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Machavaram, Vijayawada, Krishna District, AP-520 004

Board of Studies Meeting
(2022-23)
M. Sc Computer Science

Department of Computer Science

1601 : M.Sc Computer Science

SRR & CVR Government Degree & PG College

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Report on 3rd Board of Studies Meeting for PG Programmes of the Department for AY-2022-23

The 3rd meeting of the Board of Studies in PG Programmes of Computer Science was convened on 16th September 2022 at 03: 00 P.M. in the Department of Computer Science with Ms. Lakshmi Sarvani Videla Lecturer in charge PG Computer Science, SRR & CVR Govt. Degree College (Autonomous), Vijayawada – 520004 for the Academic year 2022-23. The composition of Board of Studies are as follows:

Composition of the BoS of M.Sc Computer Science

S. No	Category	Designation in BoS	Name of the person
1.	Chairman	The Board of Studies for M.Sc Programme	**Ms. Lakshmi Sarvani Videla** PG in-charge of Computer Science
2.	University Representative	Member	**Dr. Y. K. Sundara Krishna** Professor (Senior Scale), Department of Computer Science, Krishna University, Machilipatnam.
4.	In-Charge of the department	Incharge	**Sri. G. Vijayadeep** Lecturer-in-charge
4.	Subject Expert	Member	**Dr. P. Bharathi Devi** Computer Science Lecturer, Department of Computer Science, SKBRGDC, Macherla Guntur District
5.	Subject Expert	Member	**Mr. A.S.A.L.G.G Gupta** Assistant Professor, Department of Computer Science, Koneru Lakshmaiah Education Foundation, Vaddeswaram, Guntur District.
6.	Industry Representative	Member	**Mr. V. Uday Kumar** Associate-Projects, Cognizant India Pvt. Ltd, Hyderabad, Telangana

7.	Faculty of the Department	Member	**Sri. Ch. Bharat Kumar** Lecturer in Computer Science
8.	Faculty of the Departmen t	Member	**Ms. J. Sarada Lakshmi** Lecturer in Computer Science
9.	Faculty of the Department	Member	**Sri. D. P. V. Phani Raja Kumar** Guest Lecturer in Computer Science
10.	Alumni	Member	**Ms. Meenakshi Potnuru** Associate Software Engineer, AccentureIndia Pvt. Ltd Hyderabad, Telangana

PREFACE

SRR & CVR Govt. Degree College (Autonomous), Vijayawada, is one of the prestigious educational institutions, located in a historically important place like Vijayawada in Krishna District, Andhra Pradesh. Vijayawada is a place of historical and cultural significance and importance. In the same way SRR & CVR Govt. Degree College, has also acquired its significance and prominence in and around Vijayawada by molding the lives of many students to become great personalities. This college is named after late Sri Raja Rangayyappa Rao and late Sri Chunduru Venkata Reddy, who have been great and noble donors of the city Vijayawada, by whose generosity the college has reached and attained such and this elevated status by way of shaping the lives of many generations of students making them worthy citizens of the country. This college has acquired great standards academically by the contributions of great teachers as well because in the history of any educational institution its teachers play a vital role. The college was established in 1937. It offers 27 undergraduate and 10 post graduate academic programmers with 86 regular faculty members. The college has total strength of around 2,800 students. which includes 1550 boys and 650 girl students at present. The institution was accredited with grade B+ with C.G.P.A 2.6 during March 2017 by NAAC and got ISO 9001: 2015 certificate during 2019. The college was ranked by NIRF in 101-150 band at NIRF-2020 & 151-200 band in NIRF 2019.

The Department of Computer Science has been successfully spreading its branches since 1998. Initially, the Department has offered courses like B.Sc. (Computer Science, Mathematics & Physics), B.Sc.(Computer Science, Statistics & Mathematics) B.Sc.(Computer Science, Electronics & Mathematics) and B.Sc(Computer Science & Electronic Technology). In 2001 M.Sc(Computer Science) Course Introduced. But keeping in view the research output and industry requirements the Department has stemmed out of new courses like B.Sc.(Computer Science, Chemistry and Maths) was started in 2018 and B.Sc. (Data Science) in 2020.

A good number of PG students are being placed through campus placements in major IT, ITES, and core MNCs like Infosys, IBM, Tech Mahindra, Accenture, Cognizant and so on with good packages of more than 5 to 8 lakhs per annum. Global excellence and local relevance in research, teaching and technology development is the main motto of the department, to achieve this, the students are encouraged to carry out innovative research in their relevant fields and deliver quality services to match the needs of the technical edification, industry and society

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Department of Computer Science

3rd BOARD OF STUDIES MEETING FOR M.Sc PROGRAMME
AGENDA
ACADEMIC YEAR: 2022-23

The members, Board of Studies, Department of Computer Science will discuss the syllabus in CBCS pattern, additional inputs, model question papers, Co-curricular activities, list of examiners and blueprints. The agenda includes:

1. Proposal for Implementation of Course Structure of M.Sc. Computer Science (Program Code: 1601) as per R22 Regulation with effect from 2022-23.
2. To consider and follow the approved (on 01st december 2022) course structure, syllabus and model question papers for the existing (2021-22 admitted batch) III and IV semesters with minor modifications.
3. To consider and approve to conduct MOOC course in IV semester as additional paper and the marks must not be considered for calculating the percentage.
4. To consider and approve the Student Evaluation Policy and Procedure and split-up of CIA & SEE.
5. To consider and approve the list of Question paper setters and examiners.
6. To consider and approve the Departmental Activities Calendar.
7. To consider and approve the Students Centered Pedagogy Policy to enrich the curriculum.
8. Any other with the permission of the chair.

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Department of Computer Science

3rd BOARD OF STUDIES MEETING FOR M. Sc PROGRAMME CONDUCTED ON 16th SEPTEMBER, 2022

MINUTES

ACADEMIC YEAR: 2022-23

The Minutes of 3rd Board of Studies meeting in M.Sc which was convened on 16th September 2022 at 03.00 P.M. under Chairmanship of Ms. Lakshmi Sarvani V, the In- Charge of the PG department is as follows:

Minutes and Resolutions of Board of Studies Meeting

Agenda 1: **Proposal for Implementation of Course Structure of M.Sc. Computer Science (Program Code: 1601) as per R22 Regulation with effect from 2022-23.**

Proposal: The Chairperson, Smt. Lakshmi Sarvani V, the In- Charge of the PG department welcomed the members of BoS and initiated discussion on agenda points. She proposed 50 credits for the first year M.Sc Programme with programme code of 1601. It is as per R22 Regulation.

Discussion: The University Representative, Dr. Y. K. Sundra Krishna enquired above the changes made in the course titles, credits of courses, and framework of the courses. There are no notable changes in course titles, credits of courses, and framework of the courses.

Resolution 1: It is resolved to approve the Programme Structure of M.Sc Computer Science (Programme Code: 1601) from the Academic year 2022-23 onwards.

Agenda 2: **To consider and follow the approved (on 01st december 2022) course structure, syllabus and model question papers for the existing (2021-22 admitted batch) III and IV semesters with minor modifications.**

Proposal: The proposed syllabi for the courses in Semester III and Semester IV for the existing (2021-22 admitted batch) of M.Sc Computer Science is placed before the participants for approval.

Discussion: Prof. Dr. Y. K. Sundra Krishna, the University Representative, Dr. P. Bharati Devi, the subject expert enquired the level of changes made in courses. The faculty members explained the changes made in the courses and rationality behind the assigning number of teaching hours per each Unit in the courses.

Resolution 2: It is resolved to approve the Programme Structure of M.Sc Computer Science

(Programme Code: 1601) for courses in Semester III & IV under CBCS for the existing (2021-22 admitted batch).

Agenda 3: ***To consider and approve to conduct MOOC course in IV semester as additional paper and the marks must not be considered for calculating the percentage for the existing (2021-22 admitted batch).***

Proposal*:* As MOOC course is evaluated online and the result may not be available before semester end, it is proposed to be considered as additional paper.

Discussion: The University Representative, Dr. Y. K. Sundra Krishna suggested conducting the exam offline in the college. He suggested allowing students to take the course online and evaluation be done offline.

Resolution 3: It is resolved to conduct the external examination for the MOOC subject in line with other regular subjects based on the syllabi of the respective subject provided in the curriculum, the department can conduct midterm examinations.

Agenda 4: ***To consider and approve the Student Evaluation Policy and Procedure and split-up of CIA & SEE.***

Proposal*:* The chairman proposed the evaluation system in each course will be 40 : 60 for Internal Continuous Internal Evaluation (CIA) and Semester End Evaluation (SEE).

Discussion: The members of BoS discussed the merits, demerits, and feasibility for the implementation of (40% CIA & 60% SEE) proportion and split-up of CIA. Faculty members of the department expressed their willingness to frame question papers based on the active verbs used to frame question paper patterns on Blooms Taxonomy.

Resolution 4: It is resolved to approve the Student Evaluation Policy and Procedure and split-up of CIA & SEE.

Agenda 5: To consider and approve the list of Question paper setters and Examiners.

Proposal: The chairman placed the list of Question paper setters and Examiners before the participants for seeking their approval.

Discussion: The Faculty members of the department identified subject experts and prepared the list of Paper setters as well as Examiners for Semester End Examinations.

Resolution 5: It is unanimously resolved to approve the list of Question paper setters and Examiners.

Agenda 6: To consider and approve the Departmental Activities Calendar.

Proposal: The chairman placed the list Departmental Activities for PG for the Academic year 2022-23.

Discussion: The delegates suggested organizing Workshops, Seminars, Field Trips, Guest Extension Lectures, Observation of Important Days and Internships for the Academic Year 2022-23.

Resolution 6: It is unanimously resolved to approve the Departmental Activities Calendar.

Agenda 7: To consider and approve the Students Centered Pedagogy Policy to enrich the curriculum.

Proposal: On par with the vision of National Education Policy 2020, the department proposed to follow study material/ Case study based/mapped teaching pedagogy.

Discussion: At present the faculty members in the department follow Students Centered Pedagogy which include Classroom teaching; students seminars, Blended teaching through moodleCloud, Google classroom, CCE- LMS. In addition to these, the members of the Board of studies brainstormed on the appropriate pedagogical strategies that could be used for effective transaction of Commerce Curriculum. The faculty members are assured to adopt outcome based learning pedagogical matrices. It will be used to review the attainment of goals at each end of each topic/unit in the syllabi.

Resolution 7: It is resolved to adopt the Students Centered Pedagogy Policy to enrich the curriculum.

Agenda 8: Any other with the permission of the chair.

(**Lakshmi Sarvani Videla)**
Chairman, the Board of Studies

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Department of Computer Science

Programme Structure of 1601: M.Sc (Computer Science)
w.e.f Academic Year - 2020-21

Program Outcome:

Students will be able to identify, formulate, and develop solutions to computational challenges. Students will be able to design, implement, and evaluate a computational system to meet desired needs within realistic constraints.

Programme Specific Outcomes (PSOs):

By the end of the Programme, students will be able:

PSO1: Students will be able to analyze complex real-world problems and devise efficient computer-based solutions

PSO2: Students will be able to develop skills to learn new technology

PSO3: Students will be familiar with current research within various fields of Computer Science.

PSO4: Students will be able to initiate and lead projects and be responsible for the work of individuals and groups.

Programme Structure of 1601: M. Sc (Computer Science)

R22 Regulation (With Effect from admitted batch 2022-23)

Course Code	Title of the Course	Instruction Hours per week			Credits	Evaluation		
		L	T	P		CIA MARKS	SEE MARKS	SEE DURATION
SEMESTER – I								
22MCS 101	Data Structures	4	-	-	4	40	60	4 Hrs.
22MCS 102	Programming and Problem-Solving using Python	4	-	-	4	40	60	4 Hrs.
22MCS 103	Computer Networks	4	-	-	4	40	60	4 Hrs.
22MCS 104	Formal Languages and Automata Theory	4	-	-	4	40	60	4 Hrs.
22MCS 105	Personality development through Life Enlightenment Skills	3	-	1	3	40	60	4 Hrs.
22MCSLAB101	Data Structures Lab	-	-	6	3	40	60	6 Hrs.
22MCSLAB102	Programming & Problem Solving using Python Lab	-	-	6	3	40	60	6 Hrs.
Total					**25**	**280**	**420**	32 hours per week
SEMESTER – II								
22MCS201	Design and Analysis of Algorithms	4	-	-	4	40	60	4 Hrs.
22MCS202	Operating Systems	4	-	-	4	40	60	4 Hrs.
22MCS203	Database Management Systems	4	-	-	4	40	60	4 Hrs.
22MCS204	Research Methodology & IPR	3	-	1	3	40	60	4 Hrs.
22MCSDSE201 (OR) 22MCSDSE202 (OR) 22MCSDSE203	Domain Specific Elective Mobile Computing (OR) Software Engineering (OR) Data Warehousing & Data Mining	4	-	-	4	40	60	4 Hrs.
22MCSLAB201	Operating Systems Lab	-	-	6	3	40	60	6 Hrs.
22MCSLAB202	Database Management Systems Lab	-	-	6	3	40	60	6 Hrs
Total					**25**	**280**	**420**	32 hours per week

Programme Structure of 1601: M. Sc (Computer Science)

For the existing (2021-22 admitted batch) III and IV semesters

Course Code	Title of the Course	Instruction Hours per week			Credits	Evaluation		
		L	T	P		CIA MARKS	SEE MARKS	SEE DURATION
SEMESTER – III								
PMCS301	Compiler Design	4	-	-	4	40	60	4 Hrs.
PMCS302	Computer Networks	4	-	-	4	40	60	4 Hrs.
PMCS303	Principles of Programming Languages	4	-	-	4	40	60	4 Hrs.
PMCS 304	Artificial Intelligence	4	-	-	4	40	60	4 Hrs.
POMCS305.1 POMCS305.2 POMCS305.3	Open Elective-II Introduction to data science with R Python3 programming C programming	4	-	-	4	40	60	4 Hrs.
PMCS306	Compiler Design Lab	-	-	8	4	40	60	8 Hrs.
PMCS307	Computer Networks Lab	-	-	8	4	40	60	8 Hrs
Total					**28**	**280**	**420**	36 hrs/week
SEMESTER – IV								
PMCS 401	**MOOCS:** NPTEL/SWAYAM/edX/Coursera/ Stanford Online/Udacity/ Open Classrooms/ Open2Study/ ALISON/ Khan Academy/ NSE- NCFM/IRDA/NISM/ Any course related to M.Sc from the authentic sources with prior permission.	4	-	-	4	40	60	4Hrs.
PMCS402.1 Or PMCS402.2	Elective-I Big DataAnalytics Or MachineLearning	4	-	-	4	40	60	4 Hrs.
PMCS403.1 Or PMCS403.2	Elective-II Cloud computing Or DNA Computing	4	-	-	4	40	60	4 Hrs.
PMCS404	Web Technologies	4	-	-	4	40	60	4 Hrs.
PMCS405	Web Technologies Lab	-	-	4	2	40	60	4 Hrs.
PMCS406	Project	-	-	8	8		200	8 Hrs.
Total					**26**	**200**	500	28 Hrs

Summary of Programme Structure for
1601: M. Sc (Computer Science)
Total credits and Marks

R22 Regulation (With Effect from admitted batch 2022-23)

S.No	Semester	Credits	Marks
1	I Semester	25	700
2	II Semester	25	700
Total		**50**	**1400**

Signatures of members

S.No	Name of the person	Designation in BoS	Signature
1.	**Ms. Lakshmi Sarvani Videla** In-charge of PG Computer Science	Chairman of BoS	
2.	**Dr. Y. K. Sundara Krishna** Professor (Senior Scale), Department of Computer Science, Krishna University, Machilipatnam.	University Representative	
3.	**Sri. G. Vijayadeep** Lecturer-in-charge	Incharge	
4.	**Dr. P. Bharathi Devi** Computer Science Lecturer, Department of Computer Science, SKBR GDC, Macherla Guntur District	Subject Expect	
5.	**Mr. A.S.A.L.G.G Gupta** Assistant Professor, Department of Computer Science, Koneru Lakshmaiah Education Foundation, Vaddeswaram, Guntur District.	Subject Expect	
6.	**Mr. V. Uday Kumar** Associate-Projects, Cognizant India Pvt. Ltd, Hyderabad,Telangana	Industry Representative	
7.	**Sri. Ch. Bharat Kumar** Lecturer in Computer Science	Member	
8.	**Ms. J. Sarada Lakshmi** Lecturer in Computer Science	Member	
9.	**Sri. D. P. V. Phani Raja Kumar** Guest Lecturer in Computer Science	Member	
10.	**Ms. Meenakshi Potnuru** Associate Software Engineer, AccentureIndia Pvt. Ltd Hyderabad, Telangana	Alumni	

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Department of Computer Science

Blueprint for 4 credit courses

Section		Unit-1	Unit-2	Unit-3	Unit-4	Unit-5	Total questions	No of questions answered	Marks allotted
Section-A	**Short Answer Questions**	**2**	**2**	**2**	**2**	**2**	**10**	**5**	**5X 4=20**
Section-B	**Essay Questions**	**2**	**2**	**2**	**2**	**2**	**10**	**5**	**5X8=40**

Total Marks = 60
In Section –B for each question internal choice has to be given

SRR & CVR Government Degree and P.G.College(Autonomous)
Vijayawada
M.Sc (Computer Science)
Removed, Modified or Added Topics

Sl.No.	Paper Code	Paper Title	Removed, Modified or Added Topic
1	22MCS101	Data Structures	Removed topics in Unit 3: AVL Search Trees, Insertion and Deletion in AVL trees, Added topics in Unit 3: Hash Table Data structure and Counting using hashing
2	22MCS 102	Programming and Problem Solving using Python	Added Topics in Unit 3: 2D Lists, List comprehension, Lists as Arrays. Added Topics in Unit 5: Reading and writing Text files.
4	22MCS201	Design and analysis of Algorithms	Added Topics in Unit 5: Traveling salesperson decision problem - and/or graph decision problem;
5	22MCS103	Computer Networks	Removed Topics in Unit 3: OSPF – The Internet Gateway Routing Protocol, BGP – The Exterior Gateway Routing Protocol Removed Topics in Unit 5: Introduction to Digital Audio, Internet Radio, Video Compression
6	PMCS304	Artificial Intelligence	Removed Topics in Unit4 : Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing.

The **Twenty (20%) Percent** changes are made to M.Sc(Computer Science)

I & II – Semester Syllabus w.e.f. 2022 – 23

III & IV – Semester Syllabus w.e.f. 2021 – 22

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Department of Computer Science

Student Evaluation Policy and Procedure

1. EVALUATION POLICY AND PROCEDURE:

Students are evaluated for 100 marks in each course. These 100 Marks are splitted into Continuous Internal Assessment (CIA) and Semester End Evaluation (SEE). 40 marks are allocated to CIA and 60 marks for SEE.

1.1. CONTINUOUS INTERNAL ASSESSMENT (CIA) FOR 40 MARKS:

1.1.1 Out of a maximum of 100 marks in each theory paper, 40 marks shall normally be allotted for continuous internal assessment (CIA). **The CIA is conducted for 50 marks and scaled down to 40 marks.** The Assessment shall be made by the teacher handling that paper in the manner prescribed here under. Where the same paper is handled by two or more teachers, the Head of the Department shall decide upon the teacher, who shall make the internal assessment or fix the proportion of the marks among the teachers for the internal assessment of the students.

1.1.2 **Out of these 50 marks, 35 marks are allotted to Continuous Internal Exams.** Two Continuous Internal exams are conducted . First internal is for 20 marks and second internal is of 15 marks.

1.1.3 **Out of these 50 marks, 5 marks are allotted to Assignments.** Two assignments are given to the students during the course. 2.5 marks are allotted for each assignment and total of these two assignments are included in Continuous Internal Assessment. The students can submit assignments through blended mode.

1.1.4 **Out of these 50 marks, 5 marks are allotted to Project Work/ Group Discussion.** Students will be assigned a student study project for 5 Marks under CIA. Then the student has to submit a project report under the supervision of a Faculty Member. These 5 marks may also be assigned to group discussion also. Students will be evaluated here based on his/her way of expression, conceptual strength, attitude, listening -understanding skills and level of participation in the discussion.

1.1.5 **Out of these 50 marks, 5 marks are allotted to Student Seminar and 5 marks for Viva-Voce.** Each Student may give a student seminar to the peer team. This student seminar will carry 5 marks. Here feedback will be collected on a 5 points scale from the participants in the student seminar [or] Viva- Voce will be conducted by the concerned subject faculty for 5 marks.

The summarized continuous internal assessment is:

1. First Continuous Internal exams	**-**	**20 Marks**
2. Second Continuous Internal exams	**-**	**15 Marks**
3. Total of Two Assignments	**-**	**5 Marks**
4. Project Work/Group Discussion	**-**	**5 Marks**
5. Student Seminar	**-**	**5 Marks**

The CIA is conducted for 50 marks and scaled down to 40 marks.

Suggestive Question Paper Pattern for CIA & SEE (Based on Bloom's Taxonomy):

Though the faculty concerned is empowered to adopt their own pattern for question paper, a general and suggestive model for question paper is given below based on Blooms Taxonomy.

S. No	Learning Objective	Percentage of Marks
1	Memory based (Remember)	10
2	Understand (Comprehension)	10
3	Application	15
4	Analysis	15
5	Evaluation	25
6	Creativity	25
Total		**100**

1.2 CIA IN PROJECT WORK AND COMPREHENSIVE SEMINAR:

Each student has to conduct Industry oriented Research work in his/her interested area and has to prepare Project Report by using either primary data or secondary data. This is different from student study project. It is research oriented Industrial project conducted under the supervision of Faculty Member of the department. The students have to submit the project work report to the supervision of Faculty Member 15 days before commencement of IV Semester End Evaluation process. After submitting project work report, the students have to give Comprehensive Seminar by explaining their research in the industry. Project Work carries 50 Marks and Comprehensive Seminar carries 50 Marks.

1.3 Every student is required, to take every test for Continuous internal Assessment, unless he/she is permitted by the Principal to write at a later date on valid reasons, before the test is conducted. In case where permission is not obtained,

the decision of the Principal to hold or not to hold separate examination for such candidate is final.

1.4 Permission to write Internal Assessment test at the end of corresponding Semester – end exams may be given on medical grounds and other valid grounds. For such candidates, test/s is/are conducted by the faculty member concerned in consultation with the Head of the Department with a different question paper.

The Student has to get minimum 40 per cent (16 Marks) marks in the Continuous Internal Assessment to complete the Course Paper.

2. SEMESTER END EVALUATION(SEE):

2.1 The maximum marks for Semester End Examinations shall be normally 60 and the duration of the examination shall be 3 hours.

2.2 Semester End Examinations shall be conducted in theory and practical paper at the end of every semester, unless otherwise stated, I, II, III, & IV Semesters.

2.3 The date of Semester End Examinations is fixed by the principal in consultation with the Head of the Departments and the Controller of Examinations.

2.4 For Semester End Examinations, the question papers of part-A and B shall be set by External Paper-setter and the answer scripts shall be valued by the ExternalExaminer.

2.5 **Evaluation**

For the 2022-23 admitted batch I and II semesters

I Semester Marks
1. Four theory papers 5X100 = 500
2. Programming and problem solving using Python lab=100
3. Data Structures Lab =100

II Semester Marks
1. Five theory papers 5X100 = 500
2. Operating System Lab = 100
3. Database Management Systems Lab = 100

Total Marks (I and II semester) = 700+700 = 1400

At the end of Second Semester every student must undergo summer internship/ apprenticeship/project work/industrial training/ Research based project work for six weeks and must prepare a report concerned as per approved project guidelines, and submit the same to the college 14 days prior the commencement of third semester end examinations.

For the existing (2021-22 admitted batch) III and IV semesters

III Semester Marks
1. Five theory papers 5X100 = 500
2. Compiler design Lab = 100
3. Computer Networks Lab = 100

IV Semester Marks
1. Four Theory 4X100 = 400
2. Practical Lab = 100
3. Project work = 200

Grand total Marks = 700+700= 1400

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Department of Computer Science

List of Question paper setters and examiners

1. Dr.Y.K.Sundara Krishna(Krishna University Machilipatnam)
2. Dr.M. Babu Reddy (Krishna University Machilipatnam)
3. Dr. Vijaya lakshmi (Krishna University Machilipatnam)
4. Mr. T. Jaya Krishna(YVNR Government Degree College, Kaikaluru)
5. Mr. A.S.A.L.G.G. Gupta (KL Deemed to be University, Vaddeswaram)
6. Smt. Lavanya A L (GDC ,Kanchikacherla)
7. Dr. K.B.S Sastry (Andhra Loyola College Vijayawada)
8. Mrs. Kala Devi (KBN College, Vijayawada)
9. Dr.B.V.Subba Rao (P.V.P Siddhartha Engineering college ,Vijayawada)
10. Dr. T.S.Ravi Kiran (P.B.Siddhartha College Vijayawada)

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Department of Computer Science

Detailed Course Syllabus for Semester -I

1601: M.Sc (Computer Science)

(With effect from admitted batch 2022-23)

Course Code	Title of the Course	Instruction Hours per week			Credits	Evaluation		
		L	T	P		CIA MARKS	SEE	
							MARKS	DURATION
SEMESTER – I								
22MCS 101	Data Structures	4	-	-	4	40	60	4 Hrs.
22MCS 102	Programming and Problem-Solving using Python	4	-	-	4	40	60	4 Hrs.
22MCS 103	Computer Networks	4	-	-	4	40	60	4 Hrs.
22MCS 104	Formal Languages and Automata Theory	4	-	-	4	40	60	4 Hrs.
22MCS 105	Personality development through Life Enlightenment Skills	3	-	1	3	40	60	4 Hrs.
22MCSLAB101	Data Structures Lab	-	-	6	3	40	60	6 Hrs.
22MCSLAB102	Programming and Problem Solving using Python Lab	-	-	6	3	40	60	6 Hrs.
Total					**25**	**280**	**420**	32 hours per week

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

MSC (Computer Science)

(with effect from admitted batch 2022-23)

Semester	Course Code	Course Title	L-T-P	Credits
I	22MCS101	DATA STRUCTURES	4-0-0	4

Course Description and Purpose:

An overview of data structure concepts, arrays, stack, queues, trees, and graphs. Discussion of various implementations of these data objects, programming styles, and run, time representations. Course also examines algorithms for sorting, searching and some graph algorithms. Algorithm analysis and efficient code design is discussed.

COURSE OBJECTIVES:

1. Exploring basic data structures such as stacks and queues.
2. Introduces a variety of data structures such as search trees, and graphs.
3. Introduces sorting and pattern matching algorithms

COURSE OUTCOMES

At the end of this course, the students should be able to:

Ability to select the data structures that efficiently model the information in a problem.
Ability to assess efficiency tradeoffs among different data structure implementations or combinations.
Implement and know the application of algorithms for sorting and pattern matching
Design programs using a variety of data structures. including hash tables, binary and general tree structures. search trees, graphs, and AVL,trees.

Course Content

Unit 1	**Introduction and Overview** :Elementary Data Organization, Data Structures, Data Structure Operations and Algorithms: Complexity, Time and Space Tradeoff, Linear Arrays Representation and Traversing Linear Arrays, Inserting and Deleting, Linear Search, Binary Search, Multidimensional Arrays, Pointer Arrays, Record Structures, Representation of records in memory. Parallel Arrays, Matrices, Sparse Matrices.
Unit 2	**Stacks:** Stacks. Array representation, Linked List representation, Evaluation of Arithmetic Expressions, Quick sort, Recursion, Towers of Hanoi. **Queues**: Linked representation of Queues, Deques, Priority Queues. **Linked Lists**: Representation, Traversing, Searching, Memory Allocation: Garbage Collection, Insertion, Deletion, Header Linked Lists, Two Way Lists
Unit 3	**Trees:** Binary trees, Representing and traversing binary trees, Traversal algorithms using stacks, **Binary Search Trees**: Searching, insertion and Deletion Binary Search Trees, Heap: Heap Sort, Huffman's Algorithms, General trees. Hash Table data structure and counting using hashing.

Unit 4	**Multi-way Search Trees:** M-way Search Trees, Definition and properties, Searching an M-way Search Tree, B-Tree: Definition and properties, Number of elements in B-Tree, Insertion into B-Tree, Deletion from B-Tree, **B+ Tree**: Definition, Searching a B+Tree, Insertion into B+ Tree, Deletion from a B+ Tree.
Unit 5	**Graphs Algorithms —** Elementary Graph Algorithms: Topological sort, Single Source Shortest Path Algorithms: Dijkstra's, Bellman-Ford. All-Pairs Shortest Paths: Floyd-Warshall's Algorithm.

Reference Textbooks:

1. Seymour Lipschutz, Data Structures, McGraw Hill(Schaum's Outlines), First Edition

2. Seymour Lipschutz,Theory and problems of Data Structures, McGraw Hill(Schaum's Outlines)

3. John R Hubbard, Second Edition, Data Structures with Java, McGraw Hill(Schaum's Outlines)

4. Robert Lafore, Data Structures & Algorithms in Java, Second Edition, Pearson Education.

5. Fundamentals of DATA STRUCTURES in C: 2nded,, Horowitz , Sahani, Anderson-freed, Universities Press

6. Data Structures, a Pseudocode Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage.

SRR & CVR Government Degree & P.G.College(Autonomous)
Machavaram, Vijayawada, Krishna District, AP-520 004
Department of Computer Science

MSC (Computer Science) Semester -1

22MCS101 DATA STRUCTURES

(w.e.f. admitted batch 2022-2023)

Time: 3 Hours **Max. Marks: 60**

SECTION - A

Answer ANY FIVE question **5 X 4 = 20 Marks**

1. Differentiate linear and non-linear data structure
2. What is a linear array in data structure? Explain disadvantages of Linear Arrays.
3. What is DEQUEUE? Explain.
4. Write a function to print the elements of Linked List.
5. What is a Binary Search Tree (BST)? Show the structure of the binary search tree after adding each of the following values in that order: 10, 25, 2, 4, 7, 13,11, 22.
6. Explain about Hash Table Data Structure and Hash Functions.
7. Differentiate between B- Tree and B+ Tree
8. Where is B+ Tree Used? Draw its node structure.
9. Define Graph? How Graph data structure is used to solve real world problems.
10. Define Shortest path problem.

SECTION - B

Answer All Questions **5 X 8 = 40 Marks**

11. a) What is data structure? Explain various types of data structure in detail.

(OR)

b) Explain how Binary Search is performed? Write the function for Binary Search and analyze its time complexity

12. a)Convert the (A+B*C)/(D-E)+F infix expression to postfix using stack. Write the algorithm for infix to postfix conversion.

(OR)

b) What is meant by linear queue and priority queue. Write a function to insert and delete an element from a linear queue.

13. a) Illustrate about insertion, deletion operations in Binary Search Tree and Explain.

(OR)

b) Define Hashing. How do collisions happen during hashing? Explain the different techniques for resolving collisions.

14. a) Define B+ Tree and demonstrate the insertion of the keys (8,5,7,1,3,9) into B+ Tree of order 3

(OR)

b) Define B Tree and demonstrate the insertion of the keys (8,5,7,1,3,9) into B Tree of order 3

15. a) Explain how to find the shortest path using Dijkstra's algorithm with an example.

(OR)

b) Explain in detail the simple topological sort pseudocode. Illustrate with an example.

SRR & CVR Government Degree & P.G.College(Autonomous)
Machavaram, Vijayawada, Krishna District, AP-520 004
Department of Computer Science

MSC (Computer Science) Semester -1

22MCS101 DATA STRUCTURES

(w.e.f. admitted batch 2022-2023)

QUESTION BANK

SHORT ANSWER QUESTIONS - 4 MARKS

UNIT- I

1. What are Parallel Arrays? Why are they useful in Java?
2. What is a multidimensional array? Explain.
3. What is a Pointer Array? Explain.
4. Differentiate linear and non-linear data structure
5. What is a linear array in data structure? Explain disadvantages of Linear Arrays.
6. Explain Time Complexity.
7. What is the disadvantage in Linear Queue. Explain with an example.

UNIT-II

8. Explain about garbage collection in Java.
9. Can we use stack for recursion? Justify.
10. Why is a double linked list called a two way list? Explain with diagrams.
11. What is DEQUEUE? Explain.
12. Write a function to print the elements of Linked List.
13. What is priority queue? What is its application?
14. Write a function to search for an element in a Single Linked List.
15. Explain about Towers of Hanoi

UNIT-III

16. What are the applications of Trees and Graphs?
17. What is a Binary Search Tree (BST)? Show the structure of the binary search tree after adding each of the following values in that order: 10, 25, 2, 4, 7, 13,11, 22. What is the height of the created binary search tree?
18. Write the recursive function for preorder traversal.
19. What is a binary tree? What are the types of binary trees?. Explain about the basic concepts like root node, height of the tree and level order traversal.
20. How can we count using hashing? Explain with an example.
21. List out tree traversals and explain with an example.
22. Perform Heap sort on 12, 7, 5, 8, 3

UNIT- IV

23. What are the properties of B Tree
24. Differentiate between B- Tree and B+ Tree
25. Where is B- Tree Used? Draw its node structure.
26. Where is B+ Tree Used? Draw its node structure.
27. Discuss the utility of multi way search trees in general. Explain degree and order of a Btree.
28. How B-Tree is different from Binary Trees. Write 2 advantages
29. What is B-Tree? Generate a B-Tree of order 5 with the alphabets arrive in the sequence as follows : a g b k d h m j e s I r x c l n t u p.

UNIT - V

30. Define Shortest path problem.

31. Define Graph? How Graph data structure is used to solve real world problems.
32. Differentiate between Bellman Ford and Dijkstra's algorithm.
33. Explain a) Directed graph b) undirected graph
34. Explain a) degree of a vertex b) connected graph

LONG ANSWER QUESTIONS - 8 MARKS

UNIT-I

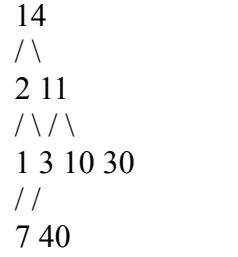
1. What is data structure? Explain various types of data structure in detail.
2. What is a sparse matrix? Write a Java program to add two sparse matrices and explain the assumed data structure.
3. Explain how Binary Search is performed? Write the function for Binary Search and analyze its time complexity
4. Explain about Time and space complexity. Write the function for Linear Search and analyze its time complexity.
5. What do you mean by complexity of an algorithm? Explain the meaning of worst case analysis and best case analysis with an example.
6. What is Analysis of Algorithms? Explain the Asymptotic Notations (Big O, Ω, θ) used while analyzing an algorithm

UNIT-II

7. Write an algorithm/pseudocode to convert a given infix expression to postfix expression? Trace the steps involved in converting the given infix expression ((A +B)^C)-((D*C)/F) to postfix expression.
8. Convert the (A+B*C)/(D-E)+F infix expression to postfix using stack. Write the algorithm for infix to postfix conversion.
9. What is meant by linear queue and priority queue. Write a function to insert and delete an element from a linear queue.
10. Define and explain the stack data structure with suitable example. Give algorithms for Push, Pop, Stackempty and Stackfull functions.
11. Define and explain the Linear Queue data structure with suitable example. Give algorithms for enqueue, dequeue, Queue Empty and Queuefull functions.
12. What do you mean by linked list? Write a function to insert and delete a node in singly linked list.
13. Trace the quick sort algorithm for the following list of numbers: 90,77,60,99,55,88,66.

UNIT-III

14. Show the result of inserting 3,1,4,6,9,2,5,7 into an initially empty binary search tree. Also show the result of deleting the root.
15. Here is a small binary tree:



What is the output obtained after preorder, inorder and postorder traversal of the following tree and write recursive functions for preorder, inorder and post order traversal.

16. Develop an algorithm to add an element into a binary search tree.
17. Consider a hash table of size 7 and hash function h(k)= k mod 7. Draw the table that results after inserting in the given order, the following values.
    19,26,13,48, 17 for each of the three scenarios.
    a) When collisions are handled by separate chaining. (3)
    b) When collisions are handled by linear probing. (3)
    c) When collisions are handled by double hashing using second hash function h'=5-(5 mod k).
18. Define Hashing. How do collisions happen during hashing? Explain the different techniques for

resolving collisions.

19. Explain creation, insertion and deletion operation on a binary search tree.
20. Explain heap as a data structure. Build a Max Heap by investing the following data arriving as a sequential set 23, 7, 92, 6, 12 14, 40, 44, 20, 21. Show the heap after deleting 2 elements
21. Using modulo-division and linear probing method, store the keys given below in an array of 13 elements. How many collisions occurred and what is the density of the list after the keys are inserted. 28, 7, 846, 786, 431, 870, 612, 675, 876, 546, 34, 12

UNIT-IV

22. Define M-way trees. Build a B-tree of order 4 by inserting data in the sequence given below: 92, 24, 6, 7, 11, 8, 22, 4, 5, 16, 19, 20, 78
23. Illustrate insertion and deletion into a B-tree with the help of an example and hence explain splitting and merging of nodes
24. Write a routine to perform insertion into a B-tree.
25. Write a routine to perform deletion from a B-Tree. When a key is deleted, is it necessary to update information in the internal nodes?
26. Define a B-tree. Draw a B-tree of order 5 when the keys arrive in the following order. a,f,g,k,b,h,d,j,m,s,e,r,i,c,x,n,l,u,t,p.
27. Demonstrate the insertion of the key (1,2,3,4,8,7,6,5,9,10,11,12,16,15,14,13) in a B-tree of order5
28. Demonstrate the insertion of the keys (8,5,7,1,3,9) into B+ Tree of order 3

UNIT -V

29. Explain how to find the shortest path using Dijkstra's algorithm with an example.
30. Explain in detail the simple topological sort pseudocode. Illustrate with an example.
31. Compare Dijkstra's and Floyd warshall's algorithm
32. Explain Dijkstra algorithm with suitable example.
33. Explain Floyd Warshall's Technique to calculate shortest path.
34. How Graphs are represented in Memory. Illustrate with examples.

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

MSC (Computer Science)

(with effect from admitted batch 2022-23)

Semester	Course Code	Course Title	L-T-P	Credits
I	22MCS102	PROGRAMMING AND PROBLEM-SOLVING USING PYTHON	4-0-0	4

Course Description and Purpose:
The course is designed to provide basic knowledge of Python. Python programming is intended for Software Engineers. system analysts, program managers and user support personnel who wish to learn the Python Programming Language.

Course Objectives: To familiarize and acquaint students with basic and advanced features of python programming and its libraries. Also to

1. Master the fundamentals of writing Python scripts
2. Learn core Python scripting elements such as variables and flow control structures
3. Discover how to work with lists and sequence data
4. Write Python functions to facilitate code reuse
5. Use Python to read and write files
6. Make their code robust by handling errors and exceptions properly
7. Work with the Python standard library
8. Explore Python's object,oriented features

Course Learning Outcomes:
At the end of this course the students should be able to:

1. Understand computer architecture and data representations (variables, representation of numbers and character strings).
2. Learn basic algorithmic problem solving techniques (decision structures, loops, functions).
3. Use and understand objects used in programming.
4. Design, document, implement and test solutions to programming problems.
5. Identify and repair coding errors in a program.

Course Content

Unit 1	**Introduction:** What is a programming language, Abstractions in programming languages, Computational paradigms, Language definition. Language translation, Language design. Principles of Programming Languages: Attributes, binding and semantic functions, Declarations, blocks and scope, The symbol table, Name resolution and overloading, Allocation, Lifetimes and the environment, Variables and Constants, Aliases, Dangling references and garbage.

Unit 2	Basics of Python Programming, Features of Python, History of Python, The Future of Python, Writing and Executing First Python Program, Literal Constants, Variables and Identifiers, Data Types, Input Operation, Comments, Reserved Words, Indentation, Operators and Expressions, Expressions in Python, Operations on Strings, Other Data Types, Type Conversion. Decision Control Statements, Conditional Branching Statements, Basic Loop Structures, Nested Loops, The break statement, The continue statement, The pass statement. The else statement used with loops.
Unit 3	Functions and Modules, Function Definition, Function Call, Variable Scope and Lifetime, The return statement, More onDefining Functions. Recursive functions, Modules, Packages in Python, Standard Library Modules. Python Strings Revisited,Concatenating, Appending and Multiplying Strings, String formatting operator, Builtin String Methods and Functions, Comparing Strings, Regular Expressions.Sequence, Lists, Functional Programming, Tuple, Sets, Dictionaries. 2D Lists, List comprehension, Lists as Arrays.
Unit 4	**Classes and Objects-** Classes and Objects, Class Method and self Argument, Class variables and Object Variables, Public and Private Data Members, Private Methods, Calling a Class Method from Another Class Method, Built-in Class Attributes, Class Methods, Static Methods.
Unit 5	**Inheritance-** Inheriting Classes in Python, Types of Inheritance, Abstract Classes and Interfaces. **Error and Exception Handling-** Introduction to Errors and Exceptions, Handling Exceptions, Raising Exceptions, Built- in and User defined Exceptions **Operator Overloading-** Concept of Operator Overloading, Advantage of Operator Overloading, Implementing Operator Overloading. Reading and Writing Text files.

Reference Textbooks:

1. Kenneth C. Louden, Programming Languages Principles and Practice, Second Edition, Cengage Learning(2008).
2. Reema Thareja, Python Programming using Problem Solving Approach, Oxford University Press
3. Wesley Chun, Core Python Programming, Prentice Hall

SRR & CVR Government Degree & P.G.College(Autonomous)
Machavaram, Vijayawada, Krishna District, AP-520 004
Department of Computer Science

MSC (Computer Science) Semester -1

22MCS102 PROGRAMMING AND PROBLEM-SOLVING USING PYTHON

(w.e.f. admitted batch 2022-2023)

Time: 3 Hours **Max. Marks: 60**

SECTION - A

Answer ANY FIVE question **5 X 4 = 20 Marks**

1. Define Language? How can it be designed?
2. Explain about print statements with examples?
3. Write about expressions in Python.
4. Explain about continue statement.
5. Define Recursive function.
6. What is a Regular expression?
7. Define sets
8. Define class.
9. Explain about static method.
10. What is Inheritance?

SECTION - B

Answer All Questions **5 X 8 = 40 Marks**

11. a) Explain about various types of programming Languages?

(OR)

b) Discuss about most commonly used programming languages with examples and features?

12. a) Explain the basic data types available in Python with examples?

(OR)

b) Describe different operators in detail with examples?

13. a) Explain Built-in String methods and functions in Python?

(OR)

b) Discuss the relation between tuples and lists, tuples and dictionaries in detail?

14. a) Explain the concept of scope and lifetime of variables in Python with an example?

(OR)

b) How to call a class method from another class method in Python?

15. a) Explain different types of inheritances in Python?

(OR)

c) Discuss about Exception handling in Python with an example?

SRR & CVR Government Degree & P.G.College(Autonomous)

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

MSC (Computer Science) Semester -1

22MCS102 PROGRAMMING AND PROBLEM-SOLVING USING PYTHON

(w.e.f. admitted batch 2022-2023)

QUESTION BANK

Essay Questions 8 Marks

1. What is Programming Language? Explain about various types of the Programming Language?
2. Discuss about most commonly used programming languages with examples and features?
3. Explain about Principles of Programming Language?
4. Explain the basic data types available in Python with examples?
5. Describe different operators in detail with examples?
6. Explain Conditional Branching statements in Python?
7. How to define and call a function in Python?
8. Explain Built-in String methods and functions in Python.?
9. Discuss the relation between tuples and lists, tuples and dictionaries in detail?
10. Explain the concept of scope and lifetime of variables in Python programming language with an example?
11. Explain about various packages in python with examples?
12. How to call a class method from another class method in Python?
13. Explain different types of inheritances in Python? 14.Discuss about method overloading with example.
15. Explain about Looping statements in Python ?
16. Explain about various String methods in Python?
17. Explain in detail about Exception Handling in Python?
18. Explain about operator overloading in detail ?

SHORT ANSWER QUESTIONS 4 MARKS

1. What is Language Syntax?
2. Write about Language Translation?
3. Explain about Language Design?
4. Write about expressions in Python.
5. Explain continue statement.
6. Define Recursive function.
7. What is Regular expression?
8. Define sets
9. Define class.
10. Explain static method.
11. What is Inheritance?
12. Write about type conversion in python?
13. Write about break and continue statements in Python?
14. Write about set datatype in Python?
15. What is class and object in Python ?
16. Explain about static methods in Python ?
17. Write about interfaces in Python ?

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

MSC (Computer Science)

(with effect from admitted batch 2022-23)

Semester	Course Code	Course Title	L-T-P	Credits
I	22MCS103	COMPUTER NETWORKS	4-0-0	4

Course Description and Purpose:

This course provides an introduction to computer networks, with a special focus on the Internet architecture and protocols. Topics include layered network architectures, addressing, naming, forwarding, routing, communication reliability, the client,server model, web and email protocols.

Course Objectives:

1. Become familiar with layered communication architectures (OSI and TCP/IP).
2. Understand the client/server model and key application layer protocols.
3. Understand the concepts of reliable data transfer and how TCP implements these concepts.
4. Learn the principles of routing and the semantics and syntax of IP.
5. Understand the basics of error detection including parity, checksums, and CRC.

Course Learning Outcomes:

At the end of this course the students should be able to:

1. Understand and describe the layered protocol model.
2. Describe, analyze and evaluate a number of datalink, network, and transport layer protocols.
3. Program network communication services for client/server and other application layouts.
4. Describe, analyze and evaluate various related technical, administrative and social aspects of specific computer network protocols from standards documents and other primary materials found through research.
5. Design, analyze, and evaluate networks and services for homes, data centers, loT/IoE, LANs and WANs

Course Content:

UNIT -I

Uses of Computer Networks, Connection Oriented and Connectionless Services, Reference Models: The OSI Reference Model, The TCP/1P Reference Model, A Comparison of OSI and TCP/IP referenceModel.

Physical Layer: ALOHA, CSMA, CSMA/CA

Data Link Layer Design Issues: Services Provided to the Network Layer, Framing , Error correcting Codes , Error Detecting Codes. An unrestricted Simplex Protocol , A simplex Stop and wait Protocol, Sliding Window Protocols: A one, bit sliding Window Protocol , A Protocol using Go Back N , A protocol using selective repeat.

UNIT-II

Ethernet : Ethernet Cabling, The Ethernet MAC sublayer Protocol , Bluetooth: Bluetooth

Architecture, Bluetooth Applications, Remote Bridges , Repeaters, Hubs,Bridges, Switches, Routers and Gateways , Virtual LANs.

UNIT-III

Network Layer Design Issues : Store and Forward Packet Switching ,Services Provided to the Transport Layer , Implementation of Connectionless Services ,Implementation of Connection Oriented Services . Comparison of Virtual Circuit and Datagram subnets.

Routing Algorithms : The Optimality Principle , Shortest Path Routing , Flooding , Distance Vector Routing , Link State Routing , Hierarchical Routing , Broadcast Routing , Multicast Routing , Routing for Mobile Hosts.

The Network Layer in the Internet lP address, IPV6 features and advantages.

UNIT-IV

The Transport Service: Services provided to the Upper Layers , Transport Services Primitives , Berkeley Sockets. Elements of Transport Protocols : Addressing , Connection Establishment , Connection Release , Flow Control and Buffering , Multiplexing , Crash Recovery.

Transport Protocols TCP : Introduction to TCP , The TCP Service Model , the TCP Protocol , The TCP segment header , TCP connection establishment , TCP connection release , TCP congestion Control . Comparison of TCP and UDP.

UNIT-V

Wireless TCP: Classical improvement in WTCP.

DNS : The Domain Name System : The DNS Name Space , Resource Records , Name Servers. Electronic Mail : Architecture and Services , The User Agent , Message Formats , Message Transfer , Final Delivery. TheWorld Wide Web: Architecture Overview , Static Web Documents , Dynamic Web Documents.

Reference Text books:

1. Andrew S. Tanenebaum, Computer Networks, PHI

2. James F.Kurose, Keith W Ross, Computer Networking, 3rd edition Pearson Edition

3. Michael A. Gallo, William M. Hancock, Data Communications and Networking, 4th edition,TMH

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Machavaram, Vijayawada, Krishna District, AP-520 004
Department of Computer Science

MSC (Computer Science) Semester -1

22MCS103 COMPUTER NETWORKS

(w.e.f. admitted batch 2022-2023)

Time: 3 Hours **Max. Marks: 60**

SECTION - A

Answer ANY FIVE questions **5 X 4 = 20 Marks**

1. What are the different types of networks?
2. What is flow control?
3. What are the responsibilities of data link layer?
4. Identify the difference between bridge and router.
5. Appraise the advantages of Ethernet.
6. Define Bluetooth.
7. What is OSPF?
8. What is multiplexing?
9. Define Berkeley socket.
10. What is SMTP?

SECTION - B

Answer All Questions **5 X 8 = 40 Marks**

11. a) Explain about the OSI reference model.

(OR)

b) Describe the guided transmission

12 a) Explain error correction and detection method with an example.

(OR)

b) Explain IEEE 802.11 protocol stack and Frame structures

13. a) Explain Distance Vector Routing algorithm with example.

(OR)

b) Explain about IP protocol.

UNIT – IV

14. a) Explain TCP protocol Header format.

(OR)

b) Explain transport service primitives and TCP connection establishment.

15. a) Explain about DNS.

(OR)

b) Explain video compression and audio compression

SRR & CVR Government Degree & P.G.College(Autonomous)

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

MSC (Computer Science) Semester -1

22MCS103 COMPUTER NETWORKS

(w.e.f. admitted batch 2022-2023)

QUESTION BANK

Essay Questions 8Marks

1. **Define the term "Computer Networks" and explain briefly various types of networks with their advantages and disadvantages?**
2. **Explain about various Uses of Networks in**

a. **Business Applications b) Home Applications c)Mobile Users**

3. **What is Topology? Explain various types of topologies with a neat sketch?**
4. **Explain how the internet works with Connection less and Connection oriented Networks?**
5. **Briefly Explain OSI Reference Model with different layers?**
6. **Briefly Explain TCP/IP Reference Model?**
7. **Explain about simplex Stop and wait Protocol?**
8. **Explain about A one-bit sliding Window Protocol using Go Back N**
9. **Briefly Explain about the Binary Exponential Backoff Algorithm?**
10. **Write about the 802.11 MAC sublayer Protocol and Frame Structure?**
11. **Explain IEEE 802.11 protocol stack and Frame structures?**
12. **Briefly Explain about a) Blue Tooth Architecture and b) Blue Tooth Frame Structure**
13. **Explain Various Network Devices of Remote Bridges - Repeaters, Hubs, Bridges, Switches, Routers**
14. **Explain about Routing Algorithms of i) Shortest Path Routing and ii) Flooding?**
15. **Explain about Distance Vector Routing Algorithm with Example?**
16. **Briefly Explain about various IP protocols and IP Address?**
17. **Write about various services provided to the upper layer by the Transport Layer?**
18. **Briefly Explain TCP Service Model?**
19. **Explain about the Domain name System ?**
20. **Briefly explain about the Architecture and Services of the Electronic mail?**

Short Questions 4 Marks

1. **What are the different types of networks?**
2. **What is flow control?**
3. **What is Topology? Explain various topologies?**
4. **What are the responsibilities of the data link layer?**
5. **Write about Error Correcting and Error Detecting Codes?**
6. **Discuss about bridge and router?**
7. **Advantages of Ethernet?**

8. **Define Bluetooth?**
9. **What is OSPF?**
10. **What is multiplexing?**
11. **Define Berkeley socket?**
12. **What is SMTP?**

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

MSC (Computer Science)

(with effect from admitted batch 2022-23)

Semester	Course Code	Course Title	L-T-P	Credits
I	22MCS104	FORMAL LANGUAGES AND AUTOMATA THEORY	4-0-0	4

Course Description and Purpose:

Formal Languages and Automata Theory deals with the concepts of automata, formal languages, grammar, algorithms, computability, decidability, and complexity. To develop methods by which computer scientists can describe and analyze the dynamic behavior of discrete systems, in which signals are sampled periodically.

COURSE OBJECTIVES: To introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability. And to

1. Understand basic properties of formal languages and formal grammars.
2. Understand basic properties of deterministic and nondeterministic finite automata
3. Understand the relation between types of languages and types of finite automata
4. Understanding the Context free languages and grammars, and also Normalizing CFG.
5. Understanding the minimization of deterministic and nondeterministic finite automata.
6. Understand basic properties of Turing machines and computing with Turing machines.
7. Understand the concept of Pushdown automata and its application.

COURSE OUTCOME:

After completion of the syllabus the students will be able to

1. Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Turing machines, Grammar,halting problem, computability and complexity
2. Be able to design FAs, NFAs, Grammars, languages modeling, small compiler basics, be able to design sample automata and be able to minimize FA's and Grammars of Context Free Languages.
3. Perceive the power and limitation of a computer; solve the problems using formal language
4. Develop a view on the importance of computational theory.

Course Content:

UNIT -I

Finite Automata: Deterministic finite automaton, Non deterministic finite automaton and NFA with c transitions - Significance, equivalence between NFA with and without E transitions, NFA to DFA conversion,minimization of FSM, equivalence between two FSMs, Finite Automata with output- Moore and Mealy machines.

UNIT-II

Regular Languages: Regular sets, regular expressions, identity rules, construction of finite automata for a given regular expressions and its inter conversion, Pumping lemma of regular sets, closure properties of regular sets (proofs not required).

UNIT-III

Context free grammar: Context free grammar, derivation trees, Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greibach normal form.

Push down Automata: Definition, model, design of PDA.

Turing Machine: Definition, model, design of TM, recursively enumerable languages and recursive languages, Chomsky hierarchy of languages.

Unit-IV

Compiler, Structure of a compiler, Design issues of compiler, Phases of Compiler, Lexical Analysis, Role of Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens

Unit-V

Lex ,Finite Automata, Regular Expressions to Automata, Minimizing DFA, An Example with Lexical analysis with Lex, Grammar analysis with YACC.

Reference Text books:

1. Hoperoft. H.E. and Ullman, Introduction to Automata Theory Languages and Computation, J. D. Pearson Education.
2. John C Martin, Introduction to Languages and the Theory of Computation, TMI- I
3. Mishra and Chandrashekaran, Theory of Computer Science and Automata Languages and Computation, 2nd Edition,PHI
4. Daniel I.A. Cohen, Introduction of Computer Theory, John Wiley

SRR & CVR Government Degree & P.G.College(Autonomous)

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

MSC (Computer Science) Semester -1

22MCS104 FORMAL LANGUAGES AND AUTOMATA THEORY

(w.e.f. admitted batch 2022-2023)

Time: 3 Hours **Max. Marks: 60**

SECTION - A

Answer ANY FIVE question **5 X 4 = 20 Marks**

1. Differentiate between DFA and NFA.
2. List the operators of Regular Expressions.
3. Define regular set and regular expression.
4. Write regular expression for all strings which ends with 01 over {0, 1}.
5. Define regular grammar with an example.
6. E → E+E | E*E | (E) | id
7. Give the formal definition of Push down automata.
8. Explain the model of PDA.
9. What are recursively enumerable languages?
10. Represent Chomsky hierarchy of languages and their counterpart automata.

SECTION - B

Answer All Questions **5 X 8 = 40 Marks**

UNIT – I.

11. a) Define DFA. Design DFA which accepts set of all strings that contains a substring aab.

(OR)

b) Compare the difference between NFA & DFA. Explain how to convert an NFA into DFA?

UNIT – II

12. a) What is Grammar ? Explain the tuple of grammar in automata with an example.

(OR)

b) Write the properties of Regular sets.

UNIT – III

13. a) Explain the Closure properties of CFL.

(OR)

b) What is the Chomsky Normal Form? Explain the algorithm to convert a CFG into Chomsky Normal Form?

UNIT – IV

14. a) What is meant by a PDA? Explain its basic structure.

(OR)

b) What is meant by parsing? Explain various types of parsing available in a PDA.

UNIT – V

15. a) What is a Turning Machine? Explain with Example?

(OR)

b) What is Undecidability? Explain?

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Department of Computer Science

MSC (Computer Science) Semester -1

22MCS104 FORMAL LANGUAGES AND AUOTMATA THEORY

(w.e.f. admitted batch 2022-2023)

QUESTION BANK

SHORT ANSWER QUESTIONS EACH QUESTION- 4 MARKS

a) What is Finite State Machine? What are the elements of FSM?

b) What is the difference between CFG and CSG?

c) write the formal definition of mealy machine

d) Give the formal definition of Moore machine

e) What are the applications of CFG?

f) List out the components of Turing machine

g)what is the input buffering

h) Give the formal definition of TM? Give the block diagram of TM

i) Write a short note on Mathematical representation of Finite State Machine?

j) List out the properties of recursive enumerable language?

k) Draw the NFA accepting the set of all strings whose second symbol from last is 1?

l) Construct a regular grammar for L={ 0n 11| n≥1}?

m) List and explain four components used to form a context free grammar?

n) Define P and NP? Give some examples that fall into the class of P and NP?

LONG ANSWER QUESTIONS-8 MARKS

a) Construct a DFA accepting the language L={w: |w| mod 8 ≠0}on ∑={a,b}

b) Obtain a DFA to accept strings of a's and b's such that, each block of 5 consecutive symbols has at least two a's.

c) What is Chomsky's hierarchy? Explain

d) Convert the following grammar to CNF.

S bA| aB

A bAA| aS a

B aBB| bSbb

e) What are the different operations on strings? Explain with examples?

f) What are the different types of languages in automata theory? Clearly give the rules for each of these languages and the relationship among these languages.

g) Consider a language L* , where L={ab,cd} with ∑={a,b,c,d}. (i) write all words in L* that have six or less letters/symbols (ii) What is the shortest string in ∑ * that is not in the language L* ?

h) What is the pumping lemma and explain the theorem and its application

i) what is the compiler and discuss about the phases of compiler

j) Give the formal definition of FSM? What are the examples of FSM?

k) Define NFA and DFA? What is the equivalence of NFA with DFA? Explain with your own example.

l) Differentiate between CFL and CSL

m) How FSM is mathematically represented? Discuss.

n) Explain about recursive language.

o) Construct the NFA for the language which accepts all string's of 0's and 1's such that either the second or third position from the end has a 1. Obtain the regular expression from this constructed NFA.

p) Explain the role of lexical analyzer

q) Explain about different types of grammar.

r) Explain mealy machine with an example

s) explain the specification and recognize the tokens

t) Discuss about different forms of formal languages.

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Department of Computer Science

Revised syllabus 2022-2023

MSC (Computer Science)

(with effect from admitted batch 2022-23)

Semester	Course Code	Course Title	L-T-P	Credits
I	22MCS105	Personality Development Through Life Enlightenment Skills	3-0-1	3

Course Description and Purpose:

Personality development is the development of your behavior patterns and attitude. It is the result of where we are born, the circle we interact with and our personal temperament. Every person is different. There are some characteristics traits that make you „you". Personality development through life enlightenment courses aims to help students identify negative behaviors which may be stopping them from reaching their desired goals. This course will help students both in their personal and desired professional life. The other purposes of personality development through life enlightenment courses are to enable you to lead stress-free and healthier life, ethical decision making ability, enhanced confidence level, and building a more pleasing personality.

Course Objectives:

The Course will introduce the students to

1. Learn to achieve the highest goal happily.
2. Become a person with a stable mind, pleasing personality and determination.
3. Learn to build positive attitude, self-motivation, enhancing self-esteem and emotional intelligence
4. Learn to develop coping mechanism to manage stress through Yoga and meditation techniques
5. Awaken wisdom among them.

Course Learning Outcomes:

At the end of this course the students should be able to:

1. Develop their personality and achieve their highest goals in life.
2. Lead the nation and mankind to peace and prosperity
3. Practice emotional self regulation.
4. Develop a positive approach to work and duties
5. Develop a versatile personality

Course Content:

UNIT- I

Introduction to Personality Development

The concept of personality - Dimensions of Personality – Theories of Personality development (Freud & Erickson) – The concept of Success and Failure – Factors responsible for Success –Hurdles in achieving Success and Overcoming Hurdles — Causes of failure – Conducting SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis.

UNIT- II

Attitude, Motivation and Self-esteem

Conceptual overview of Attitude – Types of Attitudes – Attitude Formation –Advantages/Disadvantages of Positive/Negative Attitude - Ways to Develop Positive Attitude Concept of motivation: Definition and Nature of Motivation/Motive – Internal and external motives – Theories of Motivation – Importance of self- motivation- Factors leading to demotivation.

Self-esteem - Definition and Nature of self-esteem — Do's and Don"ts to develop positive self-esteem — Low self esteem - Personality having low self esteem - Positive and negative self esteem.

UNIT- III

Other Aspects of Personality Development

Body language - Problem-solving - Conflict Management and Negotiation skills - Decision-making skills - Leadership and qualities of a successful leader — Character building -Team-work — Time management - Work ethics — Good manners and etiquette — Emotional Ability/Intelligence —Dimensions of Emotional Intelligence — Building Emotional Intelligence.

UNIT- IV

Nitisatakam-Holistic Development of Personality

Verses- 19,20,21,22 (wisdom) — Verses- 29,31,32 (pride and heroism) — Verses- 26,28,63,65 (virtue)

Personality of Role Model — Shrimad Bhagwad Geeta

Chapter2-Verses 17 — Chapter 3-Verses 36,37,42 — Chapter 4-Verses 18, 38,39 — Chapter 8 —Verses 37,38,63

UNIT- V

Yoga & Stress Management

Meaning and definition of Yoga - Historical Perspective of Yoga - Principles of Ashtanga Yoga by Patanjali — Meaning and Definition of Stress - Types of Stress - Eustress and Distress —Stress Management — Pranayama- Pranayama: Anulom and Vilom Pranayama - Nadi Suddhi Pranayama — Kapalbhati-Pranayama - Bhramari Pranayama - Nadanusandhana Pranayama — Meditation

techniques: Om Meditation - Cyclic meditation : Instant Relaxation technique (QRT), Quick

Relaxation Technique (QRT), Deep Relaxation Technique (DRT) (Theory & Practical).

PRACTICAL COMPONENTS:

- Students should identify different types of personality to know their own personality. Students are to describe the characteristics of their personalities and submit the same for assessment.
- Students are to form in groups (a group consists of 4-6 students) to identify and write a brief note on famous personalities of India and World.
- Students are required to identify different types of attitudes and give any five examples of each.
- Students are expected to check their attitudes and develop ways to improve their attitudes at the workplace and home.
- Students are required to identify keys to self-motivation to achieve their goals.
- Students are expected to identify at least seven types of body language and conduct activities with the following:

S. No.	Pose	Possible Interpretations
1	Standing with your hands on your hips	Aggressive, disgusted
2	Standing upright	Confidence
3	Arms crossed on your chest	Defensive
4	Resting your hand on your cheek	Thinking
5	Touching or rubbing your nose	Doubt, lying
6	Resting your head in your hands	Boredom, tired
7	Tapping your fingers	impatience
8	Biting your nails	Nervous, insecure
9	Playing with your hair	Insecure
10	Rubbing your eyes	Disbelief, doubt

- Conduct the following exercise to develop communication skills — Negotiation Skills and Empathy

- **Exercise: Card Pieces**

In this activity, team members trade pieces of playing cards to put together complete cards. Uses -This exercise is useful for showing team members others' perspectives. It builds communication and negotiation skills , and helps people to develop empathy .

People and Materials

- Enough people for at least three teams of two.
- Playing cards — use between four and six for each person.
- A private room.

Time -15 minutes. Instructions:

1. Cut each playing card into half diagonally, then in half diagonally again, so you have four triangular pieces for each card.

2. Mix all the pieces together and put equal numbers of cards into as many envelopes as you have teams.

3. Divide people up into teams of three or four. You need at least three teams. If you're short of people, teams of two will work just as well.

4. Give each team an envelope of playing card pieces.

5. Each team has three minutes to sort its pieces, determine which ones it needs to make complete cards, and develop a bargaining strategy.

6. After three minutes, allow the teams to start bartering for pieces. People can barter on their own or collectively with their team. Give the teams eight minutes to barter.

7. When the time is up, count each team's completed cards. Whichever team has the most cards wins the round.

Advice for the Teacher/Facilitator

After the activity, ask your team members to think about the strategies they used. Discuss These questions:

1) Which negotiation strategies worked? Which didn't?

2) What could they have done better?

3) What other skills, such as active listening or empathy , did they need to use?

Conduct following Time management activity - Ribbon of Life

Take a colored ribbon length of approximately 1 meter/100 cm. and scissors. Start with the following questions:

1. If the lifespan of an individual is say, 100 years. Consider that each cm represents one year. The response will be that few live that long. Assuming a life of 75 to 90 years, cut 10 to 25 cm off the ribbon, accordingly.
2. What is the average age of the participants sitting here? The response would be 25 to 30 depending on the group, in that case, cut another 25 cm of the ribbon and say that is gone you cannot do anything.
3. What is 50 years? People will say, "Yes,'" but the answer is NO.
4. Every year we have 52 weeks, that is 52 Sundays. If we multiply that by 50 years, it comes to 7.14 years. Reduce the ribbon by another 7.14 cm.
5. We also usually have Saturdays off, so reduce another 7. cms.
6. Public/National holidays are 10 multiples within 50 years. That comes to another 1.5 years. Reduce ribbon by another 1.5 cm.
7. Your casual leave, sick leave, and annual holidays approx. 40 days a year, multiplied by 50. Cut off another 5 cm. Now you are left with about 29.5 years. But, the calculation is not over yet.
8. You sleep an average of 8 hours daily; multiply that by 365 days and again by 50 years (i.e. 122 days X 50 = almost 17 years). Cut off another 17 cm.
9. You spend time eating lunch, breakfast, snacks, and dinner total 2 hours daily (i.e. 30 days a year X 50 years= 4 years or so). Cut off another 4 cm.
10. Last, let's figure we spend about l hour a day traveling from place to place for activities and such. (that"s about 2 more years). We're down to 6 (SIX) years of life to make it or break it.

- **<u>Exercise Decision making skills - Create Your Own</u>**

In this exercise, teams must create their own, brand new, problem-solving activity.

Uses

This game encourages participants to think about the problem-solving process. It builds skills such as creativity, negotiation and decision making, as well as communication and time management. After the activity, teams should be better equipped to work together, and to think on their feet.

What You'll Need

- Ideally four or five people in each team.
- A large, private room.
- Paper, pens and flip charts.

Time -Around one hour.

Instructions:

1. As the participants arrive, you announce that, rather than spending an hour on a problem-solving team building activity, they must design an original one of their own.

2. Divide participants into teams and tell them that they have to create a new problem-solving team building activity that will work well in their organization. The activity must not be one that they have already participated in or heard of.

3. After an hour, each team must present their new activity to everyone else, and outline its key benefits.

There are four basic steps in problem solving : defining the problem, generating solutions, evaluating and selecting solutions, and implementing solutions. Help your team to think creatively at each stage by getting them to consider a wide range of options. If ideas run dry, introduce an alternative brainstorming

technique, such as brain writing . This allows your people to develop one others' ideas, while everyone has an equal chance to contribute.

After the presentations, encourage teams to discuss the different decision-making processes they followed. You might ask them how they communicated and managed their time . Another question could be about how they kept their discussion focused. And to round up, you might ask them whether they would have changed their approach after hearing the other teams' presentations.

Advice for the Teacher/Facilitator:

- Students are asked to recite verses: 26,28,63,65 (virtue) of Neeti Satakam-Holistic development of personality.
- Students are asked to identify the personality of role Models from Shrimad Bhagvad Gita to and portray the roles of the same.
- Students are asked to practice Yoga and meditation techniques.

Reference Textbooks:

1. Hurlock, E.B. Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill, 2006.
2. Gopinath,Rashtriya Sanskrit Sansthanam P, Bhartrihari"s ThreeSatakam, Niti-sringar- vairagya, New Delhi, 2010
3. Swami Swarupananda, Srimad Bhagavad Gita, Advaita Ashram,Publication Department, Kolkata, 2016.
4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001
5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).
6. Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005.
7. Smith, B. Body Language. Delhi: Rohan Book Company. 2004
8. Yogic Asanas for Group Training - Part-1: Janardhan Swami Yogabhyasi Mandal, Nagpur.
9. Raja Yoga or Conquering the Internal Nature by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata.
10. Nagendra H.R and Nagaratna R, Yoga Perspective in Stress Management, Bangalore, Swami Vivekananda Yoga Prakashan.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc16_ge04/preview
2. https://freevideolectures.com/course/3539/indian-philosophy/11

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

MSC (Computer Science)

(with effect from admitted batch 2022-23)

Semester	Course Code	Course Title	L-T-P	Credits
I	22MCSLAB101	Data Structures Lab	0-0-6	3

COURSE OBJECTIVES: The course is designed to develop skills to design and analyze simple linear and nonlinear data structures using java programming language. It strengthens the ability of the students to identify and apply the suitable data structure for the given real-world problem.

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to

1. Implement basic data structures such as arrays.
2. Programs to demonstrate the implementation of various operations on stack and queue.
3. Programs to demonstrate the implementation of various applications of stack.
4. Programs to demonstrate fundamental algorithmic problems including Tree Traversals.
5. Implement various searching and sorting algorithms.

LIST OF EXPERIMENTS:

1. Java program to implement Stack operations using Arrays
2. Java program to implement Queue operations using Arrays
3. Java program to implement linked list operations using Arrays
4. Java Program to implement tree traversal techniques
5. Java program to convert infix expression to postfix expression
6. Java program to evaluate postfix expression
7. Java program to implement Binary search.
8. Java program to implement Selection sort
9. Java program to implement Insertion sort
10. Java program to implement quick sort
11. Java program to implement Merge Sort
12. Java Program to perform the following operations:

    a) Insertion into a B-Tree b) Searching in a B-Tree.

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Department of Computer Science

Revised syllabus 2022-2023

MSC (Computer Science)

(with effect from admitted batch 2022-23)

Semester	Course Code	Course Title	L-T-P	Credits
I	22MCSLAB102	Programming and problem solving using python Lab	0-0-6	3

COURSE OBJECTIVES: This course provides practical exposure to use the programming constructs available in python.

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to

1. Use branching and looping statements to implement a given problem.
2. Implement operator overloading using member functions where it is essential.
3. Programs to demonstrate the implementation of strings.
4. Illustrates run time and compile time polymorphism
5. Implement various searching and sorting algorithms.

LIST OF EXPERIMENTS:

1. Write a Python program to reverse a number and also find the sum of digits in the reversed number. Prompt the user for input.
2. Write Python code to check if the given year is leap year or not.
3. Write Python code to determine whether the given string is Palindrome or not using slicing
4. Write Python code to add two matrices and also find the transpose of the resultant matrix.
5. Write Python code to swap two numbers without using intermediate variables.
6. Consider a rectangle class and create two rectangle objects. Write a python program to check whether the area of the first rectangle is greater than the second by overloading greater than operator.
7. Write a Python program to count the number of times an item appears in the list.
8. Write Python code to convert uppercase letters to lowercase and vice versa
9. Write Python code to perform a linear search for a given key number in the list and report success or failure.
10. Write Python code to sort numbers in a list in ascending order using Bubble sort by passing the list as an argument to the function call.
11. Write Python code to calculate the area and perimeter of different shapes using polymorphism.

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An Autonomous & ISO 9001: 2015 Certified Institution:: Ranked by NIRF in 101-150 band at NIRF-2020 & 151-200 band in NIRF 2019
NAAC accredited Institution with grade B+ with C.G.P.A 2.6 during March, 2017

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Detailed Course Syllabus for Semester -II

1601: M.Sc (Computer Science)

(with effect from admitted batch 2022-23)

Course Code	Title of the Course	Instruction Hours per week			Credits	Evaluation		
		L	T	P		CIA MARKS	SEE MARKS	SEE DURATION
SEMESTER – II								
22MCS201	Design and Analysis of Algorithms	4	-	-	4	40	60	4 Hrs.
22MCS202	Operating Systems	4	-	-	4	40	60	4 Hrs.
22MCS203	Database Management Systems	4	-	-	4	40	60	4 Hrs.
22MCS204	Research Methodology & IPR	3	-	1	3	40	60	4 Hrs.
22MCSDSE201 (OR) 22MCSDSE202 (OR) 22MCSDSE203	Domain Specific Elective Mobile Computing (OR) Software Engineering (OR) Data Warehousing & Data Mining	4	-	-	4	40	60	4 Hrs.
22MCSLAB201	Operating Systems Lab	-	-	6	3	40	60	6 Hrs.
22MCSLAB202	Database Management Systems Lab	-	-	6	3	40	60	6 Hrs
Total					**25**	**280**	**420**	32 hours per week

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

MSC (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
II	22MCS201	DESIGN AND ANALYSIS OF ALGORITHMS	4-0-0	4

Course Description and Purpose:

This course introduces basic methods for the design and analysis of efficient algorithms emphasizing methods useful in practice. Different algorithms for a given computational task are presented and their relative merits evaluated based on performance measures.

COURSE OBJECTIVES: The course introduces the basics of computational complexity analysis and various algorithm design paradigms.

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to:

1. Understand the basic notation for analyzing the performance of the algorithms.
2. Use divide-and-conquer techniques for solving suitable problems
3. Use a greedy approach to solve an appropriate problem for an optimal solution.
4. Apply dynamic programming approach to solve suitable problems
5. Understand the limitations of algorithm power and study how to cope with the limitations of algorithm power for various problems.

DETAILED SYLLABUS:

Unit - 1	**Introduction to Algorithm** : Algorithm definition, properties, Different areas to study about Algorithms, Pseudo code expressions for an algorithm, Performance Analysis, Time Complexity & Space Complexity, Asymptotic notations **Elementary Data Structures:** Stacks and Queues, Trees: Terminology - Binary Trees, Dictionaries : Binary Search Trees, Heaps, Heapsort; Graphs: Introduction - Definitions - Graph Representations.

Unit - 2	**Introduction to Divide and Conquer** : Binary search, Binary search analysis, Quick sort, Quick sort analysis, Merge sort, Merge sort Analysis, Strassen's matrix multiplication, Finding Maximum and minimum. **Greedy Method** : Introduction, General method, Job sequencing with deadlines, single source shortest path problem, Optimal storage on tapes, Knapsack problem, Minimum cost spanning trees : Prim's Algorithm, Kruskal's Algorithm.
Unit - 3	**Dynamic Programming** : Single source shortest path problem, Multistage graphs, All pairs shortest path, Optimal Binary search tree, 0/1 Knapsack problem, Reliability design, Traveling person Problem, Flow shop scheduling. **Basic Traversal and Search Techniques:** Techniques for Binary Trees, Techniques for graphs: Breadth First Search and Traversal-Depth First Search; Connected Components and Spanning Trees -Bi-connected components and DFS.
Unit - 4	**Introduction to Backtracking :** General method, N-queens problem, sum of subsets problem, Graph coloring, Hamiltonian cycles, Knapsack problem. **Branch and Bound :** The Method: Least Cost search -The 15 puzzle - control abstractions for LC search - Bounding - FIFO Branch and Bound - LC Branch and Bound; 0/1 knapsack problem: LC Branch and Bound solution - FIFO Branch and Bound solution; Traveling Salesperson.
Unit - 5	**NP-Hard and NP -complete problems :** Basic concepts : Non deterministic algorithms -The classes NP hard and NP complex; Cook's theorem - Traveling salesperson decision problem - and/or graph decision problem;

Text books

	Author	Title	Publisher
1	Sartaj Sahni	Fundamentals of Computer Algorithms.	2nd Edition, University Press

Reference books

	Author	Tit le	Publish er
1	Anany Levitin	Introduction to the Design & Analysis of Algorithms	2nd Edition, Pearson Education
2	I Chandra Mohan	Design and Analysis of Algorithms	PHI
3	Prabhakar Gupta and Vineet Agarwal	Design and Analysis of Algorithms	PHI
4	Parag Himanshu Dave	Design and Analysis of Algorithms	Pearson Education

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MSC (Computer Science) Semester: II

22MCS 201: DESIGN AND ANALYSIS OF ALGORITHMS

(w.e.f admitted batch 2020-21)

Time: 3 Hours **Max. Marks: 60**

SECTION - A

Answer ANY FIVE question **5 X 4 = 20 Marks**

1. Define Time Complexity and Space Complexity
2. What is a binary search tree?
3. What is the best case search time in binary search?
4. Differentiate Divide and Conquer and Greedy methods
5. Write about the Single source shortest path problem.
6. Define multistage graphs?
7. Explain graph coloring problem.
8. Explain briefly branch and bound technique
9. What are non-deterministic algorithms?
10. When do we say that a problem is NP-Complete?

SECTION - B

Answer All Questions **5 X 8 = 40 Marks**

UNIT – I

11. a) What is Performance analysis and define the asymptotic notations for best, average and worst case analysis of algorithms with suitable examples.

(OR)

b) Define heap. Explain operations on heap with suitable examples.

UNIT – II

12. a) Explain with an example how divide and conquer approach can be used to sort the numbers in a file using quick sort method

(OR)

b) Apply Kruskal's algorithm to find a minimum spanning tree of a graph by taking a suitable example.

UNIT – III

13. a) Explain about the 0/1 Knapsack problem with an example?

(OR)

b) Explain in detail about BFS and DFS of a graph with an example.

UNIT – IV

14. a) Explain 8-queens problem with an algorithm

(OR)

b) Explain about the State Travelling salesman problem with an example ?

UNIT – V

15. a) Explain about the cook's theorem ?

(OR)

b) Explain about basic concepts of NP-hard and NP-complete problems.

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

22MCS 201- DESIGN AND ANALYSIS OF ALGORITHMS QUESTION BANK

SHORT ANSWER QUESTIONS **EACH QUESTION – 4 MARKS**

1. Define Time Complexity and Space Complexity
2. What is a binary search tree?
3. What is the best case search time in binary search?
4. Differentiate Divide and Conquer and Greedy methods
5. Define optimal binary search tree.
6. Explain Principle of Optimality?
7. Explain graph coloring problem.
8. Explain briefly branch and bound technique
9. What are non-deterministic algorithms?10. Define Stack ?
11. Write about different types of Queues?
12. Define Binary Tree ?
13. What is a directed Graph ?
14. Write about Graph Representations ?
15. When do we say that a problem is NP-Complete?

LONG ANSWER QUESTIONS **EACH QUESTION -8 MARKS**

1. What is Performance analysis and define the asymptotic notations for best,average and worst case analysis of algorithms with suitable example.?
2. Define heap. Explain operations on heap with suitable examples.?
3. Explain with an example how divide and conquer approach can be used to sort the numbers in a file using the quick sort method?
4. Apply Kruskal's algorithm to find a minimum spanning tree of a graph by taking suitable examples?
5. Explain about the 0/1 Knapsack problem with an example?
6. Explain in detail about the BFS of a graph with an example.?
7. Explain the 8-queens problem with an algorithm?
8. Explain about the State Travelling salesman problem with an example ?
9. Explain about Cook's theorem ?
10. Explain about basic concepts of NP-hard and NP-complete problems.?
11. Explain about the DFS algorithm on a Graph ?
12. Explain about linear search algorithm complexity for best,worst and average case with example?
13. Explain about Prim's algorithm ?
14. Explain about the Shortest Path algorithm on Graphs ?
15. Explain Binary Search algorithm with an example ?

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

MSC (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
II	22MCS 202	OPERATING SYSTEMS	4-0-0	4

Course Description and Purpose:

Covers the classical internal algorithms and structures of operating systems, including CPU scheduling, memory management and device management. Considers the unifying concept of the operating system as a collection of cooperating sequential processes. Covers topics including file systems, virtual memory, disk request scheduling, concurrent processes, deadlocks, security, and integrity.

COURSE OBJECTIVES: To acquaint students about the services provided by and the design of an operating system.

1. To understand the services provided by and the design of an operating system.
2. To understand the structure and organization of the file system.
3. To understand what a process is and how processes are synchronized and scheduled.
4. To understand different approaches to memory management.
5. Students should be able to use system calls for managing processes, memory and the file system.
6. Students should understand the data structures and algorithms used to implement an OS.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to:

1. Understand fundamental operating system abstractions such as processes, threads, files, semaphores,IPC abstractions, shared memory regions, etc.,
2. Analyze important algorithms eg. Process scheduling and memory management algorithms.
3. Categorize the operating system's resource management techniques, deadlock management techniques,memory management techniques

COURSE CONTENT:

UNIT- I

Operating-System Structures: Operating System Services, User and Operating System interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, Operating System Structure.

Processes: Process Concept, Process Scheduling, Operations on Processes, Inter Process Communication, Communication in Client-Server Systems.

UNIT- II

Threads: Overview, Multicore Programming. Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues.

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling.

Multiple Processor Scheduling.

Process Synchronization: Background, The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors.

UNIT -III

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

Main Memory: Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table, Intel 32 and 64-bit Architectures.

Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing.

UNIT- IV

Mass Storage Structure: Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Swap Space Management, RAID Structure.

File System Implementation: File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free Space Management.

UNIT -V

I/O Systems: Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware operations, STREAMS, Performance.

Protection: Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of the Access Matrix, Security and protection.

A review of Mobile Operating Systems, Features of Android Operating Systems.

Reference Text books:

1. Abraham Silberschatz,& Peter Baer Galvin, Greg, Operating System Concept, Ninth Edition, Wiley, 2015
2. William Stallings, Operating Systems-Internals and Design Principles, Fifth Edition, Pearson Education, 2007
3. Achyut S Godbole, Operating Systems, Second Edition, TMH, 2007
4. Flynn/McHoes, Operating Systems, Cengage Learning, 2008.
5. Deitel & Deitel, Operating System, Third Edition, Pearson Education, 2008

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

MSC (Computer Science) Semester: II

22MCS 202: OPERATING SYSTEMS

(w.e.f admitted batch 2022-23)

Time: 3 Hours **Max. Marks: 60**

SECTION - A

Answer ANY FIVE question **5 X 4 = 20 Marks**

1. Define Operating System?
2. Define System call.
3. What is critical section problem
4. Differentiate between Threads and process
5. What is internal and external fragmentation?
6. What is Thrashing? Explain.
7. Explain about swap space management
8. What is RAID? Explain.
9. State the primary goals of protection in an operating system
10. Explain the role of the kernel I/O subsystem

SECTION - B

Answer All Questions **5 X 8 = 40 Marks**

UNIT – I

11. a)Explain inter process communication

(OR)

b)Explain Operating system services.

UNIT – II

12. a) Explain the Round Robin Scheduling algorithm with a suitable example.

(OR)

b) Explain about process synchronization

UNIT – III

13. a) Discuss about various page replacement algorithms with examples.

(OR)

b) Explain Banker's deadlock-avoidance algorithm with an illustration

UNIT – IV

14. a)Discuss about Disk Scheduling

(OR)

b) Explain about File operations and directory structure

UNIT – V

15. a) What are the features of Android Operating System

(OR)

b) Explain the concept of access matrix in operating systems.

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

MSC (Computer Science) Semester: II

22MCS 202: OPERATING SYSTEMS
(w.e.f admitted batch 2022-23)

QUESTION BANK

UNIT-1

4 MARKS QUESTIONS

1. What is System Call?
2. Explain process states
3. With a neat diagram explain operating system interface
4. What are the operating system services? Explain.

8 Marks questions

1. Explain inter process communication
2. Explain about operating system design and implementation
3. Explain Operating system services.
4. Explain process concept, process scheduling and operations on processes

Unit- 2

4 marks questions

1. Differentiate between Threads and process
2. what are semaphores? explain
3. Explain mutex and monitors.
4. What is critical section problem
5. Define thread. Differentiate user threads from kernel threads.

8 marks questions

1. Differentiate between pre-emptive and non preemptive CPU scheduling algorithms. Explain about 2 preemptive and 2 non preemptive scheduling algorithms.
2. Explain the Round Robin Scheduling algorithm with a suitable example.
3. Explain about process synchronization

unit - 3

4 marks questions

1. What is thrashing
2. Explain about contiguous memory allocation
3. What is swapping
4. What is deadlock? Explain
5. Explain demand paging
6. Explain recovery from deadlock after detection
7. What is internal and external fragmentation? Explain their causes and solution

8 marks questions

1. Discuss about non - contiguous memory allocation
2. Discuss about various page replacement algorithms with examples.
3. Explain Banker's deadlock-avoidance algorithm with an illustration
4. What is Deadlock and what are its four necessary conditions that must simultaneously hold for deadlock to occur.
5. What is Paging? Explain structure of page table

6.(a) What is segmentation? Explain segmentation with paging

(b) What is contiguous allocation

7. What are the four necessary conditions that must hold simultaneously for dead lock to occur? Explain.

Unit-4

4 marks questions

1. Discuss about File access Methods.
2. What is a file? List the various file attributes
3. What is RAID? Explain.
4. Explain about swap space management

8 marks questions

1. Discuss about Disk Scheduling
2. Explain about File operations and directory structure
3. What are different disk scheduling algorithms? Explain in detail about SSTF and CSCAN disk scheduling algorithms.
4. What is a directory? What are the different logical structures of a directory?
5. Explain about three major methods of allocating disk space
6. Explain about free space management

unit -5

4 marks questions

1. Explain the role of the kernel I/O subsystem
2. State the primary goals of protection in an operating system
3. Compare and contrast mobile operating systems with traditional desktop operating systems

8 marks questions

1. What are the features of Android Operating System
2. Explain the concept of access matrix in operating systems.
3. Describe the hardware components involved in the I/O process of a computer system

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

MSC (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
II	22MCS203	DATABASE MANAGEMENT SYSTEMS	4-0-0	4

Course Description and Purpose:

This course introduces the core principles and techniques required in the design and implementation of database systems. This course focuses on relational database management systems. It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control and Recovery and various types of databases like distributed database, and intelligent database, Client/Server. It also provides students with theoretical knowledge and practical skills in the use of databases and database management systems in information technology applications.

Course Objectives:

1. To understand basic concepts of databases and database users.
2. To learn the basics of Functional Dependencies and Normalization for Relational Databases & Transaction Processing Concepts.
3. To learn Concurrency Control Techniques and Distributed Database Concepts.
4. To know Querying, Creating, Updating & Deleting Documents in MongoDB, Data Lakes.

Course Outcomes:

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

1. Learn the concepts of databases and database users.
2. Learn the basics of normalization.
3. Learn entity relationship models.
4. To understand relational algebra and relational calculus.
5. To know Querying, Creating, Updating & Deleting documents in SQL.

COURSE CONTENT:

Unit 1	**Databases and Database Users**: Introduction, Characteristics of the Database Approach, Actors on the Scene, Workers behind the scene, Advantages of using the DBMS Approach. **Database System Concepts and Architecture**: Data Models, Schemas and Instances, Three Schema architecture and Data Independence, Database Languages and Interfaces, Centralized and Client/Server Architecture for DBMS, Classification of Database Management Systems.

Unit 2	**Data Modeling Using the ER Model**: Conceptual Data models, Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship sets, roles and structural Constraints, Weak Entity types, Relationship Types of Degree Higher than Two, Refining the ER Design for the COMPANY Database. **The Relational Algebra and Relational Calculus:** Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples, The Tuple Calculus and Domain Calculus. **The Enhanced Entity-Relationship Model**: Sub classes, Super classes and Inheritance, Specialization and Generalization, Constraints and Characteristics of Specialization and Generalization
Unit 3	**Functional Dependencies and Normalization for Relational Databases:** Informal Design Guidelines for Relation Schemas, Functional dependencies, Normal Forms Based in Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Inclusion Dependencies.
Unit 4	**Introduction to Transaction Processing Concepts and Theory:** Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing schedules Based on Serializability. **Concurrency Control Techniques:** Two Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Multiversion Concurrency control techniques, Validation concurrency control Techniques.
Unit 5	SQL-99: Schema Definition, Constraints, Queries and Views: SQL Data Definitions and Data Types, Specifying Constraints in SQL, Schema Change Statements on SQL, Basic Queries in SQL, More Complex SQL Queries, INSERT, DELETE and UPDATE statements in SQL, Triggers and Views. Emerging Database Technologies and Applications- Mobile Databases, Multimedia Databases, Geographic information Systems.

Reference Text books:

1. Ramez Elmasri & Shamkant B. Navathe, Fundamentals of Database Systems, Pearson, Seventh Edition, 2016.
2. Pramod J.Sadalage & Martin Fowler, NoSQL Distilled , Addison-Wesley, Second Edition, 2013
3. Kristina Chodorow, MongoDB, O'Reilly, Second Edition, 2013
4. Mandy Chessell Ferd Scheepers, Maryna Strelchuk, Ron van der Starre,Seth Dobrin,Daniel Hernandez From Data Lake to Data Driven Organization, IBM-Red Guide,2018

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

MSC (Computer Science) Semester: II

22MCS 203: DATABASE MANAGEMENT SYSTEMS

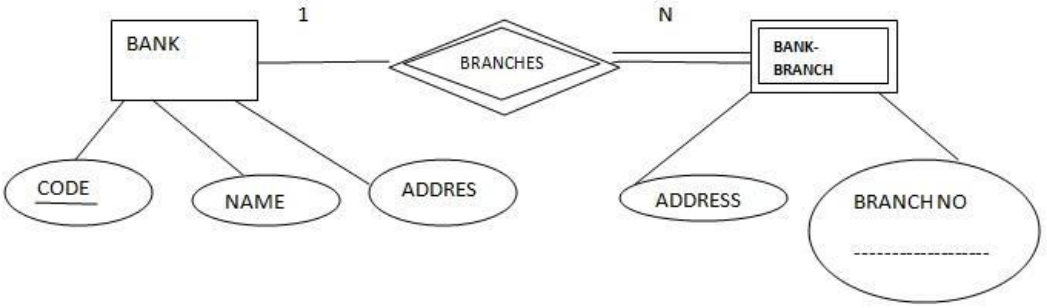
(w.e.f admitted batch 2022-23)

Time: 3 Hours **Max. Marks: 60**

SECTION - A

Answer ANY FIVE question **5 X 4 = 20 Marks**

1. Discuss the actors and workers involved in a Database Management System (DBMS)
2. Define the characteristics of the Database Approach.
3. Identify entities, weak entities, attributes, key attributes and relationships in the below figure.



4. Draw the ER diagram for the following scenario: i) The colour of the car is red
   ii) Many Students can join in a class
5. What is functional dependency and explain about first normal form
6. Explain about Fourth normal form
7. Explain about ACID properties
8. Explain the concept of recoverability in a schedule
9. Define constraints in SQL
10. Define the characteristics of multimedia databases

SECTION - B

Answer All Questions **5 X 8 = 40 Marks**

UNIT – I

11. a) Describe the Three Schema architecture

(OR)

b) Classify Database Management Systems based on their characteristics and functionalities.

UNIT – II

12. a) Explain types of entities and types of attributes

(OR)

b) Explain about Relational Algebra operations.

UNIT – III

13. a) Describe the concepts of Second, Third, Boyce-Codd Normal Forms. Provide examples for each.

(OR)

b) Discuss Multivalued Dependencies and Fifth Normal Form. How are they related to the concept of Join Dependencies?

UNIT – IV

14. a) Discuss the Two-Phase Locking (2PL) technique for concurrency control. How does it ensure serializability?

(OR)

b)Explain Concurrency Control based on Timestamp Ordering. How are timestamp values used to manage concurrent transactions?

UNIT – V

12. a) Demonstrate the use of INSERT, DELETE, and UPDATE statements in SQL.

(OR)

b) Discuss Triggers and Views in SQL and explain their role in database management

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

MSC (Computer Science) Semester: II

22MCS 203: DATABASE MANAGEMENT SYSTEMS

(w.e.f admitted batch 2022-23)

QUESTION BANK

Unit 1: Databases and Database System Concepts

Define the characteristics of the Database Approach. How does it differ from the traditional file-based approach?

Discuss the actors and workers involved in a Database Management System (DBMS) environment.

List and explain the advantages of using the DBMS Approach over traditional file systems.

Compare and contrast Centralized and Client/Server Architecture for Database Management Systems.

Describe the Three Schema architecture and explain the concept of Data Independence.

Classify Database Management Systems based on their characteristics and functionalities.

Unit 2: Data Modeling Using the ER Model

Explain the concepts of Entity Types, Entity Sets, Attributes, and Keys in the ER Model.

Define Relationship Types and Relationship Sets. What are the roles and structural constraints in a Relationship?

Discuss the concept of Weak Entity Types and explain how they are identified and represented.

Design an ER Model for a COMPANY Database, considering entities, attributes, relationships, and constraints.

Compare and contrast the Tuple Calculus and Domain Calculus for expressing queries in a relational database.

Unit 3: Functional Dependencies and Normalization for Relational Databases

Explain Functional Dependencies and their role in the normalization process.

Describe the concepts of First, Second, Third, Boyce-Codd, and Fourth Normal Forms. Provide examples for each.

Discuss Multivalued Dependencies and Fifth Normal Form. How are they related to the concept of Join Dependencies?

Unit 4: Transaction Processing and Concurrency Control Techniques

Define Transactions and their desirable properties. What are the characteristics of a schedule based on recoverability?

Discuss the Two-Phase Locking (2PL) technique for concurrency control. How does it ensure serializability?

Explain Concurrency Control based on Timestamp Ordering. How are timestamp values used to manage concurrent transactions?

Describe Multiversion Concurrency Control techniques and how they handle conflicting data access.

Unit 5: SQL-99: Schema Definition, Constraints, Queries, and Views

Create a schema definition in SQL for a simple database table.

Define constraints in SQL and explain how they maintain data integrity.

Write SQL queries to retrieve specific information from a database table.

Demonstrate the use of INSERT, DELETE, and UPDATE statements in SQL.

Discuss Triggers and Views in SQL and explain their role in database management.

Explain the concepts of Mobile Databases and their applications in modern systems.

Discuss the characteristics and applications of Multimedia Databases.

Describe the role of Geographic Information Systems (GIS) and their use in various domains.

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

MSC (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
II	22MCS204	Research Methodology & & Intellectual Property Rights (IPR)	3-0-1	3

Course Description and Purpose:

The aim of this course is to develop a research bent of mind (spirit of inquiry) and impart research skills to all Post graduate students. It also encompasses the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. This course also covers intellectual property rights (IPR), and is intended to equip students with conceptual understandings of the current scenario of IPR, and the practical issues encountered in filing patents, trademarks and copyrights.

Course Objectives:

1. To understand some basic concepts of research and its methodologies
2. To develop an understanding of the basic framework of the research process.
3. To develop an understanding of various research designs and techniques.
4. To identify various sources of information for literature review and data collection.
5. Ability to write a research Proposal, report and thesis
6. To demonstrate knowledge and understanding of IPR Filing and Rights

Course Learning Outcomes:

At the end of this course the students should be able to:

1. Understand some basic concepts of research and its methodologies
2. Identify appropriate research topics
3. Select and define appropriate research problem and parameters
4. Demonstrate the ability to choose methods appropriate to research aims and objectives
5. Have adequate knowledge on measurement & scaling techniques
6. Have basic awareness of data analysis-and hypothesis testing procedures
7. Prepare a project proposal (to undertake a project)
8. Write a research report and thesis
9. File Patents, Trademarks and Copyrights

Course Content:

UNIT I

Foundations of Research

Meaning of Research — Definitions of Research — Motivation in Research — General Characteristics of Research — Criteria of Good Research — Types of Research — Research Process — Research Methods vs. Methodology —Defining and Formulating the Research Problem — Review of Literature — Approaches to Critical Literature Review — Importance of Literature Review in Identifying Research Gaps and Defining a Problem —Development of Working Hypothesis.

UNIT II

Research Design, Sampling Concepts, and Data Collection Methods

Meaning, Significance and Characteristics of Good Research Design — Types of Research Design: Exploratory, Conclusive Research and Experimental — Sampling Theory: Types of Sampling and Errors in Sampling — Data Collection: Types of Data — Data Collection Methods and Techniques for Primary and Secondary Data.

UNIT III

Measurement & Scaling Techniques, Hypothesis Formulation and Testing, Overview of Data Analysis and Report Writing

Basic measurement scales — Reliability & Validity — Definition and Types of Hypothesis — Hypothesis Formulation and Testing Procedure — Overview of Data Analysis: Methods, Process and Types — Report Writing: Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports — How to Write a Research Proposal,Research Ethics, Conflict of Interest and Plagiarism.

UNIT IV

Intellectual Property Rights (IPR)

Definition and Nature and Features of Intellectual Property Rights (IPR) — Types of IntellectualProperty Rights —Procedure for Grants of Patents — Rights of a Patent — Scope of a Patent Rights

— Licensing and Transfer of Technology — Why is protection of intellectual property important?

— Enforcement of IPR — Infringement of IPR.

UNIT V

Indian and International Scenario and New Developments in IPR

IPR Developments in India for the past Five Years — Development of IPR Laws in India — International Cooperation on IPR — New Developments in IPR — Administration of Patent System —International Patent protection — Case Studies in Indian and Global Contexts.

PRACTICAL COMPONENTS:

1. Students should identify different research problems with examples and describe the characteristics of researchable problems in their academic area/society/community/organization concerned.

2. Students are to form in groups (a group consists of 4-6 students) and conduct a critical literature survey with regard to the identified research problems and prepare a brief literature review coupled with research gaps and working hypothesis.
3. Students are required to identify and develop good research design to address the defined research problems.
4. Students are expected to write the research design on Exploratory and DescriptiveResearch.
5. Students are required to develop practical experience in writing a research proposal by conducting a thorough critical review of any three research proposals (examples).
6. Students are expected to develop templates for technical report writing.
7. Students should conduct a team based mini research project, which is a unified and practical case on a topic of their choice, with approximately 4-6 students per group.
8. Students are expected to identify types of plagiarism in academic research, and how to avoid plagiarism in research.
9. Students are asked to identify and submit a brief report on Indian patents of International Repute.
10. Students are asked to write on Patent registration procedure, and visit Official website of Intellectual Property India https://ipindia.gov.in to know how to get 1PR in India.
11. Students are asked to identify and summarize remedies available against the infringement of intellectual property rights in Indian and global contexts.
12. Students are asked to submit any five examples of ethical issues in copyright and patents.

Reference Text Books:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002, An introduction to Research Methodology, RBSA Publishers.
2. Cohen, L. Lawrence, M., & Morrison, K. (2005), Research Methods in Education (5th edition). Oxford: Oxford University Press.
3. Kothari, C.R., 1990, Research Methodology: Methods and Techniques, New Age International.
4. Dornyei, Z. (2007). Research Methods in Applied Linguistics. Oxford: Oxford UniversityPress.
5. Anthony, M., Graziano, A.M. and Raulin, M.L., 2009, Research Methods: A Process of inquiry, Allyn and Bacon.
6. Fink, A., 2009, Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications.
7. Day, R.A., 1992, How to Write and Publish a Scientific Paper, Cambridge University Press.
8. Wadehra, B.L. 2000, Law relating to patents, trade marks, copyright designs and geographical indications. Universal Law Publishing.
9. Coley, S.M. and Scheinberg, C. A., 1990, Proposal Writing, Sage Publications.
10. Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries: the TRIPS

agreement and policy options, Zed Books, New York.

1 I. Leedy, P.D. and Ormrod, J.E., 2004, Practical Research: Planning and Design, Prentice hall.

12. Satarkar, S.V., 2000. Intellectual property rights and Copyright. Ess Publications.

13. Important Websites:

- www.ipindia.nic.in - Intellectual Property Office, India
- www.patentoffice.nic.in — Patent office, India
- http://copyright.gov.in/ - Copyright Office, India
- ipr.icegate.gov.in — Automated Recordation & Targeting for IPR Protection
- http://www.icegate.gov.in- E- Commerce portal of Central Board of Excise and Customs
- ww.ipab.tn.nic.in - Intellectual Property Appellate Board, India
- www.mit.gov.in Department of Information Technology, India
- http://www.mit.gov.in/content/office-semiconductorintegrated-circuits-layout-designregistry Semiconductor Integrated Circuits Layout-Design Registry (SICLDR)

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023 DOMAIN SPECIFIC ELECTIVE COURSE

1601: MSC (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
II	22MCSDSE201	Mobile Computing	4-0-0	4

Course Description and Purpose:
Mobile Computing is a course that illustrates basic concepts of Wireless Networks, Generation of Mobile Nodes, Mobile System Architecture, GPRS, Mobility Management, Wireless Access Technologies, lPv4, Mobile IP, Mobile Transport Layer, Wireless TCP, Next Generation Networks, File Systems.

Course Objectives:
This course will help enable the students to understand the basic concepts of wireless networks, Mobile Computing architecture, GPRS, Mobility Management and wireless access and various transport layers and file systems.
Specific objectives include:

1. To understand the basic concepts of Worldwide Networks, Wireless Transmission and Generations of Mobile Systems.
2. To perceive the architecture and common technologies for mobile communication.
3. To Grasp the [P Network Protocols and methods used in IP Routing of Packets.
4. To apprehend the working of Mobile Transport Layer and Wireless TCP.
5. To Gain knowledge regarding the Next Generation Networks and File Systems.

Course Learning Outcomes:
Upon successful completion of the course, the student will be able to:

1. Gain knowledge on the concepts of Worldwide Networks, Wireless Transmission and Generations of Mobile Systems.
2. Understand architecture and common technologies for mobile communication.
3. Know the IP Network Protocols and methods used in IP Routing of Packets.
4. Understand the working of Mobile Transport Layer and Wireless TCP.
5. Apprehend regarding the Next Generation Networks and File Systems.

Course Content:
UNIT-I
Introduction: World Wide Networks: Computer Networking, Significance of TCP/IP Protocol Stack in World Wide Networking, Internet Applications.
Wireless Networks: Limitations, Mobile Computing Paradigm, Promises/Novel Application. Generation of Mobile Systems: Features of First Generation, Second Generation, Third Generation, Fourth Generation and Comparison.

UNIT-II
Mobile System Architectures: GSM:System Architecture, Functional Subsystems of GSM: Radio Interfaces, Protocols, Handover, New Data Services.
GPRS: System Architecture, Protocol Layers, Comparison of GSM & GPRS
Mobility Management: Location Management, Handover, Mobility Management in GSM & GPRS. Wireless Access Technologies: WPAN, Bluetooth, WLAN, WMAN, Wi-MAX.

UNIT-III

IPV4: Features of IPV4, Classes in IPV4 Addressing.

Mobile IP: Entities and Terminology, IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation, IPV6, IPV4 versus IPV6.

UNIT- IV

Mobile Transport Layer: Traditional TCP: Congestion Control, Slow Start, Fast Retransmit/Fast Recovery, Implications of Mobility.

Wireless TCP: Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/Fast Recovery, Transmission/Time out Freezing, Selective Retransmission, Transaction Oriented TCP, TCP over 2.5/3G Wireless Networks.

UNIT-V

Next Generation Networks: Architecture of NGN, Core Network, Access Network, Capabilities of NGN, Characteristics ofNGN, Generalized Mobility on NGN, Transport Independent Service Paradigm.

File Systems: Coda, Little Work, Ficus, Mio-NFS, Rover Mobile Operating Systems: Symbian, Android Wireless Markup Language (WML) and WML Script, Extensible Markup Language and its Applications.

Reference Text books:

1. Jochen Schiller, Mobile Communications, Pearson Education, Second Edition 2002
2. Raj Kamal, Mobile Computing, Oxford Press(2008)
3. Ashok K Talukder and Roopa R Yavagal, Mobile Computing, TMH(2008)

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023 DOMAIN SPECIFIC ELECTIVE COURSE

1601: MSC (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
II	22MCSDSE202	Software Engineering	4-0-0	4

Course Description and Purpose:

Almost every computer science and computer engineering curriculum now includes a required team-based software development project. In some cases, the project is only one semester or quarter in length, but a year-long team based software development project is fast becoming the norm.

In the present world, every student would complete a course in software engineering before starting his or her team-based project. In practice, however, many students have to start their projects partway through their software engineering course.

Course Objectives:

Specific objectives include:

1. To understand the basic concepts of Software Engineering and its concepts.
2. To understand various life cycle models.
3. To grasp the knowledge software process and requirements workflow.
4. To apprehend the knowledge of software metrics.
5. To gain the knowledge of Object Oriented Paradigm.

Course Learning Outcomes:

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

1. Gain knowledge on the concepts of Software Engineering requirements, analysis and design.
2. Understand different life cycle models.
3. Known the concept of object oriented paradigm .
4. Understand the working of software Architecture and their design patterns

Course Content:

Unit-I

The Scope of Software Engineering- Requirements, Analysis and Design Aspects, Object Oriented Paradigm, Iteration and incrementation, Risks and other aspects of Iteration and Incrementation. Managing Iteration and Incrementation. Code and fix life cycle model, Waterfall life cycle model, Open source life cycle model, Agile processes, spiral life cycle model. Comparison of life cycle models.

Unit-II

The software process- The unified process Iteration and incrementation within the Object-Oriented Paradigm, The requirements workflow, The Analysis Workflow. The design Workflow, The Implementation workflow, The phases of the Unified Process, Capability Maturity Models.

Unit-III

Software Metrics, CASE, Taxonomy of CASE, Scope of CASE, Software Versions, Configuration Control.
Testing quality issues, Non Execution Based Testing, Execution based testing.

Unit-IV

Modules to Objects- What is a Module?, Cohesion, Coupling, Data Encapsulation, Abstract Data Types, Information Hiding, Objects, Inheritance, Polymorphism, and Dynamic Binding, Object-Oriented Paradigm.

Unit-V

Reuse concepts, Objects and Reuse , during design and implementation, Design Reuse, Application Frameworks, Design Patterns, Software Architecture, More on Design patterns.

Reference Textbooks:

I . Stephen. R. Schach, Object-oriented and classical software Engineering, Eight Edition.
2. Stephen. R. Schach, Object-oriented and classical software Engineering, Seventh Edition.

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22MCSDSE202- SOFTWARE ENGINEERING

Revised syllabus 2022-2023 DOMAIN SPECIFIC ELECTIVE COURSE

1601: MSC (Computer Science)

MODEL QUESTION PAPER

SECTION - A

Answer ANY FIVE questions (5 X 4 = 20 Marks)

1. Discuss the principles of the Open Source software life cycle model.
2. Explain about code and fix life cycle
3. What is the Unified Process in software development?
4. Explain about iteration and incrementation within the Object-Oriented Paradigm
5. Define Software Metrics
6. What is Configuration Control in software development?
7. Define and differentiate between Modules and Objects
8. Discuss the concept of Abstract Data Types (ADTs)
9. How does Reuse benefit software development?
10. What are Application Frameworks?

SECTION - B

Answer All Questions (5 X 8 = 40 Marks)

UNIT – I

11.a) Explain the characteristics of the Agile software development process.

(OR)

b) Explain about waterfall model and spiral model

UNIT – II

12. a) Briefly describe the Capability Maturity Model Integration (CMMI) and its five levels

(OR)

b) Provide a detailed overview of the phases involved in the Unified Process

UNIT – III

13. a) Compare and contrast different CASE (Computer-Aided Software Engineering) tools

(OR)

b) Discuss the challenges and issues related to testing quality.

UNIT – IV

14. a)Explain the importance of Cohesion and Coupling

(OR)

b) Explain the key principles of the Object-Oriented Paradigm

UNIT – V

15. a) Discuss the significance of Design Patterns

(OR)

b) Explain the significance of Software Architecture and its role in software development.

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Machavaram, Vijayawada, Krishna District, AP-520 004

22MCSDSE202- SOFTWARE ENGINEERING

Revised syllabus 2022-2023 DOMAIN SPECIFIC ELECTIVE COURSE

1601: MSC (Computer Science)

QUESTION BANK

Unit-I:

4 Marks Questions:

How does Agile software development differ from traditional life cycle models like the Waterfall model?

What are the key benefits of an iteration and incrementation approach in software development? How does it help in managing risks?

8 Marks Questions:

Compare the Waterfall and Spiral life cycle models in terms of advantages, disadvantages, and suitability for different types of projects.

Explain the principles of the Open Source software life cycle model. How does the open-source development model promote collaboration and community-driven innovation?

Unit-II:

4 Marks Questions:

What is the Unified Process in software development? Mention the main workflows involved in the Unified Process.

Briefly describe the Capability Maturity Model Integration (CMMI) and its five levels, which measure an organization's software development maturity.

8 Marks Questions:

How does iteration and incrementation within the Object-Oriented Paradigm benefit the Unified Process? Explain its importance in addressing changing requirements and improving the quality of the final software product.

Provide a detailed overview of the phases involved in the Unified Process, highlighting the activities and deliverables associated with each phase.

Unit-III:

4 Marks Questions:

Define Software Metrics and explain their importance in software development. Give examples of different types of software metrics used to measure software quality and productivity.

What is Configuration Control in software development? How does it help in managing changes to software products over time and ensuring version control?

8 Marks Questions:

Compare and contrast different CASE (Computer-Aided Software Engineering) tools used in software development. Discuss their advantages and limitations.

Discuss the challenges and issues related to testing quality. Explain the differences between Execution-Based Testing and Non-Execution-Based Testing approaches.

Unit-IV:

4 Marks Questions:

Define and differentiate between Modules and Objects in software development. How does the concept of Data Encapsulation contribute to achieving information hiding in the Object-Oriented Paradigm?

Explain the importance of Cohesion and Coupling in software module design. How do they influence the maintainability and flexibility of a software system?

8 Marks Questions:

Explain the key principles of the Object-Oriented Paradigm, such as Inheritance, Polymorphism, and Dynamic Binding. Provide examples to demonstrate how these principles enhance code reusability and maintainability.

Discuss the concept of Abstract Data Types (ADTs) in the Object-Oriented Paradigm and their role in promoting modularity and encapsulation.

Unit-V:

4 Marks Questions:

How does Reuse benefit software development? Explain how Object-Oriented Paradigm supports reusability during both design and implementation stages.

What are Application Frameworks? How do they facilitate software development by providing pre-designed components and structures for building applications?

8 Marks Questions:

Discuss the significance of Design Patterns in software development. Provide examples of commonly used design patterns and how they improve the efficiency of software design and implementation.

Explain Software Architecture and its role in software development. Discuss how a well-defined software architecture contributes to the scalability, maintainability, and reliability of large software systems.

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023 DOMAIN SPECIFIC ELECTIVE COURSE

1601: MSC (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
II	22MCSDSE203	Data Warehousing & Data Mining	4-0-0	4

Course Description and Purpose:

This course gives an introduction to methods and theory for development of data warehouses and data analysis using data mining. Data quality and methods and techniques for preprocessing of data. Modeling and design of data warehouses. Algorithms for classification, clustering and association rule analysis.

Course Objectives:

1. To understand basic concepts of data mining and overview
2. To learn the basics of mining patterns.
3. To learn the concepts of advanced pattern mining.
4. To understand the classification and various methods.
5. To know cluster analysis mechanism.

Course Learning Outcomes:

At the end of this course the students should be able to:

1. Understand the basics of data mining and data pre-processing techniques.
2. Aware of constructing the data warehouse, relevant data model concepts.
3. Understand the Frequent ItemsetItem Itemset Mining Methods and different levels in association rules
4. Understand the basic concepts in classification and advanced classification methods by implementing various algorithms.
5. Should be able to find the similarities among the data using clustering algorithms and outlier analysis.

Course Content:

Unit-I

Data Mining Concepts- Overview of Data Mining Technology, Association Rules, Classification, Clustering, Approaches to Other Data Mining Problems, Applications of Data Mining, Commercial Data Mining Tools.

Unit-II

Overview of Data Warehousing and OLAP- Introduction, Definitions and Terminology, Characteristics of Data Warehouses, Data Modeling for Data Warehouses, Building a Data Warehouse, Typical Functionality of a Data Warehouse, Data Warehouse versus Views, Problems and Open Issues in Data Warehouses.

Unit III

Mining Frequent patterns, Associations: Basic concept- Market basket analysis: A Motivational Example, Frequent Itemsets, closed itemsets and Association Rules, Frequent itemset Mining Methods

Advanced Pattern Mining: Pattern Mining: A Road Map, Pattern Mining in Multilevel, Multidimensional Space-Mining Multilevel association rules, Mining Multi Dimensional Associations, Mining Quantitative Association Rules.

Unit-IV

Classification: Basic Concepts:Basic concepts-What Is Classification? General Approaches to classification, Decision tree Induction- Decision tree induction, Attribute selection measures, tree pruning, Scalability and Decision Tree Induction, Bayes Classification Methods - Bayes Theorem, Naive Bayesian classification.

Advanced Methods: Bayesian Belief Networks-Concepts and mechanisms, Training Bayesian Belief Networks Classification by Back Propagation.

UNIT V

Cluster Analysis Introduction: What is Cluster Analysis? Requirements for Cluster Analysis, A Partitioning Methods-k-means, K-medoid, Hierarchical Methods- Agglomerative versus Divisive Hierarchical clustering, Distance measures in Algorithmic methods, BRICH: Multiphase hierarchical Clustering using Clustering Feature Trees, Chameleon Hierarchical Clustering, Density Based Methods: DBSCAN.

Reference Textbooks:

1. Jiawei Han, MichelineKamber, Data mining : Concepts & Techniques, Morgan Kaufmann 3rd Edition.
2. Ramez Elmasri, ShamKant B.Navathe, Fundamentals of Database Systems, Fourth Edition.
3. Ralph Kimball, The Data Warehousing, Wiley
4. S.N.Sivanandam, S.Sumathi, Data Mining-Concepts, Tasks and Techniques, Thomson.

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Department of Computer Science

Revised syllabus 2022-2023

1601: MSC (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
II	22MCSLab201	OPERATING SYSTEMS LAB	0-0-6	3

COURSE OBJECTIVES: To provide students necessary skills for developing and debugging programs in the LINUX environment. Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to:

CO1	Experiment with Unix commands and shell programming. Build 'C' program for process and file system management using system calls
CO2	Choose the best CPU scheduling algorithm for a given problem instance.
CO3	Implement various inter process communication mechanisms.
CO4	Identify the performance of various page replacement algorithms
CO5	Develop algorithm for deadlock avoidance, detection and file allocation strategies

LIST OF EXPERIMENTS

1. Write programs using the following system calls of LINUX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir

2. Write programs using the I/O system calls of LINUX operating system (open, read, write, etc)

3. Write C programs to simulate LINUX commands like ls, grep, etc.

4. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.

5. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.

6. Developing Application using Inter Process communication (using shared memory, pipes or message queues)

7. Implement the Producer – Consumer problem using semaphores (using UNIX system calls).

8. Implement some memory management schemes – I

9. Implement some memory management schemes – II

10. Implement any file allocation technique (Linked, Indexed or Contiguous)

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

1601: MSC (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
II	22MCSLab201	DATABASE MANAGEMENT SYSTEMS LAB	0-0-6	3

COURSE OBJECTIVES: To impart students with practical knowledge on designing, creating and querying relational database systems.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to:

CO1	Infer database language commands to create simple database
CO2	Analyze the database using queries to retrieve records
CO3	Implement various advanced queries execution such as relational constraints and joins.
CO4	Implement various advanced queries execution such as aggregate functions and set operations.
CO5	Develop solutions using database concepts for real time requirements.

Cycle-I: Aim: Marketing company wishes to computerize their operations by using following Tables.

Table Name: Client- Master

Description: Used to store client information

Column Name	Data Type	Size	Attribute
CLIENT_ NO	Varchar2	6	Primary key and first letter must start with ‘C’
NAME	Varchar2	20	Not null
ADDRESS 1	Varchar2	30	
ADDRESS S	Varchar2	30	
CITY	Varchar2	15	
PINCODE	Varchar2	8	
STATE	Varchar2	15	
BAL_DUE	Number	10 ,2	

Table Name: Product_ Master

Description: Used to store product information

Column Name	Data Type	Size	Attribute
PRODUCT _NO	Varchar2	6	Primary key and first letter must start with ‘P’
DESCRIPTION	Varchar2	15	Not null
PROFIT _PERCENT	Number	4, 2	Not null

UNIT _MEASUE	Varchar2	10	
QTY_ ON_ HAND	Number	8	
REORDER_ LVL	Number	8	
SELL _PRICE	Number	8, 2	Not null, cannot be 0
COST _PRICE	Number	8, 2	Not null, cannot be 0

Table Name: Salesman_master
Description: Used to store salesman information working for the company.

Column Name	Data Type	Size	Attribute
SALESMAN_ NO	Varchar2	6	Primary key and first letter must start with 'S'
SALESMAN _NAME	Varchar2	20	Not null
ADDRESS1	Varchar2	30	
ADDRESS2	Varchar2	30	
CITY	Varchar2	20	
PINCODE	Number	8	
STATE	Varchar2	20	
SAL_AMT	Number	8, 2	Not null, cannot be 0
TGT_TO_GET	Number	6, 2	Not null, cannot be 0
YTD _SALES	Number	6, 2	Not null
REMARKS	Varchar2	20	

Table Name: SALES-ORDER
Description: Used to store client's orders

Column Name	Data Type	Size	Attribute
ORDER_ NO	Varchar2	6	Primary key and first letter must start with 'S'
CLIENT _NO	Varchar2	6	Foreign Key
ORDER _DATE	Date		
DELY _ADDRESS	Varchar2	25	
SALESMAN_ NO	Varchar2	6	Foreign Key
DELY _TYPE	Char	1	Delivery: part(p)/ full(f) and default 'F'
BILL_ YN	Char	1	
DELY_ DATE	Date		Can't be less than order date

ORDER _STATUS	Varchar2	10	Values (“In Process”, “ Fulfilled”, “Back Order”, “Canceled.

Table Name: SALES_ORDER_DETAILS
Description: Used to store a client's order with details of each product ordered.

Column Name	Data Type	Size	Attribute
ORDER _NO	Varchar2	6	Primary key references SALES_ORDER table
PRODUCT_ NO	Varchar2	6	Foreign Key references SALES_ORDER_table
QTY_ ORDERED	Number	8	
QTY_ DISP	Number	8	
PRODUCT _RATE	Number	10 ,2	Foreign Key

Solve the following queries by using above tables.

1. Retrieve the list of names, city and the state of all the clients.
2. List all the clients who are located in ‘Mumbai’ or ‘Bangalore’.
3. List the various products available from the product_master table.
4. Find the names of salesmen who have a salary equal to Rs.3000.
5. List the names of all clients having ‘a’ as the second letter in their names.
6. List all clients whose Bal due is greater than value 1000.
7. List the clients who stay in a city whose first letter is ‘M’.
8. List all information from the sales-order table for orders placed in the month of July.
9. List the products whose selling price is greater than 1000 and less than or equal to 3000.
10. Find the products whose selling price is greater than 1000 and also find the new selling price as original selling price 0.50.
11. Find the products in the sorted order of their description.
12. Find the products with description as ‘540HDD’ and ‘Pen drive’.
13. Count the total number of orders.
14. Print the description and total qty sold for each product.
15. Calculate the average qty sold for each client that has a maximum order value of 15,000.
16. Find all the products whose quantity on hand is less than reorder level.
17. List the order number and day on which clients placed their order.
18. Find out the products and their quantities that will have to be delivered in the current month.
19. Find the names of clients who have placed orders worth of 10000 or more.
20. Find the client names who have placed orders before the month of June,2008.

Cycle-II

Aim: A manufacturing company deals with various parts and various suppliers supply these parts. It consists of three tables to record its entire information. Those are as follows.

Supplier (Supplier_No, Sname, City, status) Part(Part_no, pname, color, weight, city, cost)
Shipment (supplier_No, Part_no, city)
JX(project_no, project_name, city)
SPJX (Supplier_no, part_no, project_no, city)

1. Get supplier numbers and status for suppliers in Chennai with status > 20.
2. Get project names for projects supplied by supplier S.
3. Get colors of parts supplied by supplier S_1.
4. Get part numbers for parts supplied to any project in Mumbai.
5. Find the id's of suppliers who supply red or pink parts.
6. Find the pnames of parts supplied by London suppliers and by no one else.
7. Get the names of the parts supplied by the supplier 'Mart' and 'Miller'.
8. Get supplier names for suppliers who do not supply part P_2.
9. Get all pairs of supplier numbers such that the suppliers concerned are "colocated".
10. Get suppliers names for the suppliers who supply at least one red part.

Cycle –III Employee Database

Aim: An enterprise wishes to maintain a database to automate its operations. Enterprise is divided into a certain department and each department consists of employees. The following two tables describe the automation schemas.

Emp(Empno, Ename, Job, Mgr, Hiredate, Sal, Comm, Deptno) Dept(Deptno, Dname, Loc)

1. List the details of employees who have joined before the end of September' 81.
2. List the name of the employee and designation of the employee, who does not report to anybody.
3. List the name, salary and PF amount of all the employees (PF is calculated as 10% of salary)
4. List the names of employees who are more than 2 years old in the organization.
5. Determine the number of employees, who are taking commission.
6. Update the employee salary by 20% , whose experience is greater than 12 years.
7. Determine the department does not contain any employees.
8. Create a view, which contains employee names and their manager names working in the sales department.
9. Determine the employees, whose total salary is like the minimum salary of any department.
10. List the department numbers and number of employees in each department.
11. Determine the employees, whose total salary is like the minimum salary of any department.
12. List average salary for all departments employing more than five people.
13. Determine the names of employees, who take the highest salary in their departments.
14. Determine the names of employees, who earn more than their managers.

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An Autonomous & ISO 9001: 2015 Certified Institution:: Ranked by NIRF in 101-150 band at NIRF-2020 & 151-200 band in NIRF 2019
NAAC accredited Institution with grade B+ with C.G.P.A 2.6 during March, 2017

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Detailed Course Syllabus for Semester -III

(For the existing (2021-22 admitted batch) III and IV semesters)

1601: M.Sc (Computer Science)

Course Code	Title of the Course	Instruction Hours per week			Credits	Evaluation		
		L	T	P		CIA MARKS	SEE MARKS	SEE DURATION
SEMESTER – III								
PMCS301	Compiler Design	4	-	-	4	40	60	4 Hrs.
PMCS302	Computer Networks	4	-	-	4	40	60	4 Hrs.
PMCS303	Principles of Programming Language	4	-	-	4	40	60	4 Hrs.
PMCS 304	Artificial Intelligence	4	-	-	4	40	60	4 Hrs.
POMCS305.1POMCS305.2 POMCS305.3,	Open Elective-II Introduction to data science with R Python3 programming C programming	4	-	-	4	40	60	4 Hrs.
PMCS306	Compiler Design Lab	-	-	8	4	40	60	8 Hrs.
PMCS307	Computer Networks Lab	-	-	8	4	40	60	8 Hrs
Total					**28**	**280**	**420**	36 hrs/week

List of courses offered as Open Electives II

COURSE CODE: POMCS305 (to be taken by another department students)

POMCS 305.1. Introduction to Data Science With R

POMCS 305.2. Python3 programming

POMCS 305.3. C programming

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

(For the existing (2021-22 admitted batch) III and IV semesters)

Revised syllabus 2022-2023

Semester	Course Code	Course Title	L-T-P	Credits
III	PMCS301	COMPILER DESIGN	4-0-0	4

COURSE OBJECTIVES: To familiarize and acquaint the student with the principles, algorithms, and data structures involved in the design and construction of compilers. Topics include context-free grammars, lexical analysis, parsing techniques, symbol tables, error recovery, code generation, and code optimization.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to:

CO1	Specify and analyze the lexical, syntactic and semantic structures of advanced language features
CO2	Separate the lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation
CO3	Ability to construct a parser and semantic analyser
CO4	Turn fully processed source code for a novel language into machine code for a novel computer
CO5	Describe techniques for intermediate code and machine code optimisation

Detailed Syllabus

Unit-I	**Introduction to Compiling**: Compilers, Analysis of the source program, The phases of a compiler, Cousins of the compiler, The grouping of phases, Compiler-construction tools A Simple One-Pass Compiler: Overview, Syntax definition, Syntax-directed translation, Parsing, A translator for simple expressions, Lexical analysis, Incorporating a symbol table, Abstract stack machines, Putting the techniques together Lexical Analysis: The role of the lexical analyzer, Input buffering, Specification of tokens, Recognition of tokens, A language for specifying lexical analyzers, Finite automata, From a regular expression to an NFA, Design of a lexical analyzer generator, Optimization of DFA-based pattern matchers.
Unit-II	**Syntax Analysis**: The role of the parser, Context-free grammars, Writing a grammar, Top-down parsing, Bottom Up parsing, Operator-precedence parsing, LR parsers, Using ambiguous grammars, Parser generators Syntax-Directed Translation: Syntax-directed definitions, Construction of syntax trees, Bottom-up evaluation of S-attributed definitions, L-attributed definitions, Top-down translation, Bottom-up evaluation of inherited attributes, Recursive evaluators, Space for attribute values at compile time, Assigning space at compile time, Analysis of syntax-directed definitions.

Unit-III	**Type Checking**: Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions, Overloading of functions and operators, Polymorphic functions, An algorithm for unification Run-Time Environments: Source language issues, Storage organization, Storage-allocation strategies, Access to nonlocal names, parameter passing, Symbol tables, Language facilities for dynamic storage allocation, Dynamic storage allocation techniques, Storage allocation in Fortran.
Unit-IV	**Intermediate Code Generation**: Intermediate languages, Declarations, Assignment statements, Boolean expressions, Case statements, Back Patching, Procedure calls Code generation: Issues in the design of a code generator, The target machine, Run-time storage management, Basic blocks and flow graphs, Next-use information, A Simple code generator, Register allocation and assignment, The dag representation of basic blocks, Peephole optimization, Generating code from dags, Dynamic programming code-generation algorithm, Code-generator generators.
Unit-V	**Code Optimization**: Introduction, The Principal sources of optimization, Optimization of basic blocks, Loops in flow graphs, Introduction to global data-flow analysis, Iterative solution of data-flow equations, Code Improving transformations, Dealing with aliases, Data-flow analysis of structured flow graphs, Efficient data-flow algorithms, A tool for data-flow analysis, Estimation of types, Symbolic debugging of optimized code.

Text Books

- Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman - Compilers – Principles, Techniques and Tools - Pearson Education

Reference Books

- 1. J.P. Bannett - Introduction to Compiling techniques - McGraw Hill
- 2. Tremblay & Sorenson - Compiler Writing - McGraw Hill
- 3. Dhamdhere - Compiler Construction - MacMilan

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MSC (Computer Science) Semester: III

PMC301: COMPILER DESIGN

(w.e.f admitted batch 2020-21)

Time: 3 Hours **Max. Marks: 60**

SECTION - A

Answer ANY FIVE question **5 X 4 = 20 Marks**

1. List and categorize the different types of Language Processors?
2. What happens in Analysis and Synthesis phases of compilation?
3. Define an ambiguous grammar?
4. Give an example of three-address code and explain about it.
5. What is syntax-directed definition?
6. Explain Advantages of Parser.
7. Point out what does heap and stack areas of run-time memory store?
8. Recall what a CISC machine is?
9. Recall what is Code generation?
10. Define Dead code elimination.

SECTION - B

Answer All Questions **5 X 8 = 40 Marks**

UNIT – I

11. a) Explain the Structure of a Compiler. .

(OR)

b) Explain Applications of Compiler Technology.

UNIT – II

12. a) Explain the role of the Lexical Analyzer.

(OR)

b) Explain the role of the Parser

UNIT – III

13.a) Explain Applications of Syntax-Directed Translation.

(OR)

b) Discuss about Type checking

UNIT – IV

14. a) What are the limitations of Access Links? Justify how displays solve those issues?

(OR)

b) Generate code for the following three-address statements assuming stack allocation, where register SP points to the top of the stack. call p call q return call r return return

UNIT – V

15. a) Criticize the issues in the Design of a Code Generator.

(OR)

b) Explain about copy propagation and dead code elimination.

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

PMCS301: COMPILER DESIGN QUESTION BANK

UNIT-I

1. What is Compiler? Design the Analysis and Synthesis Model of Compiler.
2. Write down the five properties of compiler.
3. What is a translator? Write down the steps to execute a program.
4. Discuss all the phases of the compiler with a diagram.
5. Write a short note on:
    a. YACC
    b. Pass
    c. Bootstrapping
    d. LEX Compiler
    e. Tokens, Patterns and Lexemes
6. Write the steps to convert Non-Deterministic Finite Automata (NDFA) into Deterministic Finite Automata (DFA).
7. Explain the role of lexical analyzer with a neat sketch
8. Convert the given NFA to DFA:

Input/State	0	1
q0	{q0, q1}	q0
q1	q2	q1
q2	q3	q3
q3 (final state)	φ (null character)	q2

9. Explain the specification of tokens and recognize the tokens
10. Construct a regular expression for the language containing all strings having any number of a's and b's except the null string.
11. Explain the input buffer
12. Construct Deterministic Finite Automata to accept the regular expression : (0+1)* (00+11) (0+1)*
13. Discuss about the cousins of compiler
14. Derivation and Parse Tree:
    a. Let G be a Context Free Grammar for which the production Rules are given below:
    S -> aB|bA
    A -> a|aS|bAA

    B -> b|bS|aBB

Drive the string *aaabbabbba* using the above grammar (using Left Most Derivation and Right most Derivation).

UNIT 2

1. Explain the parsing techniques with a hierarchical diagram.
2. What are the problems associated with Top Down Parsing?
3. Write the production rules to eliminate the left recursion and left factoring problems.
4. Consider the following Grammar:
    A-> ABd|Aa|a

B-> Be|b

Remove left recursion.

5. Do left factoring in the following grammar:
A-> aAB|aA|a
B-> bB|b

6. Write a short note on:
a. Ambiguity (with example)
b. Recursive Descent Parser
c. Predictive LL(1) parser (working)
d. Handle pruning
e. Operator Precedence Parser

7. Write Rules to construct FIRST Function and FOLLOW Function.

8. Consider Grammar:
E-> E+T|T
T-> T*F|F
F-> (E)|id

9. Write the algorithm to create a Predictive parsing table with the scanning of input string.

10. Show the following Grammar:
S-> AaAb|BbBa
A-> € B-> €

Is LL(1) and parse the input string "ba".

11. Consider the grammar:
E-> E+E
E-> E*E
E->id

Perform shift reduce parsing of the input string "id1+id2+id3".

12. Write the properties of LR parser with its structure. Also explain the techniques of LR parser.

13. Write a short note on:
a. Augmented grammar
b. Kernel items
c. Rules of closure operation and goto operation
d. Rules to construct the LR(0) items

14. Consider the following grammar:
S-> Aa|bAc|Bc|bBa
A-> d B-> d

Compute closure and goto.

15. Write the rules to construct the SLR parsing table.

16. Consider the following grammar:
E-> E+T|T
T-> TF|F
F-> F*|a|b

Construct the SLR parsing table and also parse the input "a*b+a"

17. Write the rules to construct the LR(1) items.

18. what is LALR parser? Construct the set of LR(1) items for this grammar:
S-> CC
C-> aC C->d

19. Show the following grammar

S->Aa|bAc|Bc|bBa
A->d B->d

Is LR(1) but not LALR(1).

20. Write the comparison among SLR Parser, LALR parser and Canonical LR Parser.

UNIT 3

1. What is syntax directed translation (SDD)?
2. Write short note on:
    a. Synthesized attributes
    b. Inherited attributes
    c. Dependency graph
    d. Evaluation order
    e. Directed Acyclic Graph (DAG)
3. Draw the syntax tree and DAG for the following expression: (a*b)+(c-d)*(a*b)+b
4. Differentiate between synthesized translation and inherited translation.
5. What is intermediate code and write the two benefits of intermediate code generation.
6. Write the short note on:
    a. Abstract syntax tree
    b. Polish notation
    c. Three address code
    d. Backpatching
7. Construct syntax tree and postfix notation for the following expression:
    (a+(b*c)^d-e/(f+g)
8. Write quadruples, triples and indirect triples for the expression:
    -(a*b)+(c+d)-(a+b+c+d)

UNIT 4

1. Write the definition of the symbol table and the procedure to store the names in the symbol table.
2. What are the data structures used in the symbol table?
3. What are the limitations of stack allocation?
4. Write two important points about heap management.
5. Write the comparison among Static allocation, Stack allocation and Heap Allocation with their merits and limitations.
6. What is the activation record? Write the various fields of Activation Record.
7. What are the functions of the error handler?
8. Write a short note on Error Detection and Recovery.
9. Classify the errors and discuss the errors in each phase of Compiler.

UNIT 5

1. What are the properties of the code generation phase? Also explain the Design Issues of this phase.
2. What are basic blocks? Write the algorithm for partitioning into Blocks.
3. Write a short note on:
    a. Flow graph (with example)
    b. Dominators
    c. Natural loops
    d. Inner loops
    e. Reducible flow graphs
4. Consider the following program code:
    Prod=0;

```
I=1;
Do{ Prod=prod+a[i]*b[i]; I=i+1;

}while (i<=10);
```

   a. Partition in into blocks
   b. Construct the flow graph

5. What is code optimization? Explain machine dependent and independent code optimization.
6. What is a common sub-expression and how to eliminate it? Explain with examples.
7. Write a short note with example to optimize the code:
   a. Dead code elimination
   b. Variable elimination
   c. Code motion
   d. Reduction in strength
8. What is control and data flow analysis? Explain with examples.

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

(For the existing (2021-22 admitted batch) III and IV semesters)

Revised syllabus 2022-2023

Semester	Course Code	Course Title	L-T-P	Credits
III	PMCS302	COMPUTER NETWORKS	4-0-0	4

COURSE OBJECTIVES: To expose the students to different components of computer networks, error detection and correction techniques, collision detection and avoidance mechanisms, various protocols, modern technologies, and their applications.

COURSE OUTCOMES

Upon Completion of the course, the students should be able to:

CO1	Describe the basis and structure of an abstract layered protocol model
CO2	Describe, analyze and evaluate a number of datalink, network, and transport layer protocols.
CO3	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
CO4	Understand and build the skills of subnetting and routing mechanisms.
CO5	Understand how the Internet works today.

DETAILED SYLLABUS:

Unit 1	**Uses of Computer Networks**: Business Application, Home Applications, Mobile Users - Social Issues. Network Hardware : Local Area Networks - Metropolitan Area Networks - Wide Area Networks - Wireless Networks - Home Networks – lnternetworks-**Network Topologies**. Network Software: Protocol Hierarchies — Design Issues for the Layers - Connection Oriented and Connectionless Services - Service Primitives - The relationship of Services to Protocols. **Reference Models**: The OSI Reference Model - The TCP/IP Reference Model - A Comparison of OSI and TCP/IP reference Model. **Physical Layer**: Guided Transmission Media: Magnetic Media — Twisted Pair — Coaxial Cable — Fiber Optics **Data Link Layer**: Data Link Layer Design Issues: Services Provided to the Network Layer — Framing — Error Control — Flow Control. Error Detection and Correction: Error correcting Codes — Error Detecting Codes.
	Elementary Data Link Protocols : An unrestricted Simplex Protocol — A simplex Stop and wait Protocol — A simplex Protocol for a Noisy channel. Sliding Window Protocols: A one-bit sliding Window Protocol — A Protocol using Go Back N — A Protocol using selective Repeat. Example Data Link

	Protocols: HDLC — The Data Link Layer in the Internet.
Unit 2	**The Medium Access Control Sublayer**: Ethernet : Ethernet Cabling-Manchester Encoding — The Ethernet MAC sublayer Protocol - The Binary Exponential Backoff Algorithm - Ethernet Performance - Switched Ethernet - Fast Ethernet - Gigabit Ethernet - IEEE 802.2: Logical Link Control - Retrospective on Ethernet. Wireless Lans: The 802.11 Protocol Stack - The 802.11 Physical Layer – The 802.11 MAC sublayer Protocol - The 802.11 Frame Structure. **Bluetooth**: Bluetooth Architecture-Bluetooth Applications-The Bluetooth Protocol Stack - The Bluetooth Radio Layer – The Bluetooth Baseband Layer -The Bluetooth L2CAP layer - The Bluetooth Frame Structure. **Data Link Layer Switching**: Bridges from 802.x to 802.y - Local Internetworking - Spanning Tree Bridges - Remote Bridges - Repeaters, Hubs, Bridges, Switches, Routers and Gateways - Virtual LANs
Unit 3	**The Network Layer:** Network Layer Design Issues : Store and Forward Packet Switching -Services Provided to the Transport Layer - Implementation of Connectionless Services -Implementation of Connection Oriented Services - Comparison of Virtual Circuit and Datagram subnets. Routing Algorithms : The Optimality Principle — Shortest Path Routing — Flooding — Distance Vector Routing — Link State Routing - Hierarchical Routing — Broadcast Routing — Multicast Routing — Routing for Mobile Hosts. Internetworking : How Networks Differ — How Networks can be connected — Concatenated Virtual Circuits — Connectionless Internetworking — Tunneling — Internet work Routing — Fragmentation. The Network Layer in the Internet: The IP Protocol — IP address — Internet Control Protocols
Unit 4	**The Transport Layer:** The Transport Service: Services provided to the Upper Layers — Transport Services Primitives — Berkeley Sockets. Elements of Transport Protocols : Addressing — Connection Establishment — Connection Release — Flow Control and Buffering — Multiplexing — Crash Recovery. The Internet Transport Protocols :**UDP**:Introduction to UDP — Remote Procedure Call — The Real Time Transport Protocol. The Internet Transport Protocols: TCP Introduction to TCP — The TCP Service Model — the TCP Protocol — The TCP segment header — TCP connection establishment — TCP connection release — Modeling TCP connection management- TCP Transmission Policy — TCP congestion Control — TCP Timer Management — Wireless TCP and UDP — Transactional TCP.

Unit 5	**The Application Layer:** DNS : The Domain Name System : The DNS Name Space — Resource Records — Name Servers. Electronic Mail : Architecture and Services — The User Agent — Message Formats — Message Transfer — Final Delivery. The World Wide Web: Architecture Overview — Static Web Documents — Dynamic Web Documents – HTTP-- The HyperText Transfer Protocol — Performance Enhancements The Wireless Web.

Text books

	Author	Title	Publisher
1	Andrew S.Tanenbaum	Computer Networks.	PHI

Reference books

	Author	Title	Publisher
1	James F. Kurose, Keith W.Ross	Computer Networking	3rd edition, Pearson Education
2	Michael A. Gallo, William M. Hancock	Computer Communications and Networking Technologies	Cengage Learning (2008)
3	Behrouz A Ferouzan	Data Communications and Networking	4th edition, TMH (2007)

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

MSC (Computer Science) Semester: III

PMCS302: COMPUTER NETWORKS

(w.e.f admitted batch 2020-21)

Time: 3 Hours **Max. Marks: 60**

SECTION - A

Answer ANY FIVE questions **5 X 4 = 20 Marks**

1. What are the different types of networks?
2. What is flow control?
3. What are the responsibilities of the data link layer?
4. Identify the difference between bridge and router.
5. Appraise the advantages of Ethernet.
6. Define Bluetooth.
7. What is OSPF?
8. What is multiplexing?
9. Define Berkeley socket.
10. What is SMTP?

SECTION - B

Answer All Questions **5 X 8 = 40 Marks**

UNIT – I

11. a) Explain about the OSI reference model.

(OR)

b) Describe the guided transmission media.

UNIT – II

12. a) Explain error correction and detection method with an example.

(OR)

b) Explain IEEE 802.11 protocol stack and Frame structures

UNIT – III

13. a) Explain Distance Vector Routing algorithm with example.

(OR)

b) Explain about IP protocol.

UNIT – IV

14. a) Explain TCP protocol Header format.

(OR)

b) Explain transport service primitives and TCP connection establishment.

UNIT – V

15. a) Explain about DNS.

(OR)

b) Explain video compression and audio compression.

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

PMCS302: COMPUTER NETWORK QUESTION BANK

Essay Questions

1. Define the term "Computer Networks" and explain briefly various types of networks with their advantages and disadvantages? *
2. various Uses of Networks are as follows *

a. Business Applications b) Home Applications c)Mobile Users

3. What is Topology? Explain various types of topologies with a neat sketch?
4. Explain how the internet works with Connection less and Connection oriented Networks?
5. Briefly Explain OSI Reference Model with different layers? *
6. Briefly Explain TCP/IP Reference Model? *
7. Explain about simplex Stop and wait Protocol? *
8. Explain about A one-bit sliding Window Protocol using Go Back N *
9. Briefly Explain about the Binary Exponential Backoff Algorithm?
10. Write about the 802.11 MAC sublayer Protocol and Frame Structure?
11. Explain IEEE 802.11 protocol stack and Frame structures?
12. Briefly Explain about a) Bluetooth Architecture and b) Bluetooth Frame Structure
13. Explain Various Network Devices of Remote Bridges - Repeaters, Hubs, Bridges, Switches, Routers
14. Explain about Routing Algorithms of i) Shortest Path Routing and ii) Flooding?
15. Explain about Distance Vector Routing Algorithm with Example?
16. Briefly Explain about various IP protocols and IP Address?
17. Write about various services provided to the upper layer by the Transport Layer?
18. Briefly Explain TCP Service Model?
19. Explain about the Domain name System ?
20. Briefly explain about the Architecture and Services of the Electronic mail?

Short Questions

1. What are the different types of networks?
2. What is flow control?
3. What is Topology? Explain various topologies?
4. What are the responsibilities of the data link layer?
5. Write about Error Correcting and Error Detecting Codes?
6. Discuss about bridge and router?
7. Advantages of Ethernet?
8. Define Bluetooth?
9. What is OSPF?
10. What is multiplexing?
11. Define Berkeley socket?
12. What is SMTP?

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

Semester	Course Code	Course Title	L-T-P	Credits
III	PMCS303	PRINCIPLES OF PROGRAMMING LANGUAGE	4-0-0	4

COURSE OBJECTIVES: To familiarize and acquaint the student with the constructs upon which contemporary programming languages are based. Students investigate programs written in declarative and imperative programming languages including functional, logic, structured, and object-based approaches.

COURSE OUTCOMES

CO 1	Students will be able to analyze programming languages. They will be able to separate syntax from semantics.
CO 2	Students will be able to understand how language features work like Data types, control flow, Subroutines, Data abstraction etc. Students will Learn new languages more quickly and will be able to use standard vocabulary when discussing languages.
CO 3	Students will develop a greater understanding of the issues involved in programming language design and implementation. Students will be familiar with design issues of object –oriented and functional languages
CO 4	Students will learn Functional, Logic Languages like Prolog, Lisp.
CO 5	Students will know how to analyze semantic issues associated with function implementations, including variable binding, scoping rules, parameter passing.

Details of the Syllabus

Unit 1	**Introduction :** What is a programming language, Abstractions in programming languages, Computational paradigms, Language definition, Language translation, Language design. **History: T**he first programmer, The 1950s : The first programming languages, The 1960s : An explosion in programming languages, The 1970s : Simplicity, abstraction, study, The 1980s : New directions and the rise of object –orientation, The 1990s : Consolidation, The Internet, libraries and scripting, The future. **Language Design Principles:** History and design criteria, Efficiency, regularity, Further language design principles, C++ : A Case study in language design. **Syntax :** Lexical structure of programming languages, Context-free grammars and BNFs, Parse trees and Abstract syntax trees, Ambiguity, Associativity and precedence, EBNFs and syntax diagrams, Parsing techniques and tools, Lexical vs Syntax vs Semantics
Unit 2	**Basic Semantics:** Attributes, binding and semantic functions, Declarations, blocks and scope, The symbol table, Name resolution and overloading, Allocation, Lifetimes and the environment, Variables and Constants, Aliases, Dangling references and garbage. **Data Types :** Data types and type information, Simple types, Type constructors, Type equivalence, Type Checking, Type conversion, Polymorphic type checking, Explicit polymorphism.
Unit 3	**Control – I:** Expressions and Statements: Expressions, Conditional Statements and Guards, Loops and Variation on “while”, The “goto” controversy, Exception handling. **Control – II :** Procedures and Environments : Procedure definition and activation, Procedure semantics, Parameter passing mechanisms, Procedure environments, activations and allocation, Dynamic memory management, Exception handling and environments. **Abstract data types and Modules :** The algebraic specification of abstract data types, Abstract data type mechanisms and modules, Separate compilation in C, C++ name spaces and Java packages, Ada packages, Modules in ML, Modules in earlier languages, Problems with abstract data type mechanisms, The mathematics of abstract data types.

Unit 4	objects, Classes and methods, Inheritance, Dynamic binding, C++, Small Talk, Design issues in object – oriented languages, Implementation issues in object – oriented languages. **Functional Programming:** Programs as functions, Functional programming in an imperative language,Scheme : A Dialect of LISP, ML : Functional programming with static typing, Delayed Evaluation, Haskell – A fully curried lazy language with overloading, The Mathematics of functional programming I : Recursive functions, The Mathematics of functional programming II : Lambda calculus. **Logic Programming :** Logic and Logic programs, Horn clauses, Resolution and Unification, The language Prolog, Problems with logic programming, Extending logic programming : Constraint logic programming and Equational systems.
Unit 5	**Formal Semantics:** A Sample small language, Operational semantics, Denotational semantics, Axiomatic semantics, Proofs of program corrections. **Parallel programming :** Introduction to parallel processing, Parallel processing and programming languages, Threads, Semaphores, Monitors, Message passing, Parallelism in non-imperative languages.

Text books

	Author	Title	Publisher
1	Kenneth C. Louden	Programming Languages Principles and Practice	Second Edition, Cengage Learning(2008). Chapters:1 through 14

Reference books

	Author	Title	Publisher
1	Terrence W. Pratt & Mervin V. Zelkowitz	Programming Languages Design and Implementation	Fourth Edition, Pearson Education (2008)
2	Robert W. Sebesta	Concepts of Programming Languages	Pearson Education 2001

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Machavaram, Vijayawada, Krishna District, AP-520 004

MSC (Computer Science) Semester: III

MCS 303: PRINCIPLES OF PROGRAMMING LANGUAGES

(w.e.f admitted batch 2020-21)

Time: 3 Hours **Max. Marks: 60**

SECTION - A

Answer ANY FIVE questions **5 X 4 = 20 Marks**

1. What is a programming language?
2. Define the internet.
3. Explain Parse trees and Abstract syntax trees.
4. Difference between syntax and semantics.
5. What is overloading?
6. Explain explicit polymorphism.
7. Explain parameter passing mechanism.
8. What is the Abstract data type?
9. Define Recursive function.
10. Define Threads.

SECTION - B

Answer All Questions **5 X 8 = 40 Marks**

UNIT – I

1.a) Describe the structure of Context free grammars with an example.

(OR)

b) Discuss criteria for design of programming languages.

UNIT – II

2.a) Discuss in detail about function overloading and operator overloading with examples.

(OR)

b) Show the working procedure of the type checker for the expression in C a[i]+I in detail.

UNIT – III

3.a) Discuss about handling of exceptions in Object Oriented programming languages.

(OR)

b) Write about the modules of abstract data type.

UNIT – IV

4.a) How to create classes and objects in Java? Explain with suitable examples.

(OR)

b) Discuss the problems of Logic programming with suitable examples.

UNIT – V

5.a) Explain in detail about the Bounded Buffer Problem.

(OR)

b) Compare and Contrast shared and Distributed memory system

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

PMCS303: PRINCIPLES OF PROGRAMMING LANGUAGE

Question Bank

Essay Questions

1. Explain the Evolution of the Programming languages?
2. Describe the structure of Context free grammars with an example?.
3. Explain about the lexical Structure of Programming Languages?
4. Discuss criteria for design of programming languages.?
5. Discuss in detail about function overloading and operator overloading with examples.
6. Explain about attributes, Semantic Functions and Declarations of Semantics?
7. Show the working procedure of the type checker for the expression in C a[i]+I in detail.
8. Explain about various Data types with examples supported in various languages?
9. Explain the following

a. Type Constructor.
b. b. Type equivalence.
c. c. Type Checking

10. Explain about various conditional statements in OOPS?
11. Discuss about handling of exceptions in Object Oriented programming languages.
12. Write about the modules of abstract data type.
13. How to create classes and objects in Java? Explain with suitable examples.
14. Discuss the problems of Logic programming with suitable examples.
15. Explain about the concept of inheritance in OOPS with examples?
16. Discuss the Recursive functions with suitable examples?
17. Explain in detail about the Bounded Buffer Problem.
18. Compare and Contrast shared and Distributed memory system
19. Explain about Logic and Logic Programming with their limitations?
20. Write about Constraint a logic programming and equation system

Short Answer questions

1. What is a programming language?
2. Define the internet.
3. Explain Parse trees and Abstract syntax trees.
4. Difference between syntax and semantics.
5. What is overloading?
6. Explain explicit polymorphism.
7. Explain parameter passing mechanism.
8. What is the Abstract data type?
9. Define Recursive function.
10. Define Threads.

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

Semester	Course Code	Course Title	L-T-P	Credits
III	PMCS304	ARTIFICIAL INTELLIGENCE	4-0-0	4

COURSE OBJECTIVES : To familiarize and acquaint the student with intelligent systems and agents, formalization of knowledge, representations and mappings, reasoning with and without uncertainty, implementation issues and planning techniques.

Course Outcomes:

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

CO1	Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
CO3	To analyze and formalize the problem as a state space, graph, design heuristics
CO4	Understand the numerous applications and huge possibilities in the field of AI
CO5	Ability to express the ideas in AI research and programming language related to emerging technology.

Details of the Syllabus

Unit 1	**What is AI?** : The AI Problems, The Underlying Assumption, What is AI Technique?, The level of the Model, Criteria for Success. Problems, Problem spaces & Search: Defining the Problem as a State Space Search, Production Systems, Problem Characteristics.
Unit 2	Knowledge Representation Issues: Representations and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation, The Frame Problem Using Predicate Logic: Representing Simple Facts in Logic, Representing Instance and Isa Relationships.
Unit 3	Symbolic Reasoning under Uncertainty: Introduction to Non monotonic Reasoning, Logics for Non monotonic Reasoning, Implementation Issues, Augmenting a Problem Solver, Implementation: Depth-First Search, Implementation: Breadth-First Search Weak slot & filler Structures: Semantic Nets, Frames.
Unit 4	Planning : Overview, An Example Domain : The Blocks World, Components of a Planning System, Goal Stack Planning, Non-linear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques
Unit 5	Common-sense: Qualitative Physics, Common-sense Ontologies, Memory Organisation, Case Based Reasoning Expert Systems: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

Text Books

Rich & Knight - Artificial Intelligence -TMH (1991)

Reference books

Winston. P.H - Winston. P.H Artificial Intelligence - Addison Wesley (1993)

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

MSC (Computer Science) Semester: III

MCS 304 ARTIFICIAL INTELLIGENCE

(w.e.f admitted batch 2020-21)

Time: 3 Hours **Max. Marks: 60M**

SECTION - A

Answer ANY FIVE question **5 X 4 = 20 Marks**

1.Define AI.
2. Define problem characteristics.
3. What is the mapping?
4. What are the issues in knowledge representation?
5.Define Non-Monotonic reasoning.
6.Discuss about the implementation issues.
7.What are components of a planning system?
8.What is a semantic analysis.
9.Define qualitative physics.
10.what is expert system selves.

SECTION - B

Answer All Questions **5 X 8 = 40 Marks**

UNIT – I

11.a) What is AI technique and explain levels of the model.

(OR)

11. b) Describe the problem spaces and search.

UNIT – II

12. a) Explain the approach to knowledge representation.

(OR)

b) How to represent simple facts.

UNIT – III

13. a) Explain the non-monotonic reasoning.

(OR)

b) Explain the implementation of DFS.

UNIT – IV

14. a) Explain the components of the planning system.

(OR)

b) Explain the discourse and pragmatic processing.

UNIT –V

15. a) Explain about qualitative physics.

(OR)

b) Discuss about representing domain knowledge.

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Machavaram, Vijayawada, Krishna District, AP-520 004

MSC (Computer Science) Semester: III

PMCS 304 ARTIFICIAL INTELLIGENCE QUESTION BANK

(w.e.f admitted batch 2020-21)

UNIT-1

1. What is A.I technique?
2. Explain the levels of the Model.
3. Defining the problem as a state.
4. Explain the production characteristics.
5. Discuss about the problem characteristics.

UNIT -2

1. Explain the knowledge Representation and mapping.
2. Explain the issues in knowledge representation.
3. Discuss about representing simple facts in logic.
4. What is the representing instance and isa relationship.
5. What is the frame problem?

UNIT – 3

1. Discuss about the implementation issues
2. Explain the Non monotonic reasoning
3. How to represent simple facts
4. Explain the D.F.S
5. Explain the B.F.S

UNIT – 4

1. Explain about the components of planning system
2. Explain the Discourse and pragmatic system
3. What is the Hierarchical planning
4. Discuss about syntactic processing
5. What is the Reactive system

UNIT -5

1. Explain about the Qualitative physics
2. Discuss about the representing Domain Knowledge
3. What is Except System Levels
4. Explain Memory organization
5. Explain the System shells

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

OPEN ELECTIVE-II

Semester	Course Code	Course Title	L-T-P	Credits
III	POMCS305.1	INTRODUCTION TO DATA SCIENCE WITH R	4-0-0	4

COURSE OBJECTIVE: Students are introduced to the collection, preparation, analysis, modeling and visualization of data, covering both conceptual and practical issues. Examples and case studies from diverse fields will be presented, and hands-on use of statistical and data manipulation software will be included.

COURSE OUTCOMES

- Recognize the various disciplines that contribute to a successful data science effort.
- Understand the processes of data science identifying the problem to be solved, data collection, preparation, modeling, evaluation and visualization.
- Be aware of the challenges that arise in data sciences.
- Develop an appreciation of the many techniques for data modeling and mining.
- Be cognizant of ethical issues in many data science tasks.
- Be comfortable using commercial and open source tools such as the R language and its associated libraries for data analytics and visualization.

COURSE SYLLABUS

Unit-I

Introduction to the field of data science, different types of data(Database data, data Warehouse data, Transaction Data, Stock Exchange Data, Time Series and Biological data) ; data collection.

Unit-II

Experimental design; data attributes; data cleaning; data characterization and analysis.

Unit-III

Data modeling and mining techniques; model evaluation; visualization; application of data science introducing to R – R Data structures – Help functions in R

Unit-IV

Vectors-Scalars-Declarations- recycling-Common Vector operations – Using all and any Vectorized operations-NA and NULL values – Filtering – Vectorized if- then else-Vector Equality – Vector Element names.

Creating matrices –Matrix Operations-Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns.

Unit-V

Vector /Matrix Distinction –Avoiding Dimension Reduction –Higher Dimensional arrays – lists-Creating lists – General list operations – Accessing list components and values – applying functions to lists –recursive lists. Creating Data Frames – Matrix –like operations in frames – Merging Data Frames – Applying function to Data frames.

References

1. Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014. 2.Jure Leskovec, Anand Rajaraman, Jeffrey D.Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2014.
2. Mark Gardener, “Beginning R - The Statistical Programming Language”, John Wiley & Sons, Inc., 2012.
3. W. N. Venables, D. M. Smith and the R Core Team, “An Introduction to R”, 2013. 5.Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, “Practical Data Science Cookbook”, Packt Publishing Ltd., 2014.
4. Nathan Yau, “Visualize This: The FlowingData Guide to Design, Visualization, and Statistics”, Wiley, 2011.
5. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2015.

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

OPEN ELECTIVE-II

POMCS305.1: INTRODUCTION TO DATA SCIENCE WITH R

MODEL PAPER

Time: 3hrs **Max Marks:60**

SECTION-A

Answer Any FIVE of the following Questions **5 X 4= 20 marks**

1. Define data science and applications of data science?
2. Write short notes on data collection ?
3. Write about data attributes ?
4. Write about Help functions in R?
5. Briefly explain about R studio ?
6. How to declare Vector and Scalars in R?
7. Explain procedure to add and delete rows and columns in matrix ?
8. Explain the difference between a Vector and Matrix in R?
9. Write short notes on recursive lists R?
10. Explain about merging of Data Frames in R?

SECTION – B

Answer All the following questions **5 X 8=40M.**

11 a) Explain about different types of Databases in data Science?

OR

b)Explain about Data collection methods?

12.a) Explain about Data Cleaning methods ?

OR

b) Explain about Data Characterisation and Analysis ?

13.a)Explain about data structures in R language ?

OR

b)Explain about Data Modelling and Mining techniques in R ?

14.a). What is Vector and explain about common vector operations ?

OR

b) Explain about various functions applied on matrix rows and columns?

15. a) What is a List? Explain about various operations on Lists?

OR

b) What is a Data Frame ? Explain procedure to create Data Frame with example?

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

OPEN ELECTIVE-II

POMCS305.1: INTRODUCTION TO DATA SCIENCE WITH R

QUESTION BANK

SHORT ANSWER QUESTIONS - 4 MARKS

1. Define data science and applications of data science?
2. Write short notes on data collection ?
3. Write about data attributes ?
4. Write about Help functions in R?
5. Briefly explain about R studio ?
6. How to declare Vector and Scalars in R?
7. Explain procedure to add and delete rows and columns in matrix ?
8. Write short notes on Filtering ?
9. Explain the difference between a Vector and Matrix in R?
10. Write short notes on recursive lists R?
11. Explain about merging of Data Frames in R?
12. Explain about Recursive Lists?

LONG ANSWER QUESTIONS **8 MARKS**

1. Explain about different types of Databases in data Science?
2. Explain about Data collection methods?
3. Explain about Data Cleaning methods ?
4. Explain about Data Characterisation and Analysis ?
5. Explain about data structures in the R language ?
6. Explain about Data Modelling and Mining techniques in R ?
7. What is Vector and explain about common vector operations ?
8. Explain about various functions applied on matrix rows and columns?
9. What is a List? Explain about various operations on Lists?
10. What is a Data Frame ? Explain procedure to create Data Frame with example?

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

OPEN ELECTIVE-II

Semester	Course Code	Course Title	L-T-P	Credits
III	POMCS305.2	PYTHON3 PROGRAMMING	4-0-0	4

COURSE OBJECTIVES: To familiarize and acquaint the student with core syntax and semantics of Python programming language, the process of structuring the data using lists, dictionaries, tuples, strings and sets, working with the functions, modules and packages.

COURSE OUTCOMES:

CO-1: To understand the basic concepts in Python programming.

CO-2:Learn how to write, debug and execute Python programs using conditional and loops.

CO-3: Demonstrate proficiency in handling Strings.

Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries.

CO-4:Use and apply the different libraries available in python

CO-5: Ability to develop basic user interfaces

SYLLABUS

Unit	Topic	Number of Teaching Hours
Unit 1	Introduction to Python: Downloading and installing Python, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, run a simple program on Python interpreter and IDLE. Python basic Operators, Understanding python blocks, Python Data Types. Type conversions, Expressions, More about Data Output.	8
Unit 2	Python Program Flow Control Conditional blocks: if, else and else if, Simple for loops in python, For loop using ranges, string, list and dictionaries. Use of while loops in python, Loop manipulation using pass, continue, break and else. Programming using Python conditional and loop blocks.	8
Unit 3	Python Complex data types: Using string data type and string operations, Defining list and list slicing. String, List and Dictionary, String manipulation methods, List manipulation. Dictionary manipulation, Programming using string, list and dictionary in-built functions. Python Functions, Organizing python codes using functions.	8
Unit 4	Python packages: Simple programs using the built-in functions of packages seaborn, numpy, pandas etc.	8
Unit 5	Installing and Exploring different python libraries used in Graphical User Interface designing (tkinter), Tkinter examples. Python programming with IDE.	8

Text Books:

1. Reema Thareja ,"Python programming using problem solving approach ", Oxford university press.
2. Allen Downey," Think Python: How to Think Like a Computer Scientist", O'Reilly publications,2nd Edition.
3. Wesley J. Chun, "Core Python Applications Programming", 3rd Edition , Pearson Education
4. Charles Dierbach, "Introduction to Computer Science using Python", Wiley.

Reference Books:

1. Mark Lutz, Programming Python, O`Reilly, 4th Edition

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

OPEN ELECTIVE-II

POMCS305.2: PYTHON3 PROGRAMMING

MODEL QUESTION PAPER

Time: 3 Hours **Max.Marks: 60M** **I.**

Answer any 5 questions **5x4=20 Marks**

1. How to perform a user input in Python? Explain with examples.
2. Write short notes on types of operators in python with appropriate example
3. Write a python program to check whether a given year is a leap year or not.
4. Write a python program to print the first 10 even natural numbers.
5. What is String? How do you create a string in Python?
6. Write a few methods that are used in Python Lists.
7. Write a small python code to drop a row from a dataframe labeled as 0.
8. Explain about set() function available under seaborn module.
9. What is the need of the Tkinter module in python?
10. What is a Graphical user interface

II. Answer Five Questions Choosing One Question from Each Unit. **5x8=40 Marks**

UNIT–I

1. a) Write a python program to print sum of first n natural numbers

b) Write a python program to convert Celsius to Farenheit

(OR)

c) Write python program to swap two numbers without using temporary variable

d) Write a python program to find the average of 3 numbers.

UNIT–II

0. a) Write a program to print the quadrant in which the given coordinate point lie

b) Write a python program to print the multiplication table

(OR)

c) Write a python program to check whether a given number is positive, negative or zero.

d) Write a python program to check whether a given number is Armstrong or not

UNIT–III

0. a) .What are the basic list operations that can be performed in Python? Explain each operation with its syntax and example

(OR)

b) What is a Dictionary? Explain Python dictionaries in detail discussing its operations and methods.

UNIT–IV

0. a) Explain about different categories of plot in Seaborn.

(OR)

b) Define the different ways a DataFrame can be created in pandas?
c) Define DataFrame in Pandas?

UNIT–V

0. a) Explain about different tkinter widgets

(OR)

b)Explain how to organize Layouts And Widgets in a window

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

OPEN ELECTIVE-II

Semester	Course Code	Course Title	L-T-P	Credits
III	POMCS 305.3	C- PROGRAMMING	4-0-0	4

COURSE OBJECTIVES: This course is designed to provide complete knowledge of C-language and able to develop the logics which will help them to create programs, applications in C.

COURSE LEARNING OUTCOME(S):

From this course students will learn to implement the algorithms and draw flow charts for solving mathematical problems and understanding the concepts of computer programming language.

SYLLABUS

UNIT-I
Overview of C- Constants – variables - Data types - operators and expressions.
UNIT-II
Managing Input and output operations-Decision making–branching-decision making and looping.
UNIT-III
Arrays–one dimensional, two dimensional and multidimensional-Handling of character
UNIT-IV
Functions-user defined functions-.Pointers-Pointers and arrays–Pointers and functions.
UNIT-V
Structure and Unions-file management in

Prescribed Text Book:
1. C Programming and Data Structures–E. Balaguruswamy, Second Edition, Tata McGraw-Hill Publishing Company (We Should Verify 4th Edition).

Reference Books:
1. Fundamental of C Programming by E. Balaguruswamy
2. Programming in C by D. Ravichandran, 1998, New Age International.
3. C and Data Structures by Ashok N. Karthane, Pearson Education.

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MSC (Computer Science) Semester: III

Paper Title :C – LANGUAGE Code: POMCS305.3 Open Elective - II

(w.e.f admitted batch 2021-22)

Time: 3 Hour **Max. Marks: 60**

SECTION - A

Answer ANY FIVE questions 5 X 4 = 20 Marks

1. Define data?
2. List out various Header files?
3. Write about I/O functions in C?
4. What is ternary operator?
5. Differentiate between entry level and exit level statements?
6. Write a Program to find the Second largest of given 3 no.s?
7. Write a program using For statement?
8. Define Array? Explain with Matrix Addition?.
9. What Pointer?
10. Define Union?

SECTION - B

Answer All Questions **5 X 8 = 40 Marks**

UNIT – I

11. a) Discuss about the various data types available in C-Language.

(OR)

a. Explain about Operators offered by C – Language?

UNIT – II

12. a) Explain about Control Statements with an example?

(OR)

b)Explain about looping statements with Example.

UNIT – III

13. a) Define Array? Explain about Two Dimensional Arrays with an Example?

(OR)

a. Explain about the various String Functions?

UNIT – IV

14. a) Define a Function list and explain various functions in detail?

(OR)

a. What is the Recursive function explain with an example?

UNIT – V

15. a) Explain about the Structures with an example program?

(OR)

a. Discuss about Files in C- Language?

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

OPEN ELECTIVE-II

POMCS 305.3: C PROGRAMMING QUESTION BANK

Essay Questions

1. Write about the Structure of C-language?
2. Discuss about the various data types available in C-Language.
3. Explain about Operators offered by C – Language?
4. Explain various I-O functions in C-Language?
5. Write about the procedure for Editing, Compiling, Saving and Executing a C-Program?
6. Explain about Control Statements with an example?
7. Explain about looping statements with Example.
8. Define Array? Explain about Two Dimensional Arrays with an Example?
9. Write a Program on Matrix Multiplication?
10. Explain about the various String Functions?
11. Define a Function? List and explain various functions in detail?
12. What is the Recursive function explain with an example?
13. Explain about the Structures with an example program?
14. Differentiate between Structures and Unions?
15. Discuss about Files in C- Language?

Short Answer Questions

1. Define Data and Data Type?
2. List out various Header files?
3. Write about I/O functions in C?
4. Write about Formatting Specifiers?
5. Explain about backslash codes?
6. What is ternary operator?
7. What is typecasting?
8. List out various errors in C-Language?
9. Write about the syntax of nested if loops?
10. Differentiate between entry level and exit level statements?
11. Define Array? Explain with Matrix Addition?.
12. Write about Recursive Function?
13. What is Pointer?
14. What is Structure?
15. Define Union?

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

Semester	Course Code	Course Title	L-T-P	Credits
III	PMCS306	COMPILER DESIGN LAB	0-0-8	4

List of Programs

1. Implementation of symbol table.
2. Develop a lexical analyzer to recognize a few patterns in c (ex. Identifiers, constants, comments, operators etc.)
3. Implementation of lexical analyzer using lex tool.
4. Generate yacc specification for a few syntactic categories.
    a) Program to recognize a valid arithmetic expression that uses operator +, -, * and /.
    b) Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.
    c) Implementation of calculator using lex and yacc.
5. Convert the bnf rules into yacc form and write code to generate abstract syntax trees.
6. Implement type checking
7. Implement control flow analysis and data flow analysis.
8. Implement any one storage allocation strategies(heap, stack, static)
9. Construction of DAG
10. Implement the back end of the compiler which takes the three address codes and produces the 8086 assembly language instructions that can be assembled and run using a 8086 assembler. The target assembly instructions can be simple move , add, sub, jump. Also simple addressing modes are used.
11. Implementation of simple code optimization techniques (constant folding. etc.)

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Revised syllabus 2022-2023

Semester	Course Code	Course Title	L-T-P	Credits
III	PMCS307	COMPUTER NETWORKS LAB	0-0-8	4

List of Programs:

1. Write a program to implement data link layer framing method bit stuffing.
2. Write a program to implement data link layer framing method character stuffing.
3. Write a program to implement data link layer framing method character count.
4. Write a program to implement Cyclic Redundancy Check(CRC 12 ,CRC 16 and CRC CCIR) on a data set of characters.
5. Write a program to implement Dijkstra's algorithm to compute the shortest path through a graph.
6. Write a program to implement a subnet graph with weights indicating delay between nodes. Now Obtain routing table chart each node using distance vector routing algorithm.
7. Write a program to implement subnet of hosts to obtain Broadcasting
8. Write a program to implement by taking a 64 bit playing text and encrypt the same using the DES algorithm.
9. Write a program to implement break DES coding.
10. Write a program to implement RSA algorithm to encrypt a text data and decrypt the same

SRR & CVR Government Degree & PG College

An Autonomous & ISO 9001: 2015 Certified Institution:: Ranked by NIRF in 101-150 band at NIRF-2020 & 151-200 band in NIRF 2019
NAAC accredited Institution with grade B+ with C.G.P.A 2.6 during March, 2017

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

Detailed Course Syllabus for Semester -IV

1601: M.Sc (Computer Science)

SEMESTER – IV								
PMCS 401	**MOOCS:** NPTEL/SWAYAM/edX/Coursera/ Stanford Online/Udacity/ Open Classrooms/ Open2Study/ ALISON/ Khan Academy/ NSE-NCFM/IRDA/NISM/ Any course related to M.Sc from the authentic sources with prior permission.	4	-	-	4	40	60	4Hrs.
PMCS402.1 Or PMCS402.2	Elective-I Big DataAnalytics Or MachineLearning	4	-	-	4	40	60	4 Hrs.
PMCS403.1 Or PMCS403.2	Elective-II Cloud computing Or DNA Computing	4	-	-	4	40	60	4 Hrs.
PMCS404	Web Technologies	4	-	-	4	40	60	4 Hrs.
PMCS405	Web Technologies Lab	-	-	4	2	40	60	4 Hrs.
PMCS406	Project	-	-	8	8		200	-.
Total					**26**	-	-	-
Over All Programme					**106**			**2700**

List of Mooc Courses:

1. Ethical hacking, https://onlinecourses.nptel.ac.in/noc22_cs13/preview .
2. Data Analytics With Python, https://onlinecourses.nptel.ac.in/noc22_cs08/preview
3. Introduction to internet of things, https://onlinecourses.nptel.ac.in/noc21_cs17/preview
4. Cybersecurity for Everyone, https://www.coursera.org/learn/cybersecurity-for-everyone.
5. Introduction to computer vision and image processing, https://www.coursera.org/learn/introduction-computer-vision-watson-opencv/home/welcome

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
IV	PMCS402.1	BIG DATA ANALYTICS	4-0-0	4

COURSE OBJECTIVES : To familiarize and acquaint the student with the basic technologies that forms the foundations of Big Data, Accessing, storing and manipulating the huge data from different resources, differentiate the RDBMS and HADOOP architectures and implement queries to process the data, searching mechanisms, Map Reduce Jobs, analytics on Structured, Unstructured Data, working environment of Pig for processing the structured and unstructured data.

COURSE OUTCOMES

Upon Completion of the course, the students should be able to:

CO 1	Students will be able to understand the building blocks of Big Data
CO 2	Ability to use HADOOP in the process of undertaking Analytics
CO 3	Learn how to run queries against a MongoDB instance to store, manipulate and retrieve data on it.
CO 4	Implement and evaluate the data manipulation procedures using pig
CO 5	Explore different features of JasperSoft Studio, add reports to the design of your report.

Unit	Topics	No of Teaching Hours Allocated
I	.**Types of Digital data:** Classification of Digital Data. Introduction to Big Data: Characteristics of data, Evolution of Big Data, Definition of big data, Challenges with Big Data, What is BigData? Why Big Data? Traditional Business Intelligence versus BigData, A typical Data Warehouse Environment, A typical Hadoop Environment.	10
II	**Big Data analytics:** What is Big Data Analytics? Top challenges facing BigData Analytics, Why is BigData Analytics important? Data Science, Terminologies used in BigData Environments.	8
III	**The Big Data Technology Landscape:** No SQL, Hadoop, Why Hadoop? Why not RDBMS? RDBMS versus Hadoop, Hadoop Overview, HDFS, Processing Data with Hadoop, Interacting with Hadoop Ecosystem	7

IV	**Introduction to MongoDB:** What is MongoDB?, Why MongoDB? Terms used in RDBMS and MongoDB, Data Types in MongoDB, MongoDB query language. **Introduction to Map reduce programming :** Introduction Mapper, Reducer, Combiner, Partitioner, Searching, Sorting and Compression.	**10**
V	**Introduction to Pig:**WhatisPig?, Pig On Hadoop, PigLatin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, HDFS commands, Relational Operators, Eval function, Complex Data Types, User Defined Functions, Parameter Substitution, Word Count Example using Pig. **Jasper Report using Jasper soft:** Introduction to Jasper Reports, Connecting to MongoDB NoSql Database.	**10**

Text Books

	Author	Title	Publisher
1	SeemaAcharyaand Subhashini Chellappan	BigDataandAnalytics	WileyIndia Pvt.Ltd.,2016

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)

SEMESTER – IV

Title of the Course : **BIG DATA ANALYTICS Syllabus for AY 2022 – 23**

Subject Code: PMCS 402.1: BIG DATA ANALYTICS

Time: 3 Hours **Max.Marks: 60**

I Answer any 5 questions **5x4=20 Marks**

1. Define Big Data.
2. Describe any five characteristics of BigData.
3. What is HDFC? List and explain all the components of HDFC.
4. Explain different Challenges of big data.
5. What is MongoDB?
6. Write differences between RDBMS and Hadoop?
7. What is Map Reduce?
8. What is data serialization?
9. What is YARN?
10. Explain the need of big data analytics?

II. Answer Five Questions Choosing One Question from Each Unit.

All Questions Carry Equal Marks. 5x8=40 Marks

UNIT–I

11. A) Explain different Types of digital data: Unstructured, Semi-structured and Structured.

(OR)

B) Explain Need and Challenges in BigData Environment?

UNIT–II

12. A) What is Business Intelligence? List different business Intelligence applications with a suitable example?

(OR)

B)Explain Classification of Analytics with suitable example.?

UNIT–III

13. A) Describe characteristics of a No SQL database?

(OR)

B) Explain the types of Nosql Data Stores in detail?

UNIT–IV

14. A) Explain Hadoop architecture and its components with a proper Diagram?

(OR)

B) Explain the essentials of the Hadoop Ecosystem?

UNIT–V

15. A) Explain working of the following phases of Map Reduce with one common example
(i) Map Phase (ii) Combiner phase (iii) Shuffle and Sort Phase (iv) Reducer Phase.

(OR)

B) Explain HDFS commands.

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)

SEMESTER – IV

Title of the Course : **BIG DATA ANALYTICS Syllabus for AY 2022 – 23**

Subject Code: PMCS 402.1: BIG DATA ANALYTICS QUESTION BANK

Essay Questions

1. Explain different Types of digital data: Unstructured, Semi-structured and Structured.
2. Explain Need and Challenges in BigData Environment?
3. What is Business Intelligence? List different business Intelligence applications with a suitable example?
4. Explain Classification of Analytics with suitable example.?
5. Describe characteristics of a No SQL database?
6. Explain the types of No SQL Data Stores in detail?
7. Explain Hadoop architecture and its components with a proper Diagram?
8. Explain the essentials of the Hadoop Ecosystem?
9. Explain working of the following phases of Map Reduce with one common example
   (i) Map Phase
   (ii) (ii) Combiner phase
   (iii) (iii) Shuffle and Sort Phase
   (iv) (iv) Reducer Phase.
10. Explain HDFS commands.

Short answer questions

1. Define Big Data.
2. Describe any five characteristics of BigData.
3. What is HDFC? List and explain all the components of HDFC.
4. Explain different Challenges of big data.
5. What is MongoDB?
6. Write differences between RDBMS and Hadoop?
7. What is Map Reduce?
8. What is data serialization?
9. What is YARN?
10. Explain the need of big data analytics?

SRR & CVR Government Degree College(Autonomous)

Department of Computer Science

M.Sc (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
IV	PMCS 402.2	MACHINE LEARNING	4-0-0	4

COURSE OBJECTIVES : To familiarize and acquaint the student with various key paradigms for machine learning approaches, techniques, algorithms, optimization of learning models.

COURSE OUTCOMES

Upon Completion of the course, the students should be able to:

CO1	Understand a very broad collection of machine learning algorithms and problems
CO2	Choose and set up suitable parametric methods build nonparametric density estimates
CO3	Model and estimate the machine before and after fine- tuning
CO4	Factorize the problems using clustering and non-parametric methods
CO5	Model and estimate the machine before and after fine- tuning using ensemble methods

Unit	Topics	No of Teaching Hours Allocated
Unit–1	**Introduction**-Association,SupervisedLearning–Classification–Regression, Unsupervised Learning, Reinforcement Learning.	**8**
Unit–2	**Decision Tree** - Divide and Conquer - Classification Trees (ID3, CART, C4.5) -Best Split - Regression Trees - Pruning Trees - Rule Extraction from Trees -Learning Rules -Multivariate Trees, NaiveBayes Classifier. **Neural networks** - Perceptron - Training a Perceptron: Regression –Learning Boolean AND–XOR- Multi layer Perceptrons – Back propagation –Multiple Hidden Layers-and support vector machines.	**10**
Unit–3	**Clustering**-SemiparametricDensityEstimation-MixtureDensities-Classesvs.Clusters - *k*-Means Clustering - Expectation-Maximization (EM) - HierarchicalClustering-Agglomerative Clustering. **Dimensionality Reduction** - Feature Selection vs Extraction - Subset Selection -Principal Components Analysis (PCA) - Factor Analysis - MultidimensionalScaling-LinearDiscriminantAnalysis-Fisher'sLinearDiscriminant-Isomap, Kernel methods.	**10**

Unit–4	**Parametric learning** - Maximum Likelihood Estimation - Gaussian (Normal)Distribution- Bias and Variance- Bayes Estimator-Parametric Classification-Regression - Linear Regression- Polynomial Regression - Bayesian Model Selection, **Nonparametriclearning**-DensityEstimation-KernelEstimator-k-Nearest Neighbor Estimator.	**7**
Unit–5	**Reinforcement learning** – Introduction -Single State: K-armed Bandit-Model-Based Learning- Value Iteration- Policy Iteration- TemporalDifferenceLearning-ExplorationStrategies-DeterministicRewardsandActions- Nondeterministic Rewards and Actions- Q-learning- Sarsa-Eligibility Traces-The Tiger Problem **Combining Multiple Learners –**Rationale–Voting- Fixed Combination Rules -Error-Correcting Output Codes–Bagging – AdaBoost-Mixture of Experts – Stacking-Fine-Tuning Ensemble–Cascading-CombiningMultipleSources.	**10**

Text Books

	Author	Title	Publisher
1	Ethem Alpaydın	Introduction to Machine Learning, Second Edition	The MIT Press Cambridge, Massachusetts London, England.

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)

SEMESTER – IV

Title of the Course : **MACHINE LEARNING Syllabus for AY 2022 – 23**

Subject Code: PMCS 402.2: MACHINE LEARNING

Time : 3Hrs **Max.Marks:60**

I. Answer any 5 questions **5x4 = 20 Marks**

1. Define supervised learning.
2. Define Machine learning.
3. Define Information Gain.
4. Define Back Propagation.
5. What is Reinforcement Learning?
6. Explain Regression with an example?
7. Define Bagging
8. What is a Density estimator? Give an example?
9. What is Subset Selection?
10. Define Q-learning

II. Answer Five Questions Choosing One Question from Each Unit.

All Questions Carry Equal Marks. **5x8 = 40 Marks**

UNIT – I

11. A) What are classifications of Models? Explain in detail.

(OR)

B) What are the elements of Reinforcement learning?

UNIT – II

12. A) Write ID3 decision tree algorithm and explain with a suitable example.

(OR)

B) What is a Neural Network? Explain hidden layers with a suitable example.

UNIT – III

13. A) Explain K-means clustering with a suitable example.

(OR)

B) Explain in detail about Principal Component Analysis for dimensionality reduction.

UNIT – IV

14. A) Explain in detail about the following

(i) Linear Regression (ii) Polynomial Regression

(OR)

B) Discuss about the K-nearest neighbor estimator.

UNIT – V

15. A) Explain about Model based learning with Example.

(OR)

B) Discuss learning tasks and Q learning in the context of reinforcement learning.

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)

SEMESTER – IV

Title of the Course : **MACHINE LEARNING Syllabus for AY 2022 – 23**

Subject Code: PMCS 402.2: MACHINE LEARNING QUESTION BANK

ESSAY QUESTIONS

1. What are classifications of Models? Explain in detail.
2. What are the elements of Reinforcement learning?
3. Write an ID3 decision tree algorithm and explain with a suitable example.
4. What is a Neural Network? Explain hidden layers with a suitable example.
5. Explain K-means clustering with a suitable example.
6. Explain in detail about Principal Component Analysis for dimensionality reduction.
7. Explain in detail about the Linear Regression
8. Explain in detail about the Polynomial Regression
9. Discuss about the K-nearest neighbor estimator.
10. Explain about Model based learning with Example.
11. Discuss learning tasks and Q learning in the context of reinforcement learning.

SHORT ANSWER QUESTIONS

1. Define supervised learning.
2. Define Machine learning.
3. Define Information Gain.
4. Define Back Propagation.
5. What is Reinforcement Learning?
6. Explain Regression with an example?
7. Define Bagging
8. What is a Density estimator? Give an example?
9. What is Subset Selection?
10. Define Q-learning

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
IV	PMCS 403.1	CLOUD COMPUTING	4-0-0	4

COURSE OBJECTIVES

- To acquaint the student with comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications by introducing and researching state-of-the-art in Cloud Computing fundamental issues, technologies, applications and implementations.
- Another objective is to expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

COURSE OUTCOMES

Upon Completion of the course, the students should be able to:

CO1	To understand the principles and paradigm of Cloud Computing
CO2	Ability to design and deploy Cloud Infrastructure
CO3	Understand cloud security issues and solutions
CO4	Ability to understand role of Virtualization Technologies
CO5	Design & develop backup strategies for cloud data based on features

Details of the Syllabus

Unit	Topics	No of Teaching Hours Allocated
Unit–1	**Era of Cloud Computing :** Getting to know the cloud - Peer-To-Peer, Client- Server, and Grid Computing – Cloud computing versus Client-server Architecture - Cloud computing versus Peer-To-Peer Architecture - Cloud computing versus Grid Computing - How we got to the Cloud - Server Virtualization versus cloud computing - Components of Cloud computing – Cloud Types – Cloud Computing Service delivery Models.	**10**

	Introducing Virtualization : Introducing Virtualization and its benefits – Implementation levels of Virtualization – Virtualization at the OS Level – Virtualization Structure – Virtualization Mechanisms – Open Source Virtualization Technology – Binary Translation with Full Virtualization – Virtualization of CPU, Memory and I/o Devices – Hardware support for Virtualization in Intex x86 Processor	
Unit–2	**Cloud Computing Services:** Infrastructure as a Service – Platform as a Service – Language and Pass – Software as a Service – Database as a Service. **Open Source Cloud Implementation and Administration:** Open-source Eucalyptus Cloud Architecture – Open-source Openstack Cloud Architecture.	**7**
Unit–3	**Application Architecture for Cloud:** Cloud Application Requirements – Recommendations for Cloud Application Architecture – Fundamental Requirements for Cloud Application Architecture – Relevance and use of Client-server architecture for Cloud Applications – Service oriented Architecture for Cloud Applications.**Cloud Programming:** Programming support for Google Apps Engine – Big Table as Google's NOSQL System – Chubby as Google Distributed Lock Service– Programming support for Amazon EC2 – Elastic Block Store (ESB).	**10**
Unit–4	**Risks, Consequences and Costs for Cloud Computing :** Introducing Risks in Cloud Computing – Risk Assessment and Management – Risk of Vendor Lock-in – Risk of Loss Control – Risk of Not Meeting Regulatory Compliances – Risk of Resource Scarcity – Risk in Multi Tenant Environment – Risk of Failure – Risk of Failure of Supply Chain – Risk of Malware and Internet attacks – Risk of Inadequat SLA – Risk of Management of Cloud Resources – Risk of Network Outages – Risks in the Physical Infrastructure – Legal Risk due to Legislation – Risks with Software and Application Licensing – Security and Compliance Requirements in a Public Cloud – Direct and	**10**

	Indirect Cloud Costs – Calculating Total cost of Ownership for Cloud Computing – Cost Allocations in a Cloud .**AAA administration for clouds :** The AAA Model, Single Sign-on for Clouds Industry Implementations for AAA-Authentication management in the Cloud –Authorization management in the Cloud	
Unit–5	**Application Development for cloud :** Developing On-Premise Versus Cloud Applications – Modifying Traditional Applications for Deployment in the Cloud Stages during the development process of Cloud Application - Managing a Cloud Application – Using Agile Software Development for Cloud Applications -Cloud Applications : What Not to do - Static code analysis for cloud applications – Developing Synchronous and Asynchronous Cloud Applications . **Mobile Cloud Computing :** Definition of Mobile Cloud Computing – Architecture of Mobile Cloud Computing – Benefits of Mobile Cloud Computing Mobile Cloud Computing Challenges.	**8**

Text Books

	Author	Title	Publisher
1	Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde Dr. Deven Shah	Cloud Computing, Black Book	Dreamtech press

Reference books

	Author	Title	Publisher
1	Thomas Erl, Zaigham Mahmood, Ricardo Puttini	Cloud Computing - Concepts Technology and Architecture	Pearson
2	Raj Kumar Buyya, Christen vecctiola, S Tammarai selvi	Mastering Cloud Computing, Foundations and Application Programming	TMH

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)
SEMESTER – IV

Title of the Course : **CLOUD COMPUTING Syllabus for AY 2022 – 23**

Subject Code: PMCS 403.1:CLOUD COMPUTING

Time: 3 Hours **Max. Marks: 60**

I. Answer any 5 questions **5 X 4 = 20 Marks**

1. Define cloud computing.
2. What is Grid computing?
3. Define Virtualization.
4. Explain Database as a service.
5. Explain cloud application requirements.
6. Define Service oriented Architecture.
7. Explain ESB.
8. Explain Malware and Internet attacks.
9. What is a Synchronous cloud application?
10. Explain the benefits of Mobile cloud computing.

II. Answer Five Questions Choosing One Question from Each Unit.

All Questions Carry Equal Marks. **5 X8 = 40 Marks**

UNIT – I

11. A) Explain virtualization mechanisms.

(OR)

B) Write about peer-to-peer network families.

UNIT – II

12. A) Explain cloud computing services.

(OR)

B) Explain open-source Eucalyptus Cloud Architecture.

UNIT – III

13. A) Explain the NOSQL system.

(OR)

B) Explain fundamental requirements for Cloud Application Architecture.

UNIT – IV

14. A) Explain Authentication management in the cloud.

(OR)

B) What is utility computing? Explain utility model for cloud web services.

UNIT – V

15. A) Explain how to manage a Cloud Application.

(OR)

B) Write about Mobile Cloud Computing Challenges.

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)
SEMESTER – IV

Title of the Course : **CLOUD COMPUTING Syllabus for AY 2022 – 23**

Subject Code: PMCS 403.1:CLOUD COMPUTING

SHORT QUESTIONS: **4 MARKS**

1. What is a Cloud and History of Cloud Computing?
2. Explain the origins of Cloud Computing.
3. Explain the characteristics of Cloud Computing.
4. Explain the limitations of Cloud Computing Scenarios.
5. Explain Cloud Scenarios?
6. Explain Security Benefits of Cloud Scenarios.
7. Explain the SPI vs Traditional IT model.
8. Explain about Salesforce.com and Rack space.
9. Explain SPI Evaluation?
10. Write the Advantages and Disadvantages of IAAS.
11. Write about Amazon EC2 Service Level Agreement.
12. What are the Advantages of Cloud Computing?
13. Explain the Memory and Network virtualization.
14. Explain about Thin Client.
15. What is the need of Virtualization?

ESSAY QUESTIONS: **8 MARKS**

1. Explain the components of Cloud Computing.
2. Explain Essential characteristics of Cloud Computing.
3. Explain Service Level Agreements.
4. Explain the benefits of Cloud Computing Scenarios.
5. Explain the Security Concerns in Cloud Computing.
6. Explain the Regulatory issues..
7. Explain the SPI FrameWork For Cloud Computing.
8. Explain the Benefits of Software as a Service.
9. Explain the SaaS Providers.
10. Explain IaaS Service Providers.
11. Explain Cloud Deployment Model.
12. Explain about Amazon EC2 Benefits.
13. Explain the Hardware Virtualization(full, para, partial).
14. Explain about Microsoft Hyper V and VM-Ware features.
15. Explain Data Virtualization?

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
IV	PMCS 403.2	DNA COMPUTING	4-0-0	4

COURSE OBJECTIVES : To familiarize the students with the principles and computational methods used to search and compare DNA, RNA and proteins, cast as biological. "sequences". To prepare the students for productive careers in fields of biotechnology, pharmaceutical, bioinformatics, research, and healthcare industries.

COURSE OUTCOMES

Upon Completion of the course, the students should be able to:

CO1	Discuss the High Performance computing like parallel, distributed and DNA computing
CO2	Ability to analyze the Structure of DNA, RNA, difference between DNA and RNA, Splicing System, Polymerase chain reaction and Synthetization
CO3	Discuss the technologies for modern high-throughput DNA sequencing and their applications
CO4	Discuss the Quantum Cryptography advantages & disadvantages, DNA Cryptography advantages & disadvantages.
CO5	Implementation of DES using DNA, DNA ASCII Table Cryptography using DNA

Details of the Syllabus

Unit	Topics	No of Teaching Hours Allocated
Unit 1	**Computing Paradigms:** High Performance computing, Parallel Computing, Distributed Computing, Grid Computing, Cloud Computing, Quantum Computing, DNA Computing.	**9**
Unit 2	Introduction to DNA, Structure of DNA, Introduction to RNA, difference between DNA and RNA, Splicing System, Polymerase chain reaction, Gel Electrophoresis, Protein Synthetization- Codons, Proteins, DNA Cod on table.	**9**
Unit 3	Introduction to DNA Computing, NP Hard and NP Complete Problems, Adelman Hamiltonian Problem, 3-SAT Problem.	**9**

	Theoretical Development: Splicing systems, Sticker Systems, Watson Crick Automata.	
Unit 4	Cryptography, Traditional Cryptography advantages & disadvantages, quantum Cryptography advantages & disadvantages, DNA Cryptography advantages & disadvantages.	**9**
Unit 5	Symmetric Key Cryptography using DNA, Public Key. Implementation of DES using DNA, DNA ASCII Table Cryptography using DNA.	**9**

Reference books

	Author	Title	Publisher
1	W. Stallings2009	Cryptography and Network Security: Principles and Practices	4thedition, Pearson Education, Prentice Hall, NJ
2	J.D.Watson2004	Molecular Biology of the Gene	5th edition, The Benjamin/Cummings Publishing Co., Inc

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)

SEMESTER – IV

Title of the Course : **DNA COMPUTING Syllabus for AY 2022 – 23**

Subject Code: PMCS403.2: DNA COMPUTING

Time: 3 Hours **Max. Marks: 60**

I. Answer any 5 questions **5x4 = 20 Marks**

1. Define Cell?
2. Define Cloud Computing?
3. What are Purines?
4. What are the differences between DNA and RNA?
5. Define Codon?
6. Define PCR?
7. Watson Crick Automata?
8. What is DNA Computing?
9. Define Cryptography?
10. Define Public Key Cryptography?

Answer Five Questions Choosing One Question from Each Unit.
All Questions Carry Equal Marks. **5x8 = 40 Marks**

UNIT – I

11. a) Explain the components in Cloud Computing?

(OR)

b) Explain the Computing Paradgims?

UNIT – II

12. a).Explain the concept of Protein Synthetization?

(OR)

b). Explain the structured Codon Table

UNIT – III

13. a). Explain the theoretical model of Hamiltonian Path Problem solved by Adleman?

(OR)

b). Explain about NP Hard and NP Complete Problems?

UNIT – IV

14. a). Differentiate between Traditional Cryptography and DNA Cryptography?

(OR)

b) . Differentiate between Quantum Cryptography and DNA Cryptography?

UNIT – V

15. a). Explain the concept of Public Key Cryptography?

(OR)

b). Explain about the implementation of DES using DNA?

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)

SEMESTER – IV

Title of the Course : **DNA COMPUTING Syllabus for AY 2022 – 23**

Subject Code: PMCS403.2: DNA COMPUTING QUESTION BANK

Essay Questions

1. Explain the components in Cloud Computing?
2. Explain the Computing Paradgims?
3. Explain the concept of Protein Synthetization?
4. Explain the structured Codon Table
5. Explain the theoretical model of Hamiltonian Path Problem solved by Adleman?
6. Explain about NP Hard and NP Complete Problems?
7. Differentiate between Traditional Cryptography and DNA Cryptography?
8. Differentiate between Quantum Cryptography and DNA Cryptography?
9. Explain the concept of Public Key Cryptography?
10. Explain about the implementation of DES using DNA?

Short Answer Questions

1. Define Cell?
2. Define Cloud Computing?
3. What are Purines?
4. What are the differences between DNA and RNA?
5. Define Codon?
6. Define PCR?
7. Watson Crick Automata?
8. What is DNA Computing?
9. Define Cryptography?
10. Define Public Key Cryptography?

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
IV	PMCS 404	WEB TECHNOLOGIES	4-0-0	4

COURSE OBJECTIVES: This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the 'language of the Web' – HTML, the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web, and a general grounding introduction to more advanced topics such as programming and scripting.

COURSE OUTCOMES

Upon Completion of the course, the students should be able to:

CO1	Understand, analyse and apply the role languages like HTML, CSS, XML, JavaScript and protocols in the workings of web and web applications.
CO2	Understand about network and security programming using Java and know about the application of dynamic page functionality in web pages using CGI, Servlets, JSP, and ASP.
CO3	Create and communicate between client and server using Java and create a good, effective and dynamic website.
CO4	Develop a dynamic webpage by the use of java script and DHTML.
CO5	Understand and write a well formed / valid XML document

Detailed Syllabus

Unit	Topics	No of Teaching Hours Allocated
Unit 1	**Introduction:** Evolution of the Internet and World Wide Web, Web Basics, Multitier Application Architecture, Client-Side Scripting versus Server-Side Scripting, Object Technology **HTML5:**Introduction, EditingHTML5, FirstHTML5Example, W3C HTML5 Validation Service, Headings, Linking, Images, Special Characters and Horizontal Rules, Lists, Tables, Forms, Internal Linking, meta Elements, HTML5 Form inputTypes,inputanddatalistElementsandautocompleteAttribute,Page-StructureElements.	**8**

Unit 2	**CSS:** Introduction, Inline Styles, Embedded Style Sheets, Conflicting Styles, Linking External Style, Positioning Elements, Backgrounds, Element Dimensions, Box Model and Text Flow, Media Types, Building a CSS Drop-Down Menu, User Style Sheets, Text Shadows, Rounded Corners, Color, Box Shadows, Image Borders, Animation-Selectors. **JavaScript:** Introduction to Scripting, Control Statements I, Control Statements II, Functions, Arrays, Objects, Document Object Model, EventHandling.	**10**
Unit 3	**JQuery Basics**: String, Numbers, Boolean, Objects, Arrays, Functions, Arguments,Scope, Built-in Functions. jQuery – Selectors: CSS Element Selector, CSS ElementID Selector, CSS Element Class Selector, CSS Universal Selector, Multiple ElementsE, F, G Selector, Callback Functions. jQuery – DOM Attributes: Get Attribute Value, Set Attribute Value. JQuery–DOM Traversing: Find Elements by index, Filtering Out Elements, Locating Descendent Elements, JQuery DOM Traversing Methods.	**10**
Unit 4	**JQuery CSS Methods :** Apply CSS Properties, Apply Multiple CSS Properties, Setting Element Width & Height, JQuery CSS Methods. JQuery–DOM Manipulation Methods: Content Manipulation, DOM Element Replacement, Removing DOM Elements, Inserting DOM elements, DOM Manipulation Methods. jQuery – Events Handling: Binding event handlers, Removing event handlers, EventTypes, The Event Object, The Event Attributes. jQuery – Effects: JQuery Effect Methods, jQuery Hide and Show, jQuery Toggle, jQuery Slide–slide Down, slideUp, Slide Toggle, jQuery Fade–fadeIn, fadeOut, fadeTo, jQuery Custom Animations.	**10**
Unit5	**Databases:** SQL, MYSQL. **PHP:**Introduction Simple PHP Program,Converting Between DataTypes, Arithmetic Operators, Initializing and Manipulating Arrays, String Comparisons, String Processing with Regular Expressions, Form Processing and Business	**12**

	Logic, Reading from a Database, Using Cookies, Dynamic Content.	

Textbooks

	Author	Title	Publisher
1	Harvey M. Deitel and Paul J. Deitel	Internet and World Wide Web How To Program, 5e	Prentice Hall; 4th edition
2	Robert W Sebesta	Programming with World Wide Web	Pearson Education; 4th edition.
3	Jon Duckett	JavaScript & jQuery	Wiley
4	Karol Krol	A comprehensive guide to WordPress development from scratch	Oreilly, 6th Edition

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)

SEMESTER – IV

Title of the Course : **WEB TECHNOLOGIES Syllabus for AY 2022 – 23**

Subject Code: PMCS404: Web Technologies

Time: 3 Hours **Max. Marks: 60**

I. **Answer any 5 questions** **5x4 = 20 Marks**

1. What is WWW?
2. Explain Meta Elements.
3. Explain embedded style sheet with an example.
4. What is Event Handling?
5. List out built in functions in jQuery.
6. Explain Arithmetic operations in PHP.
7. What are DDL statements?
8. Define cookies.?
9. What is CMS?
10. What are plug-ins?

Answer Five Questions Choosing One Question from Each Unit.
All Questions Carry Equal Marks. **5x8 = 40 Marks**

UNIT – I

A) a) How do you add Tables and Images to an HTML page?

(OR)

b) Distinguish Client side scripting versus Server side scripting.

UNIT – II

B) a) Write short notes on user style sheets.

(OR)

b) Explain control statements in java script with examples.

UNIT – III

C) a) What are jQuery Selectors? Give some examples.

(OR)

b) Explain jQuery DOM attributes with an example.

UNIT – IV

D) a) Differentiate between SQL and MYSQL databases.

(OR)

b) How to read data from a database in PHP? Explain with an example.

UNIT – V

E) a) Briefly Explain about the various Setting of Wordpress?

(OR)

b) How we can Add, Edit and Delete pages in Word Press with examples?

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)

SEMESTER – IV

Title of the Course : **WEB TECHNOLOGIES Syllabus for AY 2022 – 23**

Subject Code: PMCS404: Web Technologies QUESTION BANK

Essay Questions

1. Briefly Explain Evolution of the Internet?
2. Briefly Explain about various List tags with their attributes with example programs
3. How do you add Tables and Images to HTML page?
4. List out various Form Dialog Boxes and explain with the designing a Form?
5. Distinguish Client side scripting versus Server side scripting?
6. What is CSS? Explain various Style sheets with the examples?
7. Write short notes on user style sheets?
8. Explain control statements in java script with example?
9. What are JQuery Selectors? Give some examples?
10. Explain JQuery DOM attributes with an example?
11. Explain jQuery CSS methods withan example?
12. Differentiate between SQL and MYSQL databases.?
13. Briefly explain about various data types available in PHP with examples?
14. How to read data from a database in PHP? Explain with an example.?
15. What is Content Management System (CMS), Explain Features, Advantages and Disadvantages?
16. Briefly Explain about the various Setting of the Wordpress?
17. How can we Add, Edit Delete and Arrange Categories?
18. How we can Add, Edit and Delete pages in Word Press with examples?
19. What is plug-ins ? how we can install, view and customize plugins?

Short Answer Questions

1. What is WWW?
2. Explain Meta Elements?
3. What is Linking?
4. Write about HTML5 validation services?
5. Explain embedded style sheet with an example?
6. What is Event Handling?
7. What is DOM? List out the elements?
8. List out built-in functions in JQuery?
9. Explain Arithmetic operations in PHP?
10. What are DDL statements?
11. Write about string comparison in PHP?
12. Define cookies?
13. What is CMS?
14. Write abut Wordpress Dashboard?
15. How we install the wordpress?
16. What are software requirements of Word press installation?
17. What is plug-ins?

SRR & CVR Government Degree & PG College

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Computer Science

M.Sc (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
IV	PMCS405	WEB TECHNOLOGIES LAB	0-0-4	2

Web Technologies Lab List of Programs

1. Write an HTML code to display your education details in a tabular format.
2. Write an HTML code to display your CV on a web page.
3. Write an HTML code to display the name of the University and Department name using inline, internal and external CSS.
4. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
5. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.
6. Write a JavaScript code that displays text with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays in BLUE color. Then the font size decreases to 5pt.
7. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
8. Write a PHP program to display a digital clock which displays the current time of the server.
9. Write the PHP program to multiply two matrices.
10. Write the PHP to find the transpose of the matrix.
11. Write a PHP program to sort the student records which are stored in the database using selection sort.
12. Using jQuery find all text areas, and makes a border. Then adds all paragraphs to the jQuery object to set their borders red.
13. Using jQuery add a new class to an element that already has a class.
14. Using jQuery insert some HTML after all paragraphs.

SRR & CVR Government Degree College(Autonomous), Vijayawada

Department of Computer Science

M.Sc (Computer Science)

Semester	Course Code	Course Title	L-T-P	Credits
IV	PMCS401	INTRODUCTION TO COMPUTER VISION AND IMAGE PROCESSING	4-0-0	4

COURSE OBJECTIVES: To familiarize the students with the fundamentals of computer vision, different types of classification methods, deep learning architectures. To acquaint the student on how to apply the knowledge of computer vision to solve real world problems.

COURSE OUTCOMES

CO-1: Describe the applications of computer vision across different industries.
Describe the common tools used for computer vision.

CO-2: Review the fundamental concepts of digital image processing.
Explain the basics of image processing technique.

CO-3: Describe the basics of image classification. Able to create image classifier using supervised learning techniques using CV Studio

CO-4: Execute an implementation of an image classification using tools such as PyTorch

CO-5: Evaluate the classification Performance Haar Cascade Classifiers and CNN models

DETAILED SYLLABUS

The MOOC course is available online at the below link:

https://www.coursera.org/learn/introduction-computer-vision-watson-opencv/home/welcome

Unit	Topics	No of Teaching Hours Allocated
UNIT-1	Introduction to computer vision, application of computer vision, recent research in computer vision, brainstorming your own applications, case studies on ways in which Computer Vision continues to revolutionize industries, computer vision in action	7
UNIT-2	What is digital image, Image processing with pillow, image processing with opencv, manipulating images, manipulating images one pixel at a time, basic image manipulation with pillow, basic image manipulation with opencv, pixel transformations, histogram and intensity	7

	transformation, geometric operations, geometric operations with pillow, geometric operations with opencv, spatial operations in image processing, spatial filtering pillow, spatial filtering opencv	
UNIT- 3	Introduction to image classification, image classification with knn, linear classifiers logistic regression : gradient descent, mini gradient descent, softmax and multi class classification, Suuport vector machines, image features	**7**
UNIT-4	Neural networks, simple neural networks for XOR, Relu Vs Sigmoid, convolution networks, data augmentation, cnn architectures,	**7**
UNIT-5	Object detection, Haar cascade classifier, object detection with deep learning , object detection with faster r-cnn, object detection with pretrained models.	**7**

SRR & CVR Government Degree College(Autonomous), Vijayawada

Department of Computer Science

M.Sc (Computer Science)

SEMESTER – IV

Title of the Course : **INTRODUCTION TO COMPUTER VISION AND IMAGE PROCESSING**

Subject Code: PMCS 401

Time: 3 Hours **Max.Marks: 60**

I Answer any 5 questions **5x4=20 Marks**

1. Describe the concept of computer Vision?
2. Explain how computer vision revolutionize industries,
3. What are the various image representation techniques?
4. What is a histogram? Explain with an example.
5. What is Geometric transformation in Image processing?
6. Define Multiclass Classification with a neat diagram?
7. Briefly explain about linear regression.
8. "Neuron inhibition depends on activation function". Justify this statement with different types of activation functions.
9. What is data augmentation? Why we augment data sometimes while using cnn
10. List and explain briefly the steps involved in Haar Cascade Classifier?

II. Answer <u>Five</u> Questions Choosing One Question from Each Unit.

All Questions Carry Equal Marks. **5x8=40 Marks**

UNIT–I

11 a) Explain knowledge based vision. Explain different forms of knowledge representation used in computer vision.

(OR)

b) Explain Need and Challenges in Computer Vision?

UNIT–II

12 a) What are intensity transformations used for?

b) Why spatial filtering is important

(OR)

c) What is geometric transformation? Explain about various geometric transformations with neat diagrams.

d) Describe image manipulation

UNIT–III

13 a) What is a Support Vector Machine? Discuss in detail.

(OR)

b) What is k-nearest neighbor classification? How does it differ from nearest neighbor classification? Describe a situation in which it might work better than nearest-neighbor classification.

UNIT–IV

14 a) Draw and explain the architecture of convolutional neural networks?

(OR)

b) Illustrate the working principle of perceptron

UNIT–V

15 a) What is r-cnn in object detection? What is faster r-cnn.

(OR)

b) What is Transfer Learning? Explain about different pretrained models available for object detection and image classification.

SRR & CVR Government Degree College(Autonomous), Vijayawada

Department of Computer Science

M.Sc (Computer Science)

SEMESTER – IV

Title of the Course : **INTRODUCTION TO COMPUTER VISION AND IMAGE PROCESSING**

Subject Code: PMCS 401

Time: 3 Hours **Max.Marks: 60**

I Answer any 5 questions **5x4=20 Marks**

1. What is computer vision, and how does it differ from human vision?
2. Give an example of how computer vision is used in everyday life.
3. What are the various image representation techniques?
4. What is a histogram? Explain with an example.
5. What is Geometric transformation in Image processing?
6. Define Multiclass Classification with a neat diagram?
7. Briefly explain about linear regression.
8. "Neuron inhibition depends on activation function". Justify this statement with different types of activation functions.
9. What is data augmentation? Why we augment data sometimes while using CNN
10. List and explain briefly the steps involved in Haar Cascade Classifier?

II. Answer <u>Five</u> Questions Choosing One Question from Each Unit.

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c) What is geometric transformation? Explain about various geometric transformations with neat diagrams. d) Describe image manipulation

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UNIT–V

15 a) What is r-cnn in object detection? What is faster r-cnn.

(OR)

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SRR & CVR Government Degree College(Autonomous), Vijayawada

Department of Computer Science

M.Sc (Computer Science)

SEMESTER – IV

Title of the Course : **INTRODUCTION TO COMPUTER VISION AND IMAGE PROCESSING**

Subject Code: PMCS 401

Time: 3 Hours **Max.Marks: 60**

I Answer any 5 questions **5x4=20 Marks**

1. Explain with an example about "Computer Vision in Action"
2. Describe the concept of computer Vision?
3. What are the various image representation techniques?
4. What is a histogram? Explain with an example.
5. What is Geometric transformation in Image processing?
6. Define Multiclass Classification with a neat diagram?
7. Briefly explain about linear regression.
8. "Neuron inhibition depends on activation function". Justify this statement with different types of activation functions.
9. What is data augmentation? Why we augment data sometimes while using CNN
10. List and explain briefly the steps involved in Haar Cascade Classifier?

II. Answer <u>Five</u> Questions Choosing One Question from Each Unit.

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UNIT–I

11 a) Explain knowledge based vision. Explain different forms of knowledge representation used in computer vision.

(OR)

b) Explain Need and Challenges in Computer Vision?

UNIT–II

12 a) What are intensity transformations used for? b) Why spatial filtering is important

(OR)

c) What is geometric transformation? Explain about various geometric transformations with neat diagrams. d) Describe image manipulation

UNIT–III

13 a) What is a Support Vector Machine? Discuss in detail.

(OR)

b) What is k-nearest neighbor classification? How does it differ from nearest neighbor classification? Describe a situation in which it might work better than nearest-neighbor classification.

UNIT–IV

14 a) Draw and explain the architecture of convolutional neural networks?

(OR)

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UNIT–V

15 a) What is r-cnn in object detection? What is faster r-cnn.

(OR)

b) What is Transfer Learning? Explain about different pretrained models available for object detection and image classification.