



Annamalai University

(Accredited with 'A' Grade by NAAC)

Faculty of Science



Department of Computer and Information Science

**MASTER OF COMPUTER APPLICATIONS
(2-Year)**

Programme Code: SCIS23



Regulations, Curricula and Syllabi

(2020-21)



Annamalai University

Faculty of Science

DEPARTMENT OF COMPUTER AND INFORMATION SCIENCE

MASTER OF COMPUTER APPLICATIONS

Programme Code: SCIS23

These rules and regulations shall govern the Two year post graduate studies leading to the award of degree of **Master of Computer Applications** in the Faculty of Science. These academic Regulations shall be called "**Annamalai University, Faculty of Science, Two year Master of Computer Applications Regulations 2020**". They shall come into force with effect from the academic year 2020 – 2021.

1. Definitions and Nomenclature

- 1.1 University** refers to Annamalai University.
- 1.2 Department** means any of the academic departments and academic centers at the University.
- 1.3 Discipline** refers to the specialization or branch of knowledge taught and researched in higher education. For example, Computer Science is a discipline in the Mathematical Sciences, while Economics is a discipline in Social Sciences.
- 1.4 Programme** encompasses the combination of courses and/or requirements leading to a Degree. For example, MCA, M.Sc., M.A.
- 1.5 Course** is an individual subject in a programme. Each course may consist of Lectures/ Laboratory /Seminar/Project work/viva-voce etc. Each course has a course title and is identified by a course code.
- 1.6 Curriculum** encompasses the totality of student experiences that occur during the educational process.
- 1.7 Syllabus** is an academic document that contains the complete information about an academic programme and defines responsibilities and outcomes. This includes course information, course objectives, policies, evaluation, grading, learning resources and course calendar.
- 1.8 Academic Year** refers to the annual period of sessions of the University that comprises two consecutive semesters.
- 1.9 Semester** is a half-year term that lasts for a minimum duration of 90 days.
- 1.10 Choice Based Credit System:** A mode of learning in higher education that enables a student to have the freedom to select his/her own choice of elective courses across various disciplines for completing the Degree programme.
- 1.11 Core Course** is mandatory and an essential requirement to qualify for the Degree.
- 1.12 Elective Course** is a course that a student can choose from a range of alternatives.
- 1.13 Value-added Courses** are optional courses that complement the students' knowledge and skills and enhance their employability.
- 1.14 Credit** refers to the quantum of course work in terms of number of class hours in a semester required for a programme. The credit value reflects the content and duration of a particular course in the curriculum.
- 1.15 Credit Hour** refers to the number of class hours per week required for a course in a semester. It is used to calculate the credit value of a particular course.

- 1.16 Programme Outcomes** (POs) are statements that describe crucial and essential knowledge, skills and attitudes that students are expected to achieve and can reliably manifest at the end of a programme.
- 1.17 Programme Specific Outcomes** (PSOs) are statements that list what the graduate of a specific programme should be able to do at the end of the programme.
- 1.18 Learning Objectives** are statements that define the expected goal of a course in **Course Objectives** in terms of demonstrable skills or knowledge that will be acquired by a student.
- 1.19 Course Outcomes** (COs) are statements that describe what students should be able to achieve/demonstrate at the end of a course. They allow follow-up and measurement of learning objectives.
- 1.20 Grade Point Average** (GPA) is the average of the grades acquired in various courses that a student has taken in a semester. The formula for computing GPA is given in section 11.3
- 1.21 Cumulative Grade Point Average** (CGPA) is a measure of overall cumulative performance of a student over all the semesters. Calculation of CGPA is given in section 11.4.

Letter Grade is an index of the performance of a student in a particular course. Grades are denoted by the letters S, A, B, C, D, E, RA, and W.

2. Programme Offered and Eligibility Criteria:

The Department of Computer and Information Science offers a Two Year Master of Computer Applications programme. The eligibility criteria and admission procedure are followed as per the guidelines of TamilNadu Common Entrance Test (TANCET).

Eligibility Criteria prescribed by TANCET:

Candidates must be graduate with Mathematics as a subject in graduation or at 10+2 level. Candidate must have secured at least 50 per cent marks (open category) and 45 percent marks (reserved category) in the Bachelor's degree exam.

- 3. Reservation Policy:** Admission to the various programmes will be strictly based on the reservation policy of the Government of Tamil Nadu.

4. Programme Duration

- 4.1** The Two Year Master's Programme consists of two academic years.
- 4.2** Each academic year is divided into two semesters, the first being from July to November and the second from December to April.
- 4.3** Each semester will have 90 working days (18 weeks).

5. Programme Structure

- 5.1** The Two Year Master's Programme consists of Core Courses, Elective Courses (Departmental & Interdepartmental), and Project.

5.2 Core courses

- 5.2.1** These are a set of compulsory courses essential for each programme.
- 5.2.2** The core courses include both Theory (Core Theory) and Practical (Core Practical) courses.

5.3 Elective courses

- 5.3.1** Departmental Electives (DEs) are the Electives that students can choose from a range of Electives offered within the Department.
- 5.3.2** Interdepartmental Electives (IDEs) are Electives that students can choose from amongst

the courses offered by other departments of the same faculty as well as by the departments of other faculties.

5.4 Experiential Learning

- 5.4.1 Experiential learning provides opportunities to students to connect principles of the discipline with real-life situations.
- 5.4.2 In-plant training/field trips/internships/industrial visits fall under this category.

5.5 Project

- 5.5.1 Each student shall undertake a Project and submit a dissertation as per guidelines in the final semester.
- 5.5.2 The Head of the Department shall assign a Research Supervisor to the student.
- 5.5.3 The Research Supervisor shall assign a topic for research and monitor the progress of the student periodically.
- 5.5.4 Students who wish to undertake project work in recognized institutions/industry shall obtain prior permission from the University. The Research Supervisor will be from the host institute.

5.6 Value added Courses (VACs)

- 5.6.1 Students may also opt to take Value added Courses beyond the minimum credits required for award of the Degree. VACs are outside the normal credit paradigm.
- 5.6.2 These courses impart employable and life skills. VACs are listed in the University website and in the Handbook on Interdepartmental Electives and VACs.
- 5.6.3 Each VAC carries 2 credits with 30 hours of instruction. Classes for a VAC are conducted beyond the regular class hours and preferably in the III Semester.

5.7 Online Courses

- 5.7.1 The Heads of Departments shall facilitate enrolment of students in Massive Open Online Courses (MOOCs) platform such as SWAYAM to provide academic flexibility and enhance the academic career of students.
- 5.7.2 Students who successfully complete a course in the MOOCs platform shall be exempted from one elective course of the programme.

5.8 Credit Distribution: The credit distribution is organized as follows:

	Credits
Core Courses	58
Elective Courses	12
Project	22
Constitution of India*	02
Total	92

5.9 Credit Assignment

Each course is assigned credits and credit hours on the following basis:

- 1 Credit is defined as,
 - 1 Lecture period of one hour duration per week over a semester
 - 1 Tutorial period of one hour duration per week over a semester
 - 1 Practical/Project period of two hours duration per week over a semester.

6 Attendance

- 6.1 Each faculty handling a course shall be responsible for the maintenance of Attendance and Assessment Record for candidates who have registered for the course.

- 6.2 The Record shall contain details of the students' attendance, marks obtained in the Continuous Internal Assessment (CIA) Tests, Assignments and Seminars. In addition the Record shall also contain the organization of lesson plan of the Course teacher.
- 6.3 The record shall be submitted to the Head of the Department and Dean once a month for monitoring the attendance and syllabus coverage.
- 6.4 At the end of the semester, the record shall be placed in safe custody for any future verification.
- 6.5 The Course teacher shall intimate to the Head of the Department at least seven calendar days before the last instruction day in the semester about the attendance particulars of all students.
- 6.6 Each student shall have a minimum of 75% attendance in all the courses of the particular semester failing which he or she will not be permitted to write the End-Semester Examination. The student has to redo the semester in the next year.
- 6.7 Relaxation of attendance requirement up to 10% may be granted for valid reasons such as illness, representing the University in extracurricular activities and participation in NCC/NSS/YRC/RRC.

7 Mentor-Mentee System

- 7.1 To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach certain number of students to a member of the faculty who shall function as a Mentor throughout their period of study.
- 7.2 The Mentors will guide their mentees with the curriculum, monitor their progress, and provide intellectual and emotional support.
- 7.3 The Mentors shall also help their mentees to choose appropriate electives and value-added courses, apply for scholarships, undertake projects, prepare for competitive examinations such as NET/SET, GATE etc., attend campus interviews and participate in extracurricular activities.

8 Examinations

- 8.1 The examination system of the University is designed to systematically test the student's progress in class, laboratory and field work through Continuous Internal Assessment (CIA) Tests and End-Semester Examination (ESE).
 - 8.2 There will be two CIA Tests and one ESE in each semester.
 - 8.3 The Question Papers will be framed to test different levels of learning based on Bloom's taxonomy viz. Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation/Creativity.
- ### **8.4 Continuous Internal Assessment Tests**
- 8.4.1 The CIA Tests shall be a combination of a variety of tools such as class tests, assignments and seminars. This requires an element of openness.
 - 8.4.2 The students are to be informed in advance about the assessment procedures.
 - 8.4.3 The setting of question paper will be decided by the respective faculty.
 - 8.4.4 CIA Tests will be for one or two hours duration depending on the quantum of syllabus.
 - 8.4.5 A student cannot repeat the CIA Test-I and CIA Test-II. However, if for any valid reason, the student is unable to attend the test, the prerogative of arranging a special test lies with the teacher in consultation with the Head of the Department.
 - 8.4.6 For the CIA Tests, the assessment will be done by the Course teacher

8.5 End Semester Examinations (ESE)

- 8.5.1 The ESE for the first and third semester will be conducted in November and for the second and fourth semester in May.
- 8.6 Candidates who failed in any course will be permitted to reappear in failed course in the subsequent examinations.
- 8.7 The ESE will be of three hours duration and will cover the entire syllabus of the course.

9 Evaluation

9.1 Marks Distribution

- 9.1.1 For each course, the Theory and Practical shall be evaluated for a maximum of 100 marks.
- 9.1.2 For the theory courses, CIA Tests will carry 25% and the ESE 75% of the marks.
- 9.1.3 For the Practical courses, the CIA Tests will carry 40% and the ESE 60% of the marks.

9.2 Assessment of CIA Tests

9.2.1 For the CIA Tests, the assessment will be done by the course instructor

9.2.2 For the Theory Courses, the break-up of marks shall be as follows

CIA for Theory	Marks
Test-I & Test-II	15
Seminar	05
Assignment	05
Total	25

9.2.3 For the Practical Courses (wherever applicable), the break-up of marks shall be as follows:

CIA for Practical	Marks
Test-I	15
Test-II	15
Viva-voce and Record	10
Total	40

9.3 Assessment of End-Semester Examinations

- 9.3.1 Evaluation for the ESE is done by internal examiner.

9.4 Assessment of Project/Dissertation

- 9.4.1 The Project Report/Dissertation shall be submitted as per the guidelines.
- 9.4.2 The Project Work/Dissertation shall carry a maximum of 200 marks.
- 9.4.3 CIA for Project work/dissertation will carry 25% and ESE 75%.
- 9.4.4 The Project Report evaluation and viva-voce will be conducted by a committee constituted by the Head of the Department.
- 9.4.5 The Project Evaluation Committee will comprise the Head of the Department, Project Supervisor, and a senior faculty.

9.4.6 **The marks shall be distributed as follows:**

Continuous Internal Assessment (50 Marks)		End Semester Examination (150 Marks)	
Review-I – 20	Review-II -30	Project / Dissertation Evaluation	Viva-voce
		100	50

9.5 **Assessment of Value-added Courses**

- 9.5.1 Assessment of VACs shall be internal. Two CIA Tests shall be conducted during the semester by the Department(s) offering VAC.
 9.5.2 The grades obtained in VACs will not be included for calculating the GPA/CGPA.

9.6 **Passing Minimum**

- 9.6.1 A student is declared to have passed in each course if he/she secures not less than 50% marks in the ESE and not less than 50% marks in aggregate taking CIA and ESE marks together.
 9.6.2 A candidate who has not secured a minimum of 50% of marks in a course (CIA + ESE) shall reappear for the course in the next semester/year.

10. **Conferment of the Master's Degree**

A candidate who has secured a minimum of 50% marks in all courses prescribed in the programme and earned the minimum required credits shall be considered to have passed the Master's Programme.

11. **Marks and Grading**

- 11.1 The performance of students in each course is evaluated in terms Grade Point (GP).
 11.2 The sum total performance in each semester is rated by Grade Point Average (GPA) while Cumulative Grade Point Average (CGPA) indicates the Average Grade Point obtained for all the courses completed.
 11.3 **The GPA** is calculated by the formula

$$GPA = \frac{\sum_{i=1}^n C_i G_i}{\sum_{i=1}^n C_i}$$

where, C_i is the Credit earned for the Course i in any semester;

G_i is the Grade Point obtained by the student for the Course i and

n is the number of Courses passed in that semester.

- 11.4 **CGPA** is the Weighted Average Grade Point of all the Courses passed starting from the first semester to the current semester.

$$CGPA = \frac{\sum_{i=1}^m \sum_{i=1}^n C_i G_i}{\sum_{i=1}^m \sum_{i=1}^n C_i}$$

Where, C_{ij} is the Credit earned for the Course i in any semester;

G_i is the Grade Point obtained by the student for the Course i

n is the number of Courses passed in that semester.

m is the number of semesters.

11.5 Evaluation :

11.5.1 Performance of the student for each course will be rated as shown in the Table.

Range of Marks	Grade Points	Letter Grade
90 and above	10	S
80-89	9	A
70-79	8	B
60-69	7	C
55-59	6	D
50-54	5	E
Less than 50	0	RA
Withdrawn from the examination	0	W

11.5.2 A ten point rating scale is used for evaluation of the performance of the student to provide overall grade for the Master's Programme.

CGPA	Classification of Final Result
8.25 and above	First Class with Distinction
6.5 and above but below 8.25	First Class
5.0 and above but below 6.5	Second Class
0.0 and above but below 5.0	Re-appear

11.6 Classification of Results. The successful candidates are classified as follows:

11.6.1 **For First Class with Distinction:** Candidates who have passed all the courses prescribed in the Programme in the first attempt with a CGPA of 8.25 and above within the programme duration. Candidates who have withdrawn from the End Semester Examinations are still eligible for First Class with Distinction (See Section 12 for details).

11.6.2 **For First Class:** Candidates who have passed all the courses with a CGPA of 6.5 and above.

11.6.3 **For Second Class:** Candidates who have passed all the courses with a CGPA between 5.0 and less than 6.5.

11.6.4 Candidates who obtain overall highest CGPA in all examinations in the first appearance itself are eligible for University Rank.

11.7 Course-Wise Letter Grades

11.7.1 The percentage of marks obtained by a candidate in a course will be indicated in a letter grade.

- 11.7.2 A student is considered to have completed a course successfully and earned the credits if he/she secures an overall letter grade other than RA.
- 11.7.3 A course successfully completed cannot be repeated for the purpose of improving the Grade Point.
- 11.7.4 A letter grade RA indicates that the candidate shall reappear for that course. The RA Grade once awarded stays in the grade card of the student and is not deleted even when he/she completes the course successfully later. The grade acquired later by the student will be indicated in the grade sheet of the Odd/Even semester in which the candidate has appeared for clearance of the arrears.
- 11.7.5 If a student secures RA grade in the Project Work/Field Work/Practical Work/Dissertation, he/she shall improve it and resubmit if it involves only rewriting/ incorporating the clarifications suggested by the evaluators or he/she can re-register and carry out the same in the subsequent semesters for evaluation.

12. Provision for Withdrawal from the End Semester Examination

- 12.1 The letter grade W indicates that a candidate has withdrawn from the examination.
- 12.2 A candidate is permitted to withdraw from appearing in the ESE for one course or courses in ANY ONE of the semesters ONLY for exigencies deemed valid by the University authorities.
- 12.3 Permission for withdrawal from the examination shall be granted only once during the entire duration of the programme.
- 12.4 Application for withdrawal shall be considered only if the student has registered for the course(s), and fulfilled the requirements for attendance and CIA tests.
- 12.5 The application for withdrawal shall be made ten days prior to the commencement of the examination and duly approved by the Controller of Examinations. Notwithstanding the mandatory prerequisite of ten days notice, due consideration will be given under extraordinary circumstances.
- 12.6 Withdrawal will not be granted for arrear examinations of courses in previous semesters and for the final semester examinations.
- 12.7 Candidates who have been granted permission to withdraw from the examination shall reappear for the course(s) when the course(s) are offered next.
- 12.8 Withdrawal shall not be taken into account as an appearance for the examination when considering the eligibility of the candidate to qualify for First Class with Distinction.

13. **Academic misconduct:** Any action that results in an unfair academic advantage/interference with the functioning of the academic community constitutes academic misconduct. This includes but is not limited to cheating, plagiarism, altering academic documents, fabrication/falsification of data, submitting the work of another student, interfering with other students' work, removing/defacing library or computer resources, stealing other students' notes/assignments, and electronically interfering with other students'/University's intellectual property. Since many of these acts may be committed unintentionally due to lack of awareness, students shall be sensitized on issues of academic integrity and ethics.

14. **Transitory Regulations:** Wherever there has been a change of syllabi, examinations based on the existing syllabus will be conducted for two consecutive years after implementation of the new syllabus in order to enable the students to clear the arrears. Beyond that, the students will have to take up their examinations in equivalent subjects,

as per the new syllabus, on the recommendation of the Head of the Department concerned.

15. Notwithstanding anything contained in the above pages as Rules and Regulations governing the Two Year Master's Programmes at Annamalai University, the Syndicate is vested with the powers to revise them from time to time on the recommendations of the Academic Council.

Master of Computer Applications (Two Year) Programme
Programme Code: SCIS23

CURRICULA AND SCHEME OF EXAMINATIONS
(For students admitted from the academic year 2020-2021)

Course Code	Course Title	Hours/Week			Credit	Marks		
		L	T	P	C	CIA	ESE	Total
Semester – I								
20MCAC101	Core 1: Object-Oriented Programming using C++	4	0	0	4	25	75	100
20MCAC102	Core 2: Advanced Data Structures and algorithms	4	0	0	4	25	75	100
20MCAC103	Core3: Relational Database Management System	4	0	0	4	25	75	100
20MCAC104	Core 4: Operating Systems	4	0	0	4	25	75	100
20MCAP105	Core 5: Practical - I Object-Oriented Programming Lab using C++	0	0	2	2	40	60	100
20MCAP106	Core 6: Practical-II RDBMS Lab	0	0	2	2	40	60	100
19XXXXXXX	Elective-I: Interdepartmental Elective	3	0	0	3	25	75	100
					23			
Semester – II								
20MCAC201	Core 7: JAVA Programming	4	0	0	4	25	75	100
20MCAC202	Core 8: Computer Networks	4	0	0	4	25	75	100
20MCAC203	Core 9: Digital Image Processing	4	0	0	4	25	75	100
20MCAP204	Core 10: Practical- III Java Programming Lab	0	0	2	2	40	60	100
20MCAP205	Core 11: Practical- IV Image Processing Lab	0	0	2	2	40	60	100
20MCAE20X	Elective-II: Department Elective	3	0	0	3	25	75	100
19XXXXXXX	Elective-III: Interdepartmental Elective	3	0	0	3	25	75	100
					22			
Semester – III								
20MCAC301	Core 12: Web Technology	4	0	0	4	25	75	100
20MCAC302	Core 13: Mobile Computing	4	0	0	4	25	75	100
20MCAC303	Core 14: Big Data Analytics	5	0	0	5	25	75	100
20MCAC304	Core 15: Python and R Programming	5	0	0	5	25	75	100
20MCAP305	Core 16: Practical – V Mobile Application Development Lab	0	0	2	2	40	60	100
20MCAP306	Core 17: Practical–VI Data Analytics: Python and R Lab	0	0	2	2	40	60	100
20MCAE30X	Elective-IV: Department Elective	3	0	0	3	25	75	100
19PSCI300	Constitution of India	2	0	0	2*	25	75	100
					25			
Semester – IV								
20MCAD401	Dissertation and Viva Voce/In plant training	0	0	#	22	50	150	200
	Total Credits				92			
Value Added Courses								
Online Courses (SWAYAM or MOOC)								

L- Lectures; P- Practical; C- Credits; CIA- Continuous Internal Assessment; ESE- End-Semester Examination

*** 19PSCI300 = NON CREDIT COMPULSORY COURSE**

Student is required to undergo **44 hours per week** of practical work in software development at any Software Industry/Research Establishment of his/her choice.

Note:

1. Students shall take both Department Electives (DEs) and Interdepartmental Electives (IDEs) from a range of choices available. The details of interdepartmental electives are given in the **"Handbook of Interdepartmental Electives-Two Year Programme"** and listed in the University website.
2. Students may opt for any Value-added Courses listed in the University website. The details of Value Added Courses are given in the **"Handbook of Value Added Courses"** and listed in the University website.

ELECTIVE COURSES

DEPARTMENT ELECTIVE COURSES

S. No.	Course Code	Course Title	Hours/ week				C	Marks		
			L	T	P	CIA		ESE	Total	
1.	20MCAE206	Compiler Design	3	0	0	3	25	75	100	
2.	20MCAE207	Data Mining Techniques	3	0	0	3	25	75	100	
3.	20MCAE208	Artificial Intelligence	3	0	0	3	25	75	100	
4.	20MCAE209	E-Commerce	3	0	0	3	25	75	100	
5.	20MCAE307	Network Security	3	0	0	3	25	75	100	
6.	20MCAE308	Internet of Things	3	0	0	3	25	75	100	
7.	20MCAE309	Machine Learning	3	0	0	3	25	75	100	
8.	20MCAE310	Open Source Technologies	3	0	0	3	25	75	100	

VALUE ADDED COURSES (VAC)(For students of other departments)

To be offered in FOURTH Semester

S. No.	Course Code	Course Title	Hours/ week				C	Marks		
			L	T	P	CIA		ESE	Total	
1.	SCISVAC01	Web Development	3	0	0	3	25	75	100	
2.	SCISVAC02	Fundamentals of Computing	3	0	0	3	25	75	100	
3.	SCISVAC03	Advanced Web Development	3	0	0	3	25	75	100	
4.	SCISVAC04	Internet and its Applications	3	0	0	3	25	75	100	

ANNAMALAI UNIVERSITY
Department of Computer and Information Science
Pattern of question paper for END semester examinations
(Based on Revised Bloom's Taxonomy)

Year : I

Programme: MCA Two Year PG Programme

Semester: I / II

Course Code:

Course Name:

Time: 3 Hrs

Max.Marks:100

Part-A (Level-K1/ Level-K2) Marks: (10x2=20)

(Answer ALL of the questions)

1. Define.....
2. Multiple Choices a. b. c. d.
3. Multiple Choices a. b. c. d.
4. Match the following i - a ii- b iii- c iv -d v -
5. Match the following i - a ii- b iii- c iv -d v -
6. Explain.....
7. Select.....
8. Describe.....
9. Classify....
10. Elucidate....

Part-B (Level-K3/ Level-K4) Marks: (8x5=40)

(Answer any EIGHT of the questions)

11. Prepare.....
12. Solve.....
13. Apply.....
14. Show.....
15. Categorize...
16. Analyze...
17. Distinguish....
18. Infer....
19. Compare....
20. Compute

Part-C (Level-K5) Marks: (3x10=30)

(Answer any THREE of the questions)

21. Discuss...
22. Summarize....
23. Evaluate.....
24. Disprove....

Part-D (Level-K6) Marks: (1x10=10)

(Answer any ONE of the questions)

25. Design....
26. Develop...

ANNAMALAI UNIVERSITY
Department of Computer and Information Science
Year : II

Programme: MCA Two Year PG Programme

Semester: III

Course Code:
Time: 3 Hrs

Course Name:
Max.Marks:100

Part-A (Level-K1/ Level-K2) Marks: (10x2=20)
(Answer ALL of the questions)

1. Define.....
2. Multiple Choices a. b. c. d.
3. Multiple Choices a. b. c. d.
4. Match the following i - a ii- b iii- c iv -d v -
5. Match the following i - a ii- b iii- c iv -d v -
6. Explain.....
7. Select.....
8. Describe.....
9. Classify....
10. Elucidate....

Part-B (Level-K3/ Level-K4) Marks: (6x5=30)
(Answer any SIX of the questions)

11. Apply.....
12. Show.....
13. Prepare
14. Make use of....
15. Categorize...
16. Analyze...
17. Distinguish....
18. Simplify.....

Part-C (Level-K5) Marks: (3x10=30)
(Answer any THREE of the questions)

19. Discuss...
20. Recommend with
21. Evaluate.....
22. Justify....
23. Optimize...

Part-D (Level-K6) Marks: (2x10=20)
(Answer any TWO of the questions)

24. Design....
25. Formulate ...
26. Modify

Master of Computer Applications(TWO YEAR) Programme**[End Semester Examinations]**

Bloom's Taxonomy - Questions Conforming to Levels K1 to K6

I Year (Two year PG)				II Year (Two Year PG)			
Level	Part	Questions & Marks	Total Marks	Level	Part	Questions & Marks	Total Marks
K1	A	5 x 2	10	K1	A	5 x 2	10
K2		5 x 2	10	K2		5 x 2	10
K3	B	4 x 5	20	K3	B	2 x 5	10
K4		4 x 5	20	K4		4 x 5	20
K5	C	3 x 10	30	K5	C	3 x 10	30
K6	D	1 x 10	10	K6	D	2x 10	20
			100				100

ANNAMALAI UNIVERSITY
Department of Computer and Information Science
[Question Paper Pattern - INTERNAL TESTS I & II (CIA)]
(Based on Revised Bloom's Taxonomy)

Programme: MCA Two Year PG Programme

Semester: All

Time: 2 Hrs

Max.Marks:50

Part-A (Level-K1) Marks: (6x2=12)

(Answer ALL of the questions)

1. Define /Choose/ Relate.....
2. What / Why / How?
3. Multiple Choices a. b. c. d.
4. Multiple Choices a. b. c. d.
5. Match the following i - a ii - b iii - c iv - d v -
6. Match the following i - a ii - b iii - c iv - d v -

Part-B (Level-K2)

Marks: (3x5=15)

(Answer any THREE of the questions)

7. Explain.....
8. Describe.....
9. Select.....
10. Compare

Part-C (Level-K3/ Level-K4) Marks: (2x7=14)

(Answer any TWO of the questions)

11. Apply....
12. Calculate....
13. Categorize...

Part-D (Level-K5/ Level-K6)

Marks: (1x9=9)

(Answer any ONE of the questions)

14. Discuss....
15. Summarize....

PROGRAMME OUTCOMES (POs)

After the successful completion of the M.C.A (2 year) Degree Programme, the graduates will be able to:

PO1	An ability to apply knowledge of mathematics, computer science and management in practice.
PO2	An ability to identify, critically analyze, formulate and develop computer applications.
PO3	An ability to select modern computing tools and techniques and use them with dexterity.
PO4	An ability to design a computing system to meet desired needs within realistic constraints such as safety, security and applicability.
PO5	An ability to devise and conduct experiments, interpret data and provide well informed conclusions.
PO6	An ability to understand the impact of system solutions in a contemporary, global, economical, environmental, and societal context for sustainable development
PO7	An ability to function professionally with ethical responsibility as an individual as well as in multidisciplinary teams with positive attitude
PO8	An ability to effectiveness in communicating with a wide range of audiences

PROGRAMME SPECIFIC OUTCOMES (PSOs)

At the end of the programme, the student will be able to

PSO1	To prepare graduates who will productive careers in software industry, corporate sector, Govt. organizations and academia by providing skill based environment for teaching and research in the core and emerging areas of the discipline.
PSO2	To prepare graduates who will contribute to society as broadly educated, expressive, ethical and responsible citizens with proven expertise.
PSO3	To prepare graduates who will achieve peer-recognition; as an individual or in a team; through demonstration of good analytical, design and implementation skills.
PSO4	Develop and deploy software systems with assured quality and efficiency.
PSO5	To prepare graduates who will thrive to pursue life-long learning to fulfill their goals.

Semester	20MCAC101: OBJECT-ORIENTED PROGRAMMING USING C++	L	T	P	C
I		4	0	0	4

Learning Objective(LO):

LO1	To explain the advantages of object oriented programming over procedure oriented programming.
LO2	Understand how to apply the major object-oriented concepts to implement object oriented programs in C++, encapsulation, inheritance and polymorphism.
LO3	To learn how to implement constructors, function, pointers and class member functions.
LO4	Explain array handling, function overloading, operator overloading and virtual functions.
LO5	Helps in implementing some important features of C++ including templates, utilizing the I/O classes in C++ and exception handling.

Course Outcomes (CO):

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

CO1	Describe the principles of object-oriented problem solving and programming.
CO2	Explain programming fundamentals, including statement and control flow.
CO3	Apply the concepts of class, method, constructor, pointers, data abstraction, function abstraction, inheritance, overriding, overloading, polymorphism, IO streams, Templates.
CO4	Design program with basic data structure like array.
CO5	Develop good quality software using object-oriented techniques.

UNIT-I

Introduction to OOP: Overview of C++ - classes - structures - union - friend function- friend class - inline function - constructors - static members - scope resolution operator - passing objects to functions - function returning objects.

UNIT-II

Arrays - pointers - this pointer - references - dynamic memory allocation - functions overloading - default arguments - overloading constructors - pointers to functions

UNIT-III

Operator overloading - member operator function - friend operator function - type conversion - inheritance - types of inheritance - virtual base class - polymorphism - virtual function.

UNIT-IV

Class templates and generic classes - function templates and generic functions - overloading function templates - power of templates - exception handling - derived class exception - exception handling functions

UNIT-V

Streams - formatted I/O with its class functions and manipulators - creating own manipulators - file I/O - conversion functions - standard template library.

Current Streams of thought: Event Driven Programming and Basic of Swings.
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Text Book:

1. Balagurusamy E, (2006) Object Oriented Programming with C++, TMG, Third Edition.

References:

1. Balagurusamy E, (2017) Object Oriented Programming with C++, TMG, 7th Edition.
2. KavitaPabreja, Neetu Narwal, (2019),Object Oriented Programming in C++. Dream tech Press. First Edition.
- 3.Hubbard, (2017) Programming with C++, Schaum Outline Series, TMH, Second Edition.
- 4.BjarneStroustrup, (2018), The C++ Programming Language, Addison Wesley Publications, Fourth Edition.
- 5.Jagadev A K, Rath A M, and Dehuri S, (2010), Object Oriented Programming Using C++, PHI.
- 6.<https://www.pdfdrive.com/object-oriented-programming-books.html>

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3		3				3			
CO2	3		3		3				3	3	3	2	2
CO3	3						2	2		3			1
CO4	3	3			3				3	2	2	1	
CO5				2		2	1		3		2		

Semester	20MCAC102: ADVANCED DATA STRUCTURES AND ALGORITHMS	L	T	P	C
I		4	0	0	4

Learning Objective (LO):

LO1	To teach efficient storage mechanisms of data for an easy access.
LO2	To design and implementation of various basic and advanced data structures.
LO3	To introduce various techniques for representation of the data in the real world.
LO4	To develop application using data structures.
LO5	To teach the concept of protection and management of data.

Course Outcomes(CO):

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

CO1	Student will be able to choose appropriate data structure as applied to specified problem definition.
CO2	Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
CO3	Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc.
CO4	Students will be able to use linear data structures.
CO5	Students will be able to use non-linear data structures.

Unit-I

The Role of algorithm in computing - Insertion sort - Analyzing algorithm - Designing algorithm - Divide and Conquer - The maximum-sub array problem - Strassen's algorithm for matrix multiplication - The substitution method for solving recurrences - The recursion tree method for solving recurrences - Proof of the master theorem.

Unit-II

Sorting and order statistics-Heapsort-Maintaining the heap priority-Building a heap - The heap sort algorithm - Priority queues - Quick sort - Description of quick sort - Performance of quick sort - A randomized version of quick sort - Analysis of quick sort - Sorting in Linear Time - Lower bounds for sorting - Counting sort - Radix sort - Bucket sort - Medians and order statistics - Minimum and Maximum - Selection in expected linear time - Selection in worst case linear time.

Unit-III

Elementary Data Structures - Stacks and Queues - Linked Lists - Implementing pointers and objects - Hash tables - Direct-address tables - Hash functions - Open addressing - Perfect hashing - Binary search trees - Querying binary search trees - Insertion and deletion - Red-Black trees - Properties - Rotations - Insertion - Deletion.

Unit-IV

Advanced Design and Analysis Techniques - Dynamic Programming - Rod cutting - Matrix chain multiplication - Elements of dynamic programming – Longest common subsequence - Optimal binary search trees - Greedy algorithms - An activity-selection algorithm - Elements of greedy strategy - Huffman codes - Matroids and Greedy method - A task scheduling problem as matroid.

Unit-V

Advanced Data Structures - B- trees - Definition - Basic Operations on B-trees - Deleting a key from B-tree - Fibonacci heaps - Structure - Mergeable heap operations-Decreasing a key and deleting a node-Bounding the maximum degree- Van Emde Boas Trees - Preliminaries - Recursive structures - Data structure for disjoint sets - Disjoint set operations - Linked list representation of disjoint sets.

Current Streams of thought: Elementary Graph Algorithm– Representation of graphs – Breadth first search – Depth first search – Topological sort – Algorithm of Kruskal and Prim – Single source shortest path –Dijkstra's algorithm and matrix multiplication.

Text Book:

1. Thomas H.Cormen, Charles E. Leiserson, Ronald L.Rivest and Clifford Stein, (2009) Introduction to Algorithms, The MIT press, Third Edition.

References:

1. Anany Levitin , (2015), Introduction to the Design and Analysis of Algorithms Pearson Education,
2. Brian W. Kernighan, Dennis Ritchie, (2015), The C Programming Language,

- Pearson Education, Second Edition.
3. Timothy Budd, (2008) An Introduction to Object Oriented Programming, Pearson Education, Third Edition.
 4. Jean Paul Tremblay and Paul G. Sorenson, (2010), An Introduction to Data Structures with Applications, Tata McGraw Hill, Second Edition.
 5. Sahini, (2016), Data Structures, Algorithms and Applications in C++, Tata McGraw Hill.
 6. <https://www.pdfdrive.com/data-structures-and-algorithms-in-c-2e-d18727272.html>

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3		3			3		3		3
CO2			3		3			2		3	3		2
CO3	3			3			2						1
CO4	3	3			3			2	2	2	2	1	
CO5		3	3			2	2				2	1	

Semester	20MCAC103: RELATIONAL DATABASE MANAGEMENT SYSTEM	L	T	P	C
I		4	0	0	4

Learning Objective(LO):

LO1	To understand the different issues involved in the design and implementation of a database system.
LO2	To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
LO3	To understand and use data manipulation language to query, update, and manage a database.
L04	To develop an understanding of essential DBMS concepts such as: database security, integrity, and concurrency.
L05	To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS

Course Outcomes(CO):

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

CO1	Define program-data independence, data models for database systems, database schema and database instances.
CO2	Recall Relational Algebra concepts, and use it to translate queries to Relational statements and vice versa.
CO3	Identify Structure Query Language statements used in creation and manipulation of Database Identify the methodology of conceptual modeling through Entity Relationship model.
CO4	Develop an understanding of the differences between OODBMS, ORDBMS and RDBMS and the practical implications of each approach.
CO5	Analyze and design a real database application.

Unit-I

Introduction - Database System Applications – Purpose of Database Systems – View of Data – Database Languages – Relational Databases – Database design – Data storage and Querying – Transaction Management – Database Architecture – Data Mining and Information Retrieval – Database Users and Administrators – History of Database Systems.

Unit-II

Relational Databases - Structure of the relational databases - Database schema - Keys - Schema diagrams - Relational query languages - Relational operations - Overview of SQL query language - SQL data definition - Basic structure of SQL queries - Additional basic operations - Set operations - Null values - Aggregate functions – Nested sub queries- Modification of the database.

Unit-III

Relational Database design - Features of Good Relational Designs - Atomic Domains and First Normal Form - Decomposition Using Functional Dependencies - Functional-Dependency Theory - Algorithms for Decomposition - Decomposition Using Multivalued Dependencies - More Normal Forms - Database-Design Process.

Unit-IV

Indexing and Hashing - Basic Concepts - Ordered Indices - B+-Tree Index Files - B+-Tree Extensions - Multiple-Key Access - Static Hashing - Dynamic Hashing - Comparison of Ordered Indexing and Hashing - Bitmap Indices - Index Definition in SQL- Measures of Query Cost - Selection Operation - Sorting - Join Operation - Other Operations - Evaluation of Expressions.

Unit-V

Distributed Databases - Introduction - Homogeneous and Heterogeneous Databases - Distributed Data Storage - Distributed Transactions - Commit Protocols - Concurrency Control in Distributed Databases - Availability – Distributed Query Processing - Heterogeneous Distributed Databases - Cloud-Based Databases - Directory Systems.

Current Streams of thought: Postgre SQL - Introduction - User Interfaces - SQL Variations and Extensions - Transaction Management in Postgre SQL - Storage and Indexing - Query Processing and Optimization - System Architecture.

Text Book:

1. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, (2002), Database System Concepts, Tata McGraw Hill, Sixth Edition.

References:

1. Ramez Elmasri, Shamkant B. Navathe,(2017), Fundamentals of Database Systems, Pearson Education, Seventh Edition.
2. R. Elmasri, S.B. Navathe, (2017), Fundamentals of Database Systems, Pearson Education/Addison Wesley, Seventh Edition.
3. Raghu Ramakrishnan, (2015), Database Management SystemsII, McGrawHill College Publications, Fourth Edition.
4. Bipin C. Desai, (2012), An Introduction to Database Systems, Galgotia Publications, Revised Edition.
5. Raghu Ramakrishnan and Johannes Gehrke, (2008), Database Management Systems, Tata McGraw Hill Higher Education, Ninth Edition.
6. Elmasri and Navathe, Fundamentals of Database Systems, (2010), Pearson Education Asia, Sixth Edition.
7. <https://www.pdfdrive.com/search?q=Dr.+S.+Sumathi>

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3			3		3		3		3		3	
CO2		3	3		3		2		3		1	2	2
CO3	3			3			2			3			1
CO4	2		2		2				3	3	3	1	
CO5		3	3			2		1		2	3		2

Semester	20MCAC104: OPERATING SYSTEMS	L	T	P	C
I		4	0	0	4

Learning objective(LO):

LO1	To learn the fundamentals of Operating Systems.
LO2	To learn the mechanisms of OS to handle processes and threads and their communication.
LO3	To learn the mechanisms involved in the memory management.
LO4	To gain knowledge on Distributed OS concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols.
LO5	To know the components and Management aspects of concurrency management.

Course Outcomes(CO):

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

CO1	Analyze the structure of OS and basic architectural components involved in design.
CO2	Analyze and design the applications to run in parallel either using process or thread models of different OS.
CO3	Analyze the various device and resource management techniques for time sharing and distributed systems.
CO4	Understand the mutual exclusion, deadlock detection and agreement protocols of Distributed OS.
CO5	Interpret the mechanisms adopted for file sharing in distributed applications.

Unit-I

Introduction – Operating System Structure - Operating System Operations – Protection and Security – Kernel Data Structures - Computing Environments - Open Source Operating Systems - Operating System Services – User operating system Interface – System calls - Types of system calls – System programs – Operating System design and Implementation – Operating System: debugging - Operating System: Generation – System Boot.

Unit-II

Process Management – Process Concepts – Process Scheduling – Operation on Processes – Inter process Communication – Threads – Multicore Programming - Multithreading Models – Thread Libraries - Implicit Threading - Threading Issues – Process Synchronization – The Critical Section Problem – Peterson’s Solution – CPU Scheduling – Scheduling Criteria – Scheduling Algorithms - Deadlocks – System Model – Deadlock Characterization – Methods for handling Deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock.

Unit-III

Memory Management – Background – Swapping – Contiguous Memory Allocation – Paging – Structure of the Page Table – Virtual Memory Background - Demand Paging – Copy-on-Write – Page Replacement – Allocation of Frames – Thrashing – Memory-Mapped Files – Allocating Kernel Memory – Other Considerations – Operating System Examples.

Unit-IV

Storage Management – Overview of Mass Storage Structure – Disk Structure – Disk Attachment – Disk Scheduling – Disk Management – Swap Space Management- RAID Structure – Stable Storage Implementation – Tertiary Storage Structure – I/O Hardware – Application of I/O Interface – Kernel I/O Subsystem - File Concept – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection – File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free Space Management – Efficiency and Performance.

Unit-V

Case study:Windows 7 - History - Design Principles - System Components - Terminal Services and Fast User Switching - File System - Networking - Programmer Interface. Android - Overview of Android Operating System - The Android ecosystem – Android Architecture - Android Versioning.

Current Streams of thought: Security and Protection: Attacks on security, computer worms, computer virus, security design principles, authentication, protection mechanism, encryption, security in distributed environment.

Text Book:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, (2004), Operating Systems Concepts, John Wiley & Sons, Inc., Ninth Edition.

References:

- 1 Abraham Silberschatz, Peter Galvin and Gagne, (2018), Operating System Concepts, Addison Wesley, 10th Edition.
- 2 Andrew S. Tanenbaum, Herbert Boston, (2015), Modern Operating Systems Pearson, 4th edition.
- 3 Ann McHoes, Ida M. Flynn, (2013), Understanding Operating Systems, Cengage Learning, 7th Edition.

- 4 Andrew S. Tanenbaum, (2007), Modern Operating Systems, Prentice Hall of India, Third Edition.
- 5 Deitel ,H. M.,(2004), Operating Systems, Pearson Education, Third Edition.
- 6 <https://www.pdfdrive.com/operating-system-books.html>

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3			3		3			3			2	
CO2		3	3		3					3	3	2	2
CO3		3					1	1		3			2
CO4	3			2	2				3	3	3	2	
CO5	3	3	2		2			1	3		3		

Semester	20MCAC105: Practical – I	L	T	P	C
I	Object Oriented Programming Lab using C++	0	0	4	2

Learning Objectives (LO)

LO1	To become familiar with object oriented programming and concepts
LO2	To write C++ programs effectively.
LO3	To understand the object oriented program written by someone else.
LO4	To debug and test the C++ programs
LO5	To become familiar with various library header files and functions by reading C++ library documentation

Course Outcomes (CO)

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

CO1	Apply the computer programming techniques to solve various practical problems.
CO2	Understand the object oriented concepts and implementation such as abstraction, encapsulation, inheritance, polymorphism, etc.
CO3	Understand and use the basic programming constructs of C++

CO4	To learn C++ data types, memory allocation/de-allocations, functions and pointers, etc.
CO5	Develop complete software applications using object oriented programming language in C++.

Lab Exercises

1. Programs on concept of classes and objects.
2. Programs using inheritance.
3. Programs using static polymorphism.
4. Programs on dynamic polymorphism.
5. Programs on operator overloading.
6. Programs on dynamic memory management using new, delete operators.
7. Programs on copy constructor and usage of assignment operator.
8. Programs on exception handling.
9. Programs on generic programming using template function & template class.
10. Programs on file handling.

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3		3		3	3	3			
CO2	3		3		3			3		3	3	2	2
CO3	3	3					3		3	3			2
CO4	2			2	2			1				1	1
CO5	2				2	2				3	3		

Semester	20MCAC106: Practical – II	L	T	P	C
I	RDBMS Lab	0	0	4	2

Learning Objectives (LO):

LO1	Keep abreast of current developments to continue their own professional development.
LO2	To engage themselves in lifelong learning of Database management systems theories and technologies this enables them to pursue higher studies.
LO3	To interact professionally with colleagues or clients located abroad and the ability to overcome challenges that arises from geographic distance,

	cultural differences, and multiple languages in the context of computing.
LO4	Develop team spirit, effective work habits, and professional attitude in written and oral forms, towards the development of database applications.

Course Outcomes (CO):

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

CO1	In drawing the ER, EER, and UML Diagrams.
CO2	In analyzing the business requirements and producing a viable model for the implementation of the database.
CO3	In converting the entity-relationship diagrams into relational tables.
CO4	To develop appropriate Databases to a given problem that integrates ethical, social, legal, and economic concerns.

LIST OF EXERCISES

Cycle – I (Simple SQL)

1. Employee Management System Using SQL Commands.
2. Students Management System Using SQL Commands.
3. Bank Management System Using SQL Commands.
4. Index Creation.
5. Implementation of SQL queries for route database.
6. Implementation of SQL queries for route database – Part I.
7. Implementation of SQL queries for route database – Part II.
8. Creating view using SQL commands.
9. Creation of Table Partition.
10. Default trigger procedure and drop command
11. Report creation.

Cycle – II (PL/SQL)

12. Factorial of number
13. Checking whether a number is prime or not
14. Fibonacci series
15. Reversing the string
16. Swapping of two numbers
17. Odd or even number
18. Duplication of records

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3		3		3		3		3	
CO2	3		3		3				3			2	2
CO3			3				2			2			1
CO4	3	2			2			2			3	1	

Semester	20MCAC201: JAVA PROGRAMMING	L	T	P	C
II		4	0	0	4

Learning Objectives (LO):

LO1	To understand fundamentals of concepts of java programming.
LO2	To understand the Applet, string handling and AWT concepts.
LO3	Gain knowledge about Swing and JDBC.
LO4	Be familiar with understand Java bean and EJB.
LO5	To gain the Knowledge of Servlet and JSP.

Course Outcomes (CO):

CO1	To learn the structure and model of the Java programming language.
CO2	To gain the knowledge of java programming statement.
CO3	Develop software in the Java programming language.
CO4	To gain the knowledge of Java servlets.
CO5	Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements.

Unit-I

Core Java: Introduction – Operators – Data types – Variables – Arrays -Control Statements - Methods& Classes- Inheritance-package and interface- Exception handling-Multithread programming

Unit-II

I/O-Java Applet-String handling-Networking- Event Handling- Introduction to AWT- AWT controls- Layout managers-Menus-Images-Graphics.

Unit-III

Java swing: Creating a swing Applet and Application-Programming using Panes- Pluggable Look and feel-Labels- Text fields-Buttons- Toggle Buttons- Checkboxes- Radio Buttons-View Ports-Scroll Panes-Scroll Bars-List-Combo Box-Progress bars- Menus and Toolbars-Layered Panes-Tabbed Panes- Split Panes-Layouts-Windows- Dialog Boxes- Inner frame.

JDBC: The connectivity Model-JDBC/ODBC Bridge-Java.sql package-connectivity to remote database – navigating through multiple rows retrieved from a database.

Unit-IV

JavaBeans: Application Builder tools-The bean developer kit (BDK)-JAR files-Introduction-Developing a simple bean-using bound properties-The java Beans API- Session Beans-Entity Beans-Introduction to Enterprise Java Beans(EJB)-Introduction to RMI (Remote Method Invocation): A simple client-server application using RMI.

Unit-V

Java Servlets: Servlet basic-Servlet API basic-Lifecycle of a Servlet-Running Servlet- Debugging Servlet – Thread – safe Servlet – HTTP Redirects-Cookies-Introduction to Java server pages (JSP).

Text Books:

1. Herbert Schidt,(2017), “*The Complete Reference: JAVA*”, Tata Mc-Graw Hill 7th Edition.

References:

1. E. Balagurusamy, (2019), “*Programming with Java: APerimer*”, TataMc-GrawHill, Sixth Edition.
2. Dustin R.Callway, (2007) “*Inside Servlets*”, Addison Wesley, Second Edition.
3. Mark Watka, (2001) “*Using Java 2 Enterprise Edition*”,Que,1st edition.
4. Setven Holzner, (2001)“*Java2 Black Book*”, Coriolis Group Books.
5. https://psv4.userapi.com/c615518/u16929061/docs/87edf3a7acda/ADVANCED_JAVA_Jitendra_Patel.pdf?extra=OBiVIanCgwV4OVKPNGKArCdhgHp8f4yfSQdI_GVORK9OzvPPq1OQCNg3Db4EHsQ7tO1mrD4MYTVOXDi7KOQwZn8f-oIRPTT7-zX4Rd2wvsGalvNtOL4ggPhwm50ZOZpo5-V7NXKVQGwmFo

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3			3		3		3		3		3	

CO2			3		3		3		3				3
CO3	3	3			3		3	3		3			2
CO4	3	2			2		1		2			2	
CO5		2	2			2		1		2	2		1

Semester	20MCAC202: COMPUTER NETWORKS	L	T	P	C
II		4	0	0	4

Learning Objectives (LO):

LO1	Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
LO2	Acquire knowledge of Application layer and Presentation layer paradigms and protocols.
LO3	Study Session layer design issues, Transport layer services, and protocols.
LO4	Gain core knowledge of Network layer routing protocols and IP addressing.
LO5	Study data link layer concepts, design issues, and protocols

Course Outcomes(CO):

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

CO1	To master the terminology and concepts of the OSI reference model and the TCP-IP reference model.
CO2	To master the concepts of protocols, network interfaces, and design / performance issues in local area networks and wide area networks.
CO3	To be familiar with wireless networking concepts.
CO4	To be familiar with contemporary issues in networking technologies.
CO5	To be familiar with network tools and network programming.

Unit-I

Introduction: The uses of computer networks-Network hardware-Network software-Reference models-Example of networks-Network standardization. The physical layer: The theoretical basis for data communication-Guided Transmission media -Wireless transmission- PSTN-Mobile telephone-Communication satellite.

Unit-II

The Data Link Layer: Data link layer design issues- Error detection and correction– Elementary data link protocols- Sliding window protocols- Example of data link protocols-ETHERNET–802.11-802.16-Bluetooth-Data link layer Switching.

Unit-III

The network layer: Network layer design issues- Routing algorithms- Congestion control algorithms-Internetworking-Network layer in Internet. Network Services BOOTP and DHCP-Domain Name Service-WINS-Web Serving and Surfing Web servers-Web clients(browsers).

Unit-IV

The transport layer: Transport layer design issues-Transport protocols-Simple transport protocol-Internet transport protocols UDP-TCP.

Unit-V

The application layer: Domain name system- Electronic mail- World wide web– Multimedia–Cryptography-Digital signature-Communication Security.

Current Streams of thought: Network Security: Type of Threads, A Model for Network Security, Network Security for LAN.

Text Book:

1. Andrew S.Tanenbaum, (2002), “*Computer networks*”, PHI, 4th edition.

References:

1. James F. Kurose, Keith W. Ross, (2017), *Computer Networking: A Top-Down Approach*, Pearson Education, Seventh Edition.
2. Nader F. Mir, (2014), *Computer and Communication Networks*, Prentice Hall, Second Edition.
3. William Stallings, (2010), *Data and computer communications*, PHI, Eighth edition.
4. Douglas E. Comer, (2015) *Internetworking with TCP/IP-Volume-I*, PHI, Fifth Edition.
5. Larry L. Peterson and Bruce S. Davie, (2012) *Computer Networks: A Systems Approach*, Morgan Kaufmann Publishers, Fifth Edition.
6. William Stallings, (2013), *Data and Computer Communications*, Pearson, Tenth Edition.
7. James F. Kurose, Keith W. Ross,(2012) *Computer Networking: A Top-Down Approach*, Pearson Education, Fifth Edition.
8. <https://www.pdfdrive.com/computer-networking-books.html>

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3			3		3		3		3		3	

CO2	3		3	3	3				3		2	2	2
CO3		3				3	2			3	3		1
CO4	3		2		2				2			1	
CO5		3				3		2			2		1

Semester	20MCAC203: DIGITAL IMAGE PROCESSING	L	T	P	C
II		4	0	0	4

Learning Objective (LO):

LO1	To understand the fundamental concepts related to image processing, feature extraction, pattern analysis etc.
LO2	To understand image processing, analysis and understanding.
LO3	To understand low-level, middle-level and high-level operations.
LO4	To apply the concepts to solve computer vision problems of different fields.
LO5	To study the image compression procedures

Course Outcomes (CO):

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

CO1	Review the fundamental concepts of a digital image processing system.
CO2	Analyze images in the frequency domain using various transforms.
CO3	Evaluate the techniques for image enhancement and image restoration.
CO4	Categorize various compression techniques.
CO5	Interpret image segmentation and representation techniques.

Unit-I

Digital Image Processing Systems: Introduction-Structure of human eye-Image formation in the human eye-Brightness adaptation and discrimination-Image sensing and acquisition-Storage-Processing-Communication-Display. Image sampling and quantization- Basic relationships between pixels

Unit-II

Image Enhancement in the Spatial Domain: Gray level transformations-Histogram processing-Arithmetic and logic operations-Spatial filtering: Introduction - Smoothing and sharpening filters

Image Enhancement in the Frequency Domain: Frequency domain filters: Smoothing and Sharpening filters- Homomorphic filtering

Unit-III

Wavelets and Multi resolution Processing: Image pyramids-Sub and coding-Haar transform - Series expansion-Scaling functions- Wavelet functions-Discrete wavelet transforms in one dimensions- Fast wavelet transform-Wavelet transforms in two dimensions

Unit-IV

Image Data Compression: Fundamentals- Redundancies: Coding- Inter pixel- Psycho-visual-Fidelity criteria-Image compression models-Error free compression- Lossy compression-Image compression standards: Binary image and Continuous tone still image compression standards-Video compression standards.

Unit-V

Morphological Image Processing: Introduction-Dilation- Erosion- Opening- Closing-Hit-or-Miss transformation-Morphological algorithm operations on binary images-Morphological algorithm operations on gray-scale images.

Image Segmentation: Detection of discontinuities - Edge linking and Boundary detection -Thresholding - Region based segmentation

Image Representation and Description: Representation schemes - Boundary descriptors – Regional descriptors.

<p>Current Streams of thought: Recent applications of image processing in various fields of agricultural, medical, robotics and remote sensing.</p>
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Text Books:

1. Gonzalez R.C and R.E.Woods, (2002), Digital Image Processing, Pearson Education, Second Edition.
2. Anil K. Jain, (2001) Fundamentals of Image Processing, PHI, Fourth Edition, New Delhi.

References:

1. Rafael Gonzalez, Richard E. Woods, (2018), Digital Image Processing, Pearson Education, Fourth Edition.
2. S. Sridhar,(2016), Digital Image Processing, Oxford University Press, Second Edition.
3. Milan Sonka, Vaclav Hlavac, Roger Boyle, (2017), Image Processing Analysis and Machine Vision, Cengage India, Fourth Edition.
4. William Pratt, (2001) Digital Image Processing, John Wiley & Sons, Third edition.
5. Hany Farid, (2010),Fundamentals of Image Processing, Dartmouth College.
6. Stefan G.Stanciu,(2012), Digital Image Processing, In Tech.
7. <https://www.pdfdrive.com/digital-image-processing-books.html>

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3		3			3			3	
CO2	3		3		3			3			3		2
CO3				3			3		2	3			1
CO4	3	2			3		2					1	
CO5		3	2			3		2		2	2		

Semester	20MCAC204: Practical – III	L	T	P	C
II	JAVA PROGRAMMING LAB	0	0	4	2

Learning Objectives (LO):

LO1	To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.
LO2	To understand the importance of Classes & objects along with constructors, Arrays and Vectors.
LO3	Discuss the principles of inheritance, interface and packages and demonstrate through problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.
LO4	To understand importance of Multi-threading & different exception handling mechanisms.
LO5	To learn experience of designing, implementing, testing, and debugging graphical user interfaces in Java using applet and AWT that respond to different user events.

Course Outcomes (CO):

CO1	Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
CO2	Identify classes, objects, members of a class and the relationships among them needed for a finding the solution

	to specific problem
CO3	Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
CO4	Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
CO5	Identify and describe common abstract.

Lab Exercises

1. Write a JAVA program to implement class and object
2. Write a JAVA program to implement command line argument.
3. Write a JAVA program to implement the bitwise operators.
4. Write a JAVA program to implement method overloading.
5. Write a JAVA program to implement packages.
6. Write a JAVA program to implement interface.
7. Write a JAVA program to implement inheritance mechanism.
8. Write a JAVA program to implement exception handling.
9. Write a JAVA program to implement user-defined exception handling.
10. Write a JAVA program to implement multithreaded programming concept.
11. Write a JAVA program to implement abstract class concept.
12. Write a JAVA program to implement RMI concept.
13. Applet using Labels, Text Fields and Buttons.
14. Library Management using JDBC concept
15. Programs using Swings Concepts

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3		3		3		3			3
CO2	3		3		3		3		3		3	2	
CO3			3		2		2			2			2
CO4	3				2				2			1	
CO5		3	3			2		1		3	2		1

Semester	20MCAC205: Practical – IV IMAGE PROCESSING LAB	L	T	P	C
II		0	0	4	2

Learning Objective(LO):

LO1	To impart skills on the processing the digital images.
LO2	To learn the transform of the image from spatial domain to frequency domain.
LO3	To perform edge deduction techniques.
LO4	To gain knowledge on compressing the images using suitable techniques.
LO5	To study the segmentation methods.

Course Outcomes(CO):

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

CO1	Read and display the image.
CO2	Transform the domain from spatial to frequency.
CO3	Apply suitable operators to detect the edge.
CO4	Perform compression and segmentation methods.

LIST OF EXERCISES

1. To perform linear and non linear operations on images.
2. To perform smoothing operations on an image in spatial domain.
3. To perform sharpening operations on an image in spatial domain.
4. To transform the image into DCT, FFT and wavelet.
5. To implement canny edge deduction.
6. To study the performance of gradient operators.
7. To implement huff-man coding technique.
8. To perform DCT compression method.
9. To implement image segmentation based on color.
10. To implement erosion and dilation.

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3		3		3		3			3
CO2	3		3		3		2		3		2	3	
CO3			3		2		3			2			2
CO4	3				2				2			1	

Semester	20MCAC301: WEB TECHNOLOGY	L	T	P	C
III		4	0	0	4

Learning Objectives (LO):

LO1	To learn about Java, HTML, DHTML concepts.
LO2	Deploy Java Applets and Servlets.
LO3	To know about appropriate client-side or Server-side applications.
LO4	To gain the Knowledge of XML and its applications.
LO5	To know about PHP scripts and create adaptive web pages.

Course Outcomes (CO):

CO1	Develop a dynamic webpage by the use of java script and DHTML.
CO2	Write a well formed / valid XML document.
CO3	Formats and languages used in modern web-pages: HTML, XHTML, CSS, XML, XSLT, JavaScript, DOM.
CO4	Write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
CO5	Write a server side java application called JSP to catch form data sent from client and store it on database.

Unit-I

HTML: History of the Internet and World Wide Web – HTTP, SMTP, POP3, MIME, Understanding roles of Web Browsers and Web Servers. Structure of HTML, Text formatting, Text styles, hyper link, image, and tables.

Unit-II

Frames, Forms and CSS: Frames, Forms and controls, Embedding audio, video and animated files in HTML, CSS –Understanding CSS, Internal CSS, External CSS, Font Properties, Text Properties, Color and Background properties, Table properties, Numbering and List Properties.

Unit-III

JavaScript: Data types and literals, operators, conditional statements, loop constructs, reserved words; core Objects: Array Object, Date Object; Functions: passing value to JavaScript functions, user defined functions, Handling old browsers , java script events, formatting cookie, retrieving cookie value from the cookie file, removing a cookie , animations using events.

Unit-IV: ASP & XML: ASP – Working of ASP – Request and Response Objects – File System Objects – Session tracking and cookies – ADO – Access a Database from ASP – XML – Structure in Data – Name spaces – DTD – Vocabularies – Accessing Web servers – IIS – Apache web server.

Unit-V

PHP & MySQL: Why PHP and MySQL - Server-Side Web Scripting - Getting Started with PHP - Adding PHP to HTML -Syntax and Variables - Control and Functions - Passing Information between Pages – Strings – Arrays and Array Functions – Numbers - MySQL Database Administration - PHP/MySQL Functions -Displaying Queries in Tables - Building Forms from Queries.

Current Streams of thought: AMP Is A New Norm, The Arrival Of Progressive Web Apps (PWA), RAIL Concept On The Rise.

Text Books

1. Kris Jamsa, Konrad King and Andy Anderson, (2002), “*HTML & Web Design Tips and Techniques*”, Tata McGraw-Hill, First Edition.
2. Thomas A. Powell, *HTML& CSS: The Complete Reference*, (2010), Tata McGraw-Hill, Fifth Edition.
3. Deitel & Deitel, Goldberg, (2005)“*Internet and World Wide Web – How to Program*”, Third Edition, Pearson Education Asia.
4. Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, and Michael K.Glass, (2005),“*Beginning PHP5, Apache, and MySQL Web Development*”, First Edition, Wrox publications.

Reference

1. Laura Lemay, Rafe Colburn and Jennifer Kymin, (2016), “*Mastering HTML, CSS & Java script Web Publishing*”,BPB Publications.
2. Rajkamal, (2001),“*Web Technology*”, First Edition, Tata McGraw-Hill.
3. Tim Converse, Joyce Park and Clark Morgan, (2004), “*PHP5 and MySQL Bible*”, Wiley Publishing.
4. **Ebook:**<https://www.pdfdrive.com/html5-and-css3-2nd-edition-level-up-with-todays-web-technologies-d12105659.html>.

Outcome Mapping

CO /PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3		3		3		3			3
CO2	3		3		2		3		3		3	2	
CO3			3		2		2			2			3
CO4	3				3				2			1	
CO5		3	3			2		1		3	2		1

Semester	20MCAC302: MOBILE COMPUTING	L	T	P	C
III		4	0	0	4

Learning Objectives (LO):

LO1	To learn about the concepts and principles of Mobile computing.
LO2	To explore theoretical issues of Mobile computing.
LO3	To develop skills of finding solutions and building software for Mobile computing applications.
LO4	To study the specifications and functionalities of various protocols/standards of mobile networks.
LO5	To learn Android and IOS platform and its architecture.

Course Outcomes:

CO1	Grasp the concepts and features of mobile computing technologies and applications.
CO2	Have a good understanding of how the underlying wireless and mobile communication networks work, their technical features, and what kinds of applications they can support.
CO3	Developing mobile computing systems and applications.
CO4	Develop mobile computing applications by analyzing their characteristics and requirements, selecting the appropriate computing models and software architectures, and applying standard programming languages and tools.
CO5	Describe Android platform, Architecture and features and design User Interface and develop Android App.

UNIT-I

Introduction: Aspects of Mobility – Mobile Device Profiles – Device Portability – Mobile Applications – Characteristics and Benefits – Application Model – Infrastructure and Managing Resources – Frameworks and Tools – Generic UI Development – Visual UI – Text to Speech Techniques–Multimodal and Multichannel UI.

UNIT-II

Tools: Google Android Platform – Eclipse Simulator – Android Application Architecture – Event based programming – Apple iPhone Platform – UI and Toolkit Interfaces – Event handling – Graphical Services – Animation Techniques.

UNIT-III

Application Design: Memory Management – Design Patterns for Limited Memory - Work Flow for Application development – Techniques for Composing Applications -

Dynamic Linking - Plug ins and rule of thumb for using DLLs - Concurrency and Resource Management - Look and Feel

UNIT-IV

Application Development: Intents and Services – Storing and Retrieving data – Communication via the Web – Notification and Alarms – Graphics and Multimedia – Telephony – Location based Services – Packaging and Deployment – Security and Hacking

UNIT-V

Cellular Networks And Wireless LANs: Cellular Network Structure and Operation - Principles - Tessellation, Frequency Reuse, Hand off - GSM - System Architecture, Elements, Interfaces, Frame Structure, Protocol Stack, Types of Handover – IEEE 802.11 WLAN - Architecture, Reference Model - Physical layer - MAC Layer - CSMA/CA - Interference Spacing – Security – WEP, 802.1x Authentication.

Current Streams of thought: Mobile Platforms and Applications: Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, and Windows Phone – M-Commerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.

Text Books:

1. Reza B'Far, (2009), "*Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML*", Cambridge Press University.
2. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, (2010), "*Mobile Computing Technology, Applications and Service Creation*", 2nd edition, Tata McGraw Hill.

References:

1. Reto Meier, "Professional Android 4 Application Development", Wrox Wiley, 2012.
2. Neil Smyth, "iPhone iOS 4 Development Essentials – Xcode", 4 Edition, Payload media, 2011.
3. Neil Smyth, "iPhone iOS 4 Development Essentials – Xcode", 4th Edition, Payload media, 2011.
4. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley, 2010.
5. Ben Shneiderman and Catherine Plaisant, "Designing the User Interface: strategies for Effective Human Computer Interaction", Addison– Wesley, 5th Edition, 2009.
6. Zigurd Mednieks, Laird Dornin, G, Blake Meike and Masumi Nakamura, "Programming Android", O'Reilly, 2011.
7. Reto Meier, Wrox Wiley, "Professional Android 2 Application Development", 2010.
8. Alasdair Allan, "iPhone Programming", O'Reilly, 2010.
9. Wei-Meng Lee, "Beginning iPhone SDK Programming with Objective-C", Wrox Wiley, 2010.
10. Stefan Poslad, "Ubiquitous Computing: Smart Devices, Environments and interactions", Wiley, 2009.
11. **Ebook:** <https://xd8gx5e75v.pdcn5.top/dl2.php?id=158523877&h=fd3276e3f3700482d7317842f3d22f4e&u=cache&ext=pdf&n=Android%20studio%2030%20development%20essentials%20-%20android%208%20edition>

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3		3		3		3	3		3
CO2	3		3		2		3			3		3	2
CO3			3				2		2	2			1
CO4	3		2		3			2			2	2	
CO5	3			3		3		2		1	1	1	

Semester	20MCAC303: BIG DATA ANALYTICS	L	T	P	C
III		4	0	0	4

Learning Objectives (LO):

LO1	To understand the concepts of Big Data Analytics and gain ability to design high scalable systems.
LO2	To understand various statistical models.
LO3	To understand the frequent item set and clustering concept.
LO4	To understand big data and use cases from selected business domains.
LO5	To learn, Install, configure, and run Hadoop and HDFS.

Course Outcomes:

CO1	Explain the concepts of big data analysis.
CO2	Identify the various big data management, processing techniques
CO3	Explain No SQL big data management.
CO4	Analyze performance of big data analysis in Hadoop environment.
CO5	Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.

Unit-I

Introduction to Big Data: Introduction to Big Data Platform – Traits of Big data - Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

Unit-II

Data Analysis: Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods.

Unit-III

Mining Data Streams: Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

Unit-IV

Frequent Item sets and Clustering: Mining Frequent Item sets - Market Based Model – Apriori Algorithm – Handling Large Data Sets in Main Memory – Limited Pass Algorithm – Counting Frequent Item sets in a Stream – Clustering Techniques – Hierarchical – K-Means – Clustering High Dimensional Data – CLIQUE And PROCLUS – Frequent Pattern based Clustering Methods – Clustering in Non-Euclidean Space – Clustering for Streams and Parallelism.

Unit-V

Hadoop and R for Visualization: Background and fundamentals-moving data in and out of Hadoop-data serialization-applying Map Reduce patterns to big data- streaming big data-integrating R and Hadoop for statistics and more-predictive analytics with Mahout- Hacking with Hive-Programming pipelines with pig – HBase- MySQL – No SQL- RHadoop.

Current Streams of thought: Recent Trends in Big Data Analytics: Software and Tools for Massive Big Data Processing, Large Scale Data Analysis for Social Networks, Big Data Analytics for Smart Healthcare, and Big Data Analytics for Business Intelligence.

Text Books:

1. Michael Berthold, David J. Hand, (2007), *“Intelligent Data Analysis”*, Springer.
2. Anand Rajaraman and Jeffrey David Ullman, (2014), *“Mining of Massive Datasets”*, Cambridge University Press.

References:

1. Raj Kamal, Preeti Saxena , “Big Data Analytics”, McGraw Hill, First Edition, February 2018.
2. Maheshwari ,”Data Analytics”, McGraw Hill, First Edition,2017.
3. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons,2012.

4. GlennJ.Myatt, "MakingSenseofData", JohnWiley&Sons,2007.
5. PeteWarden, "BigDataGlossary", O'Reilly,2011.
6. Jiawei Han, Micheline Kamber, "Data Mining Concepts and Techniques", Second Edition, Elsevier, second edition,2006.
7. Alex Holmes, "Hadoop in Pracice", Manning Publications,2012.
8. OhriA, "RforBusinessAnalytics", Springer,2012.
9. Prabhanjan NarayanacharTattar, "R Statistical Application Development by Example Beginner's Guide", Packtpublishing,2013.
10. **Ebook:** <http://infolab.stanford.edu/~ullman/mmds/book0n.pdf>

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3		3		3		3		3	
CO2	3		3		3		3		3		3	2	2
CO3				3			2			3			1
CO4		3			3		2		2		2	2	
CO5	3	2	2			2		1		1		1	

Semester		L	T	P	C
III	20MCAC304: PYTHON AND R PROGRAMMING	4	0	0	4

Learning Objectives (LO):

LO1	To acquire knowledge in Python programming.
LO2	To acquire knowledge in R programming.
LO3	To develop Python programs with conditionals and loops and data structures.
LO4	To learn how to design and program Python applications.
LO5	To learn how to build and package Python modules for reusability.

Course Outcomes (CO):

CO1	Problem solving and programming capability.
CO2	Construct and execute basic programs in Python.
CO3	Use external libraries and packages with Python.
CO4	Construct and execute basic programs in R using elementary programming techniques.
CO5	Use external R-packages in statistics and graphics.

UNIT-I

Introduction to Python Programming: Python interpreter and interactive mode; values and types variables, expressions, statements, tuple assignment, Order of operations, comments, debugging; modules and functions: function Calls, adding new functions, Definitions and Uses, flow of execution, parameters and arguments, Fruitful functions. Conditionals: Boolean values and operators, conditional (if), alternative (if- else), chained conditional (if-else-if); Iteration: state, while, for, range, break, continue, pass; recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

UNIT-II

Lists, Tuples, Dictionaries: Lists: Traversing a List, list operations, list slices, list methods, Map, Filter and Reduce, list loop, mutability, aliasing, cloning lists, list parameters; Dictionaries: operations and methods; advanced list processing - list comprehension; Tuples: tuple assignment, tuple as return value.

UNIT-III

Files, Modules, Packages: Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages: PANDAS, NUMPY, SCIKIT-LEARN;

UNIT-IV

Introduction to R Programming: Introduction and Preliminaries, numbers and vectors, Objects, their modes and attributes, Ordered and unordered factors, Arrays and matrices, Lists and data frames, Grouping, loops and conditional execution, functions.

UNIT-V

Statistical Models, Graphical Procedures, Packages: Statistical models: Defining statistical models; formulae, Linear models, Generic functions for extracting model information, Analysis of variance and model comparison, Updating fitted models, Generalized linear models, Nonlinear least squares and maximum likelihood models; Graphical procedures: High-level and low-level plotting commands, graphics parameters and list, Dynamic graphics. Packages: Standard packages, Contributed packages and CRAN, Namespaces.

Current Streams of thought: Recent trends in Python and R Programming: Python-based web application frameworks and Data Analytics in R programming.

Text Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff O'Reilly Publishers,2016.
2. Guido van Rossum and Fred L. Drake Jr,-An Introduction to Python – Revised and updatedforPython3.2,Network Theory Ltd.,2011.
3. William N. Venables, David M. Smith, An Introduction to R: A Programming Environment for Data Analysis and Graphics, 2nd edition, Network Theory Ltd,2009.
4. John V Guttag,-Introduction to Computation and Programming Using Python“, Revised and expanded Edition, MIT Press,2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero,-Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

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1. Dr.M.Suresh Anand, Dr.R.Jothikumar, Dr.N.Vadivelan ,“Python Programming” First Edition Notion press,2020
2. Sandip Rakshit, “R PROGRAMMING FOR BEGINNERS”, McGraw Hill, First Edition, 2017
3. Ebook:<http://marvin.cs.uidaho.edu/Teaching/CS515/pythonTutorial.pdf>

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3		3		3		3	3	3	
CO2			3		3				3			2	2
CO3		3		2			3			2	2		1
CO4	3				3		2		2			1	
CO5		3	2	3		3		2		2	1		

Semester	20MCAC305: Practical – V	L	T	P	C
III	Mobile Application Development Lab	0	0	4	2

Learning Objectives (LO):

LO1	To introduce Android platform and its architecture.
LO2	To learn activity creation and Android UI designing.
LO3	To be familiarized with Intent, Broadcast receivers and Internet services.
LO4	To work with SQLite Database and content providers.
LO5	To integrate multimedia, camera and Location based services in Android Application.

Course Outcomes (CO):

CO1	Understand Android platform, Architecture and features.
CO2	Design User Interface and develop activity for Android App.
CO3	Use Intent, Broadcast receivers and Internet services in Android App.
CO4	Design and implement Database Application and Content providers.
CO5	Use multimedia, and Location based services in Android App.

List of Exercises

1. Develop an application that uses GUI components, Font and Colors.
2. Implement an android application that demonstrates the use of Button, Text view & Edit text.
3. Implement an android application that demonstrates the use of Radio button, Radio group and Checkbox.
4. Develop a native calculator application.
5. Implement an android application that demonstrates the use of Intents.
6. Develop an application that uses Layout Managers and Event Listeners.
7. Develop a native application that uses GPS location information.
8. Develop an application that makes use of database.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.

Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3		3		3		3	3	3	
CO2			3		3				2			2	2
CO3		3		2			2			2	2		1
CO4	3				3		3		3			1	
CO5		3	3	2		3		2		2	1		

Semester	20MCAC306: Practical – VI	L	T	P	C
III		Data Analytics Python and R Programming Lab	0	0	4

Learning Objectives (LO):

LO1	To understand and be able to use the basic programming principles such as datatypes,variable,conditionals,loops,array,recursionandfunctioncalls.
LO2	To learn how to use basic mathematical problems are evaluated and be able to manipulate text files and file operations.
LO3	To understand the process and will acquire skills necessary to effectively attempt a programming problem and implement it with a specific programming language - Python.

Course Outcomes (CO):

CO1	Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python.
CO2	Express different Decision Making statements and Functions in R and Python.
CO3	Interpret Object oriented programming in Python.
CO4	Understand and summarize different File handling operations in R.
CO5	Design and develop Client Server network applications using Python and R.

List of Exercises

1. Python Program to check if a Number is Positive, Negative or Zero.
2. Python program to check prime numbers.
3. Python Program to check Armstrong Number.
4. Python Program to Find Hash of File.
5. Python Program to Root search.
6. R Program to Check if a Number is Odd or Even.
7. R Program to Find the Factors of a Number.
8. R Program to Convert Decimal into Binary using Recursion.
9. R Program to find Fibonacci Sequence Using Recursion.
10. R program to find the Factorial of a Number Using Recursion.

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3		3		3		3	3		
CO2			3	3	3				3			3	2
CO3	3	2					3				2		1
CO4	3				3		2		2	2		2	
CO5			3			3		2	2		1		1

DEPARTMENT ELECTIVES

Semester	20MCAE206: COMPILER DESIGN	L	T	P	C
II		3	0	0	3

Learning Objectives (LO):

LO1	To introduce the major concept areas of language translation and compiler design.
LO2	To enrich the knowledge in various phases of compiler and its use, code optimization techniques, machine code generation, and use of symbol table.
LO3	To extend the knowledge of error recovery, code generation, and code optimization.
LO4	To extend the knowledge of parser by parsing LL parser and LR parser.
LO5	To provide practical programming skills necessary for constructing a compiler.

Course Outcomes (CO):

CO1	To apply the knowledge of Lex tool & YACC tool to develop a scanner & parser.
CO2	To design & conduct experiments for Intermediate Code Generation in compiler.
CO3	To design & implement a software system for back end of the compiler.
CO4	To learn the new code optimization techniques to improve the performance of a program in terms of speed & space.
CO5	To acquire the knowledge of modern compiler & its features.

Unit-I

Introduction To Compilers: Translators-Compilation and Interpretation- The phases of Compiler-Errors encountered in different phases-The grouping of phases- Compiler construction tools-A simple one-pass compiler – Language design-Programming language grammars-Derivation-Reduction and Ambiguity.

Unit-II

Lexical Analysis: Need and role of lexical analyzer-Input Buffering-Lexical errors-Expressing tokens by regular expression-Finite Automata-Converting regular expression to NFA-Converting NFA to DFA-Minimization of DFA-Language for specifying lexical analyzers-LEX-Design of lexical analyzer for a sample language.

Unit-III

Syntax Analysis: Need and role of the parser-Context Free Grammars-Top Down parsing-Recursive Parsing-Problems- Recursive Descent parser- Predictive Parser – LL(1)Parser-Bottom up parsers-shift reduce parser-operator precedence parsers-LR parser-LR(0)item-Construction of SLR Parsing table-CLR parser-LALR Parser. Error handling and recovery in syntax analyzer-YACC-Design of a syntax analyzer for a sample language.

Unit-IV

Syntax Directed Translation: Syntax-directed definitions-Construction of syntax trees-Bottom-up evaluation, L-attributed definitions-Top down translation, Recursive Evaluator Method, Comparison of Translation Methods. Syntax directed translation for declaration statements, assignment statements, Boolean expression, control flow statements, procedure calls.

Unit-V

Run-Time Environment: Source language issues-Storage organization-Storage allocation-access to non local names-parameter passing-Symbol tables.

Code Optimization and Code Generation: Principal sources of Optimization-Optimization of basic blocks-Global Optimization-Global dataflow analysis-Efficient data flow algorithms-Issues in design of a code generator-A simple code generator algorithm.

Current Streams of thought:Advanced Code Generation - Next Use Information - Register Allocation and Assignment - Code Optimization during Code Generation.

Text Book:

1. AlfredV. Aho, Ravi Sethi and Jeffrey D Ullman, (2013)," *Compilers-Principles, Techniques and Tools*", Pearson Education, NewDelhi, Second edition.

References:

1. Peter Linz, (2012), "*An Introduction to formal languages and automata*", Fifth Edition.
2. Keith Cooper and Linda Torczon, (2011)," *Engineering a Compiler* ", Second Edition, Morgan Kauffmann.
3. Sudha Sadasivam G, (2008), "*Compiler Design*", Scitech Publications (India) Private Limited, Chennai.
4. Dhamdhare DM, (1997)," *Compiler Construction Principles & Practice*", Macmillan India Limited, NewDelhi, Second Edition.
5. JeanPaul Tremblay and Paul G Serenson, (1985), "*The Theory & Practice of Compiler Writing*", McGraw Hill Publishing Company, NewDelhi.
6. Ebook:[http://ce.sharif.edu/courses/94-95/1/ce414-2/resources/root/Text%20Books/Compiler%20Design/Alfred%20V.%20Aho,%20Monica%20S.%20Lam,%20Ravi%20Sethi,%20Jeffrey%20D.%20Ullman-Compilers%20-%20Principles,%20Techniques,%20and%20Tools-Pearson%20Addison%20Wesley%20\(2006\).pdf](http://ce.sharif.edu/courses/94-95/1/ce414-2/resources/root/Text%20Books/Compiler%20Design/Alfred%20V.%20Aho,%20Monica%20S.%20Lam,%20Ravi%20Sethi,%20Jeffrey%20D.%20Ullman-Compilers%20-%20Principles,%20Techniques,%20and%20Tools-Pearson%20Addison%20Wesley%20(2006).pdf)

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3		3		3			3	3	
CO2	3		3		3			2	3		2	2	2
CO3				3			2			3			1
CO4	3		3		2				3			2	
CO5			3			3		2		2		1	

Semester	20MCAE207: DATA MINING TECHNIQUES	L	T	P	C
II		3	0	0	3

Learning Objectives (LO):

LO1	To introduce concepts of data mining techniques.
LO2	To understand its applications in knowledge extraction from databases.
LO3	To develop skills of using recent data mining software for solving practical problems.
LO4	To understand preprocessing operations on data.
LO5	To understand data interpretation, transformation and reduction techniques.

Course Outcomes (CO):

CO1	Explain the concepts in data mining and KDD, recognizing issues in Data Mining.
CO2	Practice the preprocessing operations of Data.
CO3	Define the methodologies in Data interpretation, transformation and reduction.
CO4	Perform Association Rule Mining, Classify and Cluster the data sets into groups.
CO5	Implement star schema through ETL tools.

Unit-I

Data mining – Motivation – Importance - DM Vs KDD - DM Architecture - Data Types – DM Tasks –DM System Classification - Primitives of DM - Data Mining Query Language - DM Metrics - DM Applications - DM Issues – Social Implications of DM.

Unit-II

Data Preprocessing: Summarization - Data cleaning - Data Integration and Transformation - Data Reduction - Discretization and Concept Hierarchy Generation.

Unit-III

Mining Frequent Patterns – Frequent Item set Mining Methods. Classification: Classification by Decision Tree Induction – Bayesian Classification – Rule based Classification-Prediction–Accuracy and Error Measures.

Unit-IV

Cluster Analysis – Types of Data in Cluster Analysis – Categorization of clustering Methods – Partition Methods - Outlier Analysis – Mining Data Streams – Social Network Analysis – Mining the World Wide Web.

Unit-V

Data Warehousing: OLTP Vs OLAP - Multidimensional Data Model -DW Architecture Efficient Processing of OLAP queries - Metadata repository – DWH Implementation – OLAM.

Text book:

1. Jiawei Han, Michelineamber, (2012), "*Data Mining: Concepts and Techniques*", 3rd Edition, Elsevier India Private Limited.

References:

1. Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education, 1st Edition, 2020.
2. Pang Ning Tan and Vipin Kumar and Michael Steinbach, Pearson "Introduction To Data Mining" 2nd Edition, Pearson, October 2019.
3. K.P.Soman, Shyam Diwakar, V.Ajay, "Insight into Data Mining Theory & Practice, Prentice Hall India, 2012.
4. G.H.Gupta, "Introduction to Data Mining with Case Studies", 2nd Edition, PHI.
5. Ralph Kimball, Margy Ross "The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling", 3rd Edition, Wiley, July 2013.
6. Ebook: <https://pyxtmkbwlj.pcdn4.top/dl2.php?id=24225401&h=f6c049283bff9b1fb50f6b416b1427a4&u=cache&ext=pdf&n=Data%20mining>

Outcome Mapping

CO /PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3				3	3			3	
CO2			3		3		3			2			3
CO3				3		3			2		3		2
CO4	3	2			3		2			3	2	2	
CO5		3	2			3		1					1

Semester	20MCAE208: ARTIFICIAL INTELLIGENCE	L	T	P	C
II		3	0	0	3

Learning Objectives (LO):

LO1	To obtain a thorough knowledge of various knowledge representation schemes.
LO2	To have an overview of various AI applications.
LO3	To study about various heuristic and game search algorithms.
LO4	To know about various Expert System tools and applications.
LO5	An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.

Course Outcomes (CO):

CO1	Know how to build simple knowledge-based systems.
CO2	Apply knowledge representation and machine learning techniques to solve real- world problems.
CO3	Apply Artificial Intelligence techniques to solve real-world problems.
CO4	Ability to carry out independent (or in a small group) research and communicate it effectively in a seminar setting.
CO5	Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.

Unit-I

Introduction: Introduction – AI Problems and techniques-Problem spaces and searches -Search algorithms: Blind search-heuristic search-algorithmic search – State space representation of problems-Game playing: Two player games.

Unit-II

Knowledge Representation Issues: Procedural Knowledge-Declarative Knowledge-Logic: Using FOL – Unification-Resolution – Semantic nets – Frames-Inheritance-Scripts –Representing knowledge using rules- Rule based deduction systems.

Unit-III

Reasoning Uncertainty: Introduction to uncertain knowledge –review of probability theory–Bayes’ Theorem- Non monotonic reasoning. Planning and Learning: Planning-

Introduction-Partial order planning algorithm- Learning from examples-Discovery as learning–Learning by analogy–Explanation based learning.

Unit-IV

Fuzzy Sets: Definitions-Basic set – theoretic operations for fuzzy sets. Fuzzy measures and measures of fuzziness – fuzzy relations on sets and fuzzy sets – fuzzy functions on fuzzy sets-Fuzzy logic.

Unit-V

Applications: Principles of Natural Language Processing- Expert systems- Knowledge acquisition concepts- Introduction to Agents.

Text Books:

1. Elain Richard Kevin Knight, (1995), “*Artificial Intelligence*”, Tata McGraw– Hill Publishing Company Limited, New Delhi.
2. Stuart Russel and Peter Norvig, (2015), “*Artificial Intelligence–A Modern Approach*”, Third Edition, Pearson.
3. Patrick Henry Winston, (2000), “*Artificial Intelligence*”, Addison Wesley, Third edition.
4. Zimmerman H.J,“*Fuzzy Set Theory and its Applications*”, Allied Publishers Ltd., Second Edition.

Reference:

1. NilsJ.Nilsson, (2000), “*Principles of Artificial Intelligence*”, Narosa Publishing House.
2. **Ebook:**[https://raw.githubusercontent.com/yanshengjia/ml-road/47cadb02faa756f85fd2f058e31221cc8223b97a/resources/Artificial%20Intelligence%20-%20A%20Modern%20Approach%20\(3rd%20Edition\).pdf](https://raw.githubusercontent.com/yanshengjia/ml-road/47cadb02faa756f85fd2f058e31221cc8223b97a/resources/Artificial%20Intelligence%20-%20A%20Modern%20Approach%20(3rd%20Edition).pdf)

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3			3		3		3		3		3	
CO2	3				3	3			3		3		3
CO3		2	3	2			3			2			2
CO4	3		2		3		2		2			1	
CO5		3	2			3		2		1	1		

Semester	20MCAE209: E-COMMERCE	L	T	P	C
II		3	0	0	3

Learning Objective (LO):

LO1	This objective of this study is to use of e-commerce domain companies and consumers.
LO2	This study is conducted to evaluate the perception and attentive and secure recommending payment method based on analysis and study.
LO3	The results are expected to contribute significantly towards the current thinking, security regarding e-commerce online transactions.
LO4	The main objectives are involved an attempt to determine the current awareness and alert in the particular area in ecommerce like security issues, Screening, Recommended payment method, Internal order cancellations.
LO5	This study provides best solution to e-commerce domain companies/industries and alert and awareness to common man. For safe and secure transaction consumers and e-commerce domain companies should follow some basic rules and regulations with latest technologies.

Course Outcomes (CO):

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

CO1	Recognize the impact of Information and Communication technologies, especially of the Internet in business operations.
CO2	Recognize the fundamental principles of e-Business and e-Commerce.
CO3	Distinguish the role of Management in the context of e-Business and e-Commerce.
CO4	Explain the added value, risks and barriers in the adoption of e-Business and e-Commerce.
CO5	Examine applications of e-Commerce in relation to the applied.

Unit-I

Introduction to E-Commerce: Benefits-Impacts-Classification and Application of E-Commerce-Business Model-Architectural Frame Work.

Unit-II

Network Infrastructure: Local Area Network-Ethernet-Wide Area Network-Internet- TCP/IP Reference Model-Domain Name System-Internet Industry structure- Information Distribution and Messaging: FTP Application-Electronic Mail-World Wide Web Server - HTTP -Web Server Implementations

Unit-III

Information Publishing Technology: Information Publishing–Web Browsers–HTMLCGI-Multimedia Content-Other Multimedia Objects–VRML-Securing the Business on Internet- Why Information on Internet is Vulnerable?-Security Policy-Procedures and Practices–Site Security-Protecting the Network-Firewalls- Securing the Web Service

Unit-IV

Securing Network Transaction-Electronic Payment Systems: Introduction –Online Payment Systems–Pre–paid Electronic Payment System-Post–paid Electronic Payment System–Requirement Metrics of a Payment System

Unit-V

Search Engines and Directory Services: Information Directories –Search Engines– Internet Advertising–Agents in Electronic Commerce: Needs and Types of Agents– Agent Technologies – Agents Standards and Protocols–Agents Applications-Case Study.

Current Streams of thought: Systematic approach to build an E-Commerce, Developing a mobile Website and Mobile App.

Text Book:

1. Bharat Bhasker, (2003), “*Electronic Commerce Framework Technologies and Applications*”, Tata McGraw Hill Publication.

References:

1. Ravi Kalakota and Andrew B. Whinston, Eleventh Impression, (2011), *Frontiers of Electronic Commerce*, Pearson Education Inc., Delhi.
2. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, (2001), *Concepts in Enterprise Resource Planning*, Thomson Learning.
3. Ravi Kalakota and Andrew B Whinston, (2009), *Frontiers of Electronic Commerce*, Pearson Education Asia.
4. Marilyn Greenstein and Todd M Feinman, (2000), *Electronic commerce: Security, Risk Management and Control*, Tata McGraw Hill.
5. <https://www.pdfdrive.com/beginning-django-e-commerce-e24340189.html>

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3				3		3	3		
CO2			3		3		3					2	3
CO3		3		3		2		2			1		1
CO4	3	2			3	2			3			1	
CO5		3	2				3		3	2			

Semester	20MCAE307: NETWORK SECURITY	L	T	P	C
III		3	0	0	3

Learning Objectives (LO):

LO1	To understand the fundamentals of Cryptography.
LO2	To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
LO3	To understand the various key distribution and management schemes.
LO4	To understand how to deploy encryption techniques to secure data in transit across data Networks.
LO5	To design security applications in the field of Information technology

Course Outcomes(CO):

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

CO1	Analyze the vulnerabilities in any computing system.
CO2	Able to design a security solution.
CO3	Identify the security issues in the network and resolve it.
CO4	Evaluate security mechanisms using rigorous approaches, including theoretical.
CO5	Compare and Contrast different IEEE standards and electronic mail security

Unit-I

Symmetric Ciphers: Classical Encryption Techniques – Block Ciphers and the Data Encryption Standard – Finite Field – Advanced Encryption Standard– Symmetric Ciphers–Confidentiality using Symmetric Encryption.

Unit-II

Public Key Encryption and Hash Functions: Introduction to Number Theory–Public Key Cryptography and RSA – Key Management – other Public Key Cryptosystem– Message Authentication and Hash Functions – Hash and MAC Algorithms–Digital Signatures and Authentication Protocols.

Unit-III

Program Security: Secure Programs – Non Malicious Program Errors – Viruses and Others Malicious Code–Targeted Malicious Code–Control Against Threats.

Unit-IV

Database Security: Introduction to Database – Security Requirement – Reliability and Integrity – Sensitive Data–Inference–Multilevel Databases- Multilevel Security

Unit-V

Network Security: Networks concepts – Threats in Networks – Network Security Controls – Firewalls –Electronic Mail Security– IP Security – Web Security.

Current Streams of thought: Network Management: Network Management Goals and Functions, Network Management Architecture, Simple Network Management Protocol(SNMP), Network Management Tools, Network Management Applications.

Text Books:

1. Charles B. Pfleeger -Shari Lawrence Pfleeger, (2003), *Security in Computing*, Pearson Education, Third Edition.
2. William Stallings,(2003), *Cryptography and Network Security – Principles and Practices*, Pearson Education, Fourth Edition.

References:

1. Behrouz A. Forouzan, Debdeep Mukhopadhyay, (2011), *Cryptography and Network Security* -Tata McGraw-Hill Education Pvt. Ltd., 2ndEdition.
2. Manuel Mogollon, (2008), *Cryptography Security Services Mechanisms Applications*, CyberTech Publishing.
3. <https://www.pdfdrive.com/network-books.html>

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3			3		3	3	3			3		3
CO2	3		3		3				3		2		2
CO3	3		2		3		2			2			1
CO4		3		3	2				2			2	
CO5	3	2	3			2		1		3		1	

Semester	20MCAE308: INTERNET OF THINGS	L	T	P	C
III		3	0	0	3

Learning Objectives (LO):

LO1	To understand the fundamentals of Internet of Things
LO2	To learn about the basics of IoT protocols
LO3	To build a small low cost embedded system using IoT development boards such as Arduino, Raspberry Pi, etc.
LO4	To apply the concept of internet of things in the real world scenario.
LO5	To understand real world IoT design constraints and industrial automation in IoT.

Course Outcomes (CO):

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

CO1	Understand the fundamentals of Internet of Things and interpret the vision of IoT from a global context.
CO2	Compare and contrast the use of devices, gateways and data management in IoT using IoT protocols.
CO3	Implement state of the art architecture in IoT.
CO4	Determine the market perspective of IoT.
CO5	Illustrate the application of IoT in industrial automation and identify real world design constraints.

Unit I

Introduction to IoT: Introduction - Definition & Characteristics of IoT - Physical Design of IoT - Things in IoT - IoT Protocols - Logical Design of IoT - IoT Functional blocks - IoT Communication Models - IoT Communication APIs - IoT Enabling Technologies - Wireless Sensor Networks - Cloud Computing - Big Data Analysis - Communication protocols - Embedded Systems - IoT Levels & Deployment Templates. IoT and M2M: Introduction -M2M-Difference between IoT and M2M-SDN and NFV for IoT. Ubiquitous IoT Applications: A Panoramic View of IoT Applications-Important Vertical IoT.

Unit II

Four pillars of IoT: The Horizontal, Verticals, and Four Pillars, M2M, RFID, WSN, SCADA. The DNA of IoT - Device, Connect and Manage - Device: Things That Talk - Connect: Via Pervasive Networks- Manage: To Create New Business Value.

Unit III

Middleware and IoT: An Overview of Middleware - Communication Middleware for IoT. Protocol standardization of IoT: Web of Things versus Internet of Things - IoT Protocol Standardization Efforts-Unified Data Standards: A Challenging Task.

Unit IV

Architecture Standardization for WoT: Platform Middleware for WoT - Unified Multitier WoT Architecture - WoT Portals and Business Intelligence - Challenges of IoT Information Security. The Cloud of Things :Cloud Middleware - NIST's SPI Architecture and Cloud Standards - Cloud Providers and System. The Cloud of Things: The Internet of Things and Cloud Computing, Mobile Cloud Computing. MAI versus XaaS: The Long Tail and the Big Switch - The Cloud of Things Architecture.

Unit V

Thinking about Prototyping: Prototypes and Production - Open Source versus Closed Source. Prototyping Embedded devices : Electronics - Embedded Computing Basics - Arduino, Raspberry pi - Beagle Bone Black - Electric Imp - Other Notable Platforms.

Current Streams of thought: **IoT enabled businesses, Industrial IoT, IoT data and AI, IoT and Smart homes.**

Text Books

1. Arshdeep Bahga and Vijay Madisetti, (2014), *Internet of Things: A Hands of Approach*, Vijay Madisetti publication; First edition.
2. Honba Zhou, (2012), *The Internet of things in the Cloud: A Middleware Perspective*, CRC Press, First Edition.
3. Adrian McEwen and Hakim Cassimally, (2014), *Designing The Internet things*, John Wiley and Sons, First Edition.

Reference Books

1. Marco Schwartz, (2017), *Esp8266 Internet of Things Cookbook*, Packt Publications.
2. Marco Schwartz, (2016), *Internet of Things with ESP8266*, Packt Publications.

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3			3		3		3		3		3	
CO2		3	2		2				3		3		3
CO3	3			2			3			3			
CO4	3				3			2	2	2	2		
CO5			3			2	2					1	1

Semester	20MCAE309: MACHINE LEARNING	L	T	P	C
III		3	0	0	3

Learning Objectives (LO):

LO1	To introduce the basic concepts and techniques of machine learning as well as the dissimilarity with conventional programming.
LO2	To understand and apply appropriate machine learning algorithms to different real-world applications according to the need.
LO3	To develop skills in solving classification, pattern recognition, optimization and decision problems.
LO4	To gain experience of doing independent study and research.

Course Outcomes (CO):

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

CO1	Understand the fundamental concepts and techniques in machine learning.
CO2	Have an understanding of the strengths and weaknesses of many popular machine learning algorithms and their significance.
CO3	To choose appropriate machine learning algorithms to solve specific applications.
CO4	Be able to design and implement various machine learning algorithms in a range of real-world applications.

Unit I – Introduction- Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

Unit II – Neural Networks and Genetic Algorithms: Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

Unit III – Bayesian and Computational Learning: Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

Unit IV – Instant based Learning: K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

Unit V: Advanced Learning: Learning Sets of Rules – Sequential Covering Algorithm– Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories– ExplanationBaseLearning–FOCLAlgorithm–ReinforcementLearning Task – Q-Learning – Temporal Difference Learning.

Current Streams of thought: Application of Machine learning algorithms in various domains like data mining, text/character recognition, text/image mining, object recognition, robotics.

Text Book

1. Tom M. Mitchell, (2017) —Machine Learning, McGraw-Hill Education Private Limited, First (Indian) edition, India.

References

1. Ian Good fellow, Yoshua Bengio, Aaron Courville, Francis Bach, (2017), *Deep Learning*, The MIT Press, Illustrated edition.
2. Bishop Christopher M,(2010), *Pattern Recognition and Machine Learning*, Springer publications, Illustrated edition.
3. Ethem Alpaydin, (2014), *Introduction to Machine Learning(Adaptive Computation and Machine Learning)*, The MIT Press, Third edition.
4. Stephen Marsland, (2015), *Machine Learning: An Algorithmic Perspective*, CRC Press, Second edition.
5. Michael Affenzeller, Stephan Winkler, Stefan Wagner, Andreas Beham, (2009) *Genetic Algorithms and Genetic Programming - Modern Concepts and Practical Applications*, CRC Press, First edition.

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3				3		3	3		
CO2			3		3		3					3	2
CO3		3		3		3		2			2		1
CO4	3	2			3	2			3			1	

Semester	20MCAE310: OPEN SOURCE TECHNOLOGIES	L	T	P	C
III		3	0	0	3

Learning Objectives (LO):

LO1	To learn the concepts of dynamic web content.
LO2	To learn implementation of web development server
LO3	To understand the basics of syntax, arrays, functions and objects in PHP programming language
LO4	To know the structure of MySQL database and access using PHP.
LO5	Testing and debug a PHP applications.

Course Outcomes (CO):

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

CO1	Apply dynamic web content concept into real time web applications.
CO2	Develop web server side programming.
CO3	How to receive and process form submission data.
CO4	Design database for real time applications.
CO5	Use PHP built-in functions and creating custom functions

UNIT-I

Introduction to Dynamic Web Content: HTTP and HTML: Berners-Lee's Basics - The Request/Response Procedure - The Benefits of PHP, MySQL, JavaScript, CSS, and HTML5 - Using PHP - Using MySQL - Using JavaScript - Using CSS - And Then There's HTML5 - The Apache Web Server - About Open Source. Setting Up a Development Server: WAMP, MAMP, or LAMP - Installing XAMPP on Windows - Testing the Installation - Installing XAMPP on Mac OS X - Accessing the Document Root - Installing a - LAMP on Linux - Working Remotely - Logging In - Using FTP - Using a Program Editor - Using an IDE.

UNIT-II

Introduction to PHP: - Incorporating PHP Within HTML - The Structure of PHP - Using Comments -Basic Syntax - Variables – Operators - Variable Assignment - Multiple-Line Commands -Variable Typing - Constants - Predefined Constants – The Difference Between the echo and print Commands - Functions - Variable Scope. Expressions and Control Flow in PHP:

Expressions - Operators – Conditionals – Looping - Implicit and Explicit Casting - PHP Dynamic Linking - Dynamic Linking in Action

UNIT-III

PHP Functions and Objects: PHP Functions - Including and Requiring Files - PHP Version Compatibility - PHP Objects. PHP Arrays: Basic Access – The for each...as Loop - Multidimensional Arrays - Using Array Functions.

UNIT-IV

Practical PHP: Using printf - Date and Time Functions - File Handling - System Calls- XHTML - HTML5 Introduction to MySQL: MySQL Basics - Summary of Database Terms - Accessing MySQL via the Command Line – Indexes - MySQL Functions - Accessing MySQL via php MyAdmin.

UNIT-V

Accessing MySQL Using PHP: Querying a MySQL Database with PHP – Example - Practical MySQL - Preventing Hacking Attempts - Using mysqli procedurally Form Handling: Building Forms - Retrieving Submitted Data. Cookies, Sessions, and Authentication: Cookies in PHP - HTTP Authentication - Sessions.

Current Streams of thought: Types of **Open source solutions like Open source customer relationship management software, project management, video games, Block chain and** Open source projects like Apache Cassandra, Tensor Flow, Renovate, Kubernetes, Ansibl, Geany, Django, etc.

Text book

1. Robin Nixon, (2018), *Learning PHP, MySQL & JavaScript with jQuery, CSS & HTML5*, O'Reilly Media Publications, Fifth edition.

References:

1. Laura Thomson, Luke Welling, (2016), *PHP and MySQL Web Development*, Addison-Wesley, Fifth Edition.
2. Joel Murach, Ray Harris, (2014), *PHP and MySQL*, Mike Murach& Associates Publications, second Edition.
3. Michael K.Glass Timothy Boronczyk, Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, (2009), *Beginning PHP6, Apache, and MySQL Web Development*, Wiley publishing.
4. Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K. Glass, (2005), *Beginning PHP5, Apache, and MySQL Web Development*, Wiley publishing.
5. Tim Converse, Joyce Park, Clark Morgan, (2009), *PHP6 and MySQL Bible*, Wiley Publishing.

Outcome Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3		3				3		3	3		
CO2			3		3		3					2	2
CO3		3		3		3		2			3		1
CO4	3	2			2	3			2		1	1	
CO5		3	2				2		3	3			