis products, nucleotides, nucleosides and heterocyclic bases, Genetic Code, Finger Print test.
Application of recombinant DNA technology in production of pharmaceuticals, diagnosis of diseases, insect control, improved biological detergents, gene therapy-examples.

Reference Books and Material:

1. Chemical Aspects of Biosynthesis, John Man, Oxford University Press, Oxford, 1996.
2. Chemistry of Natural Products: A Unified Approach, N. R. Krishnaswamy, University Press (India) Ltd., Orient Longman Limited, Hyderabad, 1999.
3. Introduction to Organic Chemistry, A Streitweiser, CH Heathcock and E.M./Kosover IV
   Edition, Mc.Millan, 1992. (For Merrifield synthesis of peptides and also for other aspects of Unit IV)
4. Bio-organic Chemistry, H.Dugas and C. Penney, springer, New York, 1981.
5. Details of Primary literature: Nomenclature: Structure: Dolastatin-10: JACS, 1987, 109, 6883 (structure), ibdi, 1989, 111, 5463, JCS, Parkin I, 1996, 859 (synthesis).

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III SEMESTER
Laboratory Course-1

100 M

Multistep Synthesis of Organic Compounds:

The experiments should illustrate the use of organic reagents and may involve purification of the products by chromatographic techniques.

1. Beckmann rearrangement: Benzanilide from Benzophenone
Benzophenone → Blenzophenone oxime → Benzanilide

2. Benzilic acid rearrangement: Benzilic acid from benzoin
Benzoin → Benzil → Benzilic acid

3. P-Bromo Aniline from Aniline :
Aniline → Acetanilide → P-Bromo Acetanilide → P-Bromo Aniline

4. Symmetrical Tribromo Benzene from aniline:
Aniline → Tribromoaniline→Tribromobenzene

5. 2,4,6-trimethylquinoline from p-toluidine
p-toluidne→ 4-(p-tolylamino) pent-3-ene-2-one → 2,4,6-trimethylquinoline

6. Flavone from o-hydroxy acetophenone
o-hydroxy acetophenone → o-benzoyl acetophenone → o-hydroxy- dibenzoylmethane →
Flavone

7. 2-phenylindole from phenylhydrazine
phenylhydrazine →acetophenone phenylhydrazone→ 2-phenylindole

Laboratory Course-2

Estimations and Chromatography

100 M

1. Estimation of (a) Glucose (b) Phenol (c) Aniline (d) Acetone (e) Aspirin (f) Ibuprofen
   (g) Paracetamol
2. Separation by column chromatography: Separation of a mixture of *ortho* and *para* nitroanilines using silicagel as adsorbent and chloroform as the eluent. The column chromatography should be monitored by TLC.

Books Suggested

1. Modern Organic Synthesis in the Laboratory *A Collection of Standard Experimental Procedures,* Jie Jack Li,

   Chris Limberakis, Derek A. Pflum

2. Practical organic chemistry by Mann & Saunders

3. Text book of practical organic chemistry by Vogel

4. Text book of practical organic chemistry including qualitative organic analysis by A.I. Vogel (Longman)

IV SEMESTER
Laboratory Course-1

100 M

Chromatographic Separation and Isolation & identification of Natural Products

1. Thin layer chromatography: Determination of purity of a given sample, monitoring the progress of chemical reactions, identification of unknown organic compounds by comparing the Rf values of known standards.
2. Isolation and identification of Natural Products
(a) Isolation of caffeine from tea leaves
(b) Isolation of euginol from cloves
(c) Isolation of casein and lactose from milk
(d) Isolation of limonene from lemon peel
(e) Isolation of piperines from black pepper
(f) Isolation of lycopene from tomatoes
(g) Isolation of β-carotene from carrots

Laboratory Course-2   **100 M**

Spectral Identification of Organic Compounds (UV, IR, ^{1}H- NMR, ^{13}C- NMR and MASS).

A minimum of 40 representative examples should be studied

Books Suggested:

1. Ikan, R. *Natural Products, A Laboratory Guide*, 2nd ed.; Academic Press: New York, 1991.

2. Adapted from *Introduction to Organic Laboratory Techniques: A Microscale Approach*. Pavia, Lampman, Kriz and Engel. (1999) Saunders College Publishing.

3. Pharmaceutical drug analysis by Ashutoshkar

4. Quantitative analysis of drugs in pharmaceutical formulations by P D Sethi

5. Practical pharmaceutical chemistry part-1 and part-2 by A H Beekett and J B Stenlake

6. Practical organic chemistry by Mann & Saunders.

7. Spectrometric Identification of organic compounds, R.M. Silverstein, F.X. Webster and D.J. Kiemle, 7th Ed., (Wiley).

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Course Structure & Syllabus

for

M.Sc. Analytical Chemistry

(Syllabus for Semesters I & II is common for M.Sc. Analytical Chemistry and

M.Sc Organic Chemistry and M.Sc Physical Chemistry)

2019-2020

ADIKAVI NANNAYA UNIVERSITY

Rajamahendravaram

Course Structure of M.Sc. Analytical Chemistry

S. No.	Semester	Code of the paper	Title of the paper	Theory/ Practical /Viva	Internal marks	External marks	Total marks	Credits
1.	Semester-I		General Chemistry-I	T	25	75	100	4
2.			Inorganic Chemistry-I	T	25	75	100	4
3.			Organic Chemistry-I	T	25	75	100	4
4.			Physical Chemistry-I	T	25	75	100	4
5.			Inorganic Chemistry Practical-I	P	25	75	100	3
6.			Organic Chemistry Practical-I	P	25	75	100	3
7.			Physical Chemistry Practical-I	P	25	75	100	3
8.	Semester-II		General Chemistry-II	T	25	75	100	4
9.			Inorganic Chemistry-II	T	25	75	100	4
10.			Organic Chemistry-II	T	25	75	100	4
11.			Physical Chemistry-II	T	25	75	100	4
12.			Inorganic Chemistry Practical-II	P	25	75	100	3
13.			Organic Chemistry Practical-II	P	25	75	100	3
14.			Physical Chemistry Practical-II	P	25	75	100	3
15.	Semester-III		Separation Methods-I	T	25	75	100	4
16.			Quality Control and Traditional methods of Analysis-I	T	25	75	100	4
17.			Applied Analysis-I	T	25	75	100	4
18.			Instrumental Methods of Analysis-I	T	25	75	100	4
19.			Classical methods of Analysis-I	P	25	75	100	4
20.			Instrumental methods of Analysis-I	P	25	75	100	4
21.	Semester-IV		Separation Methods-II	T	25	75	100	4
22.			Quality Control and Traditional methods of Analysis-II	T	25	75	100	4
23.			Applied Analysis-II	T	25	75	100	4
24.			Instrumental Methods of Analysis-II	T	25	75	100	4
25.			Classical methods of Analysis-II	P	25	75	100	4
26.			Instrumental methods of Analysis-II	P	25	75	100	4
27.			Comprehensive viva-voce	V	----	50	50	2
					Total Credits			100

Note: I & II Semesters syllabus and course structure are common for M. Sc. Organic Chemistry/Analytical Chemistry /Physical Chemistry courses.

Paper- I: GENERAL CHEMISTRY-I

UNIT-1

Basic Quantum Chemistry-I- Wave equation-interpretation of wave function-properties of wave function-normalization and orthogonalisation, Operators- linear and non-linear- commutators of operators. Postulates of quantum mechanics; setting up of operators to observables; Hermitian operator- Eigen values and Eigen functions of Hermitian operator; Expansion theorems. Eigen functions of commuting operators-significance. Simultaneous measurement of properties and the uncertainty principle.

UNIT-II

Basic Quantum Chemistry-II- Wave mechanics of simple systems with constant potential energy, particle in one-dimensional box- factors influencing color transition- dipole integral, Symmetry arguments in deriving the selection rules, the concept of tunneling- particle in three -dimensional box. Calculations using wave functions of the particle in a box- Orthogonality, measurability of energy, position and momentum, average values and probabilities. Rigid rotor, Wave mechanics of systems with variable potential energy-simple harmonic oscillator- solution of wave equation- selection rules.

UNIT-III

Fundamentals of Molecular Spectroscopy-I: Microwave and IR- Spectroscopy- Rotational spectra of diatomic molecules- Rigid rotor-Selection rules- Calculations of bond length- Isotopic effect, Second order stark effect and its applications. Infrared spectra of diatomic molecules- harmonic and anharmonic oscillators- Selection rules- Overtones- Combination bands- Calculation of force constant, anharmonicity constant and zero point energy. Fermi resonance, simultaneous vibrational-rotational spectra of diatomic molecules.

UNIT- IV

Fundamentals of Molecular Spectroscopy-II: Raman and Electronic Spectra- Classical and quantum mechanical explanations- Rotational Raman and Vibrational Raman spectra. Electronic spectra of diatomic molecules- Vibrational Coarse structure- intensities of spectral lines- Franck-Condon principle- applications, Rotational Fine structure- band head and band shading. Charge transfer spectra

References/ Text books

1. Fundamentals of Molecular spectroscopy: by C.N. Banwell
2. Molecular spectroscopy: by B.K.Sharma
3. Molecular spectroscopy: by Aruldas
4. Introductory quantum mechanics: by A.K. Chandra
5. Quantum chemistry: by R.K. Prasad

Paper- II: INORGANIC CHEMISTRY-I

UNIT-1

Structure & Bonding: Applications of VSEPR, Valence Bond and Molecular orbital theories in explaining the structures of simple molecules- role of p and d orbitals in π-bonding. Application of MO theory to Tetrahedral $[CoCl_4]^{2-}$, Square planar ($[PtCl_4]^{2-}$) and Octahedral complexes ($[CoF_6]^{3-}$, $[Co(NH_3)_6]^{3+}$). Classification of ligands based on π-bonding using MO theory. Walsh diagram for H_2O molecule.

UNIT-II

Inorganic cage and ring compounds – preparation, structure and reactions of boranes, carboranes, metallocarboranes. Electron counting in boranes – Wades rules (Polyhedral skeletal electron pair theory).

Heterocyclic inorganic ring systems: Boron–Nitrogen ($H_3B_3N_3H_3$), Phosphorus–Nitrogen ($N_3P_3Cl_6$) and Sulphur-Nitrogen (S_4N_4, $(SN)_x$) cyclic compounds.

Cage Compounds: Phosphorous oxides and Phosphorous sulphides.

Isopoly and heteropoly anions.

UNIT-III

Coordination compounds: Crystal field theory - crystal field splitting patterns in octahedral, tetrahedral, tetragonal, square planar, square pyramidal and trigonal bipyramidal geometries. Calculation of crystal field stabilization energies. Factors affecting crystal field splitting energies – Spectrochemical series – Jahn – Teller effect, nephelauxetic effect – ligand field theory.

Term symbols – Russell – Sanders coupling – derivation of term symbols for various configurations. Spectroscopic ground states.

UNIT- IV

Electronic spectra of transition metal complexes: Types of electronic transitions – d-d transitions - Selection rules, break down of selection rules – Orgel and Tanabe-Sugano diagrams for d^1 –d^9 octahedral and tetrahedral transition metal complexes of 3d series – Calculation of Dq, B and β parameters. Charge transfer spectra.

Magnetic properties of transition and inner transition metal complexes – spin and orbital moments – quenching of orbital momentum by crystal fields in complexes.

Reference books & Text books:

1. Advanced Inorganic Chemistry by F.A. Cotton and G. Wilkinson, IV Edition, John Wiley and Sons, New York, 1980.
2. Inorganic Chemistry by J.E. Huheey, III Edition, Harper International Edition, 1983.
3. Theoretical Inorganic Chemistry, II Edition by M.C. Day and J. Selbin, Affiliated East-West press pvt. Ltd., New Delhi.
4. Inorganic Chemistry by Shriver and Atkins, Oxford University Press (1999).
5. Inorganic Chemistry 5th Edition by Gary L. Miessler et al, Pearson Publications.

Paper –III: ORGANIC CHEMISTRY -I

UNIT – I

Nature of bonding in organic molecules and Aromaticity 15 Hrs

(A) *Electronic Effects and Reactive intermediates:-*Inductive effect, Mesomeric effect (Resonance), Hyperconjugation, Steric effect, Tautomerism, Generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes, nitrenes and arynes

(B) *Criteria of Aromaticity:-* Huckle`s rule and MO Theory, aromaticity in benzenoid non-benzenoid compounds, Aromaticity in Charged and Fused-Ring Systems, Hetero-aromatic Systems, Annulenes: Cyclobutadiene, Benzene,1,3,5,7-Cyclooctatetraene, [10] Annulenes- [12], [14], [16] and [18] annulenes, azulenes, fulvenes, fullerenes, ferrocene, anti-aromaticity and homo-aromaticity.

UNIT – II

Stereo Chemistry & Molecular representation of organic molecules 20 Hrs

(A) Molecular Symmetry and Chirality:-Symmetry elements, Definition and classification of Stereoisomers, Enantiomer, Diastereomer, Homomer, Epimer, Anomer, Configuration and Conformation, Configurational nomenclature: D,L and R, S nomenclature, Molecules with a single chiral center: Molecules with two or more chiral centers.

(B) Geometrical Isomerism and Conformations of Cyclic Systems:- Cis-trans, E, Z- and Syn & anti nomenclature, Methods of determining configuration of Geometrical isomers using physical, spectral and chemical methods, Stability, Cis-trans inter conversion. Conformations of cyclobutane, cyclopentane, cyclohexane, mono and disubstituted cyclohaxanes.

(C) Prochirality and Prostereoisomerism:- Homotopic ligands and faces; enantiotopic ligands and faces; diastereotopic ligands and faces; nomenclature of enantiotopic ligands and faces (Pro-R, Pro-S, Re, Si carbonyl compounds and Alkenes)

(D) Stereoisomerism in molecules without chiral Center -Axial chirality Allenes, Alkylidene cycloalkanes, spiranes, nomenclature. *Atropisomerism:* Biphenyl derivatives, nomenclature. *Planar chirality*: Ansa compounds, paracyclophanes, trans-cyclooctene and Helicity.

UNIT – III

Heterocyclic compounds 15 Hrs

Importance of heterocyclic compounds as drugs. Nomenclature of heterocyclic systems based on ring size, number and nature of hetero atoms. Chemistry of heterocyclic compounds, synthesis and reactivity of the following systems: Quinoline, Isoquinoline, Indole, Pyrazole, Imidazole, Oxazole, Isoxazole, Pyridazine, pyrimidine and Pyrazine.

UNIT - IV

Chemistry of some typical natural products (Alkaloids and Terpenoids) 10 Hrs

A study of the following compounds involving their isolation, structure elucidation, synthesis and biogenesis of

Alkaloids; Atropine, Nicotine, and Quinine.

Terpenoids: α- Terpeneol, α-Pinene and Camphor.

Books Suggested:

1. Advanced Organic Chemistry-Reactions, Mechanism and structure, Jerry March, 6th Ed. (John Wiley & Sons).
2. Organic Chemistry, Paula Yurkanis Bruice, 4th Ed. (Printice Hall)
3. Organic chemistry-Clayden J. (Oxford)
4. Organic Chemsitry, Wade, L.G. Jr. 5th Ed. (Pearson)
5. Advanced Organic Chemistry: Reactions and mechanisms, Miller Bernard & Other, 2nd Ed. (Pearson)
6. Mechanism and Theory in Organic Chemistry, Thomas H. Lowry, Kathleen S. Richardson, Harper & Row, (Publishers, Inc.).
7. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, 6th Ed., (Longman).
8. Reaction Mechanism in Organic Chemistry, P.S. Kalsi, 2nd Ed. (New Age International).
9. Organic Chemistry, R. T. Morrison and R. N. Boyd (Prentice-Hall)
10. Stereochemistry to Organic Compounds, E.L. Eliel (John Wiley).
11. Stereochemistry, P.S. Kalsi, 5th Ed. (New Age International).
12. Organic Chemistry Structure and Reactivity, Ege Seyhan, 3rd Ed. (AITBS)
13. Heterocyclic Chemistry, J.A.Joule, K. Kills and G. F. Smith, Chapman and Hall
14. Heterocyclic Chemistry, T.L.Gilchrist, Longman Scientific Technical
15. Heterocyclic Chemistry, Raj.K. Bansal.
16. An Introduction to the Heterocyclic Compounds, R. M. Acheson, John Wiley.

REFERENCE BOOKS:

1. Chemistry of Natural Products, K.W.Bentley
2. Stereochemistry of carbon compounds by E.Eliel, John Wiley & Sons, Inc.
3. Stereochemistry to Organic Compounds, D. Nasipuri, 2nd Ed. (New Age International).
4. Chemistry of Natural products by R.S. Kalsi Kalyani Publishers. 1983.

Paper – IV: PHYSICAL CHEMISTRY-I

UNIT-I:

Thermodynamics-I: Concepts of partial molar properties – partial molar volume and its significance; Determination of partial molar volume: Graphical method, intercept method and apparent molar volume method. Partial molar free energy, chemical potential, Variation of chemical potential with T and P. Gibbs-Duhem equation-derivation and significance. Phase equilibrium- Derivation of phase rule from the concept of chemical potential. *Ideal solutions* - Thermodynamic properties of ideal solutions mixing quantities; Vapour pressure-Raoult's law; Thermodynamic properties of ideally dilute solutions. Vapour pressure- Henry's law.

Non-ideal systems -Concept of fugacity, fugacity coefficient. Determination of fugacity; Non ideal solutions. Activities and activity coefficients; Standard-state conventions for non ideal solutions; Determination of activity coefficients from vapour pressure measurements. Activity coefficients of non-volatile solutes using Gibbs-Duhem equation. Chemical equilibrium-effect of temperature on equilibrium constant- Van'tHoff equation

UNIT-II:

Micelles and Macro molecules: Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micellar concentration (CMC), factors affecting the CMC of surfactants, counter ion binding to micelles, thermodynamics of micellization- phase separation and mass action models, Solubilization, micro emulsion, reverse micelles.

Polymer- definition, types of polymers, electrically conducting, fire resistant, liquid crystal polymers, kinetics of free radical polymerization. Molecular mass- Number and mass average molecular weight, molecular weight determination-End group analysis, Osmometry, viscometry, ultracentrifugation and light scattering methods.

UNIT-III:

Chemical Kinetics: Theories of reaction rates- Collision theory- Limitations, Transition state theory. Effect of ionic strength - Debye Huckel theory-Primary and secondary salt effects; Effect of dielectric constant, effect of substituent, Hammett equation-limitations, Taft equation; Prediction of rate constants- Consecutive reactions, parallel reactions, opposing reactions (Uni molecular steps only, no derivation). Specific and general acid-base catalysis; Skrabal diagram; Fast reactions- different methods of studying fast reactions- flow methods, relaxation methods- temperature jump and pressure jump methods.

UNIT-IV:

Photochemistry: Electronic transitions in molecules, Franck-Condon principle. Electronically excited molecules- singlet and triplet states, spin-orbit interaction. Quantum yield and its determination; Actinometry - ferrioxalate and uranyl oxalate actinometers-problems. Derivation of fluorescence and phosphorescence quantum yields. Quenching effect- Stern Volmer equation. Photochemical equilibrium and delayed fluorescence - E type and P type. Photochemical primary processes, types of photochemical reactions-photodissocoation, addition and isomerisation reactions with examples.

Books:

1.	Physical Chemistry by Peter Atkins and Julio de Paula, Oxford University Press.

2.	Physical Chemistry by G.W. Castellon, Narosha Publishing House

3.	Physical Chemistry by W.J.Moore, Prentice Hall

4.	Thermodynamics for Chemists, Samuel Glasstone

5.	Chemical Kinetics by K.J.Laidler, McGraw Hill Pub.

6.	Photochemistry, R.P. Kundall and A. Gilbert, Thomson Nelson.

7.	Polymer Chemistry by Billmayer

8.	Introduction to Polymer Science, V.R. Gowriker, N.V.Viswanadhan and J. Sreedhar., Wiley Easter.

9.	Micells, Theoretical and applied aspects, V.Morol, Plenum publishers.

LABORATORY WORK (6 hrs/week)

Practical-1

INORGANIC CHEMISTRY PRACTICALS - I

I. *Inorganic Synthesis: Preparation of*

   (i)   Tetraamminecopper(II) sulphate

   (ii)   Potassium tris(oxalato)ferrate(III) trihydrate

   (iii)   Tris(thiourea)copper(I) sulphate

II. *Semi micro qualitative analysis of six radical mixtures*

   (One interfering anion and one less familiar cation for each mixture)

   Anions: CO_3^{2-} , S^{2-} , SO_3^{2-} , Cl^- , Br^- , I^- , NO_3^- , SO_4^{2-}, CH_3COO^-

                  $C_2O_4^{2-}$, $C_4H_4O_6^{2-}$, PO_4^{3-} , CrO_4^{2-}, AsO_4^{3-}, F^- , BO_3^{3-}

   Cations :   Ammonium (NH_4^+)

                  1st group: Hg, Ag, Pb, Tl, W

                  2nd group: Hg, Pb, Bi, Cu, Cd, As, Sb, Sn, Mo

                  3rd group: Fe, Al, Cr, Ce, Th, Ti, Zr, V, U, Be

                  4th group: Zn, Mn, Co, Ni

                  5th group: Ca, Ba, Sr

                  6th group: Mg, K, Li

Recference books:

Vogel's textbook of semimicro qualitative analysis, 5th Edition by G. Svehla.

Practical-2

ORGANIC CHEMISTRY PRACTICALS -I

Preparation, recrystallization, and determination of melting point & yield of the following compounds:

(i)	Aspirin,	(ii)	Nerolin,	(iii)	Chalcone,
(iv)	*p*-Nitro acetanilide,	(v)	2,4,6- Tribromoaniline,	(vi)	*m*-Dinitrobenzene,
(vii)	Phthalimide,	(viii)	Diels-Alder adduct.		

Books Suggested

1.   Vogel's Text Book of Quantitative Chemical Analysis, J. Mendham, R. C. Denney, J. D. Barnes and M. J. Thomas, 4th & 6th Ed. (Pearson Education Asia).

2.   Vogel's Text Book of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, P.W.G. Smith, A.R. Tatchell, 5 Ed. (Longman Scientific & Technical)

Practical-3

PHYSICAL CHEMSITRY PRACTICALS -I

1. Determination of critical solution temperature of phenol-water system.
2. Effect of added electrolyte on the CST of phenol-water system.
3. Conductometric titration of Strong acid versus Strong base
4. Dissociation constant of weak acid (CH_3COOH) by conductometric method.
5. Conductometric titration of Weak acid vs Strong base.
6. Determination of cell constant
7. Adsorption of acetic acid on animal charcoal or silica gel.
8. Acid-catalyzed hydrolysis of methyl acetate
9. Determination of partial molar volume of solute –H_2O system by apparent molar volume method.

Paper- I: GENERAL CHEMISTRY-II

UNIT-1

Basic Quantum Chemistry-III- Hydrogen atom- solution of $R(r)$, $\Phi(\phi)$ and $\Theta(\theta)$ equations. Probability density in orbitals- shapes of orbitals- Perturbation theory- Time independent perturbation theory(only first order perturbation is to be dealt with)- application to ground state energy of Helium atom- Variation principle- applications- calculation of zero-point energy of harmonic oscillator- many electron atom- Hartee-Fock self-consistent field method(qualitative treatment only)

UNIT-II

Molecular symmetry and Group Theory in chemistry: Basic concepts of symmetry and Group theory-Symmetry elements, symmetry operations and point groups- Schoenflies symbols- Classification of molecules into point groups- Axioms of Group theory- Group multiplication tables for C_{2v} and C_{3v} point groups- Similarity transformations- and classes- Representations- reducible and irreducible representations, Mullikan symbols, Orthogonality theorem and its implications, Character table and its anatomy.

UNIT-III

Treatment of analytical data: Accuracy and precision- Classification of errors- Determinate and Indeterminate errors- Minimization of errors- Absolute and Relative errors, propagation of errors-Distribution of Indeterminate errors- Gaussian distribution- Measures of central tendency-Measures of precision- Standard deviation- Standard error of mean- student's t-test- Confidence interval of mean- Testing for significance- Comparison of two means- F-test- Criteria of rejection of an observation- Significant figures and computation rules.

UNIT- IV

Introduction to computer programming- FORTRAN 77: Basic structures and functioning of computer with P.C. as an illustrative example- Main memory- Secondary storage memory- input/output devices- computer languages- operating systems- principles of algorithms-and flow charts-constants and variables- Arithmetic expressions- Arithmetic statements-Replacement statement- IF statement- logical IF and BLOCK IF statements- GOTO statements-subscripted variable and DIMENSION statement. DO statement- Rules for DO statement- Functions and subroutines- Development of FORTRAN statements for simple formulae in chemistry such as Vander Waals equation- pH of a solution- First order rate equation- Cell constant-Electrode potential.

Flowcharts and computer programs for

a) Program for the calculation of Cell Constant, Specific Conductance and Equivalence.

b) Rate Constant of First order reaction or Beer's law by linear least square method.

c) Hydrogen ion concentration of a strong acid solution/Quadratic equation.

d) Solution for Vander Waals equation or Hydrogen ion concentration of a monoprotic weak acid

e) Standard deviation and Variance of univariant data

References/ Text books:

1. Introductory Quantum chemistry: by A.K. Chandra

2. Group theory for Chemistry: by A.K. Bhattacharya, 3. Chemical Applications of Group Theory by FA Cotton, 3rd Edition, Wiley Interscience Newyork

3. Introductory Group theory for chemists : by George Davidson

4. Vogel's text book of quantitative analysis: by Vogel

5. Fundamentals of Analytical chemistry: by Skog and West

6. Principles of computer programming(FORTRAN 77 IBM PC): by V.Rajaraman

7. Basics of computers for chemists: by P.C. Jurs

Paper- II: INORGANIC CHEMISTRY-II

UNIT-I

Metal cluster compounds - definition – evidences for existence of M-M bonds - conditions favorable for formation of M-M bonds – preparation, structure and bonding of the following metal cluster compounds.

$Re_2Cl_8^{2-}$, $Mo_2Cl_8^{4-}$, $Re_2(RCOO)_4X_2$, $Mo_2(RCOO)_4(H_2O)_2$, $Cr_2(RCOO)_4(H_2O)_2$, $Cu_2(RCOO)_4$ $(H_2O)_2$, $Cr_2Cl_9^{3-}$, $Mo_2Cl_9^{3-}$, $W_2Cl_9^{3-}$, Re_3Cl_9, $Re_3Cl_{12}^{3-}$, $Mo_6Cl_8^{4+}$, $Nb_6X_{12}^{2+}$ and $Ta_6X_{12}^{2+}$.

Polyatomic clusters – Zintle ions, Chevrel phases.

UNIT-II

Organometallic compounds - 16 and 18 electron rules. Isoelectronic relationship - Synthesis, structure, bonding and reactions of carbon monoxide, dinitrogen and nitric oxide complexes. Isolobal relationship – H, Cl, CH_3, $Mn(CO)_5$; S, CH_2, $Fe(CO)_4$; P, CH, $Co(CO)_3$. Synthesis, structure, bonding and reactions of metallocenes with special reference to ferrocene. Catalysis by Organometallic compounds – Homogeneous Catalysis – Alkene hydrogenation – Wilkinson's catalyst, Hydroformylation.

UNIT-III

Metal Ligand equilibria in solution: Stepwise and overall formation constants and their interaction– trends in stepwise constants – factors affecting the stability of metal complexes–Pearson's theory of hard and soft acids and bases (HSAB), chelate effect and its thermodynamic origin, determination of stability constants of complexes–spectrophotometric method and pH–metric method. Reactivity of metal complexes–inert and labile complexes. Explanation of lability on the basis of VBT & CFT.

Bio-Inorganic Chemistry: Metalloporphyrins with special reference to Haemoglobin& Myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+}. Biological and abiological Nitrogen Fixation.

UNIT- IV

Inorganic Reaction Mechanisms: Substitution reactions of metal complexes – D, Id, Ia and A mechanisms – Ligand replacement reactions of octahedral complexes – Acid hydrolysis – factors affecting acid hydrolysis – Anation and Base hydrolysis of Cobalt(III) complexes. Ligand displacement reactions of square planar complexes of platinum (II). Factors affecting square planar substitution – trans effect (theories).

Electron transfer reactions of complexes – concept of complementary and non-complementary reactions with examples. Inner and outer sphere mechanisms.

Text books:

1. Advanced Inorganic Chemistry by F.A. Cotton and R.G. Wilkinson, IV Edition, John, John Wiley and Sons, New York, 1980.
2. Inorganic Chemistry by J.E. Huheey, III edition, Harper International Edition, 1983.
3. Organometallic Chemistry-A unified approach by A. Singh and R.C. Mehrotra, Wiley Eastern Ltd.
4. Inorganic Chemistry by Shriver and Atkins, Oxford University Press (1999)
5. Theoretical Inorganic Chemistry, II Edition by M.C. Day and J. Selbin, Affiliated East-West press Pvt. Ltd..
6. Mechanisms of Inorganic reactions in solution by D.Benson, MCgraw Hill, London, 1968.
7. Inorganic chemistry by K.F. Purcell and J.C.Kotz, W.B. Saunders company, New York, 1977.
8. Elements of Bioinorganic Chemistry by G.N. Mukherjee and Arabinda Das, U.N. Dhur& sons Pvt. Ltd, Calcutta.

Paper-III: ORGANIC CHEMISTRY-II

UNIT-I

Reaction Mechanism 15Hrs

(*A*) *Aliphatic Nucleophilic Substitution and Nucleophilic Aromatic substitution:* Stereochemistry of S_N2 and S_N1 mechanisms, Neighboring Group Participation (Anchimeric assistance), NGP by O, S, N: Aromatic Nucleophilic substitution: SN2 (Ar) (Addition – Elimination), SN1(Ar) and benzyne mechanisms (Elimination - Addition); evidence for the structure of benzyne. Von Richter Sommelet-Hauser rearrangements.

(B) Elimination Reactions: Type of elimination reactions, mechanisms, Stereochemistry and Orientation, Hofmann and Saytzeff rules, Syn elimination versus anti-elimination, competition between elimination and substitution, dehydration, dehydrogenation, dehalogenation, decarboxylative eliminations and pyrolytic eliminations

UNIT-II

Addition Reactions 15 Hrs

(A) Addition to Carbon – Carbon Multiple Bonds: Mechanistic and stereo chemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, region and chemo selectivity, orientation and reactivity, Hydrogenation of double and triple bonds, hydrogenation of aromatic rings, Hydroboration.

(B) Addition to Carbon-Hetero Multiple Bonds: Steric course of addition reactions to C=O and C=N, Aldol, Cannizzaro, Perkin, Knoevenagel, Claisen- Schmidt, Claisen, Dieckman, Benzoin and Stobbe condensations, Reformatsky reaction, Tollen's reaction, Prins reaction: Wittig, Grignard, Mannich, and Michael reaction.

UNIT-III

Molecular Rearrangements 15 Hrs

Types of molecular rearrangements, migratory aptitude*;* Rearrangements to electron deficient carbon: Pinacol-pinacolone, Wagner-Meerwein, Tiffeneau – Demjanov, Dienone – Phenol, Arndt-Eistert synthesis*;*

Rearrangements to electron deficient nitrogen: Beckmann, Hofmann, Curtius, Schmidt and Lossen rearrangements; *Rearrangements to electron deficient oxygen:* Baeyer-villiger, Hydro peroxide rearrangement and Dakin rearrangements; Neber rearrangement, Benzil-Benzilic acid and Favorskii rearrangements

UNIT-IV

Spectroscopy and Protecting Groups 15 Hrs

A. i) U.V. Visible absorption laws, Electronic excitations and absorption shifts

ii) I.R. : Fundamental modes of vibrations in IR Spectroscopy, Finger Print Region and its importance.

iii) NMR: Chemical shift and its importance, Coupling constant and its importance, Factors affecting chemical shift and coupling constant, Dueteration-deuterium exchange and Deuterium Labeling.

iv) Mass: Some usefulterms used in Mass spectrometry: Molecular ion, Fragmentation, Cleavage, Rearrangement, Loss of small molecules, Isotope Abundance, Metastable ions, Even-electron rule, Nitrogen rule, Mc Lafferty Rearrangement.

B. Protection of carbonyl, Hydroxyl, carboxylic and Amine groups

Books Suggested:

1. Advanced Organic Chemistry-Reactions, Mechanism and structure, Jerry March, 6th Ed. (John Wiley & Sons).
2. Modern Organic Reactions, H. O. House (Benjamin)
3. Structure and Mechanism in Organic Chemistry C. K. Inglod (Comell University Press).

4.   Organic Chemistry, Paula Yurkanis Bruice, 4th Ed. (Printice Hall)

5.   Organic chemistry-Clayden J. (Oxford)

6.   Organic Chemsitry, Wade, L.G. Jr. 5th Ed. (Pearson)

7.   Organic Chemistry, Salmons, P.W. & Others, 8th Ed. (John Wiley & Sons)

8.   Advanced Organic Chemistry: Reactions and mechanisms, Miller Bernard & Other, 2nd Ed. (Pearson)

9.   Mechanism and Theory in Organic Chemistry, Thomas H. Lowry, Kathleen S. Richardson, Harper & Row,

10.   (Publishers, Inc.).

11.   A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, 6th Ed., (Longman).

12.   Reaction Mechanism in Organic Chemistry, P.S. Kalsi, 2nd Ed. (New Age International).

13.   Stereochemistry to Organic Compounds, E.L. Eliel (John Wiley). 13. Stereochemistry to Organic Compounds, Nasipuri, 2nd Ed. (New Age International).

14.   Stereochemistry, P.S. Kalsi, 5th Ed. (New Age International). Organic Chemistry Structure and Reactivity, Ege Seyhan, 3rd Ed. (AITBS)

15.   Spectroscopic Methods in Organic Chemistry- Forth Edition, D.H. Williams and I. Fleming Tata   - McGraw Hill, New Delhi, 1990.

16.   Organic Spectroscopy- Second Edition, W.Kemp, ELBS Macmillan, 1987.

17.   Applications of absorption spectroscopy of Organic Compounds J.R.Dyer, Prentice Hall of India, New Delhi, 1984.

18.   Spectrometric identification of Organic Compounds-Fourth Edition, R.M. Silverstein: G.C.Vassiellr and T.C. Merill, Johne Willey, Singapore, 1981.

19.   Introduction to spectroscopy-D.L.Pavia, G.M.Lampman, G.S.Kriz, 3rdEd (Harcourt college publishers).

Paper – IV: PHYSICAL CHEMISTRY-II

UNIT-I:

Physical methods of molecular structural elucidation: NMR: Principle and theory, Nature of spinning particle and its interaction with magnetic field. Chemical shift and its origin. Spin-Spin interaction, Application of NMR to structural elucidation- Structure of ethanol, dimethylformamide, styrene and acetophenone.

Electron Spin Resonance: Principle and experimental technique- g-factor, line shapes and line widths- hyperfine interactions- applications of ESR studies.

UNIT -II:

Thermodynamics-II- Brief review on entropy; entropy changes accompanying specific process – expansion, phase transition, heating, measurement of entropy. Nernst heat theorem; Third law of thermodynamics- Determination of the absolute entropy- Apparent exceptions to Third law of thermodynamics.

Statistical Thermodynamics: Objectives of statistical thermodynamics, Concept of distributions, Types of ensembles. Thermodynamic probability, Most probable distribution Law – Partition Function, (Definition and significance): Molar and molecular partitions-translational, rotational, vibrational and electronic partition functions- Relation between thermodynamic functions (E, H, S, G and C_v) and the partition functions

UNIT-III:

Electrochemistry I: Electrochemical cell- Galvanic and electrolytic cell. Concentration cell with and without transference, Effect of complexation on redox potential- ferricyanide/ ferrocyanide couple, Iron (III) phenonthroline / Iron (II) phenonthroline couple. Determination of standard potential, solubility product equilibrium constant and activity coefficients from EMF data.

Bjerrum theory of ion association (elementary treatment) Concept of activity and activity coefficients in electrolytic solutions. The mean ionic activity coefficient. Debye-Huckel theory of electrolytic solutions. Debye-Huckel limiting law (derivation not required), Calculation of mean ionic activity coefficient; Limitations of Debye-Huckel theory. Effect of dilution on equivalent conductance of electrolytes - Anomalous behavior of strong electrolytes. Debye Huckel-Onsagar equation – verification and limitations, Fuel Cells.

UNIT-IV:

Electrochemistry II: The electrode-electrolyte interface. The electric double layer. The Helmholtz-Perrin parallel-plate model, the Gouy-Chapman diffuse-charge model and the Stern model.

Electrodics: Charge transfer reactions at the electrode-electrolyte interface. Exchange current density and over-potential. Derivation of Butler-Volmer equation. High field approximation, Tafel equation, Low field equilibrium, Nernst equation. Voltametry-Concentration polarization, experimental techniques

Books:

1. Text book of Physical Chemistry by Samuel Glasstone, McMillan Pub.
2. Physical Chemistry by W.J.Moore, Prentice Hall
3. Physical Chemistry by G.W. Castellon, Narosha Publishing House
4. Physical Chemistry by Peter Atkins and Julio de Paula, Oxford University Press.
5. Modern Electrochemistry, 2A & 2B, JOM Bockris & A.K.N.Reddy, Plenum publishers
6. Introduction to Electrochemistry, S.Glasstone.
7. Fundamentals of Molecular Spectroscopy, Banwell
8. Spectroscopy by Straw & Walker.

9.   Statistical thermodynamics , M.C.Gupta

10. Statistical Thermodynamics, M.Dole

LABORATORY WORK (6 hrs/ week)

Practical-1

INORGANIC CHEMISTRY PRACTICALS –II

Quantitative analysis:

Volumetric:

1. Determination of Ferric iron by photochemical reduction
2. Determination of Nickel by EDTA
3. Determination of Calcium and Magnesium in a mixture by EDTA
4. Determination of Ferrocyanide by Ceric sulphate
5. Determination of Copper(II) in presence of iron(III)

Gravimetric:

6. Determination of Zinc as Zinc pyrophosphate
7. Determination of Nickel from a mixture of Copper and Nickel.

Reference books:

Vogel's textbook of quantitative chemical analysis, 5th edition by G.H. Jeffery et al.

Practical-2

ORGANIC CHEMISTRY PRACTICALS –II

Systematic qualitative analysis of an organic mixture containing two compounds

Identification of method of separation and the functional group(s) present in each of them and preparation of one solid derivative for the conformation of each of the functional group(s).

Practical-3

PHYSICAL CHEMISTRY PRACTICALS –II

1. Distribution of iodine between $CHCl_3$ and water
2. Distribution of I_2 between $CHCl_3$ and aq.KI solution- calculation of equilibrium constant.
3. Determination of Coordination number of cuprammonium cation.
4. Titration of mixture Strong acid and weak acid versus Strong base by conductometry.
5. Titration of Strong acid Vs Strong Base – pH – metry.
6. Titration of mixture of ($NaHCO_3$ + Na_2CO_3) Vs HCl – pH- metry.
7. Titration of Strong acid Vs Strong Base using Quinhydrone electrode.
8. Titration of Fe^{+2} Vs $K_2Cr_2O_7$ – potentiometry
9. Verification of Beer-Lambert's law by Iron-thiocyanate system –colorimetry.
10. Determination of single electrode potential of Cu^{2+}/Cu and estimate the given unknown concentration.