

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY
Chhatrapati Sambhajnagar.



CIRCULAR /SU/CM/NEP PG-I Year/51/2024

It is hereby inform to all concerned that, on the recommendation of the Dean, Faculty of Commerce & Management; **the Hon'ble Vice-Chancellor has accepted the "following Revised Curriculum at PG Level as per National Education Policy-2020" for the implementation of all concerned affiliated colleges** under the Faculty of Commerce & Management in his emergency powers under section-12 (7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council.

Sr.No.	Courses	Semester
1	M.B.A	I & II
2	M.C.A.	I & II

This is effective from the Academic Year 2024-25 and Onwards as per appended herewith.

All concerned are requested to note the contents of this circular and bring notice to the students, teachers and staff for their information and necessary action.

University Campus, *
Chhatrapati Sambhajnagar *
-431 004. *
REF.NO. SU/COM/2024-25/ 9981-10 *
Date:- 26-11-2024. * * * * *

(Signature)
Deputy Registrar,
Academic Section
Syllabus unit.

Copy forwarded with compliments to :-

- 1] **The Principal all concerned affiliated colleges, Dr. Babasaheb Ambedkar Marathwada University.**
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

- 1] The Director, Board of Examination & Evaluation,
- 2] **The Section Officer, [Concerned Unit] Examination Branch,**
- 3] The Section officer, [Eligibility Unit],
- 4] **The Programmer [Computer Unit-1] Examinations,**
- 5] **The Programmer [Computer Unit-2] Examinations,**
- 6] The In-charge, [E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr. Babasaheb Ambedkar Marathwada University.
- 7] The Public Relation Officer,
- 8] The Record Keeper.



Dr. Babasaheb Ambedkar Marathwada University,
Chhatrapati Sambhajinagar (MS)

Faculty of Commerce and Management Science

REGULATIONS SPECIFIC TO

M.C.A. PROGRAM

**Outcome Based Education Pattern Aligned with
National Education Policy (NEP) 2020**

**(Applicable for Affiliated Colleges under
the Jurisdiction of University)**



**Dr. Babasaheb Ambedkar Marathwada University,
Chhatrapati Sambhajinagar
(With Effect from 2024-25)**

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**Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati
Sambhajinagar**

MCA PROGRAM (2 Years Degree)

(Choice Based Credit & Grade System)

M.C.A program prepares students to take up positions as systems analysts, system designers, programmers and managers in any field related to information technology. The program, therefore, aims at imparting comprehensive knowledge with equal emphasis on theory and practice. The M.C.A. students are encouraged to spend a full semester working in the industry in the institute giving them insight into the workings of the IT world.

Vision

Fostering An Inclusive Environment Of Excellence In Business and IT Education Through Innovative Learning & Social Commitment By All Stake Holders.

Mission

- Create an Environment for Excellence in Management & IT Education.
- Encourage Innovations in Management & IT Education.
- Undertake Qualitative Research Studies, Consultancy and Training Programs.
- Collaborate with Stake Holders of Education & Society in Creating an Atmosphere for Value-driven Education.

The underlying principle that forms the soul of our existence as a Business and Technical School is -

- Creation of an environment - i.e. creating amenities, resources, infrastructure etc. most importantly able-human resource that shall support students to excel holistically- as a learner & as a professional too.
- Innovative Learning - here at the Department, we envision to educate students in a way that aims at interesting learning experience, illustrate the concept & retention-centric. For achieving these goals, we intend to make a blend of educational styles-right from Management Games to case-study education to 'learning through doing' projects.
- Social Commitment - While we render education, we are aware that the product that we are going to deliver shall thrive as an input to the society & industry. Hence, besides the core-education part, we impart education that shall make a wholesome being & an ideal.
- Involvement - forms the cornerstone of this Vision; as all the stakeholders of this institution are committed to deliver excellence.

Outcome Based Education System

1. Program Educational Objectives:

The program educational objectives (PEO) are the statement that describes the career and professional achievement after the program of studies (graduation/ post-graduation). The PEOs are driven from question no. (ii) of the Mission statement (What is the purpose of organization). The PEOs can be a minimum three and maximum five.

PEO1: The advance knowledge of Management Science/Computer application in the management

and administration of the organization.

PEO2: To work as a private and public sector professional through respective competitive examination/interviews.

PEO3: To establish own professional activity in the domain of Management science such as Human Resources Development, Marketing, etc.

PEO4: To be a researcher and a life-long learner.

PEO5: To be a values-based and ethical leader in the professional and social life.

2. Program Outcomes:

The program outcomes (PO) are the statement of competencies/ abilities. POs are the statement that describes the knowledge and the abilities the graduate/ post-graduate will have by the end of program studies.

1. Computational Knowledge:

Apply knowledge of computing fundamentals, computing specialisation, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

2. Problem Analysis:

Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

3. Design /Development of Solutions:

Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

4. Conduct Investigations of Complex computing Problems:

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern Tool Usage:

Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

6. Professional Ethics:

Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

7. Life-long Learning:

Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

8. Project Management and finance:

Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

9. Communication Efficacy:

Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

10. Societal and Environmental Concern:

Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

11. Individual and Team Work:

Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

12. Innovation and Entrepreneurship

Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

1. Rules and Regulations

1. Eligibility and Selection Criteria -

(A) First Year Admission.-

(1) For Maharashtra State Candidature Candidates, All India Candidature Candidates, Union Territory of Jammu and Kashmir and Union Territory of Ladakh Migrant Candidature Candidates. -

The candidate,-

(i) should be a citizen of India;

(ii) should have passed any graduation degree (e.g.: B.E. or B.Tech. or B.Sc or B.Com. or B.A. or B. Voc. or BCA etc.,) preferably with Mathematics at 10+2 level or at Graduation level and obtained at least fifty per cent marks (at least forty five per cent. in case of candidates of Reserved Categories, Economically Weaker Section and Persons with Disability category belonging to the Maharashtra State) in the qualifying examination;

iii) should have obtained non zero score in MAH-MCA CET conducted by the Competent Authority.

(2) Non Resident Indian (NRI) or Overseas Citizen of India (OCI) or Person of Indian Origin (PIO), Children of Indian workers in the Gulf countries, Foreign National Candidature Candidates.-

(i) The candidate should have passed any graduation degree (e.g.: B.E. or B.Tech. or B.Sc or B.Com. or B.A. or B. Voc. or BCA etc.,) preferably with Mathematics at 10+2 level or at Graduation level and obtained at least fifty per cent. marks in the qualifying

examination;

(ii) Any other eligibility criteria and requirement declared from time to time by the appropriate authority as defined under the Act;

(B) Second Year (Lateral Entry) Admission. –

Maharashtra State Candidature Candidates and All India Candidature Candidates.-

(i) The candidate should be a citizen of India;

(ii) The candidate should have passed B.Tech.(Computer Technology (IT)) or B.E. (Computer Science and Engineering (CSE) or Information Technology (IT)) or Bachelor of Computer Applications (BCA) (4 years);

(iii) Any other eligibility criteria and requirement declared from time to time by the appropriate authority as defined under the Act

Duration

- Duration of the MCA PROGRAM shall be 2 years/ 4 semesters.
- Duration of the MCA PROGRAM shall be 1 year/ 2 semesters if Admitted for Second Year (Lateral Entry)

2. Admission/Promotion Criteria

If candidate gets selected for MCA course through DTE admission process, he/she have to apply on the application form of the University provided with the prospectus. Once the candidate is admitted to the MCA course, he/she will be promoted to next semester with full carryon; subject to the registration of candidate in every consecutive semester. Dropout candidate will be allowed to register for respective semester in which he/she has failed, subject to the condition that his/her tenure should not exceed more than twice the duration of MCA course from the date of first registration at institute. The admission of concern candidate will automatically get cancelled if he/she fails to complete the course in maximum period.(Four years)

3. Credits and Degrees

- A candidate who has successfully completed all the Foundation, Core, Elective courses and Project Work as prescribed for the MCA Course and Service courses as approved by the University with prescribed CGPA shall be eligible to receive the

degree.

- One Credit shall mean one teaching period of one hour per week for one semester (of 15 weeks) for theory courses and two hours/week of practical for one semester.

Courses

The MCA programme comprises of

- I. Foundation Course: It may be of two kinds Compulsory Foundation Course for Knowledge Enhancement and Elective Foundation Course for value based education.
- II. Core Course: A core course is course that a candidate admitted to particular P.G. programme must successfully complete to receive the degree.
- III. Elective Course: Elective courses identified by the Departmental Committee of the department offering the programme. Means these courses given to the candidate as optional from which he/she has to opt for specialization. Whereas no elective course shall be offered unless a minimum of 10 students are registered.
- IV. Each course shall include lectures/tutorials/laboratory of field work/ seminar/practical training/assignments /mid-term and term end examinations/paper/report writing or review of literature and any other innovative practice etc., to meet effective teaching and learning needs.
- V. Each course shall have a unique alphanumerical code.

For eg.

MANC401 Advance Operating system

Here, MAN means Management Science

C means MCA course

401 means Subject Code

- VI. The University committee shall design the course structure including the detailed syllabus for this MCA programme. The committee shall have the freedom to introduce new courses and / or to modify / redesign existing courses and replace any existing course with a new course to facilitate better exposure and training for the candidates.
- VII. Attendance: A student must have 75% of mandatory attendance in each Course for appearing in the examination. In the event of Non-Compliance of Attendance criteria(75%), students will have to seek admission next year so as to complete the course. However Student having 65% attendances with medical certificate can apply to the H.O.D. for condonation of attendance.

2. Grievance Redressal Scheme

University will provide the separate guidelines for Grievance Redressal Scheme.

3. Grade Awards

- i. The Degree of MCA will be of **96 Credits**. And PG Diploma(if exit option taken) of **54 Credits**.
- ii. In order to pass the examination following choice based credit and grading system (CBC&GS) will be followed. Ten point rating scale shall be used for evaluation of performance of the student to provide Letter Grade for each course and overall grade for this course. Grade points are based on the total number of marks obtained by him / her in all the heads of the examination of the course. These grade points and their equivalent range of the marks are shown separately in following:

Table - I: Ten Point grades and grade description

Sr.No.	Equivalent Percentage	Grade points for SGPA and CGPA	Grade	Grade Description
1.	90 - 100	9.00 - 10	O	Outstanding
2.	80 - 89.99	8.00 - 8.99	A++	Excellent
3.	70 - 79.99	7.00 - 7.99	A+	Exceptional
4.	60 - 69.99	6.00 - 6.99	A	Very Good
5.	55 - 59.99	5.50 - 5.99	B+	Good
6.	50 - 54.99	5.00 - 5.49	B	Fair
7.	45 - 49.99	4.50 - 4.99	C+	Average
8.	40.01 - 44.99	4.01 - 4.49	C	Below Average
9.	40	4.00	D	Pass
10.	Below 40	0.00	F	Fail

iii. **Table – II: Classification for the degree is given as follows**

Classification	Overall letter grade
First Class with distinction	<i>A+ and above</i>
First Class	<i>A</i>
Higher Second Class	<i>B+</i>
Second Class	<i>B</i>
Pass	<i>C+ to D</i>
Fail	<i>F</i>

- iv. In the event of student registered for the examination (i.e. Internal Tests/End Semester Examination/Practical/Seminar/Project Viva-voce), non-appearance shall be treated as the student deemed to be absent in the respective course.
- v. Minimum D grade shall be the limit to clear /pass the course/subject. A student with F grade will be considered as 'failed' in the concerned course and he/she has to clear the course by reappearing in the next successive semester examinations.
- vi. Using table – I, Semester Grade Point Average (SGPA) and then Cumulative Grade Point Average (CGPA) shall be computed. Results will be announced at the end of each semester and Cumulative Grade Card with CGPA will be given on completion of the course.

4. **Computation of SGPA (Semester Grade Point Average) &CGPA (Cumulative Grade Point Average)**

The computation of SGPA and CGPA will be as below:

- i. Semester Grade Point Average (**SGPA**) is the weighted average of points obtained by a student in a semester and will be computed as follows:

$$\text{SGPA} = \frac{\text{Sum}(\text{Course Credit} * \text{Number of Points in concern course gained by the student})}{\text{Sum}(\text{Course Credit})}$$

The SGPA for all four semesters will be mentioned at the end of every semester.

- ii. The Cumulative Grade Point Average (**CGPA**) will be used to describe the overall performance of a student in all semesters of the course and will be computed as follows:

$$\text{CGPA} = \frac{\text{Sum}(\text{All Four semester SGPA})}{\text{Total number of semesters}}$$

The SGPA and CGPA shall be rounded off to the second place of decimal.

5. Evaluation Scheme

- **Appearance for both Internal and External Evaluations (Examinations) is mandatory.**
- **Separate Passing for both Internal and External Evaluations (Examinations) of course is compulsory.**
- **Minimum and Separate Passing Percentage for both Internal and External Evaluations (Examinations) is 40%.**
- Theory course of 100 Marks will be divided in to Internal Examination (Sessional) of 40 Marks and Semester End Examination of 60 Marks (40+60=100) **except Papers with Full Internal Assessment.**
- Theory course of 75 marks will be divided in to internal Examination of 30 marks and semester end examination of 45 marks (30+45=75).
- Theory course of 50 marks will be divided in to internal Examination of 20 marks and semester end examination of 30 marks. (20+30=50).
- Each Practical Course will be of 25 Marks.

a) For Theory Course

i. Internal Evaluation Scheme

There shall be weekly assessment in the form of Test/Assignment/Tutorials/seminars/Presentations/laboratory work /Field work/Project Work throughout the semester. Aggregation of these marks will be considered for the internal evaluation of 40/30/20 marks.

ii. Semester End Examination Evaluation Scheme

- English shall be the medium of instruction and examination.
- Examination shall be conducted at the end of each semester as per the academic calendar notified by University.
- The Semester End Examination theory question paper of 60 marks will have two parts **(10 + 50 = 60) Marks**
Q1 will carry short question (fill in the blanks/multiple choice questions/match the columns/state true or false/answer in one sentence) as compulsory questions and it should cover entire syllabus (10 Marks).
Q2 to Q8 will carry 7 questions out of which there shall be at least one question from each unit, student will have to answer any 5 questions out

of 7.

- The Semester End Examination theory question paper of 45 marks will have two parts (**10 + 35 = 45**) Marks

Q1 will carry short question (fill in the blanks/multiple choice questions/match the columns/state true or false/answer in one sentence) as compulsory questions and it should cover entire syllabus (10 Marks).

Q2 to Q8 will carry 7 questions, students will have to answer any 5 questions out of (**5 x 7=35**).

- The Semester End Examination theory question paper of 30 marks will have two parts (**10 + 20 = 30**) Marks

Q1 will carry short question (fill in the blanks/multiple choice questions/match the columns/state true or false/answer in one sentence) as compulsory questions and it should cover entire syllabus (10 Marks).

Q2 to Q5 will carry 4 questions, students will have to answer any 2 questions out of 4 (**2 x 10 =20**).

b) For Practical Course

i. Evaluation Scheme

- A student should complete lab assignments practically given by course teacher. However, in addition teacher can allot a mini project to students for better evaluation but assignments are compulsory. Internal evaluation for the practical will be considered for 25 Marks.
- Under this roof, a student has to face practical examinations in which he/she has to complete the task on computer system (It may computer program or testing) given by External Examiner. Also student has to present seminar or viva-voce in front of External Examiner.

c) For Mini Project –

i. Internal Evaluation –

- All the students are divided among different teams & work under the guidance of the Faculty/guide. Internal Evaluation for the project will be of 40% marks that will be evaluated by the respective faculty/ guide depending upon presentation/review/performance during project/ report writing/field work/seminars etc.
- Student has to present seminar/viva-voce/ demonstration of project in front of External Examiner. External evaluation for the project will be considered for 60% Marks.

d) Fourth Semester Project Evaluation Scheme

The Major project work should be carried out over the entire period of the final semester in an Industry. If the project is carried out in an Industry organization outside the campus, then a co-guide shall be there from Industry. Every student should do the Major Project individually. However students can opt for project in groups based on merits/requirements of the project and in consultation with the project guide. A guide will review the project periodically. At the end of the semester the candidate shall submit the Project report (two bound copies) duly approved by the guide and /Director H.O.D. of the Institute. The University will appoint external examiner for assessment of the project. The project will be assessed by the external examiner and the guide separately on the basis of the following criteria tentatively.

- | | |
|---------------------------------|-----|
| • Innovative Idea | 15% |
| • Content | 15% |
| • Preparation of Project Report | 30% |
| • Presentation/Viva- voce | 40% |

If student failed to complete the project within scheduled time then he/she has to reappear and register freshly with new project topic after paying required fees for that semester.

6. Grade Card

The university under its seal shall issue to the students a grade card on completion of each semester.

Grade card shall contain the following:

- a. Title of the courses along with code taken by the student.
- b. The credits associated with and grades awarded for each course.
- c. The number of grade and grade point secured by the student.
- d. The total credits earned by the student in that semester.
- e. The SGPA of the student.
- f. The total credits earned by the student till that semester.
- g. The CGPA of the student (At the end of the IVth semester).

7. Cumulative Grade Card

The grade card issued on completion of the programme shall contain the name of the programme, the department /school offered the programme, the titles of the courses taken, the credits associated with each course, grades awarded, the total creditsearned by the student, the CGPA and the class in which the student is placed.

8. Exit Option

- Students who have joined as two -year's Master's Degree program (MCA) may opt for exit at the end of first year and earn a PG Diploma.
- PG Diploma may be awarded to a student provided they have earned the requisite Credits (**50 +4 = 54 Credits**) in one year including on-the-job training of 04 Credits (**MANC459**) during summer break, after completion of the second semester of the First year.

9. Re-Entry

Re-entry to complete the PG Degree, after taking the exit option, will be permissible up to 05 years from the date of admission to the PG program(MCA).

10. General Clause

It may be noted that beside the above specified rules and regulations all the other rules and regulations in force and applicable to semester system in Post-Graduate courses in Dr. Babasaheb Ambedkar Marathwada University will be applicable as amended from time to time by the University. The students shall abide by all such Rules and Regulations.

MCA Program Structure

SEMESTER - I

Sem	Course Type	Ref. No	Subject Title	Teaching Scheme			Credit	Marks		
				L	T	P		Int	Ext	Total
I	Mandatory / Major / DSC	MANC401	Advance Operating System	3	1	-	4	40	60	100
		MANC402	Mathematics and Probability	3	1	-	4	40	60	100
		MANC403	Programming Using Python	3	-	-	3	30	45	75
		MANC404	Advance Web Technology	3	-	-	3	30	45	75
		MANC405	Java	3	-	-	3	30	45	75
		MANC41X	Open Elective - I	3	1	-	4	40	60	100
	Mandatory / Major / DSC	MANC451	Python Lab	-	-	2	1		25	25
		MANC452	Advance Web Technology Lab	-	-	2	1		25	25
		MANC453	Java Lab	-	-	2	1		25	25
			Total				24	210	390	600

Open Elective - I (Select any One from Following)

Sr.No	Course Type	Ref. No	Subject Title	Teaching Scheme			Credit	Marks		
				L	T	P		Int	Ext	Total
1.	OE/GE	MANC411	MIS & DSS	3	1	-	4	40	60	100
2.		MANC412	Creativity & Innovation							
3.		MANC413	Basics of Programming Language							
4.		MANC414	Software Engineering							
5.		MANC415	ERP							

SEMESTER - II

Sem	Course Type	Ref. No	Subject Title	Teaching Scheme			Credit	Marks		
				L	T	P		Int	Ext	Total
II	Mandatory / Major / DSC	MANC416	Object Oriented Analysis & Design	3	-	-	3	30	45	75
		MANC417	Data structure using C++	3	-	-	3	30	45	75
		MANC418	Advance DBMS	3	-	-	3	30	45	75
		MANC419	Software Testing	3	-	-	3	30	45	75
		MANC420	Research Methodology	3	1	-	4	40	60	100
	Major/DSE	MANC42X	Open Elective - II	3	-	-	3	30	45	75
		MANC42X	Open Elective - III	3	1	-	4	40	60	100
	Mandatory / Major / DSC	MANC454	Advances in Data Structure & Algorithms Lab	-	-	2	1		25	25
		MANC455	Advance DBMS Lab	-	-	2	1		25	25
		MANC45X	Open Elective - II Lab	-	-	2	1		25	25
			Total				26	230	420	650

Open Elective – II (Select any One from Following)

Sr.No	Course Type	Ref. No	Subject Title	Teaching Scheme			Credit	Marks		
				L	T	P		Int	Ext	Total
1.	Major/DSE	MANC421	Advance JAVA	3	-	-	3	30	45	75
		MANC456	Advance JAVA Lab	-	-	2	1		25	25
2.		MANC422	Data Science using Python	3	-	-	3	30	45	75
		MANC457	Data Science using Python Lab	-	-	2	1		25	25
3.		MANC423	ASP.NET	3	-	-	3	30	45	75
		MANC458	ASP.NET LAB	-	-	2	1		25	25

Open Elective – III (Select any One from Following)

Sr.No	Course Type	Ref. No	Subject Title	Teaching Scheme			Credit	Marks		
				L	T	P		Int	Ext	Total
3.		MANC424	Entrepreneurship Development	3	1	-	4	40	60	100
		MANC425	Artificial Intelligence							
		MANC426	Cyber Security							
		MANC427	Fundamentals of Digital Marketing							

* The On The Job Training (MANC459) is only applicable to students who wish for PG Diploma by taking Exit after First Year.

Sr.No	Course Type	Ref. No	Subject Title	Teaching Scheme			Credit	Marks		
				L	T	P		Int	Ext	Total
1.	OJT	MANC459	on-the-job training	-	-	4	4	40	60	100

SEMESTER -III

Sem	Course Type	Ref. No	Subject Title	Teaching Scheme			Credit	Marks		
				L	T	P		Int	Ext	Total
III	Mandatory /Major / DSC	MANC501	Advances In Algorithm	3	-	-	3	30	45	75
		MANC502	Web Development using PHP	3	-	-	3	30	45	75
		MANC503	Optimization Techniques	3	1	-	4	40	60	100
		MANC504	Advance Networking	3	1	-	4	40	60	100
	Major/DSE	MANC52X	Open Elective - IV	3	-	-	3	30	45	75
	Mandatory /Major / DSC	MANC551	Advances in Algorithm Lab	-	-	2	1		25	25
		MANC552	PHP Lab	-	-	2	1		25	25
	RP	MANC553	Research Project	-	-	4	4	40	60	100
	SEC	MANC554	Research Project -Seminar	-	-	2	2	20	30	50
	Major/DSE	MANC55X	Open Elective - III Lab	-	-	2	1		25	25
Total							26	230	420	650

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Open Elective – IV (Select any One from Following)

Sr.No	Course Type	Ref. No	Subject Title	Teaching Scheme			Credit	Marks		
				L	T	P		Int	Ext	Total
1.		MANC521	Linux Admin & Server Config.	3	-	-	3	30	45	75
		MANC555	Linux Admin & Server Config. Lab	-	-	2	1	--	25	25
2.	Major/DSE	MANC522	Mobile Application Development Using Android	3	-	-	3	30	45	75
		MANC556	Android Lab	-	-	2	1	--	25	25
3.		MANC523	Cloud Computing	3	-	-	3	30	45	75
		MANC557	Cloud Computing Lab	-	-	2	1	--	25	25
4.		MANC524	Data Visualization using Power BI and Tableau	3	-	-	3	30	45	75
		MANC558	Power Bi & Tableau Lab	-	-	2	1	--	25	25

SEMESTER -IV

Sem	Course Type	Ref. No	Subject Title	Teaching Scheme			Credit	Marks		
				L	T	P		Int	Ext	Total
		MANC559	Seminar	-	4	-	4	40	60	100
	Field Project	MANC560	Project	-	-		16	160	240	400
			Total				20	200	300	500

*The teaching, learning process for subject MANC506 – Software Project Management and MANC507 – Entrepreneurship Development, MANC508 – Report Writing, MANC509 – Quantitative Aptitude of MCA- IV sem will be conducted in ONLINE mode only.

MCA Degree (Two Years Programme)			Marks		
	Credits		Int	Ext	Total
Course Total	96	--	870	1530	2400

PG Diploma (One Year Programme)			Marks		
	Credits		Int	Ext	Total
Course Total	54	--	480	870	1350

(Handwritten signatures and initials)

Semester-I

Subject Title	:	Advanced Operating System		
Subject Ref. No.	:	MANC401	No. of Credits	: 4
			Assignments / Sessional	: 40
			Semester Examination	: 60
Course Outcomes (COs)				
At the end of the course, students will be able to:				
CO-1		Demonstrate understanding of design issues of advanced operating systems and compare different types of operating systems		
CO-2		Analyze design aspects and data structures used for file subsystem, memory subsystem and process subsystem of Linux OS		
CO-3		Differentiate between threads and processes and compare different processor scheduling algorithms		
CO-4		Master concepts of memory management including virtual memory & Master system resources sharing among the users		
Pre Requisite	:	Working knowledge of C programming, Basic Computer Architecture-Concepts., Basic algorithms and data structure concepts.		
Unit - I	:	Introduction: Functions of operating systems, Design approaches: layered, kernel based and virtual machine approach, types of advanced operating systems (NOS, Multiprocessor OS, Mobile OS, RTOS, Cloud OS)		
Unit - II	:	Process Management: Process Concept, Process Control Block, Process Schedule CPU Scheduling: Scheduling Concept, Scheduling Criteria, Scheduling algorithm Process Synchronization & Deadlock: Synchronization concept, Synchronization Requirement, Critical Section Problem, Monitors, Deadlock concepts, Deadlock prevention & avoidance, Deadlock Detection, Deadlock Recovery		
Unit - III	:	Memory Management: Memory Management Techniques, Contiguous & Non Contiguous allocation, Logical & Physical Memory, Conversion of Logical to Physical address, Paging, Segmentation, Segment with paging Virtual Memory Concept, Demand paging, Page Replacement algorithm, Allocation of Frames, Page fault.		
Unit - IV	:	Distributed Operating system concepts: Goals, Distributed Computing Models, Hardware Concepts, Software Concepts, Architecture of DOS. Design Issues: Transparency, Flexibility, Scalability, Reliability, Performance, fault tolerance		
Unit - V	:	Mobile OS: Architecture, Android OS, iOS, Virtual OS, Cloud OS and their design issues		
Text Books	:	<ol style="list-style-type: none"> 1. The Design of the UNIX Operating System, PHI, by Maurice J. Bach. 2. Distributed Computing 2nd Edition, Mahajan and Seema Shah, Oxford. 3. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjana G Shivaratri. 4. Mobile Computing by Rajkamal, 1st edition, Oxford. 		
	:	<ol style="list-style-type: none"> 1. Silberschatz, Galvin, and Gagne "Operating System Concepts", John Wiley, 8th Ed., 2016. 2. D. M. Dhamdhere Operating Systems--A Concept Based Approach, McGraw-Hill, 2018 		
Additional Reference Books		<ol style="list-style-type: none"> 1. William Stallings, "Operating Systems Internals & Design Principles", Pearson Education, 6th Ed., 2016. 		

Subject Title	Mathematics and Probability
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Subject Ref. No.	MANC402		
		No. of Credits	: 4
		Assignments / Sessional	: 40
		Semester Examination	: 60
Course Outcomes (COs)			
At the end of the course, students will be able to:			
CO-1	To extend student's logical and mathematical maturity & ability to deal with abstraction and to introduce most of the basic terminologies used in computerscience courses and application of ideas to solve practical problems.		
CO-2	To understand the basic concepts of combinatorics, graph theory and to familiarizethe applications of algebraic structures.		
CO-3	To understand the concepts and significance of lattices and boolean algebra whichare widely used in computer science and engineering.		
CO-4	To provide a foundation in probability theory in order to solve applied problemsand to prepare for more advanced courses in probability.		
CO-5	To learn various distributions, Sampling Distributions that helps to enhance the quality of research approach.		
Course	In this subject student will learn Logic, Relations and Functions, Algebraic Functions,		
Objective	Graph Theory and Trees will be introduced in this course. Students will be able to calculate permutations and combinations to then find the probability of a compound event or to solve a problem.		
Prerequisites	Prerequisites for this course is student should have basic knowledge of abstract algebra and permutation and combination		
Unit I	LOGIC AND PROOFS: Propositional logic – Propositional equivalences – Predicates and quantifiers – Nested quantifiers – Rules of inference – Introduction to proofs – Proof methods and strategy. COMBINATORICS: Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.		
Unit II	GRAPHS AND GRAPH MODELS – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths. ALGEBRAIC SYSTEMS – Semi groups and monoids – Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem – Definitionsand examples of Rings and Fields.		
Unit III	LATTICES AND BOOLEAN ALGEBRA: Partial ordering – Posets – Lattices as posets – Properties of lattices – Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra.		

Unit IV	Probability : Sample Space , Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence and Product Rules, Bayes' Rule. Random Variables and Probability Distributions : Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Joint Probability Distributions. Mathematical Expectation : Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables 127, Chebyshev's Theorem.
Unit V	Discrete Probability Distributions : Binomial, Multinomial, Hypergeometric Distributions, Negative Binomial and Geometric Distributions, Poisson Distribution and the Poisson Process. Continuous Probability Distributions : Continuous Uniform Distribution, Normal Distribution, areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial, Gamma and Exponential Distributions, Chi-Squared Distribution. Sampling Distributions and More Graphical Tools : Random Sampling and Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, Sampling Distribution of S^2 , t-Distribution , F-Distribution.
Text Book	<ol style="list-style-type: none"> 1. Swapan Kumar Sarkar, "A text book of Discrete Mathematics", S. Chand Publication 2. Discrete Mathematical Structures for Computer Science by Kolman B and Bushy R, Prentice - Hall of India 1998 3. A Basic Course in Probability Theory by Rabi Bhattacharya & Edward C. Waymire 4. Probability and Random Variables: A Beginner's Guide by David Stirzaker
Reference Books	<ol style="list-style-type: none"> 1. Discrete Mathematics by C L Liu- Tata McGraw Hill Publishing house 2000 2. Discrete Mathematical Structures with applications to Computer Science by Tremblay and Manohar, Prentice - Hall of India 1997



Subject Title	:	Programming using Python			
Subject Ref. No.	:	MANC403	No. of Credits	:	3
			Assignments / Sessional	:	30
			Semester Examination	:	45
Course Outcomes (COs) At the end of the course, students will be able to:					
CO-1	Apply the principles python programming.				
CO-2	Write clear and effective python code.				
CO-3	Create applications using python programming.				
CO-4	Access database using python programming.				
CO-5	Develop web applications using python programming.				
CO-6	Develop and use Web Services using python.				
Pre Requisite	:	Working knowledge of C/C++ programming, Basic algorithms and data structure concepts.			
Unit – I	:	Introduction to Python Programming Language : Strengths and Weaknesses, IDLE, Dynamic Types, Naming Conventions, String Values, String Operations, String Slices, String Operators, Numeric Data Types, Conversions, Built In Functions			
Unit – II	:	Data Collections and Language Component: Introduction, Control Flow and Syntax, Indenting, The if statement, Relational Operators, Logical, Operators, True or False, Bit Wise Operators, The while Loop, break and continue, The for Loop, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections.			
Unit – III	:	Object and Classes : Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, File Organization Special Methods, Class Variables, Inheritance, Polymorphism, Type Identification, Custom Exception Classes			
Unit – IV	:	Functions and Modules : Introduction, Defining Your Own Functions, Parameters, Function Documentation, Keyword and Optional Parameters, Passing Collections to a Function, Variable Number of Arguments, Scope ,Functions - "First Class Citizens", Passing Functions to a Function, Mapping Functions in a Dictionary, Lambda, Modules			
Unit – V	:	I/O and Error Handling In Python : Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, ,Reading Data From a File, Additional File Methods, Using Pipes as Data Streams, Handling IO Exceptions, Working with Directories, Metadata, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions			
Text Books	:	Learning Python, 4th Edition by Mark Lutz Programming Python, 4th Edition by Mark Lutz			



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Subject Title	Advance Web Technology		
Subject Ref. No.	MANC404	No. of Credits	3
		Assignments/Sessional	30
		Semester Examination	45
Course Outcomes (COs) At the end of the course, students will be able to:			
CO-1	Design WebPages using basic HTML tags & forms.		
CO-2	Apply different CSS to WebPages.		
CO-3	Write basic script in JavaScript to perform different functionalities.		
CO-4	Validate the forms input depending upon different events.		
CO-5	Write simple programs using jQuery & AJAX.		
CO-6	Design website using Dream Viewer tool.		
Prerequisites	Student should know the basic programming concepts.		
Unit I	HTML & Forms Introduction To HTML, WWW, W3C, web publishing, Common HTML, Tags Physical & Logical, Some basic tags like <body> , changing background color of page, text color etc., Text formatting tags, <p> , <hr> tags, Ordered & Unordered Lists Tags, Inserting image, Links: text, image links, image mapping , Tables , Frames, Form Introduction with text box, text area, buttons, List box, radio, checkbox etc. HTML 5 Introduction , form elements – date, dateTime, email, number, range, tel, color, URL, datetimelocal, month , week, time, placeholder attribute, autofocus attribute, required attributes , HTML audio , video		
Unit II	CSS Introduction To Style sheet, types of style sheets- Inline, External, Embedded CSS, text formatting properties, CSS Border, margin properties, Positioning Use of classes in CSS, color properties, use of <div>&		
Unit III	JavaScript		
	Intro to script, types, intro of JavaScript, JavaScript identifiers, operators, control& Looping structure, Intro of Array, Array with methods, Math, String, Date Objects with methods User defined & Predefined functions, DOM objects, Window Navigator, History, Location. Event handling & Validations on Forms – JavaScript Handling Events on Button, Textbox, radio button, checkbox, drop down box, text area etc. Form Validation – numeric, alphanumeric, alphabets and any combination of these. Disabling the keys on the keyboard, regular expression		



Unit IV	jQuery Introduction to jQuery, Syntax Overview Anatomy of a jQuery Script, Creating first jQuery script Traversing the DOM, Selecting Elements with jQuery, Refining & Filtering Selections, Selecting Form Elements Working with Selections - Chaining, Getters & Setters CSS, Styling, & Dimensions
Unit V	Manipulating Elements - Getting and Setting Information about Elements, Moving, Copying, and Removing Elements, Creating New Elements Manipulating Attributes, Utility Methods Events - Connecting Event to Elements, Namespacing Events, Event handling, Triggering Event handlers, Event Delegation jQuery Effects -hide/show, fade, slide, animate, callback, stop Interactions - Draggable, Droppable, Resizable, Selectable, Sortable Widgets - Accordion, DatePicker, Menu, Tabs Plugins - Using readymade plugins, Create a basic plugin, Writing Plugins
Text Books	<ul style="list-style-type: none">• HTML, DHTML, JavaScript, Perl & CGI Ivan Bayross• HTML & CSS : The Complete reference, Fifth Edition By Thomas Powell
Reference books	<ul style="list-style-type: none">• <u>Html, Xhtml, And Css Bible (English) 5th Edition (paperback)</u> by Schafer, Steven• <u>HEAD FIRST HTML AND CSS, 2/ED (UPDATED FOR HTML)</u> by ROBSON• <u>Beginning HTML and CSS (English) (Paperback)</u> by Rob Larsen• <u>Learn to Code HTML and CSS (English) (Paperback)</u> by Howe• Javascript Bible (English) 7th Edition by <u>Danny Goodman Michael Morrison Paul Novitski Tia GustaffRayl</u>• Javascript Programming: Pushing the Limits (English) 1st Edition By (2013) Jon Raasch• Head First JavaScript (2007) By michael Morrison• <u>JavaScript: The Definitive Guide (2011)</u> by Flanagan, David• Introducing HTML5 - Bruce Lawson, Remy Sharp• AngularJS - Brad Green, Shyam Seshadri• Learning jQuery - Jonathan Chaffer, Karl Swedberg• Professional Ajax, 2nd Edition Wrox Press• Internet Technology at work Hofstetter fred, TMH.
Web references	<ol style="list-style-type: none">1. www.w3school.com2. www.tutorialpoint.com



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Subject Title	JAVA		
Subject Ref. No.	MANC405		
		No. of Credits	3
		Assignments / Sessional	30
		Semester Examination	45
Course Outcomes (COs)			
At the end of the course, students will be able to:			
CO-1	Write, compile, and execute Java programs that may include basic data types and control flow constructs using J2SE or other Integrated Development Environments (IDEs) such as Eclipse, NetBeans, and JDeveloper		
CO-2	demonstrate the use of good object-oriented design principles including encapsulation ,information hiding, Inheritance , Full Abstraction and Partial Abstraction		
CO-3	Create GUI Application using Applet & HTML		
CO-4	Implement the Multithreading Concept with real time application		
CO-5	Control & Maintain Run-Time Exception occurred during web based software development		
CO-6	Maintain the file using File handling concepts and provide the ability to inspect & modify the runtime behavior of application using Reflection		
Course Objective	This subject helps to clarify the programming concepts in JAVA language. This language covers all the techniques of developing the JAVA programs. The course structure of JAVA programming Languages is help to develop web based applications and APPs for Android Mobiles		
Prerequisites	Fundamentals of Computer System , operating system , C and C++ Language		
Unit I	Java Fundamentals , J2SE, J2EE, J2ME, Features of Java , OOPs concepts, benefits of JAVA, Hardware / Software requirement, Support system and Environment of JAVA, System Variable, Environment Variable, Path and Class Path. JAVA API. Application of More JAVA, application with two classes , program structure , tokens, statements installing and configuration JAVA , implementing JAVA program, JAVA virtual M/C Architecture and different alias with functionality, command line arguments, program style, keywords , data types, Operators, Decision Making and Branching , looping Statement . Predefined classes (Scanner, Date, Random)		
Unit II	Class objects and methods: class definition,class types-Bean Class, POJO class, Factory Class, Singleton Class, Runtime class, Inner Class. methods, fields declaration.Object, ways to create an object and operations on it. Garbage Collector. constructor , overloading , static members , nesting methods , Inheritance, overloading , Final class and Methods , array string and vector, Interfaces : definition , implementation , accessing Interface Variables , Packages : introduction, uses , creating , accessing adding a class to package hiding class		



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Unit III	Multithreaded Programming : Introduction , creating threads stopping and blocking a threads , Life cycle of a thread, its exceptions priority, synchronization, Managing Errors and Exception : types of error , exception , syntax of exception Handling , multiple catch statement, throwing our own exception Applet Programming : Introduction , preparing to write Applets building Applets code, creating an executable Applet , designing a web page , applet tag, adding Applet Tag, running applet more HTML tags , event handling
Unit IV	AWT programming : introduction , create JAVA application using AWT, creating JAVA Applet using AWT , execute applet, execute applet in browse, message in the status bar, get HTML and AREA size , window and event, Graphic Programming : introduction, Graphic class, lines and rectangles, circle, ellipse, arcs poly, line graphs, using control loops in Applets , Bar charts , Text Field, Label , button , check box layouts , text area, scroll list , selection control, scrollbar, menu, dialog.
Unit V	Managing Input / Output Files in JAVA : streams, streams classes, Byte streams classes , reading and writing characters , bytes, Random Access Files , Interactive I/pand o/p,Reflection API- class identification, interface identification, parent class informationand methods information.
Text Book	Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies, Core Java, Dietel and Dietel
Reference Books	The complete reference JAVA2, Herbert schildt. TMH, Java Programming John P. Flynt Thomson 2nd, Java Programming Language Ken Arnold Pearson , Big Java, Cay Horstmann 2nd edition, Wiley India Edition



Open Elective –I

Subject Title	:	MIS and DSS
Subject ref. No.	:	MANC411
		No. of credits : 4
		Internal : 40
		Semester Exam : 60
Course Objectives	:	<ol style="list-style-type: none">1. Understand the fundamental concepts, definitions, characteristics, and objectives of Management Information Systems (MIS) and their role in enhancing organizational effectiveness.2. Analyze the decision-making process within organizations and the impact of MIS in supporting managerial decision-making and control systems.3. Examine IT infrastructure, data collection methods, and the classification of information, with a focus on contemporary platforms and their organizational impact.4. Explore the concepts, components, and limitations of Decision Support Systems (DSS), Group Decision Support Systems (GDSS), AI, KMS and their integration with MIS for improved business processes.
Pre Requisite	:	NA
Unit-I MIS, Decision Making: An overview	:	Concept, definition , characteristics, objectives , Role and impact of MIS, Management as a control system, MIS: A support to the management, application of MIS to e- business, organization effectiveness, Decision making concept, decision making process, organizational decision making, MIS and decision making.
Unit-II Information, Knowledge, Business Intelligence	:	Information: A quality product, Classification of information, methods of data and information collection, value of information, IT infrastructure, components, Planning, contemporary platforms, IT Capabilities and their organizational impact – Telecommunication, Networks & internet, current trends in technologies & tools -- IT enabled services, e business, wireless technologies etc. information systems levels , information system in business , Computer based information system, limitation and disadvantages of IS, Human as an information processor, knowledge and knowledge management system, business intelligence.
Unit-III System Engineering: Analysis and design, BPR	:	System: concept and control, types of system, general model of MIS, need of system Analysis, SDM, SSAD, OOA, OOSAD Development Life cycle, development process of MIS, Strategic design of MIS, Business process, Process model of an organization, MIS and BPR
Unit-IV DSS, ESS, OAS	:	SS: concept and philosophy, objectives and characteristics of DSS, major functions of DSS, Components of DSS, DSS generators and tools, limitations of DSS, GDSS, components of GDSS, MIS and benefits of DSS, ESS and components of ESS, OAS, EMS, teleconferencing, telecommuting, automated office, off- line and online data processing.



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Unit-V	:	
Knowledge system , artificial intelligence and ERP	:	Knowledge system, types of knowledge system, Expert system, application of ES, benefits and Limitations of ES, knowledge base, inference engine, AI, neural network in business, SIS, EMS, ERP, ERP models and modules, benefits of ERP, ERP implementation, SCM, CRM.
Text Books	:	<ol style="list-style-type: none">1. Decision Support & Expert System, Efraim Turban2. W.S.Jawadekar, Management Information System3. Dr. A.K.Gupta, Management Information System, S.Chand4. C.S.V. Murthy, Management Information System, Himalaya publishing house, millennium edition
Additional Reference Books	:	<ol style="list-style-type: none">1. Spargue, Ralph H. <i>Decision Support for Management</i>, Englewood Cliffs, New Jersey, Prentice Hall Inc., 1995.2. Turban, E. <i>Decision Support & Expert Systems</i>, 2nd ed., New York, MacMillan, 1990.3. Ken Laudon, jane Laudon, Rajanish Dass, <i>Management Information System</i>, Pearson, Eleventh edition



Subject Title	Creativity & Innovation		
Subject Ref. No.	MANC412	No. of Credits	4
		No. of Periods / Week	3
		Internal Evaluation	40
		External	60
Course Outcomes (COs)			
At the end of the course, students will be able to:			
CO-1	To foster creative thinking and problem-solving skills in the context of computer applications.		
CO-2	To explore various innovation methodologies and tools relevant to the IT industry.		
CO-3	To enable students to apply creativity and innovation principles to software development and other computer-based projects.		
Prerequisites			
Unit I	Overview of Creativity Meaning and concept of creativity - Creativity Process- Nature and characteristics of creativity - Factors affecting creativity - understanding creativity from studying the profiles of most creative personalities.		
Unit II	The Creative Process Stages of the creative process (Preparation, Incubation, Illumination, Verification), Techniques for enhancing creativity (Brainstorming, Mind Mapping, SCAMPER), Innovation Fundamentals Innovation Concepts Definition of innovation and its types (Product, Process, Business Model) Difference between creativity and innovation The role of innovation in competitive advantage Innovation Strategies Innovation strategies in IT companies Open Innovation and Crowdsourcing Disruptive Innovation and its impact on the industry		
Unit III	Tools and Techniques for Creativity and Innovation Week 5: Design Thinking Introduction to Design Thinking The five stages of Design Thinking (Empathize, Define, Ideate, Prototype, Test) Application of Design Thinking in software development		
Unit IV	Creativity and Innovation in Software Development Week 8: Creative Coding Introduction to creative coding and generative art Tools and platforms for creative coding Examples of creative coding in real-world applications		
Unit V	Intellectual Property and Innovation Understanding patents, trademarks, and copyrights in the IT industry Protecting software innovations Ethical considerations in innovation		



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Text Books	"Creativity, Inc." by Ed Catmull "The Innovator's Dilemma" by Clayton M. Christensen "Design Thinking: Understanding How Designers Think and Work" by Nigel Cross "The Lean Startup" by Eric Ries "TRIZ for Engineers: Enabling Inventive Problem Solving" by Yuri Salamatov
Reference books	Online tutorials and courses on Design Thinking and Agile methodologies Industry case studies and guest lectures from innovation leaders in IT This curriculum is designed to provide MCA students with the skills and knowledge to be creative and innovative in their approach to software development and other technology-related projects.

Subject Title	: Basics of Programming Languages										
Subject Ref. No.	: MANC413	No. of Credits	: 4								
		Internal marks	: 40								
		Semester Examination	: 60								
<p>Course Objectives: The primary goals of programming languages are to provide a means for people to transmit instructions to computers, to make code easy for humans to write, read, and understand, and to allow the machine to execute the instructions efficiently.</p> <p style="text-align: center;">Course Outcomes (COs) At the end of the course, students will be able to:</p> <table border="1" style="width: 100%;"> <tr> <td style="width: 10%;">CO-1</td> <td>To learn how to enhance the thinking capacity to develop the logic of any programming language</td> </tr> <tr> <td>CO-2</td> <td>To develop the programs in C & C++</td> </tr> <tr> <td>CO-3</td> <td>To understand the applications of Kotlin Programming Language</td> </tr> <tr> <td>CO-4</td> <td>To create a basic awareness of C# programming languages</td> </tr> </table>				CO-1	To learn how to enhance the thinking capacity to develop the logic of any programming language	CO-2	To develop the programs in C & C++	CO-3	To understand the applications of Kotlin Programming Language	CO-4	To create a basic awareness of C# programming languages
CO-1	To learn how to enhance the thinking capacity to develop the logic of any programming language										
CO-2	To develop the programs in C & C++										
CO-3	To understand the applications of Kotlin Programming Language										
CO-4	To create a basic awareness of C# programming languages										
Pre Requisite	: Computer Fundamentals & Operating System										



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Unit - I	:	Basic of Programming Languages : Programming Languages concepts, Types, Translators, System Software & Application Software , Program definition, steps to write a program in any programming languages, Formulation of Problem, Algorithms, Flowchart, Symbols using in Flowcharts, examples of algorithms using flowcharts.
Unit - II	:	Introduction to C programming language : C Language Structure, Data Types, Identifiers, tokens , Statements : Conditional & Loop , Array Function, Structure , Union, pointer & File handling
Unit - III	:	Introduction to C++ Programming Language : <i>Difference between C & C++</i> , Characteristics of OOPs, Class & Object, Inheritance, Abstraction , Encapsulation, virtual class, file handling
Unit - IV	:	Introduction to Kotlin programming Language : Basic difference between C++ & Kotlin, Features of Kotlin , Environment Setup, IDE, Control Flow, Function, Array, String, Exception , Null Safety, Collections & OOPs concepts in Kotlin
Unit - V	:	Introduction to C# programming Language : Basic Structure of C#, Control Statements, Function , Array, Object Class, Properties, Inheritance, Polymorphism, Collections, Delegates, Reflection, String, Exception, Multi-threading
Text Books	:	<ol style="list-style-type: none"> 1. Concepts of Programming Languages by Pearson – Robert W. Sebesta 2. C Programming – Balguruswami 3. Let Us C & C++ - Yashwant Kanetkar 4. Kotlin at A Glance by bpb publication , Swati Saxena
Reference Book	:	<ol style="list-style-type: none"> 1. Head First Kotlin: A Brain - Friendly Guide Paperback – 26 February 2019, by Dawn Griffiths (Author), David Griffiths (Author) 2. Object Oriented Programming with C++ 8th Edition, E.Balagurusamy Paperback – 24 September 202

Subject Title : SOFTWARE ENGINEERING				
Subject Ref. No.	MANC414	No. of Credits	:	04
		No. of Periods/Week	:	3
		Assignments/Sessional	:	40
		External Assessment	:	60
Course Objective	The purpose of this course is to understand the Software Engineering process, DFD, ERD, Software Inspection process, different design methods, maintenance, CASE TOOLS.			
	CO-1 Understand basics concepts related with software engineering CO-2 Understand object oriented methodologies. CO-3 Understand different models of software development. CO-4 Design the SRS for software.			
Prerequisite :	Emergence of Software Engineering, Different software life cycle models.			



Unit -I :	Current trends in Software Engineering 1.1 Software Engineering for projects & products. 1.2 Introduction to Web Engineering and Agile process Models: Waterfall, Prototyping, Spiral (including WIN-WIN Spiral), RAD ,Group Based Approach: JAD, Object Oriented methodology
Unit -II :	Activities in Requirements Determination a) Requirements Anticipation b) Requirements Investigation c) Requirements Specifications Software requirement Specification (SRS) 1] Structure and contents of the requirements specification analysis modeling, types of requirements - functional and non-functional , Quality criteria, requirements definition, SRS format, Fundamental problems in defining requirements 2] Structure and standards followed for SRS 3] characteristics of good SRS – Unambiguous , complete , verifiable , consistent , modifiable , traceable , usable during maintenance Feasibility Study : economical, operational, social, technical
Unit -III:	Maintenance 3.1 Types of Maintenance 3.2 Maintenance Cost 3.3 Reverse Engineering 3.4 Introduction to legacy systems Documentation 3.5 Types 3.6 Role of documentation in maintenance
Unit - IV:	Object Oriented Methodologies SSAD VS OOAD.Why Object -Orientation? Object Oriented Design -Booch Object Modeling Techniques - Rumbaugh Object - Oriented Analysis - Cood Yourdon Object - Oriented Software engineering - Ivar Jacobson Unified Approach
Unit - V :	Object-Oriented Systems Development Process Rational Unified Process - Four Major phases:- Inception ,Elaboration, Construction, Transition Requirements Engineering Problem analysis. Understanding Stockholders need Type of requirements. Use-case Model: Writing Requirements
Text Books:	1. Software Engineering by Pressman 2. Design Object- Oriented Software - Rebecea Wrifs - Brock. Brian Wilkerson, LaurenWiener 3. Object Oriented Analysis and Design - Bennett , Simon McGraw Hill.



Reference Books :	<ol style="list-style-type: none">1. System Analysis and Design by Jalote2. Software Engineering by Sommerville3. Software Engineering - W S Jawadekar4. System Analysis & Design methods – Whiten, Bentley5. System Analysis & Design – Elias Awad6. Object Oriented Modeling& Design – James Rumbaugh7. Analysis & Design of Information System – James Senn8. Analysis & Design of Information System – V. Rajaraman9. Software Engineering Concepts-Richard Fairley
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Subject Title	ERP		
Subject Ref. No.	MANC 415	No. of Credits	4
		Assignments / Sessional	40
		Semester Examination	60
Course Outcomes (COs)			
At the end of the course, students will be able to:			
CO-1	To provide an understanding of ERP concepts, architecture, and their implementation.		
CO-2	To explore the integration of business processes through ERP.		
CO-3	To study ERP modules, selection, and implementation challenges.		
CO-4	To equip students with knowledge about ERP technologies and trends.		
Prerequisites			
Unit I	Introduction to ERP <ul style="list-style-type: none"> • ERP Overview: Definition, evolution, and growth of ERP. • Business Process Management: Need for ERP in organizations. • Benefits of ERP: Strategic, operational, and managerial advantages. • ERP and Related Technologies: SCM, CRM, and E-Commerce integration. • ERP Lifecycle: Pre-implementation, implementation, and post-implementation phases. 		
Unit II	ERP Architecture and Infrastructure <ul style="list-style-type: none"> • ERP System Architecture: Client-server architecture, web-based ERP systems. • ERP Components: Modules, database management systems, and application servers. • ERP Vendors and Products: SAP, Oracle, Microsoft Dynamics, and others. • ERP Deployment Models: On-premises, cloud-based, and hybrid ERP systems. • Case Study: Comparative analysis of ERP architectures from popular vendors. 		
Unit III	ERP Modules and Functionalities <ul style="list-style-type: none"> • Core ERP Modules: <ul style="list-style-type: none"> ○ Financial Management: Accounting, budgeting, and financial reporting. ○ Human Resource Management: Payroll, recruitment, and employee management. 		



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	<ul style="list-style-type: none"> ○ Supply Chain Management: Procurement, inventory, and logistics. ○ Manufacturing and Production: Planning, scheduling, and execution. ● Extended ERP Modules: CRM, business intelligence, and analytics. ● Inter-dependencies and Integration: Flow of information between modules.
Unit IV	<p>ERP Implementation and Challenges</p> <ul style="list-style-type: none"> ● ERP Implementation Process: Project planning, gap analysis, and configuration. ● Data Migration and Testing: Data preparation, mapping, and migration strategies. ● Change Management: User training, organizational alignment, and adoption. ● Common Challenges: Cost overruns, time delays, resistance to change, and scalability issues. ● Risk Management in ERP: Identifying and mitigating implementation risks.
Unit V	<p>ERP Trends and Emerging Technologies</p> <ul style="list-style-type: none"> ● Next-Generation ERP: AI, ML, and IoT in ERP systems. ● Cloud ERP: Benefits, challenges, and future trends. ● Mobile ERP: Features and applications. ● Green ERP: Role in sustainable business practices. ● ERP in Industry 4.0: Smart manufacturing and digital supply chains. ● Case Study: A successful ERP implementation in a real-world organization.
Text Books	
Referenc ebooks	<p>Alexis Leon, <i>Enterprise Resource Planning</i>.</p> <p>Ellen Monk and Bret Wagner, <i>Concepts in Enterprise Resource Planning</i>.</p> <p>Mary Sumner, <i>Enterprise Resource Planning</i>.</p> <p>Case Studies and White Papers from leading ERP vendors like SAP and Oracle.</p>

Subject Title	Python Lab		
Subject Ref. No.	MANC451	No. of Credits	1
		Internal	:
		External	:
			25



Content : Assignment containing on basis of python programming .

Subject Title	Advance Web Technology LAB		
Subject Ref. No.	MANC452	No. of Credits	1
		Internal	--
		External	25
Course Outcomes (COs)			
At the end of the course, students will be able to:			
CO-1	Design WebPages using basic HTML tags & forms.		
CO-2	Apply different CSS to WebPages.		
CO-3	Write basic script in JavaScript to perform different functionalities.		
CO-4	Validate the forms input depending upon different events.		
CO-5	Write simple programs using jQuery & AJAX.		
CO-6	Design website using Dream Viewer tool.		
Content	Assignment based on the HTML,JAVASCRIPT, JQuery, AJAX will be covered.		



Subject Title	JAVA LAB		
Subject Ref. No.	MANC453	No. of Credits	1
		Internal	--
		External	25
Course Outcomes (COs) At the end of the course, students will be able to:			
CO-1	Design the fundamentals of object oriented application, and have the ability to apply them		
CO-2	Identify, formulate and solve problems by using object oriented programming		
CO-3	Use APIs (Application Programmer Interfaces) and design/program APIs		
CO-4	Implement Inheritance , Association and Abstraction using OOPs concepts		
CO-5	Maintain the Exceptions in Software Development & Design GUI using AWTcontrols		
CO-6	Develop Webpage using Applet & Implement multithreading concept in real application		
Course Objective	This subject helps to clarify the programming concepts in JAVA language. This language covers all the techniques of developing the JAVA programs. The course structure of JAVA programming Languages is help to develop web based applicationsand APPs for Android Mobiles		
Prerequisites	Fundamentals of Computer System , operating system , C and C++ Language		
Unit I	Java Fundamentals		
	1.	Practical demo on JDK installation, Path setting , Classpath Setting , Run programon Console, MyEclipse	



	2.	WAP a to demonstrate the primitive data types with their default values.
	3.	WAP a to demonstrate the Looping and decision statements in Java.
	4.	WAP a to demonstrate the function of Predefined class Scanner .
	5.	WAP a to demonstrate the function of Predefined class Date .
	6.	WAP a to demonstrate the function of Predefined class Random .
Unit II	Class objects and methods	
	7.	WAP a program to demonstrate the use of Static member and static method
	8.	WAP a program to demonstrate the use of Static member, static block and static method
	9.	WAP a program to demonstrate the use of this, Instance Initializer block
	10.	WAP a program to demonstrate the application of Inheritance using IS-A relation & Has-A relation.
	11.	WAP a program to demonstrate the application of constructors in Inheritance concept using IS-A relation & Has-A relation.
	12.	WAP to implement static binding in JAVA.
	13.	WAP to implement dynamic binding in JAVA.
	14.	WAP to demonstrate the use of super keyword in inheritance.
	15.	WAP to demonstrate the use of final keyword with instance variable , with method and with class name.
	16.	WAP to demonstrate the implementation of an Array & Vector in Java and its access methods using enhance for a& Enumeration
	17.	WAP to demonstrate all Access Modifiers in JAVA. Default, public, private & protected.
	18.	WAP that demonstrate the applications of abstract class and interface in JAVA
	19.	WAP that demonstrate the applications of package in JAVA
	20.	WAP that demonstrate how to import package, class and how to access the static members and methods of class in JAVA
Unit III	Multithreaded Programming	
	21.	WAP to demonstrate the implementation of Multi Threading using Thread Class.
	22.	WAP to demonstrate the implementation of Multi Threading using Runnable Interface.
	23.	WAP to demonstrate the implementation of sleep() & join() methods with Multi-Threading.
	24.	WAP to demonstrate the application of Daemon thread in java.



	25.	WAP to demonstrate the application of Synchronized thread for Mutual Exclusion in java.
	26.	WAP to manage the ArithmeticException in Java.
	27.	WAP to manage the NullPointerException in Java.
	28.	WAP to manage the NumberFormatException in Java.
	29.	WAP to manage the ArrayIndexOutOfBoundsException in Java.
	30.	WAP to management nested Exceptions
	31.	WAP to demonstrate a Simple Applet Functionality in JAVA.
	32.	WAP to demonstrate various shapes avaiLabel in Graphics class which can be implements in JAVA Applet.
	33.	WAP to demonstrate the Applet with FontSize, Font, Color.
	34.	WAP to implement Mutli threading in Applet.
	35.	WAP to configure the components in HTML file and fetch it in Applet & manipulate.
	36.	WAP to configure the number in HTML file and print its table in Applet.
	37.	WAP to create Random Circles in Applet using Random Class and Multi Threading.
	38.	WAP to create Random Circles in different colors in Applet using Random Classand Multi Threading.
Unit IV		AWT programming
	39.	WAP a program to Create a Frame by using Inheritance and Association
	40.	WAP to demonstrate the BorderLayout Layout Manager
	41.	WAP to demonstrate the GridLayout Layout Manager
	42.	WAP to demonstrate the FlowLayout Layout Manager
	43.	WAP to demonstrate the BorderLayout Layout Manager
	44.	WAP to demonstrate the CardLayout Layout Manager
	45.	WAP a program to validate Login Page using TextField & Button
	46.	WAP to create a Calculator in awt
	47.	WAP to enter two numbers and print its addition using Label, Button & TextField
	48.	WAP to perform All Arithmetic Operations on two numbers and print its addition using Label, TextField & Button ActionListener Interface
	49.	WAP to add Checkbox & Label. And apply ItemListener Interface application onit.



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	50.	WAP to add CheckboxGroup & Label. And apply ItemListener Interface application on it.
	51.	WAP to add Choice & Label. And apply ActionListener on it
	52.	WAP to add List & Label. And apply ActionListener on it
	53.	WAP a create four Buttons and Two Lists and write code of each Button click to perform different operations
	54.	WAP to demonstrate Canvas Implementation.
	55.	WAP to create Scrollbar application using Label.
	56.	WAP to create MenuBar using Menu and MenuItem application using Label.
	57.	WAP to create MenuBar using Menu and MenuItem application using Label and apply ActionListener Interface
	58.	WAP to demonstrate the Use of Dialog Box.
	59.	WAP to enter two numbers in Dialog Box and perform Addition on it
	60.	WAP to demonstrate the Use of ActionListener on Different Components.
	61.	WAP to demonstrate the Use of MouseListener.
	62.	WAP to demonstrate the Use of ItemListener on Difference Components.
	63.	WAP to demonstrate the Use of KeyListeners .
	64.	WAP to demonstrate the Use of WindowsListeners.
	65.	WAP to demonstrate the Use of Adapter Classes .
	66.	WAP to implement WindowCloseEvent .
	67.	WAP to implement Awt control in Applet
	68.	WAP to implement Awt control & Multi Threading concept in Applet
	69.	WAP program to implement Awt control , Multi Threading & Exception concept in Applet
Unit V		Managing Input / Output Files in JAVA
	70.	WAP to write & read a character to File.
	71.	WAP to write & read a string to File.
	72.	WAP to write & read the data from & to File using BufferedOutputStream & BufferedInputStream
	73.	WAP to read the data from two files and writes into another file using FileStreams and SequenceStreams.
	74.	WAP to demonstrate the use of Write & Reader classes.
	75.	WAP to demonstrate the use of FileWrite & FileReader classes.



	76.	WAP to demonstrate the use of CharArrayReader & CharArrayWritr classes.
		Reflection in JAVA
	77.	WAP to demonstrate the use of newInstance() method
	78.	WAP to demonstrate the use of javap tool.
	79.	Few program of Refection Concepts



Semester-II

Subject Title :	Object Oriented Analysis And Design		
Subject Ref. No.	MANC415	No. of Credits:	03
		Assignments/Sessional:	30
		Semester Exam.:	45
Course Outcomes (COs)			
At the end of the course, students will be able to:			
CO-1	Design UML diagrams as Class, sequence, use case, activity, component, deployment, state.		
CO-2	Generate the documentation associated with SDLC using UML.		
Prerequisite :	Students must have knowledge of Software development life cycle.		
Unit -I :	<p>Analysis</p> <ul style="list-style-type: none"> • Behavioral Analysis <ul style="list-style-type: none"> • Domain Analysis or Business ObjectAnalysis • Use-case Driven Object Oriented analysis <p>The UML approach Use Case Diagram Use-case Description Activity Diagram Class Diagram, Object Diagram</p> <ul style="list-style-type: none"> ○ Identify the classes. <ul style="list-style-type: none"> ▪ Introduction to different approaches for identifying classes ▪ "Noun Phrase" approach OR ▪ "Conman Class Pattern" approach Or "CRC" approach Or ▪ Use case Driven Approach. ○ Containment and Composition ○ Aggregation ○ Inheritance, Subtypes and IS-A Hierarchies. ○ Association and Link Relationships. 		
Unit -II :	<p>Design Phases</p> <ul style="list-style-type: none"> • Translating Analysis Concept into Design. • Optimizing classes and Objects: The Multi-tiered Architecture View • Mapping System functions to objects. • Objects-to-Object Visibility. • Collaboration Diagram • Sequential Diagram • Specification Class Diagram • State Transition Diagram 		
Unit -III :	<p>Implementation</p> <p>3.1 Component diagram 3.2 Deployment diagram</p>		



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Text Books :	1. Object Oriented Analysis and Design with Applications - Grady Booch., Benjamin / Cummings , 1994. 2. Object – Oriented Modeling and Design - J Rumbaugh, M Blaha, W .Premerlani
Reference Books :	1. Principles of Object- Oriented Software Development - Anton Eliens , Addison Wesley. 2. Object Oriented System Development - Ali Bahrami McGRAW-HILL International Edition. 3. Object-Oriented Software Engineering - Ivar Jacobson Pearson Education INC 4. Applying UML And Pattern - Craig Larman Pearson Education INC 5. UML Distilled - Martin Fowler Pearson Education INC 6. The Unified Modeling Language User Guide - Grady Booch, James Rumbaugh, Ivar Jacobson-Pearson Education INC 7. The Unified Modeling Language Reference Guide - Grady Booch, James Rumbaugh, Ivar Jacobson-Pearson Education INC 8. Instant UML – Muller – Apress LP 9. UML Instant – Thomas A Pendar – Wiley Publication 10. UML in Nutshell

Subject Title	:	Data Structure using C++											
Subject Ref. No.	:	MANC417	No. of Credits	:	3								
			Assignments / Sessional	:	30								
			Semester Examination	:	45								
<p>The main objective of the course : To provide the knowledge of basic data structures and their implementations, to understand importance of data structures in context of writing efficient programs and to develop skills to apply appropriate data structures in problem solving.</p> <p>Course Outcomes (COs) At the end of the course, students will be able to:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">CO-1</td> <td>To introduce the concepts of Abstract data Type implement linear data structures</td> </tr> <tr> <td>CO-2</td> <td>To learn real time applications using Stack and Queue</td> </tr> <tr> <td>CO-3</td> <td>To implement various search data structures such as hashing, binary search trees, AVL trees, B+ trees and B*-trees using programming languages</td> </tr> <tr> <td>CO-4</td> <td>To implement graph theory concept (Minimum Spanning Tree) in Civil Network Planning, Computer Network Routing Protocol and summarize searching and sorting techniques</td> </tr> </table>						CO-1	To introduce the concepts of Abstract data Type implement linear data structures	CO-2	To learn real time applications using Stack and Queue	CO-3	To implement various search data structures such as hashing, binary search trees, AVL trees, B+ trees and B*-trees using programming languages	CO-4	To implement graph theory concept (Minimum Spanning Tree) in Civil Network Planning, Computer Network Routing Protocol and summarize searching and sorting techniques
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CO-4	To implement graph theory concept (Minimum Spanning Tree) in Civil Network Planning, Computer Network Routing Protocol and summarize searching and sorting techniques												
Pre Requisite	:	C & C++ Programming Languages											



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Unit - I	:	Introduction To Data Structure : Introduction, Data Definition, Data Object, Data Types, Built-in Data Type, Derived Data Type, Data Structure, Implementation of Data Structure Array : Array as Data Structure, Storage Representation of Arrays, Applications of Arrays, Polynomial Representation Using Arrays, Addition of Two Polynomial, Multiplication of Two Polynomial, Sparse Matrices, Addition of Sparse Matrices, Transpose of a Sparse Matrix
Unit - II	:	Stack : Introduction, Definition, Operation on Stack, Static & Dynamic Implementation of a Stack, Application of Stack, Recursion, Infix, Prefix & Postfix expression, Matching Parentheses in an expression Queue : Introduction, Definition of a Queue, Operation on a Queue, Static & Dynamic Implementation of Queue, Types of Queue, Circular Queue, Priority Queue, DEQueue, Application of Queue, Job Scheduling, Reversing Stack using Queue
Unit - III	:	Linked List : Introduction, Drawback of Sequential Storage, Concept of Linked List, Implementation of Linked List, Operation of Linked List, Creating a List, Displaying a List, Inserting an element in the List, Deleting an element, Other Operation & Applications, Reversing a Linked List, Concatenation of Two Lists, Representation of Polynomial, Circular Linked List & Operation, Doubly Linked List & Operation, Doubly Circular Linked List & Operation, Difference between an array and Linked list, Generalized Linked List,
Unit - IV	:	Tree : Tree Terminology, Binary Tree, Binary Tree Representation, Binary Search Tree (BST), Creating a BST, Binary Search Tree Traversal, Preorder Traversal, Inorder Traversal, Postorder Traversal Binary Threaded Tree : AVL tree, B tree, introduction to B tree, insertion in B tree, deletion from B tree, introduction to B+, B* tree, Expression Tree, Threaded Binary Tree
Unit - V	:	Graph : Introduction, Graph Representation, Adjacency Matrix, Adjacency List, Graph Traversals, Depth First Search, Breadth First Search. minimumspanning trees -- Prims and Kruskals Searching and Sorting : Insertion Sorting , Selection Sorting , Bubble Sorting , Shell Sorting , Merge Sorting, Quick Sorting , Divide and Conquer Sorting, Radix sorting , Heap Sorting , Binary Tree Sort. Binary Search, Hashing and Rehashing, Extendible Hashing, Storage
Text Books	:	<ol style="list-style-type: none">1. C & Data Structure Balagurusamy,2. Data Structure through C in depth Shrivastava&Shrivastava ,3. Data Structure through C Y.P. Kanetkar4. Introduction to Algorithms, 3Ed. (International Edition) (MIT Press) by T Cormen (Author), C Leiserson (Author), R Rivest (Author), C Stein (Author).5. Computer Algorithms, by Horowitz, Sahni, and Rajasekaran, Silicon Press
Reference Book	:	<ol style="list-style-type: none">1. Data Structure Seymour Liptsuz, Data Structure Tannebaum ,6. Data structure and program design in c R.L.Kruse



Subject Title :	Advanced DBMS
Subject Ref. No.	MANC418
	No. of Credits : 03
	No. of Periods/Week : 03
	Assignments/Sessional : 30
	Semester Exam. : 45
Course Objective	Keen stress on the Advanced concepts of distributed and object oriented databases is focused on for effective understanding of the subject
Prerequisite :	NA
Unit -I :	Introduction Database and Need for DBMS, Characteristics of DBMS, Database Users, 3-tier architecture of DBMS (its advantages over 2-tier), Data Models, Views of data-schemas and instances.
Unit -II :	Transaction and Concurrency Control Concept of transaction, ACID properties' Serializability, States of transaction, Concurrency control, Locking techniques, Time stamp based protocols, Granularity of data items, Deadlock.
Unit -III :	Relational Model and Relational Database design Relational data model & relational algebra, Relational model concept, Relational model constraints, Relational Algebra, Relational database language Data definition in SQL, Views and Queries in SQL, Specifying constraints and Indexes in SQL, Specifying constraints management systems, Normalization.
Unit - IV :	Data warehousing Data Marts, Getting data into the warehouse, Extraction, Transformation, Cleansing, Loading, Summarization, Meta data, Data warehousing & ERP, Data warehousing & KM, Data warehousing & CRM
Unit - V :	Object Databases Systems Introduction, User-defined ADTs, Structured types, Object, object identity and references, Inheritance, Database design for ORDBMS, New Challenges in implementing ORDBMS, Storage & access methods, Query processing & Optimization
Text Books :	Database system concept, Korth Fundamentals of Database Systems, Elmasri Navathe Database Management Systems, Bipin Desai
Reference Books :	1. Raghu Ramakrishnan, Johannes Gerhke, "Database Management Systems" McGraw Hill. 2. Decision support & database system -Efreem G. Mallach. 3. Datawarehousing fundamental - Paulraj Ponniah Wiley. 4. Introduction to data mining with case studies - G.K. Gupta. 5. Data Warehousing (OLAP) S. Nagabhushana New Age.



Subject Title	Software Testing											
Subject Ref. No.	MANC419	No. of Credits	:	3								
		Assignments / Sessional	:	30								
		Semester Examination	:	45								
	<p>Course Objective Understand the different types of testing , testing life cycle , manual & automated test casewriting etc.</p>											
	<p>Course Outcome (CO) At the end of the course, students will be able to:</p> <table border="1"> <tr> <td>CO 1</td> <td>Understand the basic concepts of software testing, levels of testing.</td> </tr> <tr> <td>CO 2</td> <td>Learn the White box and Blackbox testing techniques.</td> </tr> <tr> <td>CO 3</td> <td>Design Manual test cases</td> </tr> <tr> <td>CO 4</td> <td>Write automated test cases using any tool.</td> </tr> </table>				CO 1	Understand the basic concepts of software testing, levels of testing.	CO 2	Learn the White box and Blackbox testing techniques.	CO 3	Design Manual test cases	CO 4	Write automated test cases using any tool.
CO 1	Understand the basic concepts of software testing, levels of testing.											
CO 2	Learn the White box and Blackbox testing techniques.											
CO 3	Design Manual test cases											
CO 4	Write automated test cases using any tool.											
Pre Requisite	Students must have knowledge of Software development life cycle.											
UNIT - I	<p>Introduction Fundamentals of Testing 1.1 What is Testing? 1.1.1 Typical Objectives of Testing 1.1.2 Testing and Debugging Why is Testing Necessary? Testing's Contributions to Success 1.2.2 Quality Assurance and Testing 1.2.3 Errors, Defects, and Failures 1.2.4 Defects, Root Causes and Effects 1.3 Seven Testing Principles 1.4 Test Process 1.4.1 Test Process in Context 1.4.2 Test Activities and Tasks 1.4.3 Test Work Products 1.4.4 Traceability between the Test Basis and Test Work Products 1.5 The Psychology of Testing 1.5.1 Human Psychology and Testing Tester's and Developer's Mind-set</p>											
UNIT - II	<p>Testing Throughout the Software Development Lifecycle 2.1 Software Development Lifecycle Models 2.1.1 Software Development and Software Testing 2.1.2 Software Development Lifecycle Models in Context 2.2 Test Levels 2.2.1 Component Testing 2.2.2 Integration Testing 2.2.3 System Testing 2.2.4 Acceptance Testing 2.3 Test Types 2.3.1 Functional Testing 2.3.2 Non-functional Testing 2.3.3 White-box Testing</p>											



	<p>2.3.4 Change-related Testing 2.3.5 Test Types and Test Levels 2.4 Maintenance Testing 2.4.1 Triggers for Maintenance 2.4.2. Impact Analysis for Maintenance</p>
UNIT - III	<p>3 Static Testing 3.1 Static Testing Basics 3.1.1 Work Products that Can Be Examined by Static Testing 3.1.2 Benefits of Static Testing 3.1.3 Differences between Static and Dynamic Testing 3.2 Review Process 3.2.1 Work Product Review Process 3.2.2 Roles and responsibilities in a formal review 3.2.3 Review Types 3.2.4 Applying Review Techniques 3.2.5 Success Factors for Reviews</p>
UNIT - IV	<p>4 Test Techniques 4.1 Categories of Test Techniques 4.1.1 Choosing Test Techniques 4.1.2 Categories of Test Techniques and Their Characteristics 4.2 Black-box Test Techniques 4.2.1 Equivalence Partitioning 4.2.2 Boundary Value Analysis 4.2.3 Decision Table Testing 4.2.4 State Transition Testing 4.2.5 Use Case Testing 4.3 White-box Test Techniques 4.3.1 Statement Testing and Coverage 4.3.2 Decision Testing and Coverage 4.3.3 The Value of Statement and Decision Testing 4.4 Experience-based Test Techniques 4.4.1 Error Guessing 4.4.2 Exploratory Testing 4.4.3. Checklist-based Testing</p>
UNIT - V	<p>Tool Support for Testing Test Tool Considerations 5.1 Test Tool Classification 5.1.1 Benefits and Risks of Test Automation 5.1.2 Special Considerations for Test Execution and Test Management Tools 5.2 Effective Use of Tools 5.2.1 Main Principles for Tool Selection 5.2.2 Pilot Projects for Introducing a Tool into an Organization 5.2.3 Success Factors for Tools</p> <p>One Automated Testing Tool Demonstration will be covered.</p>
Text Books	<p>A. Introducing Software Testing by Louise Tamres B. Effective Methods for software Testing by William Perry C. Software Testing in Real World by Edward Kit D. Software Testing Techniques by Boris Beizer</p>



Subject Title	:	Research Methodology			
Subject Ref. No.	:	MANC420	No. of Credits	:	4
			Assignments / Sessional	:	40
			Semester Examination	:	60
Course Outcomes (COs)					
At the end of the course, students will be able to:					
CO-1	To provide students with a comprehensive understanding of research methodology in the context of computer applications.				
CO-2	To equip students with the skills needed to design, conduct, analyze, and report research in the field of computer science.				
CO-3	To introduce students to various research methods, tools, and techniques relevant to computer applications.				
Pre Requisite	:				
Unit - I	:	Introduction to Research in Computer Applications Definition and objectives of research Types of research: Basic, applied, exploratory, descriptive, analytical Importance of research in computer science and applications			
Unit - II	:	Research Process and Research Design Overview of the research process Steps in conducting research: Problem identification, literature review, hypothesis formulation, research design Types of research design: Experimental, correlational, survey, case study			
Unit - III	:	Importance of literature review in research Sources of literature: Journals, conferences, books, online databases Techniques for effective literature search and review Research Problem and Hypothesis Identifying and defining a research problem Formulating research questions and hypotheses Importance of clarity and specificity in problem formulation			
Unit - IV	:	Quantitative Research Methods Overview of quantitative research methods in computer applications Data collection techniques: Surveys, experiments, simulations Data analysis techniques: Statistical analysis, regression, correlation Qualitative Research Methods Overview of qualitative research methods Data collection techniques: Interviews, focus groups, case studies Data analysis techniques: Thematic analysis, content analysis, coding			
Unit - V	:	Data Collection and Analysis Sampling Techniques Concepts of population and sample Probability and non-probability sampling techniques Determining sample size and sampling error Ethical Issues in Research Ethical considerations in research: Privacy, consent, plagiarism Intellectual property rights and copyright issues			



	Best practices for ethical research in computer science
Text Books	(i) "Research Methodology: Methods and Techniques" by C.R. Kothari and Gaurav Garg (ii) "Research Methods for Computer Science" by Michael O. Rabin and Panagiotis K. Chrysanthis (iii) "The Craft of Research" by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams (iv) "Design and Analysis of Experiments" by Douglas C. Montgomery

Open Elective -II

Subject Title	Advance JAVA		
Subject Ref. No.	MANC421	No. of Credits	3
		Assignments / Scssional	30
		Semester Examination	45
Course Outcomes (COs)			
At the end of the course, students will be able to:			
CO-1	Develop Swing-based GUI application & understand the real application of Collections in Software Development		
CO-2	Develop the server side programming using Servlet		
CO-3	Connect the server side database and its implementation in client server terminology using JDBC		
CO-4	Develop client/server application and TCP/IP socket programming using Networking Technology		
CO-5	Develop component-based Java software using JavaBeans		
CO-6	Develop distributed applications using Remote Method Invocation		
Course Objective	This subject is essential for providing knowledge and hands on experience over the issues of managing data on web, developing powerful GUI based friendly user interface, server side programming and developing applications for communication over network using object oriented fundamentals.		
Prerequisites	Concepts of OOPs and Core JAVA		



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Unit I	SWINGS : introduction , JApplet , JFrame, Jcomponent , Labels, TextFields, Buttons, Check Boxes, Radio Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Tree, Tables, GenericProgramming : class, methods bounds for type variable , generic code and the virtual machine, translating generic expressions and methods, calling legacy code, restrictions and limitations , Inheritance rules for Generic type, wildcard types , reflection and generic
Unit II	COLLECTION: collection interfaces , concrete collections : Linked List, Array List, Hash Sets, Tree Sets. NETWORKING : introduction, Socket Overview, Client/Server, InetAddress class, TOP-UP socket : Socket, Server Socket, Datagram, Address indetifiers , URL connection
Unit III	JDBC: Overview, who and why JDBC, JDBC architecture JDBC API, Types of JDBC Drivers, JDBC basic -java Database connectivity steps, Test JDBC driver Installation, Test JDBC connection, JDBC driver name and version, JDBC create table JDBC insert Data into SQL Tables, JDBC select data, JDBC update Data.
Unit IV	SERVLETS: What is servlets, advantages servlets over traditional CGI , Basic structure of servlets, A simple servlets generating plain text, computing, and installing the servlet, running servlet interface and life cycle. Request and response Objects, Request onto, , A servlet that Generates HTML, Simple HTML building utilities, cookies , The servlet cookies API, generating cookies , reading cookies from client , some minor cookies utilities, session tracking , the session tracking API, associating the information with a session
Unit V	JAVA RMI :overview, The RMI architecture , Operation on an RMI distributed system summary, Note on code mobility, writing RMI services , writing a RMI client , developing of RMI.
Text Book	<ol style="list-style-type: none">1. Core Java Vol 2 Advanced Features by Cay Horstmann, Gary Cornell2. Head First Java by Kathy Sierra & Bert Bates3. The Complete Reference -J2EE Jim Keogh
Reference Books	<ol style="list-style-type: none">1. Swing a Beginner's Guide by Herbert Schildt2. An Introduction to object-oriented programming with JAVA by C. Thomas WU3. Graphic JAVA Mastering the JFC-David Geary



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Subject Title	Advance JAVA Lab		
Subject Ref. No.	MANC456	No. of Credits	1
		External	25
Course Outcomes (COs)			
At the end of the course, students will be able to:			
CO-1	Develop Swing-based GUI application & understand the real application of Collections in Software Development		
CO-2	Develop the server side programming using Servlet		
CO-3	Connect the server side database and its implementation in client server terminology using JDBC		
CO-4	Develop client/server application and TCP/IP socket programming using Networking Technology		
CO-5	Develop component-based Java software using JavaBeans		
CO-6	Develop Distributed Applications using Remote Method Invocation		
Course Objective			
Unit I	1.	WAP to create Login Validation form using JButton , JLabel, JTextField ,JPasswordField and ActionListener & KeyPressedListeners	
	2.	WAP to create Arithmetic operation GUI form using JButton , JLabel & ActionListener	
	3.	WAP to demonstrate the use of JTextArea control with its methods.	
	4.	WAP to create JCheckBox and implement ItemListener interface	
	5.	WAP to create a application of multiple JCheckBox with ItemListener	
	6.	WAP to demonstrate the use of JRadioButton control with JOptionPane & ActionListener Interface	
	7.	WAP program to create JOptionPane with showMessageDialog, showInputDialog, showConfirmationDialog.	
	8.	WAP to create a JScrollBar with AdjustmentListener	
	9.	WAP to create a note application using JMenuBar, JMenu, JMenuItem & ActionListener	



	10.	WAP to create JPopupMenu withMouseListener & ActionListener
	11.	WAP to create JCheckBoxMenuItem & JSeparator using ActionListener
	12.	WAP to create JProgressBar & JScrollBar with all methods.
	13.	WAP to create JTable, JTree & JSlider with all methods.
	14.	WAP to create JColorChooser with ActionListener.
	15.	WAP to demonstrate use of JFileChooser control in Swing
	16.	WAP to demonstrate all LayoutManagers in swing
	17.	Demonstration of other controls available in swing
	18.	WAP to create JDBC Connection Type-1 (JDBC-ODBC bridge driver)
	19.	WAP to create JDBC Connection Type-2 (Native-API driver (partially java drive
	20.	WAP to create JDBC Connection Type-3 (Network Protocol driver (fully java driver)
	21.	WAP to create JDBC Connection Type-4 (Thin driver (fully java driver)
	22.	WAP to implement Statement Interface in JDBC. (Insert, Delete, update and Display the records from oracle table)
	23.	WAP to implement PreparedStatement Interface in JDBC. (Insert, Delete, update and Display the records from oracle table)
	24.	WAP JDBC program to write & read a BLOB and CLOB to Table
	25.	WAP to demonstrate the CallableStatement Interface to retrieve the procedure for IN parameter
	26.	WAP to demonstrate the CallableStatement Interface to retrieve the procedure for OUT parameter
	27.	WAP to demonstrate the CallableStatement Interface to retrieve the procedure for INOUT parameter
	28.	WAP to demonstrate the CallableStatement Interface to retrieve the function from SQL.
	29.	WAP to demonstrate how to get primary key value(Auto generated keys) from inserted queries using JDBC
	30.	WAP for CallableStatement statement with batch execution.
	31.	WAP to execute SQL cursor using CallableStatement Interface.
	32.	WAP to demonstrate the batch update using Statement Interface.
	33.	WAP to demonstrate the batch update using PreparedStatement Interface.
	34.	Write an example for scrollable result set with read only mode.
	35.	WAP to get JDBC Connection object using properties file.



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Unit II	36.	WAP to print a Welcome Message in servlet using Servlet Interface
	37.	WAP to print a Welcome Message in servlet using GenericServlet class
	38.	WAP to print a Welcome Message in servlet using HttpServlet Class
	39.	WAP to retrieve the Client Input Data in Servlet using getParameter()
	40.	WAP to retrieve the Client Input Data in Servlet using getParameterValues()
	41.	WAP to retrieve the Client Input Data in Servlet using getParameterNames()
	42.	WAP to demonstrate the application of ServletConfig Interface.
	43.	WAP to demonstrate the application of ServletContext Interface.
	44.	WAP to connect servlet to database.
	45.	WAP to create login Application using JDBC concept.
	46.	WAP that demonstrate the implementation of RequestDispatcher Interface..
	47.	WAP to demonstrate the difference between forward() & sendRedirect() method
	48.	WAP to demonstrate the difference types of attributes in Servlet i.e. request scope, session scope & application scope.
	49.	WAP to demonstrate how session tracking can be achieve by Cookies
	50.	WAP to create a Login & Logout application using Cookies.
	51.	WAP to demonstrate how session tracking can be achieve by Cookies
	52.	WAP to create a Login & Logout application using Cookies.
	53.	WAP to demonstrate how session tracking can be achieve by Hidden Form Field
	54.	WAP to create a Login & Logout application using Hidden Form Field.
	55.	WAP to demonstrate how session tracking can be achieve by URL rewriting
	56.	WAP to demonstrate how session tracking can be achieve by HttpSession.
	57.	WAP to create a Login & Logout application using HttpSession .
	58.	WAP to demonstrate CRUD implementation in Servlet.
Unit III	59.	WAP to add the elements in collection object.
	60.	WAP to demonstrate all methods of Collections class.
	61.	WAP to demonstrate the use of Enumeration Cursor in Collection.
	62.	WAP to demonstrate the use of Iterator Cursor in Collection.
	63.	WAP to demonstrate the use of ListIterator Cursor in Collection.
	64.	WAP to perform all operations of ArrayList & iterate it.
	65.	WAP to perform all operations of LinkedList & iterate it.
	66.	WAP to perform all operations of Stack & iterate it.
	67.	WAP to perform all operations of Vector & iterate it.



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	68.	WAP to perform all operations of LinkedHashSet & iterate it.
	69.	WAP to perform all operations of TreeSet & iterate it.
	70.	WAP to perform all operations of Queue & PriorityQueue and iterate it.
	71.	WAP to perform all operations of Deque & ArrayDeque and iterate it.
	72.	WAP to perform all operations of Map Interface & iterate it.
	73.	WAP to perform all operations of HashMap Interface & iterate it.
	74.	WAP to perform all operations of LinkedHashMap Interface & iterate it.
	75.	WAP to perform all operations of TreeMap Interface & iterate it.
	76.	WAP to perform all operations of HashTable Interface & iterate it.
	77.	WAP to perform natural sorting using Comparable Interface.
	78.	WAP to perform customize sorting using Comparator Interface.
Unit IV	79.	WAP to create a URL.
	80.	WAP to create a File URL.
	81.	WAP to create a URL object with all properties.
	82.	WAP to get URL Properties.
	83.	WAP to get URL object with relative path .
	84.	WAP to read URL content, encode & decode URL content.
	85.	WAP to get machine IP address, IP address of host, host name by IP address, machine host name .
	86.	WAP to get all IP address of a Host
	87.	WAP to create Connection Oriented client server application using ServerSocket & Socket
	88.	WAP to create Connection Oriented client server chatting application using ServerSocket & Socket
	89.	WAP to create Connection less client server application using DatagramSocket & DatagramPacket
Unit V	90.	WAP to create RMI application using Remote
Text Book		



Subject Title	:	Data Science Using Python		
Subject Ref. No.	:	MANC422	No. of Credits	: 3
			Assignments / Sessional	30
			Semester Examination	45
Course Outcomes (COs)				
At the end of the course, students will be able to:				
CO-1	Use Python for Data Science and Machine Learning			
CO-2	Learn to use NumPy for Numerical Data, Pandas for Data Analysis, Matplotlib for Python Plotting			
CO-3	K-Means Clustering Logistic Regression			
Pre Requisite	:	Basics of Python, Probability, and Statistics		
Unit - I	:	Introduction: Basics of Python Revision, Basics of Probability, Statistics		
Unit - II	:	Introduction to Numpy: Numpy Arrays, Quick Note on Array Indexing, Numpy Array Indexing, Numpy Operations, Numpy Exercises Overview Numpy Exercises Solutions Introduction to Pandas: Series, DataFrames - Part 1, DataFrames - Part 2, DataFrames - Part 3, Missing Data, Groupby, Merging Joining and Concatenating, Operations, Data Input and Output		
Unit - III	:	Python for Data Visualization - Matplotlib: Matplotlib Part 1, Matplotlib Part 2, Matplotlib Part 3, Matplotlib Exercises Overview, Matplotlib Exercises - Solutions Introduction to Seaborn, Categorical Plots, Matrix Plots, Grids, Regression Plots, Style and Color, Seaborn Exercise Overview, Seaborn Exercise Solutions		
Unit - IV	:	Introduction of Machine Learning: Supervised Learning Overview, Evaluating Performance - Classification Error Metrics, Evaluating Performance - Regression Error Metrics, Machine Learning with Python Linear Regression Theory model_selection Updates for SciKit Learn, Linear Regression with Python Logistic Regression Theory, Logistic Regression with Python, KNN Theory KNN with Python		
Unit - V	:	Introduction to Tree Methods: Decision Trees and Random Forest with Python, SVM Theory Support Vector Machines with Python, K Means Algorithm Theory K Means with Python, Principal Component Analysis PCA with Python		
Text Books	:	Python for Data Science, Ben Chan Published by Notion Press available on Flipkart		
	:	Python for Data Science For Dummies John Paul Mueller Luca Massaron		
E BOOKS	:	Python Data Science Handbook: Essential Tools for Working with Data by Jake VanderPlas O'Reilly Publications		
MOOC	:	https://www.udemy.com/course/python-for-data-science-and-machine-learning-bootcamp/		



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Subject Title	:	Data Science Using Python Lab		
Subject Ref. No.	:	MANC457	No. of Credits	: 1
			External	25
Course Outcomes (COs) At the end of the course, students will be able to:				
CO-1	Use Python for Data Science and Machine Learning			
CO-2	Learn to use NumPy for Numerical Data, Pandas for Data Analysis, Matplotlib for Python Plotting			
CO-3	K-Means Clustering Logistic Regression			
As per necessity of Data Science using Python Theory				

Subject Title		ASP.NET		
Subject Ref. No.		MANC 423	No. of Credits	3
			Assignments / Sessional	25
			Semester Examination	50
Course Outcomes (COs) At the end of the course, students will be able to:				
CO-1	Describe basic concepts of ASP.NET and identify components of a form.			
CO-2	Use various validation controls on respective objects on the form.			
CO-3	Establish connectivity with back end using ADO.Net.			
CO-4	Implement stored procedures in ASP.NET.			
CO-5	Describe use of Authentication services in ASP.NET.			
CO-6	Create a mini-project using controls learnt.			
Prerequisites	Before attending this course, students must have:			



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	<p>The ability to create HTML or DHTML, including:</p> <ul style="list-style-type: none">• Tables• Images• Forms <p>Programming experience using Visual Basic .NET, including:</p> <ul style="list-style-type: none">• Declaring variables• Using loops <p>Using conditional statements</p>
Unit I	<p>Overview of the Microsoft .NET Framework, Using Microsoft Visual Studio .NET, Introduction to the .NET Framework, Overview of ASP.NET, Creating a Microsoft ASP.NET Web Form, Adding Code to a Microsoft ASP.NET Web Form Using Code-Behind Pages, Adding Event Procedures to Web Server Controls</p>
Unit II	<p>Validating User Input Overview of User Input Validation, Using Validation Controls, Page Validation Creating User Controls Adding User Controls to an ASP.NET Web Form, Creating User Controls</p>
Unit III	<p>Accessing Relational Data Using Microsoft Visual, Studio .NET Overview of ADO.NET, Creating a Connection to the Database, Displaying a DataSet in a List-Bound Control Accessing Data with Microsoft ADO.NET</p> <p>Introduction to Using ADO.NET, Connecting to a Database, Accessing Data with DataSets, Using Multiple Tables, Accessing Data with DataReaders</p>
Unit IV	<p>Calling Stored Procedures with Microsoft ADO.NET, Overview of Stored Procedures, Calling Stored Procedures, Reading and Writing XML Data Overview of XML Architecture in ASP.NET, XML and the DataSet Object, Working with XML Data, Using the XML Web Server Control, Securing a Microsoft ASP.NET Web Application</p>
Unit V	<p>Web Application Security Overview</p> <p>Working with Windows-Based Authentication Working with Forms-Based Authentication Overview of Microsoft Passport Authentication</p>
Text Books	<p>1. Programming ASP.NET By Jesse Liberty, Dan Hurwitz, Publisher: O'Reilly Media</p>
Reference books	<p>1. ASP. NET: a beginner's guide By Dave Mercer, Publisher McGraw-Hill Companies</p>



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Subject Title	ASP.NET Lab		
Subject Ref. No.	MANC458	No. of Credits	1
		External	25
Course Outcomes (COs) At the end of the course, students will be able to:			
CO-1	Write Simple programs using C#.		
CO-2	Use calendar control and Treeview control in forms.		
CO-3	Using various validation controls on objects on the forms.		
CO-4	Implement Datagrid control, data binding and connectivity using C#.Net.		
CO-5	Learn to use hyperlink control on Forms.		
CO-6	Create a minor project using ASP.NET and SQL Server.		
Prerequisites	HTML and VB.net		
Unit I	Simple application using web controls A Finding factorial Value B Money Conversion C Quadratic Equation D Temperature Conversion E Login control		
Unit II	States of ASP.NET Pages, Adrotator Control, Calendar Control A Display messages in a calendar control BDisplay vacationinacalendarcontrol CSelected dayin a calendar controlusing style DDifference between twocalendardates Treeview control A Treeview control and datalist B Treeview operations		
Unit III	Validation controls Query textbox and Displaying records Display records by using database Datalist link control Databinding using dropdownlist control Inserting record into a database		
Unit IV	Deleting record into a database Databinding using datalist control Datalist control templates Databinding using datagrid Datagrid control template		
Unit V	Datagrid hyperlink Datagrid button column Datalist event Datagrid paging Creating own table format using datagrid		
Text Books	ProgrammingASP.NET ByJesseLiberty, Dan Hurwitz, Publisher: O'ReillyMedia Visual Basic .NET Programming Black Book By Steven Holzner Publisher: Dreamtech Press ASP. NET: abeginner's guide By DaveMercer, Publisher McGraw-HillCompanies		



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Subject Title	Data Structure using C++ Lab		
Subject Ref. No.	MANC454	No. of Credits	1
		External	25
			-

Course Outcomes (COs)

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

CO-1	To implement the concepts of Abstract data Type using Programming Languages
CO-2	To learn the practical approaches of Stack & Queue in real time applications
CO-3	To implement various search data structures such as hashing, binary search trees, AVL trees, B+ trees and B*-trees using programming languages
CO-4	To implement graph theory concept (Minimum Spanning Tree) in Civil Network Planning, Computer Network Routing Protocol and summarize searching and sorting techniques

Practical Lab

1.	WAP a program to implement the addition of two Polynomial using an Array .
2.	WAP a program to implement the multiplication of two Polynomial using an Array .
3.	WAP a program to convert Array into Sparse Array using an Array .
4.	WAP a program to implement the stack operations such as push, pop, display & search element using an Array .
5.	WAP a program to implement the queue operation such as front , rear, display& search using an Array .
6.	WAP a program to implement the Circular Queue using an Array .
7.	WAP a program to implement the Priority Queue using an Array
8.	WAP a program to implement the DeQueue Queue using an Array
9.	WAP a program to implement the Reverse Stack using Queue implementation.
10.	WAP a program to demonstrate the application of malloc, calloc and freefunction.
11.	WAP a program to implement the addition of two Polynomial using Linked List.
12.	WAP a program to implement the multiplication of two Polynomial using using Linked List.
13.	WAP a program to Create the Linked List and Print it.
14.	Write a menu driven program in to perform all operations such as create , delete (first,last & between), insert(first,last & between), display, search element in Linked List .
15.	Write a menu driven program in to perform all operations of stack such as create , delete, insert, display, search element by using Linked List.
16.	Write a menu driven program in to perform all operations of queue such as create , delete, insert, display, search element by using Linked List.
17.	Write a menu driven program in to perform all operations such as create , delete (first,last & between), insert(first,last & between), display, search element in Circular Linked List .
18.	Write a menu driven program in to perform all operations such as create , delete (first,last & between), insert(first,last & between), display, search element in Doubly Linked List .
19.	Write a menu driven program in to perform all operations such as create , delete



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	(first,last & between), insert(first,last & between), display, search element in Doubly Circular Linked List .
20.	Write a program to convert normal linked List into Reverse Linked List .
21.	Write a program to construct Tree by using three arrays.
22.	Write a program to construct Tree by using one array.
23.	Write a program to construct Tree by using Linked List
24.	Write a program to construct BST by using array.
25.	Write a program to construct BST by using Linked List.
26.	Write a program to construct Tree by using three arrays and perform inorder,preorder and post order on it.
27.	Write a program to construct Graph using Adjacency Matrix.
28.	Write a program to construct Graph using Adjacency List.
29.	Write a program to construct Graph using Incidence Matrix.
30.	Write a program to perform Bubble Sorting.
31.	Write a program to perform Insertion Sorting.
32.	Write a program to perform Selection Sorting.
33.	Write a program to perform Merge Sorting.
34.	Write a program to perform Shell Sorting.
35.	Write a program to perform Quick Sorting.



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Subject Title	Advanced DBMS Lab		
Subject Ref. No.	MANC 455	No. of Credits	1
		Internal	25
Course Outcomes (COs)			
At the end of the course, students will be able to:			
CO-1	Execute and create Triggers and write Advanced Triggers		
CO-2	Implement Cursors Management in PL/SQL		
CO-3	Write Subprograms and implement them.		
CO-4	Write Functions and use them in PL/SQL.		
CO-5	Write programs to perform Error Handling using PL/SQL.		
Practical based on SQL and Introduction to PL/SQL			



Open Elective -III

Subject Title	Entrepreneurship Development		
Subject Ref. No.	MANC	No. of Credits	4
		Assignments / Sessional	40
		Semester Examination	60
Course Outcomes (COs) At the end of the course, students will be able to:			
CO-1	To provide a comprehensive understanding of entrepreneurship and its significance in the modern economy.		
CO-2	To develop entrepreneurial skills and mindset for identifying and evaluating business opportunities.		
CO-3	To equip students with knowledge of business planning, funding, and managing startups.		
CO-4	To explore the challenges and strategies for sustainable business growth and innovation.		
Prerequisites			
Unit I	Introduction to Entrepreneurship <ul style="list-style-type: none">• Entrepreneurship Overview: Definition, evolution, and types of entrepreneurs.• Role of Entrepreneurs: Economic development and job creation.• Entrepreneurial Mindset: Characteristics, qualities, and skills of successful entrepreneurs.• Entrepreneurship vs. Intrapreneurship: Key differences and relevance.• Case Study: Success stories of notable entrepreneurs.		
Unit II	Business Opportunity Identification and Planning <ul style="list-style-type: none">• Opportunity Identification: Sources of ideas, creativity, and innovation.• Market Research: Identifying target customers, market demand, and competition analysis.• Feasibility Analysis: Technical, financial, and operational viability.• Business Models: Understanding value proposition, customer segments, and revenue streams.• Business Plan Development: Components of a business plan and pitching techniques.		



Unit III	Funding and Financial Management for Entrepreneurs <ul style="list-style-type: none">• Sources of Funding: Bootstrapping, angel investors, venture capital, crowdfunding, and government schemes.• Financial Planning: Budgeting, cost estimation, and financial forecasting.• Understanding Financial Statements: Balance sheet, income statement, and cash flow.• Managing Risks: Identifying and mitigating business risks.• Case Study: Analysis of funding strategies of successful startups.
Unit IV	Managing and Growing a Startup <ul style="list-style-type: none">• Startup Lifecycle: Stages of a startup and scaling strategies.• Team Building and Leadership: Hiring, retaining talent, and leadership styles.• Operations Management: Processes, technology, and resource optimization.• Marketing Strategies: Branding, digital marketing, and customer relationship management (CRM).• Legal and Regulatory Framework: Compliance, intellectual property rights, and contracts.
Unit V	Innovation, Trends, and Sustainability in Entrepreneurship <ul style="list-style-type: none">• Role of Innovation: Disruptive technologies and competitive advantage.• Social Entrepreneurship: Creating impact and addressing societal challenges.• Sustainable Business Practices: Green entrepreneurship and circular economy.• Global Trends in Entrepreneurship: Startups in the digital age, AI, and IoT-driven ventures.• Future of Entrepreneurship: Emerging industries and entrepreneurial opportunities.
Text Books	
Reference books	<ol style="list-style-type: none">1. Hisrich, Peters, and Shepherd, Entrepreneurship.2. Donald F. Kuratko, Introduction to Entrepreneurship.3. Eric Ries, The Lean Startup.4. Steve Blank, The Startup Owner's Manual.5. Research articles, case studies, and online resources on entrepreneurship and startups.



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Subject Title	Artificial Intelligence		
Subject Ref. No.	MANC 425	No. of Credits	4
		Assignments / Sessional	40
		Semester Examination	60
Course Outcomes (COs) At the end of the course, students will be able to:			
CO-1	To introduce the foundational concepts and techniques of Artificial Intelligence.		
CO-2	To understand the problem-solving strategies and intelligent systems.		
CO-3	To explore AI applications in real-world scenarios, including machine learning and natural language processing.		
CO-4	To gain knowledge about current AI trends, tools, and ethical considerations.		
Prerequisites			
Unit I	Introduction to Artificial Intelligence <ul style="list-style-type: none">• Definition and History of AI: Evolution, scope, and goals of AI.• AI Techniques: Problem-solving, reasoning, and learning.• Intelligent Agents: Characteristics, environments, and architecture.• Applications of AI: Healthcare, finance, robotics, gaming, and education.• Ethics in AI: Bias, fairness, and privacy considerations.		
Unit II	Problem-Solving and Search Techniques <ul style="list-style-type: none">• Problem Representation: State space, problem formulation, and solutions.• Search Strategies:<ul style="list-style-type: none">○ Uninformed Search: Breadth-first, depth-first, and uniform cost search.○ Informed Search: A*, greedy search, and heuristics.• Adversarial Search: Minimax algorithm and alpha-beta pruning.• Constraint Satisfaction Problems (CSPs): Backtracking and local search.• Optimization Techniques: Genetic algorithms, simulated annealing, and hill climbing.		
Unit III	Knowledge Representation and Reasoning <ul style="list-style-type: none">• Knowledge Representation: Propositional logic, predicate logic, and ontologies.• Reasoning Methods: Forward and backward chaining, inference, and resolution.• Uncertainty in AI: Probability theory, Bayesian networks, and fuzzy logic.		



	<ul style="list-style-type: none">• Semantic Networks and Frames: Representation of knowledge structures.• Rule-Based Systems: Expert systems and their applications.
Unit IV	<p>Machine Learning and Natural Language Processing</p> <ul style="list-style-type: none">• Machine Learning Basics: Types of learning - supervised, unsupervised, and reinforcement learning.• Key Algorithms:<ul style="list-style-type: none">○ Supervised Learning: Regression, decision trees, and neural networks.○ Unsupervised Learning: Clustering and dimensionality reduction.○ Reinforcement Learning: Q-learning and deep reinforcement learning.• Natural Language Processing (NLP):<ul style="list-style-type: none">○ Basic Tasks: Tokenization, stemming, and lemmatization.○ Advanced Techniques: Sentiment analysis, machine translation, and chatbots.○ Applications of NLP: Speech recognition and text-to-speech systems.
Unit V	<p>Advanced AI and Emerging Trends</p> <ul style="list-style-type: none">• Deep Learning: Neural networks, convolutional neural networks (CNNs), and recurrent neural networks (RNNs).• AI in Robotics: Perception, path planning, and robot motion control.• AI in IoT: Smart systems, edge AI, and real-time decision-making.• Ethical AI: Accountability, transparency, and societal impact.• Emerging Trends: Explainable AI (XAI), generative AI, and quantum AI.• Case Study: Real-world AI applications in industries like autonomous vehicles or healthcare.
Text Books	
Reference books	<p>Stuart Russell and Peter Norvig, <i>Artificial Intelligence: A Modern Approach</i>. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, <i>Artificial Intelligence</i>. Tom M. Mitchell, <i>Machine Learning</i>. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, <i>Deep Learning</i>. Research papers, online resources, and tools like TensorFlow and PyTorch.</p>



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Subject Title	:	Cyber Security		
Subject Ref. No.	:	MANC426	No. of Credits	: 4
			Assignments / Sessional	: 40
			Semester Examination	: 60
Course Outcomes (COs) At the end of the course, students will be able to:				
CO-1		Understand the broad set of technical, social & political aspects of		
CO-2		Computer Security		
CO-3		Describe the operational and organizational security Aspects		
CO-4		Have understood the fundamentals of cryptography		
CO-5		Explain Authentication Methods		
Pre Requisite	:	Basics of Networking		
Unit - I	:	Introduction To Security Trends: The Computer Security Problem - Targets and Attacks - Approaches to Computer Security - Ethics - Basic Security Terminology - Security Models		
Unit - II		Operational and Organizational Security: Policies, Procedures, Standards, and Guidelines - Security Awareness and Training - Interoperability Agreements - The Security Perimeter - Physical Security - Environmental Issues		
Unit - III	:	Cryptography: Cryptography in Practice - Historical Perspectives - Algorithms - Hashing Functions - Symmetric Encryption - Asymmetric Encryption - Quantum Cryptography- Cryptography Algorithm Use		
Unit - IV		Authentication and Remote Access: User, Group, and Role Management - Password Policies - Single Sign-On - Security Controls and Permissions - Preventing Data Loss or Theft - The Remote Access Process - Remote Access Methods		
Unit - V	:	Intrusion Detection Systems: History of Intrusion Detection Systems - IDS Overview - Network-Based IDSs - Host-Based IDSs- Intrusion Prevention Systems - Honeypots and Honeynets - Tools		
Text Books	:	W.A.Coklin, G.White, Principles of Computer Security: Fourth Edition, McGrawHill, 2016 William Stallings, Cryptography and Network Security Principles and Practices, Seventh Edition, Pearson Achyut S. Godbole, Web Technologies: TCP/IP, Web/Java Programming, and Cloud Computing, Tata McGraw-Hill Education, 2013		
EBOOKS MOOC		https://www.newhorizons.com/promotions/cybersecurity-ebooks https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks#syllabus		



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Subject Title	:	Introduction to Digital Marketing		
Subject ref. No.	:	MANC427		
		No. of credits	:	4
		No. of periods per week	:	3
		Assignment/Sessionals	:	40
		Semester Exam	:	60
Course Objectives	:	<ol style="list-style-type: none">1. Gain a comprehensive understanding of digital marketing principles, channels, and strategies to effectively reach and engage customers in the digital environment.2. Develop the ability to apply advanced digital marketing techniques, including SEO, social media, and data analytics, to drive measurable business outcomes and adapt to emerging trends.		
Pre Requisite	:	NA		
Unit-I Fundamentals of Digital Marketing	:	<ol style="list-style-type: none">1. Overview of Digital Marketing2. Evolution and Importance of Digital Marketing3. Key Digital Marketing Channels and Strategies4. Customer Behavior in the Digital Age5. Role of Data Analytics in Digital Marketing6. ☑ Legal and Ethical Considerations in Digital Marketing		
Unit-II Core Components of Digital Marketing	:	<ol style="list-style-type: none">1. Search Engine Optimization (SEO)2. Social Media Marketing (SMM)3. Pay-Per-Click Advertising (PPC)4. Content Marketing and Blogging5. Email Marketing Strategies6. ☑ Mobile Marketing and Optimization		
Unit-III Advanced Techniques and Trends in Digital Marketing	:	<ol style="list-style-type: none">1. Affiliate and Influencer Marketing2. E-Commerce Marketing Strategies3. Marketing Automation Tools and Techniques4. Understanding Digital Metrics and KPIs5. Artificial Intelligence in Digital Marketing6. Emerging Trends: Voice Search, Chatbots, and AR/VR Marketing		
Text Books	:	<ol style="list-style-type: none">1. Chaffey, D., & Ellis-Chadwick, F. (2019). <i>Digital Marketing: Strategy, Implementation, and Practice</i> (7th ed.). Pearson.2. Kotler, P., Kartajaya, H., & Setiawan, I. (2021). <i>Marketing 5.0: Technology for Humanity</i>. Wiley.		
Additional Reference Books	:	<ol style="list-style-type: none">1. Ryan, D. (2017). <i>Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation</i> (4th ed.). Kogan Page.2. Kingsnorth, S. (2019). <i>Digital Marketing Strategy: An Integrated Approach to Online Marketing</i> (2nd ed.). Kogan Page.3. ☑ Charlesworth, A. (2020). <i>Digital Marketing: A Practical Approach</i> (4th ed.). Routledge.		



<i>Subject Title</i>	<i>on-the-job training</i>		
<i>Subject Ref. No.</i>	<i>MANC462</i>	<i>No. of Credits</i>	<i>4</i>
		<i>Internal</i>	<i>40</i>
		<i>External</i>	<i>60</i>
<i>Content</i>	<i>: Students needs to complete the on the job training.</i>		