Your Dreams Our Goal

POORNIMA
U N I V E R S I T Y

Member of Association of Indian Universities & Approved by UGC (Govt. of India) under 2(f) & 12(B)

FACULTY OF
COMPUTER SCIENCE & ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE & APPLICATION

SCHEME & SYLLABUS
BOOKLET

MCA BATCH 2023-2025

MCA GENERAL

SCHEME & SYLLABUS

BATCH: 2023-25

INDEX

S. No	Contents	Page No.
1	Vision, Mission And Quality Policy Of University	
2	Knowledge Wheel	
3	Preamble	
4	About Program and Program Outcomes (POs)	
5	Examination System	
6	Assessment & Grade Point Average: SGPA, CGPA	
7	Guidelines for MOOC Courses	
8	Teaching Scheme of all Semesters	
9	Teaching Syllabus of all Semesters	

Disclaimer: The scheme, syllabus and other materials published in this booklet may be changed or modified as per the requirement after approval of competent authority. The decision taken by the management of Poornima University will be final and abiding to all.

Student Details

Name of Student:

Name of Program:

Semester: Year: Batch:

Faculty   of

Member of Association of Indian Universities & Approved by UGC (Govt. of India) under 2(f) & 12(B)

VISION

To create knowledge based society with scientific temper, team spirit and dignity of labor to face global competitive challenges.

Mission

To evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication and commitment to excellence in all spheres of life.

Quality Policy

To provide Quality Education through Faculty development, updating of facilities and continual improvement meeting University norms and keeping stake holders satisfied.

Knowledge Wheel

At Poornima, the academic atmosphere is a rare blend of modern technical as well as soft skills and traditional systems of learning processes.
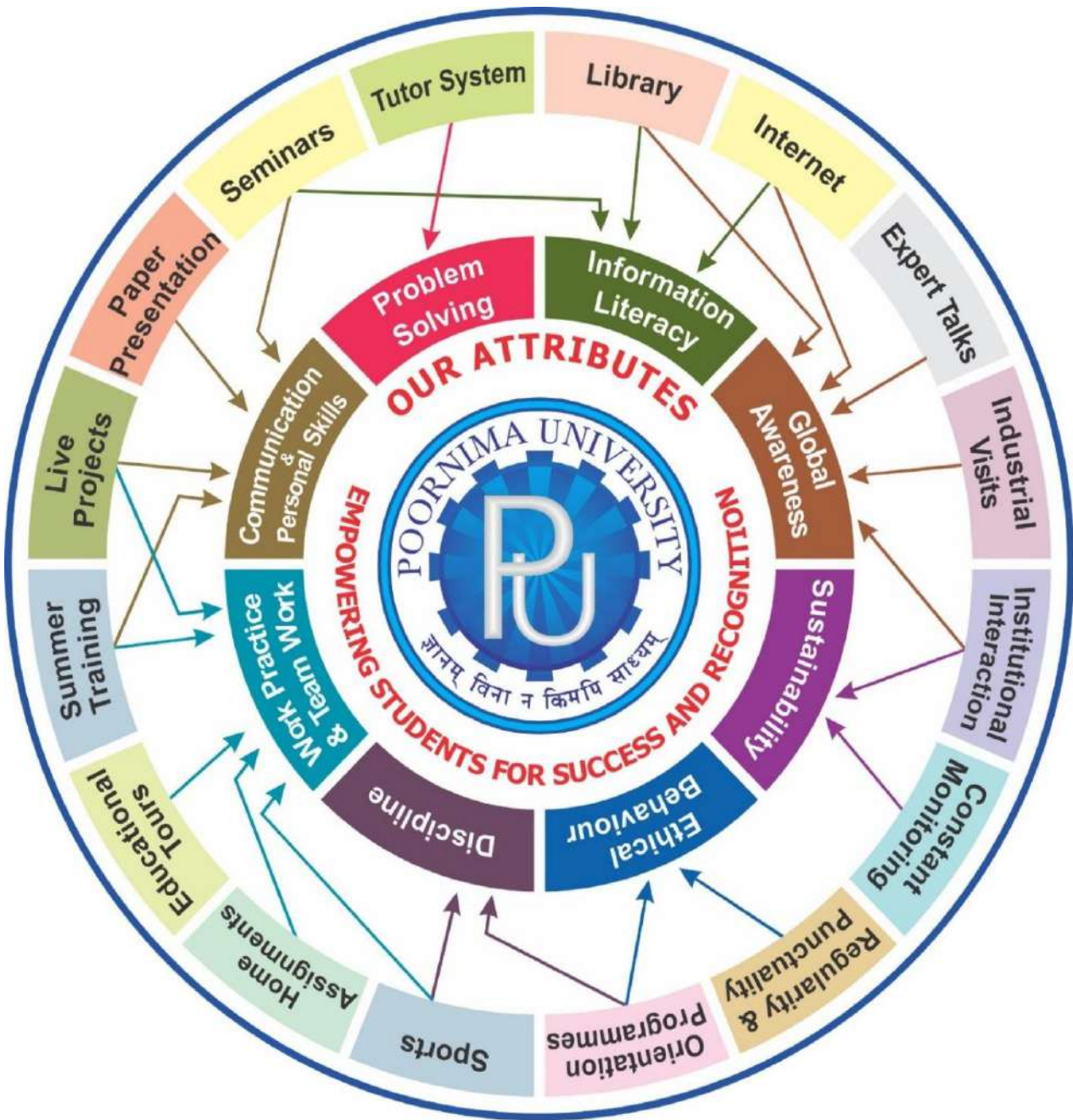
About Program and Program Outcomes (PO):

Title of the Programme: Masters of Computer Applications (MCA)

Nature of the Programme: MCA is a two year full-time programme.

Program Outcomes (PO) :

Post Graduateswill beableto:

PO1: ComputationalKnowledge: Apply knowledge of computing fundamentals,computingspecialisation, mathematics, and domain knowledge appropriate for the computing specialisation totheabstractionandconceptualisationofcomputingmodelsfromdefinedproblemsandrequirements.

PO 2: Problem Analysis: Identify, formulate, research literature, and solve complex computingproblemsreachingsubstantiatedconclusionsusingfundamentalprinciplesofmathematics,computingsciences, andrelevant domain disciplines.

PO 3: Design /Development of Solutions: Design and evaluate solutions for complex computingproblems,anddesignandevaluatesystems,components,orprocessesthatmeetspecifiedneedswithappropriate considerationforpublichealthandsafety,cultural,societal,andenvironmentalconsiderations.

PO 4: Conduct investigations of complex Computing problems: Use research-based knowledgeand research methods including design of experiments, analysis and interpretation of data, andsynthesisof theinformation to providevalid conclusions.

PO 5: Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources, andmoderncomputingtoolstocomplexcomputingactivities,with anunderstandingofthelimitations.

PO 6: Professional Ethics: Understand and commit to professional ethics and cyber regulations,responsibilities,and norms of professional computingpractices.

PO 7: Life-long Learning: Recognise the need, and have the ability, to engage in independentlearningfor continual development as acomputingprofessional.

PO8:Projectmanagementandfinance: Demonstrateknowledgeandunderstandingofthecomputing and management principles and apply these to one's own work, as a member and leaderina team, to manageprojects and in multidisciplinaryenvironments.

PO 9: Communication Efficacy: Communicate effectively with the computing community, andwith society at large, about complex computing activities by being able to comprehend and writeeffectivereports,designdocumentation,makeeffectivepresentations,andgiveandunderstandclearinstructions.

PO 10: Societal and Environmental Concern: Understand and assess societal, environmental,health, safety, legal, and cultural issues within local and global contexts, and the consequentialresponsibilitiesrelevant to professional computing practices.

PO11:IndividualandTeamWork: Functioneffectivelyasanindividualandasamemberorleaderindiverseteams and inmultidisciplinaryenvironments.

PO 12: Innovation and Entrepreneurship: Identify a timely opportunity and using innovation topursue that opportunity to create value and wealth for the betterment of the individual and society atlarge.

Examination System :

    A. **Marks Distribution of Theory Course:**
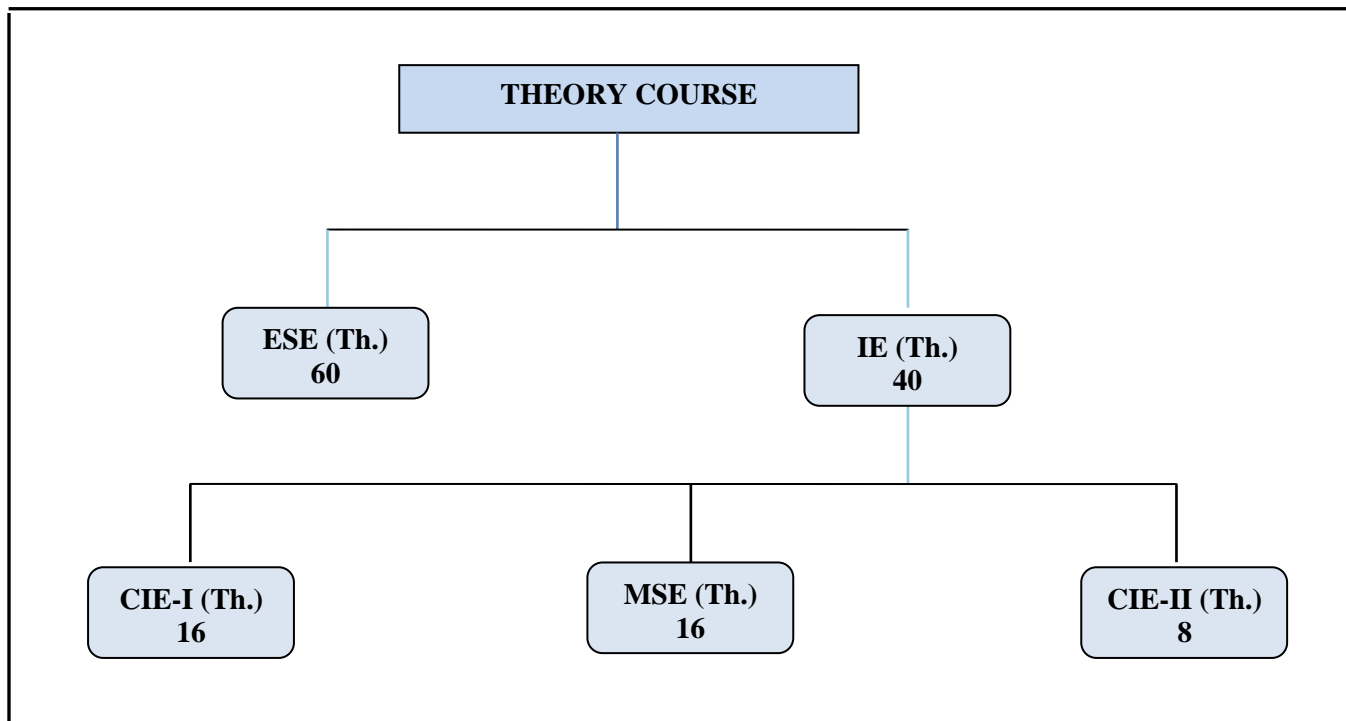
    B. **Marks Distribution of Practical Course :**
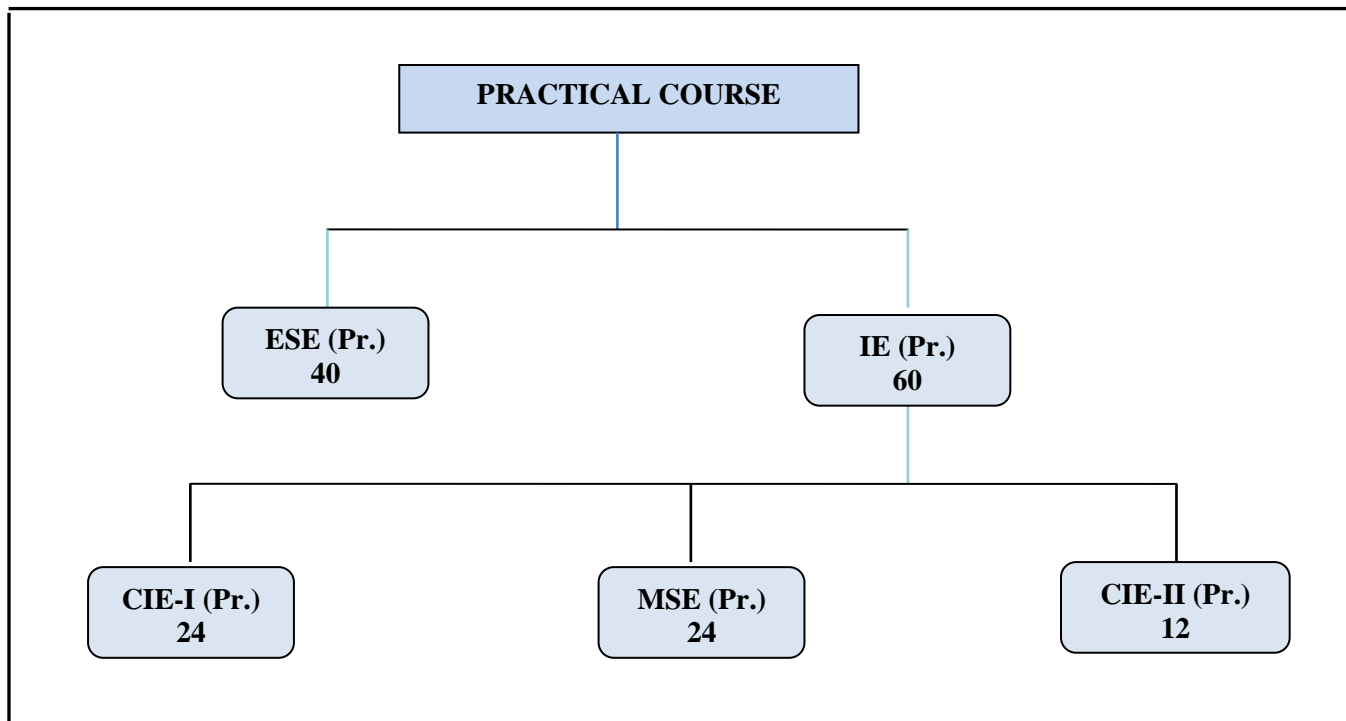
Th.: Theory, **Pr.**: Practical, **ESE:** End Semester Examination, **MSE:** Mid Semester Examination, **CIE:** Continuous Internal Evaluation.

CO Wise Marks Distribution:

Exam Entity	Theory Subject		Practical/ Studio Subject	
	Maximum Marks	CO to be Covered	CO to be Covered	Maximum Marks
CIE-I	16 (8 + 8)	1 & 2	1 & 2	24 (12 + 12)
MSE	16(8 + 8)	3 & 4	3 & 4	24 (12 + 12)
CIE-II (Activity/ Assignment)	8 (8)	5	5	12 (12)
ESE	60	-	-	40
TOTAL	100	-	-	100

Minimum Passing Percentage in All Exams:

S No.	Program Name	Minimum Passing Percentage in		
		IE Component	ESE Component	Total Component
1	Course Work for PhD Registration	-	-	50%
2	B. Arch.	-	45%	50%
3	MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH	-	40%	40%
4	MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH	-	35%	35%

SGPA Calculation

$$SGPA = \frac{C_1 G_1 + C_2 G_2 + \ldots\ldots\ldots + C_n G_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

$$SGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

C_i is the number of credits of subject i,

G_i is the Grade Point for the subject I and i = 1 to n,

n = number of subjects in a course in the semester

CGPA Calculation

$$CGPA = \frac{C_1 G_1 + C_2 G_2 + \ldots\ldots\ldots + C_n G_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

$$CGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

C_i is the number of credits of subject i,

G_i is the Grade Point for the subject I and i = 1 to n,

n = number of subjects in a course of all the semesters up to which CGPA is computed

Grading Table:

Applicable for B.Arch. & Ph.D. Courses

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	$90 \le x \le 100$
Excellent	A+	9	$80 \le x < 90$
Very Good	A	8	$70 \le x < 80$
Good	B+	7	$60 \le x < 70$
Above Average	B	6	$50 \le x < 60$
Fail	F	0	$x < 50$
Absent	Ab	0	Absent

Applicable for All Courses except B.Arch. & Ph.D.

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	$90 \le x \le 100$
Excellent	A+	9	$80 \le x < 90$
Very Good	A	8	$70 \le x < 80$
Good	B+	7	$60 \le x < 70$
Above Average	B	6	$50 \le x < 60$
Average	C	5	$40 \le x < 50$
Pass	P	4	$35 \le x < 40$
Fail	F	0	$x < 35$
Absent	Ab	0	Absent

CGPA to percentage conversion rule:

$$Equivalent\%ofMarksintheProgram = CGPA*10$$

Award of Class

CGPA	Percentage	Equivalent Division
$7.50 \le CGPA$	75% or more	First Division with Distinction
$6.00 \le CGPA < 7.50$	$60\% \le x < 75\%$	First Division
$5.00 \le CGPA < 6.00$	$50\% \le x < 60\%$	Second Division
$4.00 \le CGPA < 5.00$	$40\% \le x < 50\%$	Pass Class

Guidelines for Massive Open Online Courses (MOOCs)

(Session 2023-24)

Poornima University, in its never ending endeavor to equip students with best-of-class learning and knowledge, has undertaken to include MOOC courses as part of its credit scheme from session 2023-24 onwards. The objective behind this is to enable students to study courses designed by the best teachers in the country and to scale their knowledge base with the rest of learners from the nation. The MOOCs which are included under this scheme is can be chosen from SWAYAM and NPTEL.

1. Introduction of MOOCs: SWAYAM and NPTEL

About SWAYAM:

SWAYAM is a programme initiated by Government of India and designed to achieve the three cardinal principles of Education Policy viz., access, equity and quality. The objective of this effort is to take the best teaching learning resources to all, including the most disadvantaged. SWAYAM seeks to bridge the digital divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

This is done through a platform that facilitates hosting of all the courses, taught in classrooms to be accessed by anyone, anywhere at any time. All the courses are interactive, prepared by the best teachers in the country and are available, free of cost to any learner. However learners wanting a SWAYAM certificate should register for the final proctored exams that come at a fee and attend in-person at designated centers on specified dates. Eligibility for the certificate will be announced on the course page and learners will get certificates only if this criteria is matched.

The courses hosted on SWAYAM are in 4 quadrants – (1) video lecture, (2) specially prepared reading material that can be downloaded/printed (3) self-assessment tests through tests and quizzes and (4) an online discussion forum for clearing the doubts. Steps have been taken to enrich the learning experience by using audio-video and multi-media and state of the art pedagogy / technology.

In order to ensure that best quality content is produced and delivered, nine National Coordinators have been appointed. They are:

1. AICTE (All India Council for Technical Education) for self-paced and international courses
2. NPTEL (National Programme on Technology Enhanced Learning) for Engineering
3. UGC (University Grants Commission) for non-technical post-graduation education
4. CEC (Consortium for Educational Communication) for under-graduate education
5. NCERT (National Council of Educational Research and Training) for school education
6. NIOS (National Institute of Open Schooling) for school education
7. IGNOU (Indira Gandhi National Open University) for out-of-school students
8. IIMB (Indian Institute of Management, Bangalore) for management studies
9. NITTTR (National Institute of Technical Teachers Training and Research) for Teacher Training programme

Two types of courses are offered on SWAYAM platform: Credit Courses and Non- Credit Courses. Credit courses are offered for each semester in January and July every year. The list is available on SWAYAM official website: https://onlinecourses.swayam2.ac.in/

About NPTEL:

NPTEL (National Programme on Technology Enhanced Learning), is a joint venture of the IITs and IISc, funded by the Ministry of Education (MoE) Government of India, and was launched in 2003. Initially started as a project to take quality education to all corners of the country, NPTEL now offers close to 600+ courses for certification every semester in about 22 disciplines.

Some highlights:

▪ Largest online repository in the world of courses in engineering, basic sciences and selected humanities and management subjects

▪ YouTube channel for NPTEL – most subscribed educational channel, 1.3 billion views and 40+ lakhs subscribers

- More than 56000 hours of video content, transcribed and subtitled

- Most accessed library of peer-reviewed educational content in the world

- Translation of more than 12000 hrs of English transcripts in regional Indian languages

NPTEL Online Certification:

The objective of enabling students obtain certificates for courses is to make students employable in the industry or pursue a suitable higher education programme. Through an online portal, 4, 8, or 12-week online courses, typically on topics relevant to students in all years of higher education along with basic core courses in sciences and humanities with exposure to relevant tools and technologies, are being offered. Enrolment to and learning from these courses is free. Following these online courses, an in-person, proctored certification exam is conducted and a certificate is provided through the participating institutions and industry, as applicable.

Some statistics regarding the open online courses since March 2014 till Dec 2021

Completed courses: 3496;

Enrollments across courses: 1.58 CRORE +

Number of exam registrations: 15.1 LAKH +

All the statistics pertaining to completed courses are available at https://beta.nptel.ac.in/courses

All courses are completely free to enroll and learn from. The certification exam is optional and comes at a fee of Rs 1000/course exam.

2. MOOCs at Poornima University:

MOOCs envelops best in class teaching - learning processes along with meeting the requirements of various courses in terms of quality of teaching and evaluation system. To promote the MOOCs among students of Poornima University, it is decided to consider the credits earned through MOOCs.

(a) Options for MOOCs at Poornima University

(For this document, only those MOOCs will be considered which are available on SWAYAM & NPTEL platforms)

- Credit and Non-credit SWAYAM MOOCs can be opted by anyone, anytime, anywhere and in any language. However, prior-permission of the University Authorities is mandatory if the credits are to be transferred to regular degree.

- In case of credit courses, there are two ways to opt these courses for the purpose of credit transfer to PU system as given below:

OPTION–I: As Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards):

Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards) are available at University level in offline mode for which relevant booklets are already published. **These courses carries 02 credits.** These category/type of courses (similar/different) are also available as MOOC courses. The respective Deans / HODs shall provide both the options to all the students to either select offline courses or MOOCs as per details given below:

- Deans / HODs shall prepare a list of upto 05 appropriate MOOC courses of 02/03 credits each, well in advance (at-least 15 days prior to commencement of semester) and take approval from the Office of Dean, Academics / Pro-President, PU.

- After approval, the respective Deans / HODs shall circulate a notice to all their respective students so that they can select any one course from the list, the credits **(only 02)** of which will be counted against Open Elective/ Multidisciplinary courses pertaining to that particular semester.

- If the students are not willing to opt for MOOC Open Elective/ Multidisciplinary course, they can proceed with the current offline practice of opting for Multidisciplinary courses.

- The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean.

OR

OPTION–II: As Major / Minor Courses:

▪ Deans / HODs shall identify a course of **03 credits** for each semester, well in advance (at-least 15 days prior to commencement of semester) and take approval from the Office of Dean, Academics / Pro-President, PU.

▪ After approval, the respective Deans / HODs shall circulate a notice to all their respective students citing that the particular course will be conducted through MOOCs only and is compulsory for all respective students. The credits of this course will be counted against Major/Minor courses pertaining to that particular semester.

▪ The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean.

▪ This is to be noted that if Deans / HODs decide to conduct any major/minor course in any semester through MOOCs, no offline course will be conducted against that.

(b) Important points related to MOOCs at Poornima University

▪ Only one MOOC shall be allowed in a particular semester for the purpose of credit transfer in the beginning.

▪ No attendance will be taken for MOOC courses.

▪ Last period of T/T/S shall be taken for MOOC courses which shall be in self-study mode.

▪ The method of assessments of MOOC such as assignments and examination are completely associated with that particular MOOC and no exam will be conducted by the department as well as by the Examination Cell.

▪ The respective Dean / HOD must submit the detail of course i.e., code, name and credit of MOOC opted against that particular course in particular semester attached with highlighting in the related examination scheme of syllabus of that semester signed by BOS Convener / HoD and Dean of Faculty to the office of Pro-President before commencement of the classes.

▪ SWAYAM will award a certificate to all the students passing the examination along with the credit earned. The center of examination for SWAYAM MOOCs will be finalized by SWAYAM. All the responsibility related to registration for MOOCs, timely submission of assignments, examinations etc. will be borne by the students only.

▪ The list of registered students in MOOC along with name of course will be submitted to the Examination Cell by the Deans / HoDs before commencement of the classes.

▪ Any student who would not be able to register/present/clear/pass the MOOC in the stipulated time, it is the choice of the student that he or she may register in next semester (odd or even) with MOOC again or appear as a back exam candidate of the University as per PU norms.

▪ There will be no provision of re-evaluation of MOOC.

▪ The scorecard and related certificate of MOOC along with a consolidated list of students with marks of assignment and final exam will be submitted to the examination cell by the concerned Dean / HOD for further process. It is also recommended that alteration/changes/scaling in marks obtained by the students in any MOOC will not be considered.

▪ The exam registration fee of MOOC up to Max. INR 1000/- will be reimbursed to the student only after successful completion of the course in first attempt and submission of the fee receipt, score-card and certificate of the MOOC to the concerned department within stipulated time after declaration of the results.

NOTE: This is to be noted that the procedure for getting approval from BOS, Faculty Board, Academic Council and BoM is to be followed as per regular process.
Attached Items:

Open Elective Booklet	Annexure-1
Soft Skills Booklet	Annexure-2
Value Added Course Booklet	Annexure-3

POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

Name of Program : MCA General   **Duration: 2 years**   **Total Credits: 82**

Teaching Scheme for Batch 2023-25

Course Code	Name of Course	Teaching Scheme				Marks Distribution				Credits
		Lecture (L)	Tutorial (T)	Practical (P)	SH	IE	ESE	Total		
A.	**Major (Core Courses)**									
A.1	**Theory**									
MCACSA1101	Foundation of Mathematics	3			1*	40	60	100		3
MCACCA1101	Programming in C	3			1*	40	60	100		3
MCACCA1102	Data Structure and Algorithms	3			1*	40	60	100		3
MCACCA1103	Python Programming	3			1*	40	60	100		3
MCACCA1104	Linux Shell Programming	3			1*	40	60	100		3
A.2	**Practical**									
MCACCA1201	Programming in C Lab			2		60	40	100		1
MCACCA1202	Data Structure and Algorithm Lab			2		60	40	100		1
MCACCA1203	Python Programming Lab			2		60	40	100		1
MCACCA1204	Linux Shell Programming Lab			2		60	40	100		1
B.	**Minor Stream Courses/Department Elective**									
B.1	**Theory**									
MCAECA1111/ MCAECA1112/ MCAECA1113	Software Engineering/ Computer Graphics and Multimedia/ Data Mining and Data Warehouse	3			1*	40	60	100		3
B.2	**Practical**									
	-	-	-	-	-	-	-	-		-
C	**Multidisciplinary Courses**									
	-	-	-	-	-	-	-	-		-
D	**Ability Enhancement Courses (AEC)**									
MULCHU1201	Personality Development & Emotional Intelligence			2		60	40	100		1
E	**Skill Enhancement Courses (SEC)**									
MULCSE1201	Skill Enhancement Generic course –I			2		60	40	100		1
F	**Value Added Courses (VAC)**									
G	**Summer Internship / Research Project / Dissertation**									
Total		18		12	6*					
Total Teaching Hours		30/36								24

SH: Supporting Hours

- Classes will be conducted fortnightly

POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

| Name of Program : MCA General | | | | | | Duration: 2 years | | Total Credits: | 82 |

Teaching Scheme for Batch 2023-25

Semester-II

Course Code	Name of Course	Teaching Scheme				Marks Distribution				Credits
		Lecture (L)	Tutorial (T)	Practical (P)	SH	IE	ESE	Total		
A.	**Major (Core Courses)**									
A.1	**Theory**									
MCACCA2101	OOPs with Java	3			1*	60	40	100		**3**
MCACCA2102	Design & Analysis of Algorithms	3			1*	60	40	100		**3**
MCACCA2103	Data Base Management System	3			1*	60	40	100		**3**
MCACCA2104	Web Technologies	3			1*	60	40	100		**3**
A.2	**Practical**									
MCACCA2201	OOPs with Java Lab			2		40	60	100		**1**
MCACCA2202	Design & Analysis of Algorithms Lab			2		40	60	100		**1**
MCACCA2203	Data Base Management System Lab			2		40	60	100		**1**
MCACCA2204	Web Technologies Lab			2		40	60	100		**1**
B.	**Minor Stream Courses/Department Elective**									
B.1	**Theory**									
MCAECA2111/ MCAECA2112/ MCAECA2113	Computer Architecture/ Soft Computing/ Internet of Things	3			1*	60	40	100		**3**
B.2	**Practical**									
C	**Multidisciplinary Courses**									
MCAEMC2121	MOOC Course-I	1	-	-	1*	40	60	100		**1**
D	**Ability Enhancement Courses (AEC)**									
MULCHU2201	Spoken English & Communication Skills I			2		60	40	100		**1**
E	**Skill Enhancement Courses (SEC)**									
MULCSE2201	Skill Enhancement Generic Course II			2		60	40	100		**1**
F	**Value Added Courses (VAC)**									
G	**Summer Internship / Research Project / Dissertation**									
MCACCA2401	Industrial Training Seminar-I			2		60	40	100		**1**
	Total	**16**	-	**14**	**6***					
	Total Teaching Hours	**30/36**								**23**

SH: Supporting Hours

- Classes will be conducted fortnightly

Name of Program : MCA General					Duration: 2 years			Total Credits:	82

<div align="center"><u>Teaching Scheme for Batch 2023-25</u></div>

<div align="center">Semester-III</div>

Course Code	Name of Course	Teaching Scheme			SH	Marks Distribution				Credits
		Lecture (L)	Tutorial (T)	Practical (P)		IE	ESE	Total		
A.	**Major (Core Courses)**									
A.1	**Theory**									
MCACCA3101	Operating System	3			1*	40	60	100		3
MCACCA3102	Computer Networks	3	-	-	1*	40	60	100		3
MCACCA3103	Cloud Computing	3			1*	40	60	100		3
MCACCA3104	Artificial Intelligence	3	-	-	1*	40	60	100		3
A.2	**Practical**									
MCACCA3201	Operating System Lab	-	-	2		60	40	100		1
MCACCA3202	Computer Networks Lab			2		60	40	100		1
MCACCA3203	Cloud Computing Lab	-	-	2		60	40	100		1
MCACCA3204	Artificial Intelligence Lab			2		60	40	100		1
B.	Minor Stream Courses/**Department Elective**									
B.1	**Theory**									
MCAECA3111/ MCAECA3112/ MCAECA3113	Big Data/ Blockchain Technology/ Mobile Application Development	3			1*	40	60	100		3
B.2	**Practical**									
C	Multidisciplinary Courses									
MCAEMC3121	MOOC Course-II	1	_	_	1*					1
D	Ability Enhancement Courses (AEC)									
MULCHU3201	Spoken English & Communication Skills II	-	-	2		60	40	100		1
E	Skill Enhancement Courses (SEC)									
MULCSE3201	Skill Enhancement Generic Course –III	-	-	2		60	40	100		1
F	Value Added Courses (VAC)									
G	Summer Internship / Research Project / Dissertation									
MCACCA3401	Industrial Training Seminar-II			2		60	40	100		1
	Total	16	-	14	6*					
	Total Teaching Hours		30/36							23

SH: Supporting Hours

- Classes will be conducted fortnightly

POORNIMA UNIVERSITY, JAIPUR
Faculty of Computer Science and Engineering

Name of Program : MCA General						Duration: 2 years		Total Credits: 82	

Teaching Scheme for Batch 2023-25

Semester-IV

Course Code	Name of Course	Teaching Scheme				Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)	SH	IE	ESE	Total	
A.	**Major (Core Courses)**								
A.1	**Theory**								
	NIL								
A.2	**Practical**								
	NIL								
B.	Minor Stream Courses/**Department Elective**								
B.1	**Theory**								
	NIL								
B.2	**Practical**								
	NIL								
C	**Multidisciplinary Courses**								
	NIL								
D	**Ability Enhancement Courses (AEC)**								
	NIL								
E	**Skill Enhancement Courses (SEC)**								
MULCSE4201	Skill Enhancement Generic Course- IV			2		60	40	100	1
F	**Value Added Courses (VAC)**								
G	**Summer Internship / Research Project / Dissertation**								
MCACCA4501	Project/Internship			22		60	40	100	11
	Total	-		24		-	-	-	
	Total Teaching Hours		24						12

Semester-I

Major (Core Courses)
Theory

Code: MCACSA1101	Foundation of Mathematics	3 Credits [LTP: 3-0-0]

COURSE OUTCOME:

The student would be able to:

- Describe the basic concept of matrices and their various properties
- Obtain the solution of Eigen value and Eigen vectors and inverse of matrix using Cayley Hamilton theorem.
- Obtain important features of vector, Del operator and its various forms in gradient, divergence and curl.
- Solve the order and degree of differential equations and their solutions
- Analyze of complex number and their properties

A.   OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Matrix Theory**	**08**
2.	**Eigen Values**	**07**
3.	**Vector calculus**	**08**
4.	**Differential Equation**	**08**
5.	**Complex Algebra**	**07**

B.   DETAILED SYLLABUS

Unit	Unit Details
1.	**Matrix Theory**
	- Introduction of Unit - Introduction to the matrix theory - Types of matrices, - Inverse of matrices, - Rank of matrices, - Solving system of linear equations. - Conclusion of Unit
2.	**Eigen Values**
	- Introduction of Unit - Eigen values and Eigen vectors, - Cayley-Hamilton Theorem (without proof) with application , - Diagonalization of matrices. - Conclusion of Unit
3.	**Vector calculus**
	- Introduction of Unit - Scalar and Vector quantity - Derivative of a vector function, Velocity and accelerations - Basic concepts of vectors, gradient, divergence and curl of a vector. - Conclusion of Unit
4.	**Differential Equation**
	- Introduction of Unit - Basic idea of differential equations - Degree and order of Differential equation - Variable separation, Homogeneous, - Linear equations and equations reducible to linear form

5.	Complex Algebra		
	•	Introduction of Unit	
	•	Introduction to the complex algebra, complex numbers,	
	•	Geometrical representation of complex numbers,	
	•	Argand diagram,	
	•	De- Moirvre's theorem	
	• Conclusion of Unit		

Exact Differential equation
Conclusion of Unit

C.

ECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Higher Engineering Mathematics	Ramana B. V.	Latest	Tata McGraw – Hill
2.	Engineering Mathematics	Babu Ram	Latest	Pearson
3.	Higher Engineering Mathematics	B S Grewal	Latest	Khanna Publication
Reference Book				
1.	Higher Engineering Mathematics, Grewal B. S. and Grewal J. S, Khanna Publishers, New Delhi, Latest Edition			
2.	Engineering Mathematics, KreyszigErrwin, John Wiley& Sons, New York, Latest Edition			
Online Recourses				
1.	https://www.tutorialspoint.com/mathematical-foundation-introduction			
2.	https://archive.nptel.ac.in/courses/111/104/111104071/			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2		-	-	-	-	-	-	-	-	-	-	-
CO3	-	2		1	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	2	2	1	-	-	-	-	-	-	-	-	-	-
CO5	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: MCACCA1101	Programming in C	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Illustrate the concept of data types, loops, functions, array, pointers, string, structures and files.
- Analyze the conditional and iterative statements to write C programs.
- Develop user defined functions to solve real life problems.
- Design C programs using pointers and to allocate memory using dynamic memory management functions.
- Apply programming concepts to compile and debug c programs to find solutions.

A.   OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to CProgramming**	**7**
2.	**Decision Making & Looping**	**7**
3.	**Array, String and Functions**	**8**
4.	**Advance programminginC**	**8**
5.	**File handling & Additionalfeatures**	**8**

B.   DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to CProgramming**
	• Introduction of Unit
	• Introduction to computer-based problem solving, Program design and implementation issues- Flowcharts & Algorithms, Top-down design & stepwise refinement
	• Programming environment – Machine language, assembly language, high level languages, Assemblers,Compilers, and Interpreters.
	• Overview of C, Data Types, Constants & Variables, Literals, Operators & Expressions
	• Conclusion of Unit
2.	**Decision Making & Looping**
	• Introduction of Unit
	• Decision making in C- if statement, if-else statement, Nested if statement, if else if Ladder, Switch case
	• Loop control in C – for loop, while loop, do-while loop
	• Control flow in C- break, continue and goto statement.
	• Conclusion of Unit
3.	**Array, String and Functions**

	• Introduction of Unit	
	• Array- 1D array, 2D array and dynamic array	
	• Scope rules- Local & global variables, scope rules of functions	
	• Functions-parameter passing, call by value and call by reference, calling functions with arrays, command line argument, recursion- basic concepts.	
	• String – String in build function	
	• Conclusion of the Unit	
4.	**Advance programminginC**	
	• Introduction of Unit	
	• Pointers- pointer expression, assignments, arithmetic, comparison, arrays of pointers, pointers to pointers, initializing pointers, pointers to functions, function retuning pointers.	
	• Structures- Basics, declaring, referencing structure elements, array of structures, passing structures to functions, structure pointers, arrays and structures within structures, typedef.	
	• Unions – Declaration, uses	
	• Enumerated data-types	
	• Conclusion of the Unit	
5.	**File handling & Additionalfeatures**	
	• Introduction of Unit	
	• File Handling – The file pointer, file accessing functions-fopen, fclose, putc, getc, fprintf, reading and writing into a file	
	• Advance features- storage classes and dynamic memory allocation	
	• C Preprocessor- #define, #include, #undef, Conditional compilation directives.	
	• C standard library and header files: Header files, string functions, mathematical functions, Date and Time functions.	
	• Conclusion of the Unit	

C.   **RECOMMENDED STUDY MATERIAL**

S. No	Text Books:	Author	Edition	Publication
1.	Let us C, 6th Edition	YashwantKanetka	PBP Publication	Let us C, 6th Edition
2.	Programming in ANSI C 3rd Edition, 2005	Balaguruswamy	Tata McGraw Hill	Programming in ANSI C 3rd Edition, 2005
Reference Book				
1.	The C programming Language, Richie and Kenninghan, BPB Publication,2004			
2.	Absolute beginner's guide to C, Greg M. Perry, Edition 2, Publisher: Sams Pub., 1994			
Online Resources				
1.	https://nptel.ac.in/courses/106104128			
2.	https://www.tutorialspoint.com/cprogramming/index.htm			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2		-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	2	2	1	-	-	-	-	-	-	-	-	-	-
CO5	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

| Code: MCACCA1102 | Data Structure and Algorithms | 3 Credits [LTP: 3-0-0] |

COURSE OUTCOME

The student would be able:

- State various types of data structures and their uses according complexity.
- Illustrate the concept of searching and sorting techniques and apply on data.
- Analyze and design stack and queue data structure
- Design tree data structure for real life applications
- Design linked list and graph data structure for real life applications

A.   **OUTLINE OF THE COURSE**

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Complexity, Memory Allocation, and Arrays**	**08**
2.	**Sorting Techniques and Linked List**	**07**
3.	**Stack and Queue**	**08**
4.	**Tree and its Applications**	**08**
5.	**Graphs**	**08**

B.

ETAILED SYLLABUS

Unit	Unit Details
1.	**Complexity, Memory Allocation, Arrays, and Searching Techniques**
	• Introduction of Unit
	• Classification of data structures: primitive and non-primitive
	• Applications of data structures
	• Time and space complexity of an algorithm
	• Asymptotic Notations
	• Memory allocation functions: Malloc(), Calloc(), free() and realloc()
	• Array Operations
	• Search Techniques: Sequential search
	• Iterative and Recursive methods-Binary search
	• Conclusion of Unit
2.	**Sorting Techniques and Linked List**
	• Introduction of Unit
	• Sorting: General background and definition,
	• Bubble sort, Selection sort and Insertion sort
	• Merge sort and Quick sort.

	• Radix Sorts
	• Complexity of Sorting Algorithms
	• Components of linked list, Representation of linked list,
	• Advantages and disadvantages of linked list.
	• Types of linked list: Singly linked list, doubly linked list, Circular linked list,
	• Operations on singly linked list: creation, insertion, deletion, search and display.
	• Conclusion of Unit
3.	**Stack and Queue**
	• Introduction of Unit
	• Stack – Definition, Array representation of stack,
	• Operations on stack: Infix, prefix and postfix notations,
	• Conversion of an arithmetic expression from Infix to postfix,
	• Applications of stacks.
	• Queue: Definition, Array representation of queue,
	• Types of queue: Simple queue, Circular queue, Double ended queue (deque), Priority queue,
	• Operations on all types of Queues
	• Conclusion of Unit
4.	**Tree and its Applications**
	• Introduction of Unit
	• Binary Trees - Operations on Binary trees
	• Binary Tree Representations - node representation,
	• Internal and external nodes, implicit array representation
	• Binary Search Tree (BST),
	• BST Insertions, Searching, Traversing and Deletions
	• Introduction to AVL Tree, Heap Tree and General trees
	• Conclusion of Unit
5.	**Graphs**
	• Introduction of Unit
	• Graphs - An application of graphs - Representation
	• Shortest path algorithm - a flow Problem
	• Dijkstra's algorithm - An application of scheduling

		Graph Traversals
	•	Minimum Spanning Tree- Prims and Kruskal's Algorithm
	• Conclusion of Unit	

C.RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Data Structures using C	Tanenbaum A.S., Langsam Y. Augestein M.J	Latest	Pearson Education
2.	Data Structures and Program Design in C	Robert Kruse &ClovisL.Tondo	Latest	Prentice Hall
Reference Book				
1.	Weiss, "Data Structures and Algorithm Analysis in C", Addison Wesley, Second Edition, 2005.			
2.	Y.Langsam, M.J.Augestein, A.M.Tanenbaum, "Data Structures Using C and C++", 2nd Edition,Prentice Hall of India, 2000.			
Online Resources				
1.	https://nptel.ac.in/courses/106102064			
2.	https://www.coursera.org/learn/data-structures			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

COURSE OUTCOME

The student would be able to:

- Memorize Python basics and its data types.
- Use flow control to solve problems.
- Create functions to facilitate code reuse and flow control structure.
- Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow   statements.
- Identify the commonly used operations involving file systems and regular expressions.

A. **OUTLINE OF THE COURSE**

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Introduction To Python and Data Types**	**08**
2.	**Python Program Flow Control**	**07**
3.	**Python Functions, Modules and Packages**	**08**
4.	**Python String, List and Dictionary Manipulations**	**07**
5.	**Python File Operation**	**08**

B. **DETAILED SYLLABUS**

Unit	Unit Details
1.	**Introduction To Python and Data Types**
	- Introduction of Unit - Installation and Working with Python - Understanding Python variables, Operators - Understanding python blocks - Declaring and using Numeric data types: int, float, complex - Using string data type and string operations - Defining list and list slicing - Use of Tuple data type - Conclusion of Unit
2.	**Python Program Flow Control**
	- Introduction of Unit - Conditional blocks using if, else and elif - Simple for loops in python - For loop using ranges, string, list and dictionaries

	• Use of while loops in python
	• Loop manipulation using pass, continue, break and else
	• Programming using Python conditional and loops block
	• Conclusion of Unit
3.	**Python Functions, Modules And Packages**
	• Introduction of Unit
	• Organizing python codes using functions
	• Organizing python projects into modules
	• Importing own module as well as external modules
	• Understanding Packages
	• Powerful Lamda function in python
	• Programming using functions, modules and external packages
	• Conclusion of Unit
4.	**Python String, List and Dictionary Manipulations**
	• Introduction of Unit
	• Building blocks of python programs
	• Understanding string in build methods
	• List manipulation using in build methods
	• Dictionary manipulation
	• Programming using string, list and dictionary in build functions.
	• Conclusion of Unit
5.	**Python File Operation**
	• Introduction of Unit
	• Reading various types of files in python
	• Writing log files in python
	• Understanding read functions, read(), readline() and readlines()
	• Understanding write functions, write() and writelines()
	• Manipulating file pointer using seek
	• Programming using file operations.
	• Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1	Fundamentals of Python: First Programs	Kenneth Lambert	Latest	Course Technology, Cengage Learning
2	Python: The Complete Reference	Martin Brown	Latest	McGraw Hill
3	Programming and Problem Solving with Python	Ashok NamdevKamthane	Latest	McGraw Hill
Reference Book				
1	Python Programming Fundamentals: A Beginner's Handbook, By NischaykumarHegde, Educreation Publishing			
2	Python Programming: An Introduction to Computer Science, By John M. Zelle, Jim Leisy Publication			
Online Resources				
1	https://www.tutorialspoint.com/python/index.htm			
2	https://nptel.ac.in/courses/106106145			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	1		-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	2	2	1	-	-	-	-	-	-	-	-	-	-
CO5	-	3	2	1	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code:MCACCA1104	Linux Shell Programming	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Use various Linux commands that are used to manipulate system operations at admin level and a prerequisite to pursue job as a Network administrator.
- Write Shell Programming using Linux commands.
- Design and write application to manipulate internal kernel level Linux File System.
- Develop IPC-API's that can be used to control various processes for synchronization.
- Develop Network Programming that allows applications to make efficient use of resources available on different machines in a network.

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	Introduction to Linux and Linux utilities	07
2.	Introduction to shells	08
3.	Unix file structure	08
4.	Process and signals	07
5.	Inter process communication	07

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Linux and Linux utilities**
	- Introduction of Unit - INTRODUCTION TO LINUX AND LINUX UTILITIES: A brief history of LINUX, architecture of LINUX, - features of LINUX, introduction to vi editor. - Linux commands- PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, - rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, file handling utilities, security by file permissions, - process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, - ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text Processing utilities and backup utilities , tail, head , - sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio - Conclusion of Unit
2.	**Introduction to shells**
	- Introduction of Unit - Introduction to Shells: Linux Session, Standard Streams, Redirection, Pipes, Tee Command, - Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, - Variables, Predefined Variables, Options, Shell/Environment Customization. - Filters: Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, - Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, - Comparing Files. - Conclusion of Unit
3.	**Unix file structure**
	- Introduction of Unit - Grep: Operation, grep Family, Searching for File Content. - Sed :Scripts, Operation, Addresses, commands, Applications, grep and sed. - UNIX FILE STRUCTURE: Introduction to UNIX file system, inode (Index Node), file

4.	Process and signals
	• Introduction of Unit
	• PROCESS AND SIGNALS: Process, process identifiers, process structure: process table, viewing
	• processes, system processes, process scheduling, starting new processes: waiting for a process,
	• zombie processes, orphan process, fork, vfork, exit, wait, waitpid, exec, signals functions, unreliable
	• signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets.
	• File locking: creating lock files, locking regions, use of read and write with locking, competing locks,other lock commands, deadlocks.
	• Conclusion of Unit
	Inter process communication
	• Introduction of Unit
	• INTER PROCESS COMMUNICATION: Pipe, process pipes, the pipe call, parent and child
	• processes, and named pipes: fifos, semaphores: semget, semop, semctl, message queues: msgget,
	• msgsnd, msgrcv, msgctl, shared memory: shmget, shmat, shmdt, shmctl, ipc status commands.
	• INTRODUCTION TO SOCKETS: Socket, socket connections - socket attributes, socket addresses,
	• socket, connect, bind, listen, accept, socket communications.
	• Awk and perl Programming: Awk pattern scanning and processing language, BEGIN and END patterns, Awk arithmetic and variables, Awk built in variable names and operators, arrays, strings,
	• functions, perl; the chop() function, variable and operators, $_ and $. , Lists, arrays, regular expression and substitution, file handling, subroutines, formatted printing.
	• Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S.N o	Text Books:	Author	Edition	Publication
1.	Advanced Programming in the UNIX Environment	W. Richard. Stevens	3rd edition	Pearson Education
2.	Unix and shell Programming	Stephen Kochan, Patrick Wood	Latest	Sams
Reference Book				
1.	Linux System Programming, Robert Love, O'Reilly, SPD.			
2.	Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education.			
3.	UNIX Network Programming, W.R. Stevens, PHI. UNIX for Programmers and Users, 3rd Edition, Graham Glass, King Ables, Pearson Education			
Online Resources				
1.	https://www.tutorialspoint.com/unix/shell_scripting.htm			
2.	https://www.javatpoint.com/shell-scripting-tutorial			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2		-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	2	2	1	-	-	-	-	-	-	-	-	-	-
CO5	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Practical

Code: MCACCA1201	Programming in C Lab	1 Credits [LTP: 0-0-2]

Course Outcome:-

Students will be able to:

- Demonstrate concept of functional hierarchical code organization.
- Work with textual information, characters and strings
- Implement file handling concepts
- Implement real time applications using the power of C language features.
- Handle possible errors during program execution.

A.   LIST OF EXPERIMENTS:

1	Given the values of the variables x, y and z, write a program to rotate their values such that x has the value of y, y has the value of z, and z has the value of x
2	Write a program that reads a floating point number and then displays the right-most digit of the integral part of the number.
3	Write a C program to calculate the sum of digits of given number.
4	Program to find largest and smallest number from four given number.
5	Program to find whether a year is leap or not.
6	Write a C program in which enter any number by the user and perform the operation of Sum of digits of entered number.
7	Write a C Program to convert Decimal number to Binary number.
8	Find the sum of this series up to n terms 1+2+3+4+5+6+………..
9	Program to print Armstrong's numbers from 1 to 100.
10	Write a program to convert years into Minute, Hours, Days, Months, Seconds using switch () statements
11	Write a C menu driven program
12	Write a program to generate the various pattern of numbers
13	Write a C Program to print the reverse of an integer number
14	Write a C program to perform the factorial of given number
15	Write a C program in which a function prime that returns 1 if its argument is a prime and return zero otherwise.
16	Write a C program to calculate factorial of a number using recursion
17	Write a C program in which enter 10 elements by the user and perform the operation of sorting in ascending order
18	Write a C program to perform to perform Matrix addition and multiplication operations
19	Write a program to determine the length of the string and find its equivalent ASCII codes.
20	Write a program to delete all the occurrences of the vowels in a given text. Assume that the text length will be of

	one line	
21	Write a program to maintain the library record for 100 books with book name, author's name, and edition, year of publishing and price of the book	

B.   RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
	Let us C, 6th Edition YashwantKanetka PBP Publication	YashwantKanetkar	6th Edition	PBP Publication
	The C programming Language	2. Richie and Kenninghan	2. 2nd Edition 2004	PBP Publication,2004
	Programming in ANSI C	Balaguruswamy Tata McGraw Hill	3. 3rd Edition, 2005	Tata McGraw Hill
Reference Book				
	The C programming Language Richie and Kenninghan PBP Publication,2004			
	Programming in ANSI C 3rd Edition, 2005 Balaguruswamy Tata McGraw Hill			
Online Resources				
	https://www.programiz.com/c-programming/examples			
	https://www.w3resource.com/c-programming-exercises			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2		-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

| Code: MCACCA1202 | Data Structure and Algorithms Lab | 1 Credit [LTP: 0-0-2] |

Course Outcome:-

Students will be able to:

- Develop skills to design and analyze simple linear and nonlinear data structures.
- Choose appropriate data structures to represent data items in real world.
- Implement and know the application of algorithms for sorting and searching and data items.
- Design data structures such as stacks, queues, hash tables, binary trees, search trees, heaps, graphs, and B-trees according to the requirement of software.
- Implement ADTs such as lists, graphs, search trees in C to solve problems

A. LISTof PROGRAMS:

1.	Write a program to implement the linear array operations. (a) Insertanintegerintoagivenposition inan array. (b) Deletinganintegerfromanarray.
2.	Write a program to perform the following operations on matrix using array: Addition, Multiplication, Transpose
3.	Write a program to implement binary search.
4.	WriteaprogramtosortNnumbersusingselectionsort.
5.	WriteaprogramtosortNnumbersusingbubblesort.
6.	WriteaprogramtosortNnumbersusinginsertionsort.
7	Writeaprogramtoimplement mergesort
8..	Writeaprogramtoimplement quicksort.
9.	Write a program to implement stack operations
10.	Write a program to implement queue operations
11.	Creatingabinarysearchtree andtraversingitusinginorder,preorderandpost order.
12.	Perform deletion operation on binary search tree
13.	Create singly linked list and perform following operations on it.
14.	Insertinganodeinto asinglylinkedlist.
15.	Deletinga nodefromasinglylinkedlist.
16.	Searching a node from a singly linked list.
17.	Create a doubly linked list and perform insertion and deletion operations
18.	Write a program to implement BFS & DFS

B.   RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1	Data Structures using C	Tanenbaum A.S., Langsam Y. Augestein M.J	Latest	Pearson Education
2	Data Structures and Program Design in C	Robert Kruse &ClovisL.Tondo	Latest	Prentice Hall
Reference Books				
1	Weiss, "Data Structures and Algorithm Analysis in C", Addison Wesley, Second Edition, 2005.			
2	Y.Langsam, M.J.Augestein, A.M.Tanenbaum, "Data Structures Using C and C++", 2nd Edition,Prentice Hall of India, 2000.			
Online Resources				
1	https://nptel.ac.in/courses/106102064			
2	https://www.coursera.org/learn/data-structures			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	2	2	2	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-		1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	2	2	1	-	-	-	-	-	-	-	-	-	-
CO5	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: MCACCA1203	Python Programming Lab	1 Credits [LTP: 0-0-2]

COURSE OUTCOME

Students will be able to:

- Get the basic set of commands and utilities in Linux/UNIX systems
- Able to work on VI editor and its commands
- Apply the concept of shell script to do basic programming.
- Implement Shell script to perform conditional statements
- Implement Shell script to perform Looping statements.

A.   LIST OF EXPERIMENTS:

1	Write a python program to compute the GCD and LCM of two numbers.
2	Write python program to perform following operations on Lists: a) Create list b) Access list c) Update list (Add item, Remove item) d) Delete list
3	Write a Python program to remove the ‒i‖ th occurrence of the given word in a list where words repeat
4	Write a Python program to count the frequency of words appearing in a string using a dictionary.
5	Write Python program to create a dictionary with key as first character and value as words starting With that character.
6	Write a Python program to check if a substring is present in a given string.
7	Write a Python program to find the intersection and union of two lists.
8	Write a Python program to find the length of a list using recursion.
9	Writer a Python program to read a file and capitalize the first letter of every word in the file.
10	Write a Python program to read the contents of a file in reverse order
11	Write a python program to create a package (Engg), sub -package(years),modules (sem) and create staff and student function to module
12	Write a python program to read 3 subject marks and display pass or failed using class and object

B.   RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1	Advanced Programming in the UNIX Environment	W. Richard. Stevens	3rd	P Pearson Education, New Delhi, India
2	Introduction to Unix and Shell Programmin	M.G Vrenkateshmurthy	Latest	Pearson

Reference Book	
1	Linux System Programming, Robert Love, O'Reilly, SPD.

Online Resources	
1	https://www.udemy.com/course/linux-shell-scripting-free/?LSNPUBID=JVFxdTr9V80&ranEAID=JVFxdTr9V80&ranMID=39197&ranSiteID=JVFxdTr9V80-UsJPAU2ZeiS.IB5HWdi8Ug&utm_medium=udemyads&utm_source=aff-campaign
2	https://www.youtube.com/watch?v=cQepf9fY6cE

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	3	2	-	-	-	-	-	-	-	-	-	-
CO4	2	3	1	1	2	-	-	-	-	-	-	-	-	-	-
CO5	-	-	2	1		-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: MCACCA1204	Linux Shell Programming Lab	1 Credit [LTP: 0-0-2]

COURSE OUTCOME

Students will be able to:

- Use shell script to create files and handle text documents
- Create child processes, background process and zombies
- Familiarize basic concepts of shell programming
- Demonstrate use of system calls
- Demonstrate Inter process communication

A. LIST OF EXPERIMENTS:

1	Study and Practice on various commands like man, passwd, tty, script, clear, date, cal, cp, mv,ln, rm, unlink, mkdir, rmdir, du, df, mount, umount, find, unmask, ulimit, ps, who, w.
2	Study and Practice on various commands like cat, tail, head , sort, nl, uniq, grep, egrep,fgrep,cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, tar, cpio.
3	a) Write a Shell Program to print all .txt files and .c files. b) Write a Shell program to move a set of files to a specified directory.
4	c) Write a Shell program to display all the users who are currently logged in after a specified time. d) Write a Shell Program to wish the user based on the login time.
5	a) Simulate cat command. b) Simulate cpcommand.
6	a) Simulate head command. b) Simulate tail command.
7	a) Simulate mv command. b) Simulate nlcommand.
8	Write a program to handle the signals like SIGINT, SIGQUIT, SIGFPE.
9	Implement the following IPC forms a) FIFO b) PIPE
10	Implement message queue form of IPC.
11	Implement shared memory form of IPC.
12	Write a Socket program to print system date and time (Using TCP/IP).

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	UNIX Shell Scripting	Randal Michael	2003	Wiley
2.	Bash Cookbook	Carl Albing, JP Vossen	2017	O'Reilly
3.	Linux Command Line and Shell Scripting Bible	RichardBlum , ChristineBresnahan	2015	Wiley
Reference Book				
1.	Linux Command Line and Shell Scripting Bible 4th Edition by Richard Blum			
Online Resources				
1.	https://www.tutorialspoint.com/unix/shell_scripting.htm			
2.	https://www.javatpoint.com/shell-scripting-tutorial			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2		-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	2	2	1	-	-	-	-	-	-	-	-	-	-
CO5	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Department Elective

Theory

COURSE OUTCOME

After completion of the course, the students will be able to:

- Analyze software process models including traditional and evolutionary models
- Design applicable solutions in one or more application domains using software design methods that integrate planning and design process
- Draw UML diagram using basic behavioral modeling and advanced structured modeling
- Deliver quality software products by possessing the effective analytical skills by applying the testing processes
- Apply new software models, techniques and technologies to design a software project for the growth of the society

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	Software Engineering Fundamentals	07
2.	Software Project Planning	08
3.	Software Design and UML	08
4.	Software Testing	07
5.	AGILE Project Management	07

B.DETAILED SYLLABUS

Unit	Unit Details
1.	**Software Engineering Fundamentals**
	• Introduction of Unit • Software Engineering - A layered Technology, The importance of software, software myths, software engineering paradigms • Software Process Models: Linear Sequential Model, Prototyping Model, RAD Model • Evolutionary Software Process Models: Incremental Model, Spiral Model Component Assembly Model, Formal Methods, Fourth-Generation Techniques. • Conclusion of Unit
2.	**Software Project Planning**
	• Introduction of Unit • Software Project Planning, Size Estimation, Cost Estimation, Models, Static, single variable models, Static, Multivariable Models, COCOMO, The Putnam Resource Allocation Model,

		• Risk Identification and Projection: RMMM, Project scheduling and Tracking.
		• Software Design Process, Design Principles, and Design Concepts: Effective Modular Design, Design Heuristics, Design Documentation,
		• Design Methods: Data Design, Architectural Design, Interface Design, Human Computer Interface Design, Procedural Design. Case Study for Design of any Application Project.
		• Conclusion of Unit
3.	**Software Design and UML**	
		• Introduction of Unit
		• Unified Modeling Language, Basic structures and modeling classes, common modeling techniques, relationships, common mechanism, class diagrams.
		• Advanced structured modeling, advanced classes and relationships, interfaces, types and roles, instances and object diagram.
		• Basic behavioral Modeling: Use cases, use case diagrams, Interaction diagram, Activity diagrams, state chart diagrams, component diagrams, deployment diagrams, patterns and frame works.
		• Conclusion of Unit
4.	**Software Testing**	
		• Introduction of Unit
		• S/W Testing Fundamentals, Unit, integration, system testing, black box and white box testing Incremental testing, formal proof of correctness, software matrix
		• Automated Testing: Introduction to Automated testing, Software testing with automated tools
		• Conclusion of Unit
5.	**AGILE Project Management**	
		• Introduction of Unit
		• Agile Programming- Introduction, Flavors of Agile Development, Agile Manifesto, Refactoring Techniques, Limitations of the Agile Process.
		• Agile Modeling: Introduction, Agile Modeling – Principles, Comparing Waterfall and Agile Modeling
		• Scrum Methodology- The roles of Scrum, Project Artifacts, Meetings, Advantages of Scrum.
		• Conclusion of Unit

B.RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Software Engineering: A Practitioner"s Approach	Roger S Pressman, Bruce R Maxim	8th Edition	TMH.
2.	Software engineering	Ian Sommerville	9th Edition	Addison Wesley Longman
Reference Book				
1.	Grady Booch, James Rumbaugh, IvarJacobson.," The Unified Modeling Language User Guide", 2nd Edition, 2017			
2.	James Rumbaugh. MichealBlaha "Object oriented Modeling and Design with UML", 2011			
3.	Ali Behforooz, Hudson, "Software Engineering Fundamentals", Oxford, 2009			
4.	Charles Ritcher, "Designing Flexible Object Oriented systems with UML", TechMedia , 2008			
Online Resources				
1.	https://nptel.ac.in/courses/106105182			
2.	https://www.w3schools.in/sdlc/software-development-life-cycle-sdlc			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-		-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CO4	-	2	3	-	2	-	-	-	-	-	-	-	-	-	-
CO5	-	2	3	2		-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: MCAECA1112 Computer Graphics and Multimedia	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

The student would be able:

- State the basics of computer graphics, different graphics systems and applications of computer graphics.
- Identify the different color models.
- Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
- Use of geometric transformations on graphics objects and their application in composite form.
- Extract scene with different clipping methods and its transformation to graphics display device.

A.   OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to computer graphics & graphics systems	08
2.	Scan Conversion Points, Lines& Circles	07
3.	2D & 3D Transformations	08
4.	Viewing & Hidden Surfaces Detections	07
5.	Introduction to Multimedia	08

B.DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to computer graphics & graphics systems**
	• Introduction of Unit • Overview of computer graphics • Representing pictures • Preparing, presenting & interacting with pictures for presentations • Visualization & image processing • RGB color model, direct coding • Raster scan display • Conclusion of Unit
2.	**Scan Conversion Points, Lines& Circles**
	• Introduction of Unit • Concepts of Pixels, Resolution, Persistence, Aspect Ratio • Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, • Circle generation algorithm, Ellipse generating algorithm • Scan line polygon, fill algorithm, boundary fill algorithm, flood fill

		algorithm
		• Conclusion of Unit
3.	**2D & 3D Transformations**	
		• Introduction of Unit
		• 2D-Translation, 2D-Rotation, 2D-Scaling
		• 2D-Matrix representations & homogeneous coordinates,
		• Transformations between coordinate systems
		• Reflection shear
		• 3D-Translation, 3D-Rrotation, 3D-Scaling
		• Conclusion of Unit
4.	**Viewing & Hidden Surfaces Detections**	
		• Introduction of Unit
		• Window to viewport
		• Co-ordinate transformation, clipping operations
		• Point clipping, line clipping,
		• Clipping circles, polygons & ellipse
		• Z-buffer algorithm, Back face detection, BSP tree method,
		• Hidden line elimination
		• Conclusion of Unit
5.	**Introduction to Multimedia**	
		• Introduction of Unit
	• Concepts, uses of multimedia, hypertext and hypermedia.	
	• Image, video and audio standards	
	• Digital audio, MIDI, processing sound, sampling, compression	
	• MPEG compression standards, compression through spatial and temporal redundancy	
	• Inter-frame and intra-frame compression	
	• Animation: types, techniques, key frame animation	
	• Virtual Reality concepts.	
	• Conclusion of Unit	

C.RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Computer Graphics	Donald Hearn and Pauline Baker M	Latest	Prentice Hall, New Delhi
2.	Procedural Elements of Computer Graphics	Rogers	Latest	Tata McGraw Hill
Reference Book				
1.	Foley, Vandam, Feiner and Hughes, ―Computer Graphics: Principles and Practice‖, 2nd Edition, Pearson Education,			
2.	Jeffrey McConnell, Computer Graphics: Theory into Practice, Jones and Bartlett Publishers			
3.	Andleigh, P. K and Kiran Thakrar, Multimedia Systems and Design, PHI,			
Online Resources				
1	https://nptel.ac.in/courses/106106090			
2	https://www.javatpoint.com/computer-graphics-tutorial			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	2	-	-	-	-	-	-	-	-	-	-	-
CO4	-	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

COURSE OUTCOME

Students will be able to

- Design a data warehouse system and perform business analysis with OLAP tools.
- Apply suitable pre-processing and visualization techniques for data analysis
- Apply frequent pattern and association rule mining techniques for data analysis and apply appropriate classification and clustering techniques for data analysis
- Design a data mart or data warehouse for any organization
- Extract knowledge using data mining techniques and Adapt to new data mining tools.

A.   **OUTLINE OF THE COURSE**

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Data Warehousing, Business Analysis And On-Line Analytical Processing (Olap)	08
2.	Data Mining – Introduction	07
3.	Data Mining – Frequent Pattern Analysis	08
4.	Classification And Clustering	07
5.	Weka Tool	08

B.DETAILED SYLLABUS

Unit	Unit Details
1.	**DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING (OLAP)**
	- Introduction of Unit - Basic Concepts – Data Warehousing Components - Building a Data Warehouse - Database Architectures for Parallel Processing - Parallel DBMS Vendors – Multidimensional Data Model - Data Warehouse Schemas for Decision Support, Concept Hierarchies – - Characteristics of OLAP Systems - Typical OLAP Operations, OLAP and OLTP. - Conclusion of Unit
2.	**DATA MINING – INTRODUCTION**
	- Introduction to Data Mining Systems - Knowledge Discovery Process – Data Mining Techniques – Issues –

	applications
	• Data Objects and attribute types, Statistical description of data
	• Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization
	• Data Visualization, Data similarity and dissimilarity measures.
	• Conclusion of Unit
3.	**DATA MINING – FREQUENT PATTERN ANALYSIS**
	• Introduction of Unit
	• Mining Frequent Patterns, Associations and Correlations
	• Mining Methods- Pattern Evaluation Method
	• Pattern Mining in Multilevel, Multi Dimensional Space
	• Constraint Based Frequent Pattern Mining,
	• Classification using Frequent Patterns
	• Conclusion of Unit
4.	**CLASSIFICATION AND CLUSTERING**
	• Introduction of Unit
	• Decision Tree Induction
	• Bayesian Classification – Rule Based Classification – Classification by Back Propagation –
	• Support Vector Machines — Lazy Learners – Model Evaluation and Selection-
	• Techniques to improve Classification Accuracy.
	• Clustering Techniques – Cluster analysis-Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods –
	• Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods.
	• Conclusion of Unit
5.	**WEKA TOOL**
	• Introduction of Unit
	• Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database –
	• Introduction to WEKA,
	• The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.
	• Conclusion of Unit

C.RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Data Mining Concepts and Techniques,	Jiawei Han and Micheline Kamber	Third Edition	Elsevier, 2012
Reference Book				
1.	Alex Berson and Stephen J.Smith, ―Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016.			
2.	K.P. Soman, ShyamDiwakar and V. Ajay, ―Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.			
3.	Ian H.Witten and Eibe Frank, ―Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.			
Online Resources				
1	https://www.tutorialspoint.com/data_mining/index.htm			
2	https://nptel.ac.in/courses/106105174			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	-	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Ability Enhancement Courses (AEC)

Code: MULCHU1201	Personality Development and Emotional Intelligence	1 Credit [LTP:0-0-2]

Course Outcomes:

On successful completion of the course the learners will be able to

- Realize the art of Power Dressing and making a great first impression by polishing their Corporate/ Business manners.
- Enhance their self-esteem, confidence and assertive behaviour to handle difficult situations with grace, style, and professionalism.
- Apply the understanding of harmony in existence in their profession and lead an ethical life.
- Recognize and use emotional intelligence to create and maintain productive workplace relationships and team environment.
- Apply collaborative, inclusive and creative communication skills.

A.   OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	Personal Grooming & Attitude Building	6
2	Mentoring & Interpersonal Skills	6
3	Conflict & Stress Management	7
4	Social Skills Development	7
5	Self Esteem Enhancement	2

B.   DETAILED SYLLABUS

Unit	Unit Details	
1.	**Personal Grooming & Attitude Building**	**Method**
	- Introduction of the Course & the topic - Impactful Personality - Attitude Building Activities - Self-Grooming & Dressing Sense - Time Management - Team Building Activities - Conclusion & Summary of the Unit	- Theory/Practical - Theory - Practical - Practical - Practical - Practical - Theory/ Practical
2.	**Mentoring & Interpersonal Skills**	
	- Introduction of the topic - Mentoring: Coaching one or more people - Leadership: Leading and assisting others by example - Problem Solving: Resolving personal, group, and business conflict - Communicating with Confidence - Conclusion & Summary of the Unit	- Theory/Practical - Practical - Practical - Practical - Practical - Theory/ Practical
3.	**Conflict & Stress Management**	

		•	Theory/Practical
	• Introduction of the topic	•	Theory/Practical
	• The role of communication in conflict/stress and conflict/stress management processes.	•	Theory/Practical
	• Analyse the components of conflict/stress that lead to constructive or destructive communication patterns.		
	• Recommend effective conflict/stress management communication for a given situation	•	Theory/Practical
	• Practice Sessions.		
	• Conclusion & Summary of the Unit	•	Practical
		•	Theory/Practical
4.	**Social Skills Development**		
		•	Theory/Practical
	• Introduction of the topic	•	Practical
	• Listening Skills activities	•	Practical
	• Social Problem Solving	•	Practical
	• Being a part of the group and expression of feelings	•	Theory/Practical
	• Conclusion & Summary of the Unit		
5.	**Self Esteem Enhancement**		
	• Introduction of the topic	•	Theory/Practical
	• Face your Fear & Speak with Confidence	•	Practical
	• Case Study/Class Survey	•	Practical
	• Personal Growth & Development Session	•	Practical
	• Conclusion & Summary of the Unit	•	Theory/Practical

Skill Enhancement Courses (SEC)

Code: MULCSE1201	Skill Enhancement Generic Course-I	1 Credit [LTP:0-0-2]

COURSE OUTCOMES:

Students will be able to:

CO.1: Enhance problem solving skills.

CO.2: Prepare for various public and private sector exams & placement drives

CO.3: Communicate effectively & appropriately in real life situation.

CO.4: Improve verbal ability skill among students.

CO.5: Enrich their knowledge and to develop their logical reasoning thinking ability.

LIST OF ACTIVITIES	
1	SMART Goals,Goal Setting (IKIGAI), Wheel of Satisfaction, Exchanging pleasantries
2	Root Words, Prefix-Suffix, Antonyms, Synonyms & Analogies, Sentence Correction-1
3	Numbers,Relations& Functions, HCF & LCM, Average & Divisibility
4	Resume Tips & Resume Review
5	How to win friends & Influence people, Sentence Correction-2
6	Series & Progressions
7	Number Series & Letter Series, Crypto-arithmetic, SWOT/SWOC
8	Percentage, Profit & Loss, Ratio Proportion, CI & SI
9	Mixtures and Allegations, Short Cut Tricks, Seating Arrangement, Sequencing & Ranking
10	Surds & Indices, Problem on ages,Solving Equations - Quadratic & Linear
11	Time & Distance, Boats & Streams, Clocks and Calendars
12	GD, Practice of GD, Reading and Comprehension

Semester-II

Code: MCACCA2101	OOPs with Java	3 Credits [LTP:3-0-0]

COURSE OUTCOME

- Describe the concepts and features of object oriented programming
- Execute java's exception handling mechanism, multithreading, packages and interfaces.
- Implement object oriented programming concepts using java
- Apply object oriented programming features and concepts for solving given problem
- Implement the concept of class and objects with access control to represent real world entities.

A.   OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Java**	**08**
2.	**Working with classes ,objects and Inheritance**	**09**
3.	**Packages, Interfaces & Exception Handling**	**09**
4.	**Multithreaded Programming & Applet**	**07**
5.	**JAVA Database Connectivity (JDBC) and Java 8 Features**	**07**

B.   DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Java**
	• Introduction to Unit
	• History and Overview of Java
	• Object Oriented Programming features.
	• Class Fundamentals
	• Declaring objects, Assigning object reference variables.
	• Literals, variables comments, separators,
	• Scope and Life Time of Variables
	• Data types - Integers, Floating point, characters, Boolean,
	• Type conversion and casting
	• Operators - Arithmetic operators, Bit wise operators, Relational Operators, Boolean Logical operators, Assignment Operator, Operator Precedence.
	• Conclusion of unit
2.	**Working with classes, objects and Inheritance**
	• Introduction to Unit
	• Control Statements – Selection Statements - if, Switch, Iteration Statements - While,

Do-while, for Nested loops, Jump statements.

- Methods - constructors, "this" keyword, finalize ( ) method A stack class, Over loading methods. Using objects as parameters, Argument passing, Returning objects.

- Recursion, Access control, introducing final, understanding static.

- Introducing Nested and Inner classes.

- Command line arguments.

- Inheritance – Basics, Using super, method overriding, and Dynamic method Dispatch, Using abstract classes and final with Inheritance.

- Conclusion of Unit

3.	Packages, Interfaces & Exception Handling

- Introduction to Unit

- Definition and Implementation, Access protection importing packages.

- Interfaces: Definition and implementation.

- Exception Handling – Fundamentals, types, Using try and catch

- Multiple catch clauses

- Nested try Statements, Throw, finally.

- User Defined Exception

- Conclusion of Unit

4.	Multithreaded Programming & Applet

- Introduction of Unit

- Java thread model – main thread, creating single Multithreading

- Is alive ( ) and join ( ) Methods

- Thread – Priorities, Synchronization

- Inter thread communication, suspending, resuming and stopping threads

- Reading control input, writing control output, Reading and Writing files.

- Applet Fundamentals – AWT package

- AWT Event handling concepts.

- Conclusion of Unit

5.	JAVA Database Connectivity (JDBC) and Java 8 Features

- Introduction to Unit

- Database connectivity – JDBC architecture and Drivers.

- JDBC API - loading a driver, connecting to a database, creating and executing JDBC

statements

- Handling SQL exceptions.

- Accessing result sets: types and methods.

- JDBC application to query a database.

- Introduction to java 8 features :-Functional Interfaces And Lambda Expressions

- Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1	The complete reference Java –2	Herbert Schildt	V Edition,	TMH.
2	SAMS teach yourself Java – 2	Rogers Cedenhead and Leura Lemay	3rd Edition,	Pearson Education
Reference Book				
1	The complete reference Java –2			
2	SAMS teach yourself Java – 2			
Online Resources				
1	https://www.programiz.com/java-programming/online-compiler/			
2	https://www.tutorialspoint.com/compile_java_online.php			
3	https://onecompiler.com/java			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	_	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code:MCACCA2102	Design and Analysis of Algorithm	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

After completion of the course, the students will be able to:

- Analyze the asymptotic performance of algorithms
- Choose appropriate algorithm design paradigm like Divide and Conquer and Greedy for solving engineering problems
- Apply Dynamic Programming and Backtracking to solve engineering problems
- Solve common engineering design problems using Randomize algorithms
- Evaluate arithmetic expressions using parallel model.

A.   OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	Introduction to Analysis of Algorithms	07
2.	Divide and Conquer and Greedy Methods	08
3.	Dynamic Programming and Backtracking	08
4.	Randomized Algorithms	07
5.	Parallel Models	07

B.DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Analysis of Algorithms**
	- Introduction of Unit - Algorithm definition and specification, Design of Algorithms, and Complexity of Algorithms, Asymptotic Notations, Growth of function, Recurrences, - Performance analysis - Elementary Data structures:- stacks and queues, trees, dictionaries, priority queues – sets and disjoint set union, graphs, basic traversal and search techniques. - Conclusion of Unit
2.	**Divide and Conquer and Greedy Methods**
	- Introduction of Unit - Divide and conquer:- General method, binary search, merge sort, Quick sort, - The Greedy method:-General method, knapsack problem, minimum cost spanning tree, single source shortest path. - Conclusion of Unit
3.	**Dynamic Programming and Backtracking**
	Introduction of Unit

| | | Dynamic Programming, general method, multistage graphs, all pair shortest path, optimal binary search trees, 0/1 Knapsack, traveling salesman problem, flow shop scheduling. |
| | | |

S.No	Unit
	• Dynamic Programming, general method, multistage graphs, all pair shortest path, optimal binary search trees, 0/1 Knapsack, traveling salesman problem, flow shop scheduling. • Backtracking:- general method, 8-Queens problem, sum of subsets, graph coloring, Hamiltonian cycles, knapsack problem, Branch and bound:- The Method, 0/1 Knapsack problem, traveling salesperson. • Conclusion of Unit
4.	**Randomized Algorithms**
	• Introduction of Unit • Randomized Algorithms: Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2- SAT. Problem definition of Multicommodity flow, Flow shop scheduling and Network capacity assignment problems. • Conclusion of Unit
5.	**Parallel Models**
	• Introduction of Unit • Parallel models:-Basic concepts, performance Measures, • Parallel Algorithms: Parallel complexity, Analysis of Parallel Addition, Parallel Multiplication and division • Parallel Evaluation of General Arithmetic Expressions, First-Order Linear recurrence. • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Design and analysis of Algorithms	Aho A.V , J.D Ulman	Third Edition	Addison Wesley
2.	Design and Analysis of Algorithms	Dave and Dave	Second Edition	Pearson
Reference Book				
1.	Introduction to Algorithms, Cormen, Leiserson, Rivest, Prentice Hall of India			
2.	Fundamental of Computer algorithms, Horowitz and Sahani			
Online Resources				
1.	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm			
2.	https://nptel.ac.in/courses/106106131			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-		-	-	-	-	-	-	-
CO3	2	3	2	-	-	-	-		-	-	-	-	-	-	-
CO4	-	2	3	2	-	-	-	-		-	-	-	-	-	-
CO5	-	-	-	-		-	-	-		-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code:MCACCA2103	Database Management System	3 Credits [LTP: 3-0-0]

Course Outcome

Students will be able to

- Describe DBMS architecture, physical and logical database designs, database modeling, relational, hierarchical and network models.
- Identify basic database storage structures and access techniques such as file organizations, indexing methods including B-tree, and hashing.
- Learn and apply structured query language (SQL) for database definition and database manipulation.
- Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
- Learn various transaction processing, concurrency control mechanisms and database protection mechanisms.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Introduction to Database Management System**	**7**
2	**RDBMS**	**7**
3	**SQL**	**7**
4	**PL/SQL**	**8**
5	**Oracle, Trigger and wrapping**	**7**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Database Management System**
	• Introduction to Database Management System
	• Characteristics of database approach
	• Advantages of DBMS
	• Schemas: Three schema architecture - The external level, the conceptual level and the internal level.
	• Data Independence
	• Database languages and Interfaces
	• Roles of Database Administrator
	• Introduction to Data Models (Hierarchical, Network and Relation)
	• Entity type, Entity sets, Attributes and keys.
	• The ER Model: ER Diagram & Database design with the ER Model
	• Conclusion of the Unit
2.	**RDBMS**
	• Introduction to Distributed Database
	• Classification of DBMS
	• Introduction to RDBMS
	• Relational Model –Concepts
	• Relational operations (Insert, delete, update, select, project, rename, union, intersection, minus, Join, division)
	• Transactions and ER mapping Examples
	• Normalization of RDBMS (1NF, 2NF, 3NF and 4NF) and inference rules.
	• Conclusion of the Unit
3.	**SQL**
	• Introduction to Unit
	• DBMS v/s RDBMS
	• Introduction to SQL: Data types, Constraints
	• Commands in SQL: Create table, Drop command, Alter Queries in SQL
	• Statements in SQL (Insert, delete and update)
	• Features of SQL
	• Manipulation of data

	• Tables in SQL	
	• Conclusion of the Unit	
4.	**PL/SQL**	
	• Introduction to PL/SQL	
	• Approaches to database programming: with function calls, Embedded SQL using CURSORs, Dynamic SQL, SQL commands in Java, Retrieving multiple triples using Iterators	
	• Advantages of PL/SQL	
	• Features of PL/SQL :Blocks structure, Error handling, Input and output designing, variables and constant, data abstraction, control structures and subprogram	
	• Fundamentals of PL/SQL : character sets, lexical, delimeters, identifiers, declarations, scope and visibility, Static and dynamic and static SQL, Implicit and explicit locking	
	• Conclusion of the Unit	
5.	**Oracle, Trigger and wrapping**	
	• Introduction to **Oracle, Trigger and wrapping**	
	• Functions/responsibilities of DBA	
	• Oracle product details	
	• Oracle files, System and User process	
	• Oracle Memory	
	• Protecting data: Oracle backup & recovery	
	• Triggers **-** types, uses, data access for triggers	
	• PL/SQL Packages and Wrapping	
	• Conclusion of the Unit	

C. RECOMMENDED STUDY MATERIAL:

S. No	Text Books:	Author	Edition	Publication
1.	Database System Concepts	S. Sudarshan, Henry F. Korth, AviSilberschatz	6th Edition	McGraw Hill
2.	SQL, PL/SQL	Ivan Bayross		Bpb
3.	Oracle Complete Reference	Kevin Loney		Bpb

Reference Book
1 PL/SQL, best practices, Bpb Publications, Steven Feuerstein
2 The Oracle Cook Book, Bpb Publications, Liebschuty
3 Oracle A Beginners Guide, TMH Publication, Michael Abbey, Michael J.Corey

Online Resources
1 https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2 https://nptel.ac.in/courses/106106093
3 https://www.coursera.org/learn/introduction-to-relational-databases

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

COURSE OUTCOME

The studentswill be able to

- Analyzea web page and identify its elements and attributes.
- Design and implement dynamic websites with good aesthetic sense of designing and
- Use web designing tools knowledge.
- Write HTML and understand how to effectively implement it in the web environment.
- Write CSS effectively to create well organized, styled web pages. Use the HTML Document

A.   OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to HTML	08
2.	Introduction to Java Scripts	07
3.	JDBC OBJECTS	09
4.	Introduction to Servlet	07
5.	Introduction to JSP	08

B.DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to HTML**
	• Introduction of Unit
	• Core Elements, Links and Addressing,
	• Images, Text, Colors and Background,
	• Lists, Tables and Layouts,
	• Frames,
	• Forms,
	• Cascading Style Sheets
	• Conclusion of Unit
2.	**Introduction to Java Scripts**
	• Introduction of Unit
	• Elements of Objects in Java Script,
	• Dynamic HTML with Java Script
	• Document type definition, XML Syntax, XML Schemas,
	• Document Object model, Presenting XML, Using XML Processors

	• Conclusion of Unit
3.	**JDBC OBJECTS**
	• Introduction of Unit
	• JDBC Driver Types,
	• JDBC Packages, Database Connection, Statement Objects, Result Set
	• JDBC and Embedded SQL
	• Tables, Inserting Data into Tables, Selecting Data from a Table,
	• Meta Data, Updating Table, deleting data from Table,
	• Joining Table, Calculating Data,
	• Grouping and Ordering Data, Sub quires, View
	• Conclusion of Unit
4.	**Introduction to Servlet**
	• Introduction of Unit
	• Servlet Life Cycles, Servlet Basics,
	• Tomcat Web Server, Configuring Apache Tomcat,
	• Handling Client Request and Response,
	• Handling Cookies,
	• Session Tracking
	• Conclusion of Unit
5.	**Introduction to JSP**
	• Introduction of Unit
	• Benefits of JSP, Basic Syntax,
	• Invoking Java code with JSP Scripting
	• Elements, JSP Page Directive,
	• Including Files in JSP Pages, Introduction to Java Beans,
	• Using JAVA Bean Components in JSP Documents,
	• MVC Architecture
	• Conclusion of Unit

C.RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Web Programming, building internet applications	Chris Bates, Dreamtech	Latest	Wiley
2.	The complete Reference HTML and DHTML	A. Powey	Latest	Thomas
3.	The complete Reference J2ME,	James Keogh	Latest	-
4.	Core Servlets and Java Server Pages	Marty Hall Larry Brown	Latest	-
Reference Book				
1.	Internet, World Wide Web, How to program, Dietel , Nieto, PHI/PEA			
2.	Web Tehnologies, Godbole, Kahate, 2nd Ed., TMH			
Online Resources				
1.	https://nptel.ac.in/courses/106105084			
2.	https://www.tutorialspoint.com/web_developers_guide/web_basic_concepts.htm			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	3	2	1	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

PRACTICALS

Code:MCACCA2201	OOPS with Java Lab	1 Credit [LTP: 0-0-2]

Course Outcomes:

Students will be able to:

- Implement object oriented programming concepts to solve real world problems
- Implement the concept of class and objects with access control to represent real world entities.
- Apply different techniques on creating and accessing packages (fully qualified name and import statements).
- Create concepts on file streams and operations in java programming for a given application programs
- Create the backend connectivity process in java program by using JDBC drivers

A. LIST OF EXPERIMENTS:

1	A. Write a program to print "Hello World" in Java. B. Write a program to add two numbers C. Write a program to demonstrate the different access specifiers D. Write a program which uses different packages
2	A. Write a program to demonstrate inheritance, abstraction, encapsulation and Polymorphism. B. Write a program to find the factorial of n numbers C. Write a program to calculate Fibonacci series D. Write a program to add n numbers and series
3	A. Write a program to create an array and store elements into the array. B. Write a program to find the sum of elements in an array C. Write a program to demonstrate switch case, if, if-else and for loop
4	A. Write a program to demonstrate the working of methods. B. Write a program which has four methods – add(), subtract(), multiply() and divide() and demonstrate a simple console calculator. C. Write a program to accept command line arguments and display them to the user
5	A. Write a program to create a package. B. Write a program to handle different exceptions
6	A.Write a program to demonstrate try-catch, throw and throws. B. Write a program for user defined exception
7	A. Write a program to read a file Write a program to write into a file
8	Write a program to demonstrate client server communication (socket programming)
9	Write a program to create threads and manipulate them
10	Write a program to create a user interface to check user authentication.
11	Write a program to create a registration form and save the details into a file
12	Write a program to save and fetch the details from database

B.   RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	The complete reference Java –2	Herbert Schildt	V Edition,	TMH.
2.	SAMS teach yourself Java – 2	Rogers and Leura Lemay	3rd Edition,	Pearson Education
Reference Book				
1.	The complete reference Java –2			
2.	SAMS teach yourself Java – 2			
Online Resources				
1.	https://www.programiz.com/java-programming/online-compiler/			
2.	https://www.tutorialspoint.com/compile_java_online.php			
3.	https://onecompiler.com/java			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Course Outcomes:

Students will be able to:

- Designanalgorithminaeffectivemanner
- Apply iterative and recursive algorithms.
- Designiterativeandrecursivealgorithms.
- Implementoptimizationalgorithmsforspecificapplications.
- Designoptimizationalgorithmsfor specificapplications

LIST OF EXPERIMENTS:

1	SortagivensetofelementsusingtheQuicksortmethodanddeterminethetime required tosortthe elements.Repeat the experimentfordifferentvaluesofn,thenumberofelementsinthelisttobesorted.Theelementscanbereadfromafileorcanbe generatedusingtherandomnumbergenerator.
2	ImplementaMergeSortalgorithm tosortagivensetofelementsanddetermine the time required to sort the elements. Repeat the experiment fordifferent values of n, the number of elements in the list to be sorted .Theelementscanberead fromafileorcanbegeneratedusingtherandom numbergenerator.
3	A. ObtaintheTopologicalorderingofverticesinagivendigraph. B.ComputethetransitiveclosureofagivendirectedgraphusingWarshall'salgorithm.
4	Implement0/1KnapsackproblemusingDynamicProgramming.
5	Fromagivenvertexinaweightedconnectedgraph,findshortestpathstootherverticesusingDijikstra'salgorithm
6	FindMinimumCostSpanningTreeofagivenundirectedgraphusingKruskal'salgorithm.
7	A. PrintallthenodesreachablefromagivenstartingnodeinadigraphusingBFSmethod. B. CheckwhetheragivengraphisconnectedornotusingDFS method.
8	Find a subset of a given set S = {s1, s2,…..,sN} of n positive integers whosesum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8}andd=9therearetwosolutions{1,2,6}and{1,8}.Asuitablemessageistobedisplayed ifthegivenprobleminstancedoesn't haveasolution.
9	ImplementanyschemetofindtheoptimalsolutionfortheTravelingSalespersonproblemandthensolvethesameprobleminstanceusingany approximationalgorithmanddeterminetheerror intheapproximation.
10	FindMinimumCostSpanningTreeofagivenundirectedgraphusingPrim'salgorithm.
11	ImplementAll-PairsShortestPathsProblemusingFloyd'salgorithm.
12	ImplementNQueen'sproblemusingBackTracking.

C.   RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1	Design and analysis of Algorithms	Aho A.V , J.D Ulman	Third Edition	Addison Wesley
2	Design and Analysis of Algorithms	Dave and Dave	Second Edition	Pearson
Reference Book				
1	Introduction to Algorithms, Cormen, Leiserson, Rivest, Prentice Hall of India			
2	Fundamental of Computer algorithms, Horowitz and Sahani			
Online Resources				
1	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm			

2.	https://nptel.ac.in/courses/106106131	
3.	Design and analysis of Algorithms	

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code:MCACCA2203	**Data Base Management System Lab**	1 Credit [LTP: 0-0-2]

Course Outcome:-
Students will be able:

- Appreciate, define and effectively demonstrate the underlying concepts of database technologies.
- Design and implement a database schema for a given problem-domain.
- Populate and query a database using SQL DML/DDL commands.
- Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS.
- Programming PL/SQL including stored procedures, stored functions, cursors, packages.

A. LIST OF EXPERIMENTS:

1.	To setup and removal phases of a Student database using the basic Data Definition Language (DDL) commands: 1. CREATE 2. ALTER 3. DROP 4. RENAME 5. TRUNCATE
2.	The routine operation of the Employee database like retrieve, insert and modify by basic Data Manipulation Language (DML) commands: 1. INSERT 2. UPDATE 3. DELETE
3.	To Retrieve data from one or more tables using DATA RETRIEVAL LANGUAGE (DRL) commands - SELECT FROM - SELECT - FROM –WHERE - SELECT - FROM -GROUP BY - SELECT - FROM -ORDER BY - JOIN using SELECT - FROM - ORDER BY - JOIN using SELECT - FROM - GROUP BY - UNION - INTERSET - MINUS
4.	DATA CONTROL LANGUAGE (DCL) and TRANSATIONAL CONTROL LANGUAGE (TCL) commands. i. Creating objects: tables, views, users, sequences, Collections etc. ii. Privilege management through the Grant and Revoke commands iii. Transaction processing using Commit and Rollback iv. Save points.
5.	Queries for following functions i. Conversion functions (to_char, to_number and to_date) ii. string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), iii. date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
6.	Simple queries: selection, projection, sorting on a simple table for employee database i. Small-large number of attributes ii. Distinct output values iii. Renaming attributes iv. Computed attributes v. Simple-complex conditions (AND, OR, NOT) vi. Partial Matching operators (LIKE, %, _, *, ?) vii. ASC-DESC ordering combinations viii. Checking for Nulls
7.	To manipulate data items and returning the results using Group functions or Aggregate functions and Single Row or scalar functions:

	i.	Group functions or Aggregate functions: Sum(), Avg(), Min(), Max() and Count()
	ii.	Single Row or scalar function: Abs(), Power(), Sqrt(), Round(), Exp(), Greastest(), Least(), Mod(), Floor(), Sign() and Log().
8.	Multi-table queries (JOIN OPERATIONS)	
	i.	Simple joins (no INNER JOIN)
	ii.	Aliasing tables – Full/Partial name qualification
	iii.	Inner-joins (two and more (different) tables)
	iv.	Inner-recursive-joins (joining to itself)
	v.	Outer-joins (restrictions as part of the WHERE and ON clauses)
	vi.	Using where & having clauses
9.	Write Nested queries to retrieve the name of each employee who has a dependent with the same first name and same sex as the employee using following Nested queries.	
	i.	In, Not In
	ii.	Exists, Not Exists
	iii.	Dynamic relations (as part of SELECT, FROM, and WHERE clauses)
10	Write a query to make a list of all project numbers for projects that involve an employee whose last name is 'Smith', either as a worker or as a manager of the department that controls the project using the following Set Oriented Operations	
	i.	Union
	ii.	Difference
	iii.	Intersection
	iv.	Division
11	PL/SQL Programming using the following	
	i.	Programs using named and unnamed blocks
	ii.	Programs using Cursors, Cursor loops and records
12	PL/SQL Programming using	
	i.	Creating stored procedures, functions and packages
	ii.	Error handling and Exception
	iii.	Triggers and auditing triggers

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Database System Concepts	S. Sudarshan, Henry F. Korth, AviSilberschatz	6th Edition	McGraw Hill
2.	SQL, PL/SQL	Ivan Bayross		Bpb
3.	Oracle Complete Reference	Kevin Loney		Bpb
Reference Book				
1.	PL/SQL, best practices, Bpb Publications, Steven Feuerstein			
2.	The Oracle Cook Book, Bpb Publications, Liebschuty			
3.	Oracle A Beginners Guide, TMH Publication, Michael Abbey, Michael J.Corey			
Online Resources				
1.	https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm			
2.	https://nptel.ac.in/courses/106106093			
3.	https://www.coursera.org/learn/introduction-to-relational-databases			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	--	-	-	-	-	-	-	-	-	-	-	-	-
CO5	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-

Code:MCACCA2204	Web Technologies Lab	1 Credit [LTP: 0-0-2]

Course Outcome:-

Students will be able to:

- Run web programming
- Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's.
- Describe Web Application Terminologies, Internet Tools, E – Commerce and other web services.
- Define Database Connectivity to web applications.
- Familiarize with Client-Side Programming, Server-Side Programming, Active server Pages.

A.   LIST OF EXPERIMENTS:

1.	Design of the Web pages using various features of HTML and DHTML
2.	Client server programming using Servlets, ASP and JSP on the server side and java script on the client side
3.	Web enabling of databases
4.	Multimedia effects on web pages design using Flash.
5.	Case Study: Design & Development of Websites with Database Connectivity and Multimedia Effects
6.	Creating Online shopping
7.	Creating Online examination
8.	Design Chat system
9.	Design Mailing system
10.	Design a university home page
11.	Design navigation on university home page
12.	Design a website as minor project

B.   RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Web Programming, building internet applications	Chris Bates, Dreamtech	Latest	Wiley
2.	The complete Reference HTML and DHTML	A. Powey	Latest	Thomas
3.	The complete Reference J2ME,	James Keogh	Latest	-
4.	Core Servlets and Java Server Pages	Marty Hall Larry Brown	Latest	-
Reference Book				
	Internet, World Wide Web, How to program, Dietel , Nieto, PHI/PEA			
	Web Tehnologies, Godbole, Kahate, 2nd Ed., TMH			
Online Resources				
	https://nptel.ac.in/courses/106105084			
	https://www.tutorialspoint.com/web_developers_guide/web_basic_concepts.htm			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	1	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO3	1	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO4	-	1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	1	3	-	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code:MCAECA2111	Computer Architecture	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students should be able to:

- Describe the organization of basic computer, its design and the design of control unit.
- Demonstrate the working of central processing unit and RISC and CISC Architecture.
- Examine the operations and language, register transfer, micro operations and input- output organization.
- Describe the organization of memory and memory management hardware.
- Elaborate advanced concepts of computer architecture, Parallel Processing, inter processor communication and synchronization.

A.   OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Register Transfer and Micro-operation	08
2.	Basic Computer Organization	08
3.	Micro Programmed Control Unit	08
4.	Computer Arithmetic	07
5.	Modes of Data Transfer and Memory Organization	07

B.DETAILED SYLLABUS

Unit	Unit Details
1.	**Register Transfer and Micro-operation**
	• Introduction of Unit
	• Subsystems of computer: Von Neuman Architecture, Flynn Classification, Sequential and combinational devices
	• Register Transfer Language, Register Transfer, Bus and Memory Transfer: Three state bus buffers, Memory Transfer.
	• Arithmetic Micro-operations: Binary Adder, Binary Adder-Sub trator, Binary Incrementor,
	• Logic Micro-operations: List of Logic micro operations, Shift Micro-operations (excluding H/W implementation), Arithmetic shifting.
	• Arithmetic Logical Shift Unit.
	• Conclusion &Real Life Application
2.	**Basic Computer Organization**
	• Introduction of Unit
	• Instruction Codes,

		• Computer Registers: Common bus system, Computer Instructions:
		• Timing and Control unit
		• Instruction formats, Instruction Cycle: Fetch and Decode, Flowchart for Instruction cycle,
		• Memory-reference instructions
		• Register reference instructions.
		• IO reference Instructions.
		• Conclusion &Real Life Application
3.	**Micro Programmed Control Unit**	
		• Introduction of Unit
		• Control Memory, Address Sequencing, Conditional branching, Mapping of instruction, Subroutines.
		• Design of Control Unit, Central Processing Unit: Introduction,
		• General Register Organization,
		• Stack Organization: Register stack, Memory stack;
		• Three address, two address, one address, Zero address Instruction Formats,
		• Conclusion &Real Life Application
4.	**Computer Arithmetic**	
		• Introduction of Unit
		• Introduction, Addition and Subtraction,
		• Multiplication Algorithms (Booth algorithm), Division Algorithms,
		• Input – Output Organization: Peripheral devices, Input – Output interface, Introduction of Multiprocessors: Characteristics of multi-processors.
		• Conclusion &Real Life Application
5.	**Modes of Data Transfer and Memory Organization**	
		• Introduction of Unit
		• Input-Output Organization:
		• Input-Output Interface
		• Modes of Data Transfer: Priority Interrupt, Direct Memory Access,
		• Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory,
		• Introduction of Associative Memory, Cache Memory, Virtual Memory
		• Conclusion &Real Life Application

C.RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Computer System Architecture	Morris Mano	Latest	PHI
2.	Computer Organization and Architecture	William Stallings	Latest	PHI
Reference Book				
1.	Digital Computer Electronics:	An Introduction to Microcomputers by Malvino	Latest	TMH

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code:MCAECA2112	Soft Computing	3 Credits [LTP: 3-0-0]

COURSE OUTCOME
- Describe soft computing techniques and their applications.
- Analyze various neural network architectures.
- Define the fuzzy systems.
- Implement the genetic algorithm concepts and their applications.
- Identify and select a suitable Soft Computing technology to solve the problem.

A.   OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	Introduction to Soft Computing	8
2.	Fuzzy Logic	7
3.	Artificial Neural Networks	7
4.	Nature Inspired Algorithms	8
5.	Multi-Objective Optimization	8

B.DETAILED SYLLABUS

Unit	Unit Details
1.	Introduction to Soft Computing
	• Introduction of Unit • Concept of Computing Systems • Soft Computing Versus Hard Computing • Characteristics of Soft Computing, • Applications of Soft Computing Techniques • Conclusion of Unit
2.	Fuzzy Logic
	• Introduction of Unit • Fuzzy Sets and Membership Functions, • Operations on Fuzzy Sets, • Fuzzy Relations, Rules, Propositions, • Implications and Inferences, • Defuzzification Techniques - Fuzzy Logic Controller Design, • Applications of Fuzzy Logic

	• Conclusion of Unit
3.	Artificial Neural Networks
	• Introduction of Unit
	• Biological Neurons and its Working,
	• Simulation of Biological Neurons to Problem Solving,
	• Different ANNs Architectures,
	• Training Techniques for ANNs,
	• Applications of ANNs to Solve Real Life Problems
	• Conclusion of Unit
4.	Nature Inspired Algorithms
	• Introduction of Unit
	• Genetic Algorithms, Concept of "Genetics" and "Evolution"
	• Application to Probabilistic Search Techniques,
	• Basic GA Framework and Different GA Architectures, GA Operators- Encoding, Crossover, Selection, Mutation, etc.,
	• Solving Single-Objective Optimization Problems Using GAs, Particle Swarm Optimization- Implementation, Operators,
	• Ant Bee Colony Optimization Implementation, Operators, Case Studies.
	• Conclusion of Unit
5.	Multi-Objective Optimization
	• Introduction of Unit
	• Problem Solving Concept of Multi-Objective Optimization Problems (MOOPs) and Issues of Solving Them.
	• Multi-Objective Evolutionary Algorithm (MOEA),
	• Non-Pareto Approaches to Solve MOOPs,
	• Pareto-Based Approaches to Solve MOOPs,
	• Applications with MOEAs.
	• Conclusion of Unit

C.RECOMMENDED STUDY MATERIAL

S. No	Textbooks:	Author	Edition	Publication
1.	Principles of soft computing	Sivanandam.S. N, Deepa.S.N	Second Edition	Wiley India Pvt Limited, 2011
2.	"Neuro fuzzy and soft computing	JuhShing Roger Jang, Cheun Tsai Sun, EijiMizutani	Fourth Edition	Prentice Hall, 1997
Reference Book				
1.	Aliev,R.A, Aliev,R.R, "Soft Computing and its Application", World Scientific Publishing Co. Pvt. Ltd., 2001			
2.	Mehrotra.K, Mohan.C.K, Ranka.S, "Elements of Artificial Neural Networks", The MIT Press, 1997			
3.	JuhShing Roger Jang,Cheun Tsai Sun,EijiMizutani, "Neuro fuzzy and soft computing", Prentice Hall, 1997.			
4.	Ronald R.Yager, LoftiZadeh, "An Introduction to fuzzy logic applications in intelligent Systems", Kluwer Academic, 1992.			
5.	Cordón.O, Herrera.F, Hoffman.F, Magdalena.L "Genetic Fuzzy systems", World Scientific Publishing Co. Pvt. Ltd., 2001.			
Online Resources				
1.	https://www.w3schools.com/ai/ai_neural_networks.asp			
2.	https://www.javatpoint.com/what-is-soft-computing			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	2	2	3	1	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

COURSE OUTCOME

The student would be able to:

- Describe general concepts of Internet of Things (IoT) and identify various devices, sensors and applications
- Apply design concept to IoT solutions
- Analyze various M2M and IoT architectures
- Evaluate design issues in IoT applications
- Create IoT solutions using sensors, actuators and Devices

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**INTRODUCTION TO IOT**	**8**
2.	**IOT NETWORKING CORE**	**8**
3.	**IOT ARCHITECTURE**	**7**
4.	**IOT APPLICATION DEVELOPMENT**	**8**
5.	**INDUSTRIAL IOT**	**7**

(B is noted beside the table header row)

B.DETAILED SYLLABUS

Unit	Unit Details
1.	**INTRODUCTION TO IOT**
	• Introduction of Unit
	• IoT Definition, Characteristics of IoT
	• Functional Blocks, Physical design of IoT, Logical design of IoT
	• Communication models & APIs
	• Sensors, Actuators, Networking basics,
	• Communication Protocols
	• Sensor Networks
	• Conclusion of Unit
2.	**IOT NETWORKING CORE**
	• Introduction to unit
	• Introduction to Arduino Programming
	• Integration of Sensors and Actuators with Arduino
	• Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi
	• Other IoT supported hardware platforms such as: ARM Cortex

		Processors, Intel Galileo boards
		• Wireless networking equipment and configurations
		• Accessing hardware and device file interactions
		• Conclusion of Unit
3.	**IOT ARCHITECTURE**	
		• Introduction of Unit
		• IoT reference Model and Architecture
		• Remote monitoring and sensing
		• Remote controlling and performance analysis
		• Communication pattern, 6LoWPAN,
		• Sensors and sensor Node and interfacing using any Embedded target boards
		• Conclusion of Unit
4.	**IOT APPLICATION DEVELOPMENT**	
		• Introduction of Unit
		• Introduction to Node MCU
		• Node MCU Pin Description
		• Programming of NodeMCU using Arduino IDE
		• Application protocols: MQTT, REST/HTTP, CoAP, MySQL
		• Back-end Application Designing
		• Apache for handling HTTP Requests
		• Conclusion of Unit
5.	**INDUSTRIAL IOT**	
		• Introduction of Unit
		• Cloud Computing Platforms for IoT
		• Data Handling and Analytics
		• Sensor-Cloud, Cloud Computing Services for IoT
		• Case Study: Agriculture, Healthcare, Activity Monitoring
		• Conclusion of Unit

C.RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Internet of Things: Architectures, Protocols and Standards	Simone Cirani, Gianluigi, Marco, and Luca Veltri	Latest	WILEY
2.	Internet of Things	RMD SundaramShriram K Vasudevan, Abhishek S	Latest	WILEY
Reference Book				
1.	Designing the Internet of Things, Adrian McEwen, Hakim Cassimally, John Wiley and Sons			
2.	Internet of Things (A Hands-on Approach), Vijay Madisetti and Arshdeep Bahga,1st Edition, VPT, 2014			
Online Resources				
1	https://onlinecourses.nptel.ac.in/noc22_cs53/preview			
2	https://www.tutorialspoint.com/internet_of_things/index.htm			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		-	-	-	-	-	-	-	-	-	-	-	-	-
CO2			-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3		-	-	-	-	-	-	-	-	-	-	-	-	-
CO4		2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5		2	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Ability Enhancement Courses (AEC)

Code:MULCHU2201	Spoken English & Communication Skills- I	1 Credit	[LTP: 0-0-2]3

Course Outcomes:

Students will be able to:

- Prepare and deliver a clear and fluent demonstrative, informative, and persuasive presentation and enlarge their vocabulary by keeping a vocabulary journal.
- Classify the factors that influence use of grammar and vocabulary in speech and writing.
- Recognize and Consciously Use English to Create and Maintain Productive work in professional and educational settings.
- Enhance their language proficiency in writing by identifying the errors and rectifying them.
- Generate a pile of ideas by examining issues in greater depth, looking at different dimensions of these issues.

A.   OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	Speaking Skills Enhancement Training	6
2	Vocabulary Building Training	7
3	Proficiency in English	4
4	Written Communication Skill	6
5	Group Discussion	6

B.   DETAILED SYLLABUS

Unit	Unit Details		Method
1.	**Speaking Skills Enhancement Training**		**Method**
	• Introduction of the Course & the topic	•	Theory/Practical
	• Describing people – Appearance & Character	•	Practical
		•	Practical
	• Correcting common mistakes while speaking English.	•	Theory/Practical
	• Appreciating & Criticizing: Events & Performances	•	Practical
		•	Practical
	• Preparing speech on different situations.	•	Theory/Practical
	• Practice Session		
	• Conclusion & Summary of the Unit		
2.	**Vocabulary Building Training**		
	• Introduction of the topic	•	Theory/Practical
	• Vocabulary for situational dialogues	•	Theory/Practical
		•	Theory/Practical
	• Phrasal Verbs & Idioms	•	Theory/Practical
	• Vocabulary for speeches and descriptions	•	Theory/Practical
		•	Practical
	• Developing Professional Vocabulary	•	Theory/Practical

3.	Proficiency in English		
	• Introduction of the topic	•	Theory / Practical
	• Feedback and questioning Technique	•	Theory/Practical
	• Objectiveness in Argument	•	Practical
	• Development etiquettes and manners	•	Practical
	• Study of different pictorial expression of non-verbal communication and its analysis	•	Theory/Practical
	• Practice Session	•	Practical
	• Conclusion & Summary of the Unit	•	Theory/Practical
4.	Written Communication Skill		
	• Introduction of the topic	•	Theory/Practical
	• Correction of errors	•	Practical
	• Making of Sentences	•	Practical
	• Paragraph Writing	•	Practical
	• Conclusion & Summary of the Unit	•	Theory/Practical
5.	Group Discussion		
	• Introduction of the topic	•	Theory/Practical
	• Face your Fear & Speak with Confidence	•	Practical
	• Introduction to Group Discussion	•	Practical
	• Important Do's & Don'ts of GD.	•	Practical
	• Practice Session	•	Practical
	• Conclusion & Summary of the Unit	•	Theory/Practical

The rows above the table (continuation of a previous unit):

- Practice Sessions
- Conclusion & Summary of the Unit

Skill Enhancement Courses (SEC)

Code:MULCSE2201	Skill Enhancement Generic Course -II	1 Credit [LTP: 0-0-2]

COURSEOUTCOMES:

Students will be able to:

CO.1: Enhance problem solving skills.

CO.2: Prepare for various public and private sector exams & placement drives

CO.3: Communicate effectively & appropriately in real life situation.

CO.4: Improve verbal ability skill among students.

CO.5: Enrich their knowledge and to develop their logical reasoning thinking ability.

	LIST OF LABS
1	Types of Interviews, Interview Practice
2	Time & Work, Syllogisms
3	Critical Reasoning
4	Mensuration, Cubes & Dices
5	Para Jumble, Permutations & Combinations
6	Blood Relations & Direction Sense, Manners & Etiquette
7	Idiom & Phrases, Prefix-Suffix
8	Probability. Puzzles
9	Data Sufficiency, Logical Choices & Connectives
10	Date Interpretations, Deductions
11	Essay Writing, E-mail Writing
12	Personal Grooming

Code:MCACCA2401   Industrial Training Seminar -I1 Credit [LTP: 0-0-2]

OBJECTIVE: To expose engineering students to technology development at workplaces and appraise them regarding shop-floor problems. To provide practical experience in solving open ended problems in real work setting so as to cause transfer of college based knowledge and skills to solve practical problems and thereby develop confidence in the students in the analysis, synthesis and evaluation of practical problems leading to creative thinking.

At the end of the second semester each student would undergo Industrial Training in an industry/ Professional organization / Research Laboratory with the prior approval of the Head of Department and Training & Placement Officer, and shall be required to submit a written typed report along with a certificate from the organization and present a PPT based on the training.

This period shall include orientation and preparation for the said Training incorporated in the curriculum after second semester.

The report of the Training shall be evaluated during III Semester by a Board of Examiners to be appointed by the Faculty Coordinator-Training Seminar who will award the grades.

Semester-III

Major (Core Courses)
Theory

Code: MCACCA3101	Operating System	3 Credits [LTP: 3-0-0]

COURSEOUTCOME
Studentswillbeableto:

- Describe the structure and organization oft he file system.

- Demonstrate a process synchronization ands cheduling.

- Determine different approaches to memory management.

- Use system calls for managing processes, memory and the file system.

- Define the data structures and algorithms used to implement an OS.
  A. OUTLINEOFTHECOURSE

UnitNo.	TitleofTheUnit	TimerequiredfortheUnit(Hours)
1	OperatingSystemOverview	07
2	ProcessManagement	08
3	ProcessDeadlocks	08
4	MemoryManagement	07
5	FileManagement	07

B. DETAILEDSYLLABUS

Unit	UnitDetails
1	**OperatingSystemOverview**
	• IntroductionofUnit • Definition,Twoviewsofoperatingsystem,Evolutionofoperatingsystem,TypesofOS. • SystemCall,HandlingSystemCalls,SystemPrograms,OperatingSystemStructures, • TheShell,OpenSourceOperatingSystems • ConclusionofUnit
2	**ProcessManagement**

	• IntroductionofUnit
	• ProcessvsProgram,Multi-programming,ProcessModel,ProcessStates,ProcessControlBlock.
	• Threads,ThreadvsProcess,UserandKernelSpaceThreads.
	• InterProcessCommunication,RaceCondition,CriticalSection
	• ImplementingMutualExclusion:MutualExclusionwithBusyWaiting(Disabling
	• Interrupts,LockVariables,StrictAlteration,Peterson'sSolution,TestandSetLock),
	• SleepandWake-up,Semaphore,Monitors,MessagePassing,
	• ClassicalIPCproblems:ProducerConsumer,SleepingBarber,DiningPhilosopher Problem
	• Process Scheduling: Goals, Batch System Scheduling (First-Come First-Served, Shortest Job First,ShortestRemainingTimeNext),InteractiveSystemScheduling(Round-RobinScheduling,PriorityScheduling,Multiple Queues),OverviewofRealTimeSystemScheduling
	• ConclusionofUnit
3	**ProcessDeadlocks**
	• IntroductionofUnit
	• Introduction,DeadlockCharacterization,PreemptableandNon-preemptableResources,
	• Resource–AllocationGraph,ConditionsforDeadlock
	• HandlingDeadlocks:OstrichAlgorithm,Deadlock prevention,DeadlockAvoidance
	• DeadlockDetection(ForSingleandMultipleResourceInstances),RecoveryFrom
	• Deadlock(ThroughPreemptionandRollback)
	• ConclusionofUnit
4	**MemoryManagement**
	• IntroductionofUnit
	• Introduction,Monoprogrammingvs.Multi-programming,ModellingMultiprogramming,Multiprogrammingwithfixedand variablepartitions,Relocationand Protection.
	• Memorymanagement(Bitmaps&Linked-list),MemoryAllocationStrategies
	• Virtualmemory:Paging, PageTable,PageTableStructure,HandlingPageFaults,TLB's
	• PageReplacementAlgorithms:FIFO,SecondChance,LRU,Optimal,LFU,Clock,WS-Clock,ConceptofLocalityofReference, Belady'sAnomaly
	• Segmentation:NeedofSegmentation,itsDrawbacks,SegmentationwithPaging(MULTICS)
	• ConclusionofUnit
5	**FileManagement**

- IntroductionofUnit

- FileOverview:FileNaming,FileStructure,FileTypes,FileAccess,File
  Attributes,FileOperations,SingleLevel,twoLeveland Hierarchical
  DirectorySystems,FileSystemLayout.

- Implementing Files: Contiguous allocation, Linked List Allocation, Linked List Allocation using Table
  inMemory,Inodes.

- DirectoryOperations,PathNames,DirectoryImplementation,SharedFiles

- FreeSpaceManagement:Bitmaps,LinkedList

- ConclusionofUnit

C. RECOMMENDEDSTUDYMATERIAL

S.No	TextBooks:	Author	Edition	Publication
1	Operatingsystemconcepts	Silberschatz,Galvin,Gagne	8th edition	JohnWileyand Sons
2	ModernOperatingSystem	A.S.Tanenbaum	Second Edition	Pearson
ReferenceBook				
1	OperatingSystems-SHalder,AlexAAravindPearsonEducationSecondEdition2016.			
OnlineResources				
1	https://www.coursera.org›courses›query=operatings...			
2	https://www.javatpoint.com›best-courses-for-the-oper...			
3	https://hackr.io›tutorials›learn-operating-systems			

Code: MCACCA3102	Computer Networks	3 Credits [LTP: 3-0-0]

COURSEOUTCOME

Students willbeableto:

- Design&illustratethevariousreference modelsandnetworks
- IdentifythedifferenttypesofnetworkdevicesandMultiple AccessProtocols.
- Usevariousroutingmechanisms forfindingshortestpathinthenetwork.
- UseIPaddressingSchemeandtointerconnectvariousnetworks.
- Describeand usevariousapplicationlayer protocols:HTTP,DNS,andSMTP,FTPetc.

A. OUTLINEOFTHECOURSE

UnitNo.	Titleoftheunit	TimerequiredfortheUnit(Hours)
1.	Introductionto NetworksandDevices	07
2.	TheData LinkLayer	08
3.	NetworkLayer	08
4.	TransportLayer	07
5.	ApplicationLayer	07

B. DETAILEDSYLLABUS

Unit	UnitDetails
1.	**IntroductiontoNetworksandDevices**
	- IntroductionofUnit - DefinitionandUsesofComputerNetwork - NetworkTopologies - Networkclasses - Repeaters,Hub,Bridges,Switches - Routers,Gateways - RoutingAlgorithms,Distance VectorRouting,LinkStateRouting - ConclusionofUnit
2.	**TheData LinkLayer**
	- IntroductionofUnit - Designissues,errordetectionandcorrection - Elementarydatalinkprotocols, - Datalinklayerintheinternet - THEMEDIUMACCESSSUBLAYER:Channelallocationsproblem - Multipleaccessprotocols,Ethernet,DataLinkLayerswitching, - WirelessLAN,BroadbandWireless,Bluetooth - ConclusionofUnit
3.	**NetworkLayer**

	• IntroductionofUnit	
	• LogicalAddressing,IPv4Addresses,IPv6Addresses,	
	• InternetProtocol,Internetworking,IPv4,IPv6,	
	• TransitionfromIPv4to IPv6,	
	• AddressMapping,ErrorReportingandMulticasting,	
	• ForwardingandRouting,	
	• UnicastRoutingProtocols,MulticastRoutingProtocols	
	• ConclusionofUnit	
4.	**TransportLayer**	
	• IntroductionofUnit	
	• Process-ProcessDelivery	
	• UDP,TCPand SCTP	
	• CongestionControl,FlowControlandQualityofService	
	• TechniquestoimproveQoS,IntegratedServices,	
	• QoSinSwitchedNetworks	
	• ConclusionofUnit	
5.	**ApplicationLayer**	
	• IntroductionofUnit	
	• DomainName System,Name Space,DomainNameSpace,	
	• DistributionofNameSpace,DNSintheInternet,	
	• TypesofRecords,Registrars,Dynamic DomainNameSystem(DDNS)	
	• ElectronicMailandFileTransfer,RemoteLogging,Telnet,ElectronicMail	
	• WWWandHTTP:Architecture,	
	• WebDocuments	
	• ConclusionofUnit	

C. RECOMMENDEDSTUDY MATERIAL

S.No	TextBooks:	Author	Edition	Publication
1.	DataCommunicationsandNetworking,	BehrouzaA.Forouzan	Fourth Edition	TMH.
2.	ComputerNetworks	A.S.Tanenbaum	Fourth Edition	Pearson
ReferenceBook				
1.	DataCommunicationsandNetworking,TATAMcGrawHill,Ferouzan,Behrouz A.			
2.	DataandComputerCommunication,PearsonEducation,StallingsWilliam			
3.	ComputerNetworks,PHI,Tanenbaum,AndrewS,			
OnlineResources				
1.	https://nptel.ac.in/courses/106105082			
2.	https://www.tutorialspoint.com/data_communication_computer_network/index.htm			

Code: MCACCA3103	Cloud Computing	3 Credits [LTP: 3-0-0]

COURSEOUTCOME

Studentswillbeableto:

- Describethemainconcepts,keytechnologies,strengths,andlimitationsofcloud
- Demonstratethearchitectureandinfrastructureofcloudcomputingandvariousservice models.
- Definetheconceptand applicationofvirtualization
- Analyzetheconceptofservice managementincloudcomputing
- Examinesecurityandprivacyissuesincloudcomputing

B. OUTLINEOFTHECOURSE

Unit No.	Titleoftheunit	TimerequiredfortheUnit (Hours)
1.	**IntroductiontoCloudTechnologies**	**08**
2.	**CloudComputing ArchitectureandServiceModels**	**08**
3.	**Virtualization**	**06**
4.	**ServiceManagementinCloudComputing**	**06**
5.	**CloudSecurity**	**06**

C. DETAILEDSYLLABUS

Unit	UnitDetails
1.	**IntroductiontoCloudTechnologies**
	Overview of computing paradigm: Recent trends in Computing - Grid Computing, Cluster Computing,Distributed Computing, Utility Computing, Cloud Computing.History of Cloud Computing,Evolution ofcloud computing - Business driver for adopting cloud computing, Cloud service providers. Properties,Characteristics&Disadvantages-ProsandConsofCloudComputing,BenefitsofCloud Computing,Cloudcomputing vs.Clustercomputing vs. Gridcomputing.
2.	**CloudComputingArchitecture**
	CloudComputingArchitecture:Cloudcomputingstack-Comparisonwithtraditionalcomputingarchitecture(client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks inCloud computing, protocols used, Role of Web services. Service Models (XaaS) - Infrastructure as a Service(IaaS),PlatformasaService(PaaS), SoftwareasaService(SaaS).DeploymentModels,Publiccloud, Privatecloud,Hybridcloud,Communitycloud
3.	**Virtualization**
	Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, VirtualMachine (VM). Resource Virtualization - Server, Storage, Network. Virtual Machine (resource) provisioningand manageability,storageasaservice,Datastorageincloudcomputing(storageasa service).Renting,EC2 ComputeUnit,PlatformandStorage,pricing,customers.ServiceOrientedArchitecture(SOA).CloudPlatforma

	ndManagement–computationWeb services, Web2.0,WebOS	
4.	**ServiceManagementinCloudComputing**	
	Service Management in Cloud Computing: Service Level Agreements(SLAs), Billing & Accounting,ComparingScalingHardware: Traditionalvs.Cloud,Economicsofscaling:Benefittingenormously, ManagingData-LookingatData,Scalability&CloudServices,Database &DataStores inCloud,LargeScaleData Processing	
5.	**CloudSecurity**	
	Cloud Security: Infrastructure Security - Network level security, Host level security, Application levelsecurity. Data security and Storage - Data privacy and security Issues, Jurisdictional issues raised by Datalocation:Identity&AccessManagement,AccessControl,Trust,Reputation,Risk,Authenticationincloud computing,Clientaccessincloud,CloudcontractingModel,Commercialandbusinessconsiderations	

D. RECOMMENDEDSTUDY MATERIAL

S.No	TextBooks:	Author	Edition	Publication
1.	CloudComputingBible	BarrieSosinsky	Latest	JohnWiley&Sons
2.	CloudComputing:APracticalApproach	Velte Anthony T.,VelteTobyJ. and ElsenpeterRobert	Latest	McGrawHill,Indiane dition
3.	CloudComputing:PrinciplesandParadigms	RajkumarBuyya	Latest	JohnWiley&Sons,

S.No	TextBooks:	Author	Edition	Publication
1.	CloudComputingBible	BarrieSosinsky	Latest	JohnWiley&Sons
2.	CloudComputing:A PracticalApproach	VelteAnthonyT., Velte Toby J. andElsenpeterRo bert	Latest	McGrawHill,Indianedition
ReferenceBook				
1	CloudComputing:PrinciplesandParadigms,RajkumarBuyya,JohnWiley&Sons			
OnlineResources				
1	https://onlinecourses.nptel.ac.in/noc22_cs20/preview			
2	https://www.w3schools.in/cloud-computing			

Code: MCACCA3104	Artificial Intelligence	3 Credits [LTP: 3-0-0]

COURSEOUTCOME

Studentswillbeableto:

- DeveloptheskillstogainabasicunderstandingofneuralnetworktheoryandartificialIntelligencetheory.
- Explorethefunctionalcomponentsofneuralnetworkclassifiersandthefunctionalcomponentsofartificialintelligence classifiers.
- DevelopandimplementabasictrainableneuralnetworkoranartificialIntelligencesystemforatypicalbiomedicalappli cation.
- Describe,apply,andimplementuninformedandinformedsearchtechniquestosolveproblems.
- IndependentlyinvestigateanAItechniqueanddescribe,apply,andimplementthattechnique.

A. OUTLINEOFTHECOURSE

Unit No.	Titleoftheunit	TimerequiredfortheUnit(Hours)
1.	**Introductionto AIandIntelligentagent**	**08**
2.	**GamePlaying**	**08**
3.	**KnowledgeandReasoning**	**08**
4.	**Learning**	**07**
5.	**NLP**	**07**

B. DETAILEDSYLLABUS

Unit	UnitDetails
1.	**Introductionto AIandIntelligentagent:**
	DifferentApproachofAI,ProblemSolving:SolvingProblemsbySearching,Uninformedsearch,BFS,DFS,Iterati vedeepening,Bidirectionalsearch,Hillclimbing,Informedsearchtechniques:heuristic, Greedysearch, A*search, AO*search,constraintsatisfactionproblems
2.	**GamePlaying:**
	GamePlaying:Minimax,alpha-betapruning,jugproblem,chessproblem,tilesproblem.
3.	**KnowledgeandReasoning:**
	Knowledge and Reasoning: Building a Knowledge Base: Propositional logic, first order logic, situationcalculus.TheoremProvinginFirstOrderLogic.Planning,partialorderplanning.UncertainKnowledge andReasoning,Probabilities,BayesianNetworks.
4.	**Learning:**
	Learning:Overviewofdifferentformsoflearning,Supervisedbaselearning:LearningDecisionTrees,SVM,Unsuper vised basedlearning,Market BasketAnalysis, NeuralNetworks.
5.	**NLP:**
	IntroductiontoNaturalLanguageProcessing:DifferentissueinvolvedinNLP,ExpertSystem,Robotics.

C. RECOMMENDED STUDY MATERIAL

TextBooks:	
1.	ArtificialIntelligence:ElaineRich,KevinKnight,Mc-GrawHill.
2.	IntroductiontoAI&ExpertSystem:DanW.Patterson,PHI.
ReferenceBook	
1.	DavidPoole,AlanMackworth,RandyGoebel,"ComputationalIntelligence:alogicalapproach",Oxford UniversityPress
2.	G.Luger,"ArtificialIntelligence:StructuresandStrategiesforcomplexproblemsolving",FourthEdition, PearsonEducation.
OnlineResources	
1.	https://onlinecourses.nptel.ac.in/noc22_cs56/preview
2.	https://www.w3schools.com/ai/

Practical

Code: MCACCA3201	Operating System Lab	1 Credit [LTP: 0-0-2]

COURSE OUTCOME
Students will be able to:

Implement basic services and functionalities of the operating system using system calls.
Use modern operating system calls and synchronization libraries in software/ hardware interfaces.
Know the benefits of thread over process and implement synchronized programs using multi-threading concepts.
Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
Implement memory management schemes and page replacement schemes.

A. LIST OF EXPERIMENTS:

1	Write a C program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. a) FCFS b) SJF c) Round Robin d) Priority
2	Write a C program to simulate the following file allocation strategies. a) Sequential b) Indexed c) Linked
3	Write a C program to simulate multi-level queue scheduling algorithm considering the following scenario. All the processes in the system are divided into two categories – system processes and user processes. System processes are to be given higher priority than user processes. Use FCFS scheduling for the processes in each queue
4	Write a C program to simulate the MVT and MFT memory management techniques.
5	Write a C program to simulate the following contiguous memory allocation techniques a) Worst-fit b) Best-fit c) First-fit
6	Write a C program to simulate paging technique of memory management
7	Write a C program to simulate Bankers algorithm for the purpose of deadlock avoidance.
8	Write a C program to simulate disk scheduling algorithms a) FCFS b) SCAN c) C-SCAN
9	Write a C program to simulate page replacement algorithms a) FIFO b) LRU c) LFU
10	Write a C program to simulate page replacement algorithms
11	Write a C program to simulate producer-consumer problem using semaphores.
12	Write a C program to simulate the concept of Dining-Philosophers problem.

A. RECOMMENDEDSTUDYMATERIAL

S.No	TextBooks:	Author	Edition	Publication
1	Operatingsystemconcepts	Silberschatz,Galvin,Gagne	8thedition	JohnWileyand Sons
2	ModernOperatingSystem	A.S.Tanenbaum	Second Edition	Pearson
ReferenceBook				
1	OperatingSystems-SHalder,AlexAAravindPearsonEducationSecondEdition2016.			
OnlineResources				
1	https://www.coursera.org›courses›query=operatings...			
2	https://www.javatpoint.com›best-courses-for-the-oper...			
3	https://hackr.io›tutorials›learn-operating-systems			

Code: MCACCA3202	Computer Networks Lab	1 Credit [LTP: 0-0-2]

Course Outcome:-
Students will be able to:

- Use the clamping tool for making Cross and Straight cable and identify network IP
- Create local area network and do file sharing activity
- Configure switch and routers
- Configure WEP and Ethernet.
- Recognize static and dynamic routing.

A. LIST OF EXPERIMENTS:

1	Implementation of TCP/IP protocol – I
2	Implementation of TCP/IP protocol – II
3	Troubleshooting Scenarios Network – I
4	Troubleshooting Scenarios Network – II
5	Router – Configuration – I
6	Router – Configuration – II
7	Router – Configuration – III
8	Configuration of IP Address for a Router – I
9	Configuration of IP Address for a Router – II
10	Setting up of Passwords – I
11	Setting up of Passwords – II
12	Setting up of Passwords – III

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Data Communications and Networking,	Behrouza A. Forouzan	Fourth Edition	TMH.
2.	Computer Networks	A.S.Tanenbaum	Fourth Edition	Pearson
Reference Book				
3.	Data Communications and Networking, TATA McGraw Hill, Ferouzan, Behrouz A.			
4.	Data and Computer Communication, Pearson Education , Stallings William			
5.	Computer Networks, PHI, Tanenbaum, Andrew S,			
Online Resources				
6.	https://www.edx.org/learn/computer-networking			
7.	https://www.udemy.com/topic/computer-network/			
8.	https://www.coursera.org/computer_network			

Code: MCACCA3203	Cloud Computing Lab	1 Credit [LTP: 0-0-2]

CourseOutcome:-

Studentswillbeable to:

- DemonstrateVirtualizationanduseinreallifescenario.
- ApplyServerandStorageVirtualization
- InstallandconfigureVmware
- ApplytheconceptofvSpher
- InstallVSAN

A. LISTOFEXPERIMENTS:

1	DesktopVirtualization–NetworkVirtualization
2	ServerandMachineVirtualization
3	StorageVirtualization-System-levelorOperatingVirtualization
4	SeverVirtualization-PhysicalandLogicalPartitioning-TypesofServerVirtualization
5	InstallingandconfiguringESXi5.5/6.0Server[OnPremise]
6	IntroductiontoManagementwithvCenterServer
7	IntroductiontovSphereNetworkingAndSecurity
8	IntroductiontovSphereStorage
9	VSAN6.6SetupandEnablement
10	vSANScaleOutwithConfigurationAssist
11	vSANAllFlashCapabilities
12	VSANiSCSITarget

B. RECOMMENDEDSTUDY MATERIAL

S. No	TextBooks:	Author	Edition	Publication
1.	Virtualization101:IntroductiontovSphere	A.s.solanki		TMH
ReferenceBook				
1.	CloudComputing:PrinciplesandParadigms,RajkumarBuyya,JohnWiley&Sons			
OnlineResources				
1.	https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SCSA7022.pdf			
2	https://docs.hol.vmware.com/HOL-2022/hol-2210-01-sdc_pdf_en.pdf			

Code: MCACCA3204	Artificial Intelligence Lab	1 Credit [LTP: 0-0-2]

Course Outcome:-

Students will be able:

- To design and analyze AI based algorithms.
- To work on various AI tools.
- To have skills to address the solution of real life problems.
- Elicit, analyze, and specify software requirements for AI based applications.
- Simulate a problem in hand and analyze its performance.

A. LIST OF EXPERIMENTS:

1	Installation and working on Python and PROLOG. and getting familiar with various AI tools in Python viz. tensor flow, keras, theano, nltk, scikit-learn, FANN, Pytorch, open cv etc.
2	Study of Prolog. Write simple facts for the statements using PROLOG.
3	Write a program to solve the 5-queens problem.
4	Write programs for computation of recursive functions like factorial Fibonacci numbers, etc.
5	Write Program for Monkey-banana Problem.
6	Write a Program for water jug problem.
7	Write a program for traveling salesman problem.
8	Write a program which behaves like a small expert for medical Diagnosis.
9	Implement hidden Markov models (HMM) for inference
10	Create a bayesian network in python and make inference through it.
11	Write programs for computation of recursive functions like factorial Fibonacci numbers, etc.

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build	AurélienGéron	2nd Edition	O'Reilly Media
2.	Programming in Prolog	W.P. Clocksin, C.S.	4th Edition	Springer
Reference Book				
3.	Barber, David. Bayesian reasoning and machine learning. Cambridge University Press, 2012.			
4.	Meent, Jan-Willem van de. et al. "An introduction to probabilistic programming." (2018).			
Online Resources				
5.	Journals: Artificial Intelligence, Artificial Intelligence Programming, Machine Learning, IEEE Expert, Data and Knowledge Engineering, Pattern Recognition etc.			
6.	Conferences: AAAI, IJCAI, UAI, ICML, ACL etc.			

Department Elective Courses
Theory

Code: MCAECA3111	Big Data	3Credits [LTP: 3-0-0]

COURSEOUTCOME

Studentswillbeableto:

- ProvideHDFSConceptsandInterfacingwithHDFS
- AccessandProcessDataonDistributedFileSystem
- ExecutejobinHadoopEnvironment
- IdentifythecomponentsofHadoopand HadoopEco-System
- ApplyMachineLearningTechniquesusingR

A. OUTLINEOFTHECOURSE

UnitNo.	TitleofTheUnit	TimerequiredfortheUnit(Hours)
1.	**Introductionto BigData AndHadoop**	**07**
2.	**HDFS(HadoopDistributedFileSystem)**	**08**
3.	**MapReduce**	**08**
4.	**HadoopEco System**	**07**
5.	**Data AnalyticswithR**	**07**

B. DETAILEDSYLLABUS

Unit	UnitDetails
1.	**IntroductiontoBig Data**
	- IntroductionofUnit - IntroductiontoBigData,BigDataCharacteristics - TypesofDigitalData,IntroductiontoBigData,BigDataAnalytics, - RelationshipsandRepresentations,GraphDatabases. - HistoryofHadoop,ApacheHadoop,AnalysingDatawithUnixtools, - AnalysingDatawithHadoop,HadoopStreaming, - HadoopEchoSystem, IBMBigDataStrategy,IntroductiontoInfosphereBigInsightsandBigSheets. - ConclusionofUnit

2.	**HDFS(HadoopDistributedFileSystem)**
	• IntroductionofUnit
	• TheDesignofHDFS,HDFSConcepts,Command LineInterface,
	• Hadoopfilesysteminterfaces,Dataflow,
	• DataIngestwithFlumeandScoopandHadooparchives,
	• HadoopI/O:Compression,Serialization,AvroandFile-BasedDatastructures
	• ConclusionofUnit
3.	**MapReduce**
	• IntroductionofUnit
	• AnatomyofaMap ReduceJobRun,Failures,
	• JobScheduling,ShuffleandSort,
	• TaskExecution,MapReduce TypesandFormats,MapReduceFeatures.
	• ConclusionofUnit
4.	**HadoopEco System**
	• IntroductionofUnit
	• Pig:IntroductiontoPIG,ExecutionModesofPig,
	• ComparisonofPig withDatabases,Grunt,PigLatin,
	• UserDefinedFunctions,Data Processingoperators.Hive:HiveShell,
	• HiveServices,HiveMetastore,ComparisonwithTraditionalDatabases,
	• HiveQL,Tables,QueryingDataandUserDefinedFunctions.Hbase:HBasics,Concepts,Clients, Example,Hbase VersusRDBMS.
	• BigSQL:Introduction
	• ConclusionofUnit
5.	**Data AnalyticswithR**
	• IntroductionofUnit
	• MachineLearning:Introduction,SupervisedLearning,
	• UnsupervisedLearning,CollaborativeFiltering.
	• BigData Analytics withBigR.
	• ConclusionofUnit

C. RECOMMENDEDSTUDYMATERIAL

S.No	TextBooks:	Author	Edition	Publication
1.	Hadoop:TheDefinitiveGuide	TomWhite	Third Editon	O'reily
2.	BigDataAnalytics	SeemaAcharya, SubhasiniChellappan	2015	Wiley
ReferenceBook				
1.	MichaelBerthold,DavidJ.Hand,"IntelligentDataAnalysis",Springer,2007.			
2.	JayLiebowitz,"BigDataandBusinessAnalytics"AuerbachPublications,CRCpress(2013)			
3.	TomPlunkett,MarkHornick,"UsingRtoUnlocktheValueofBigData:BigDataAnalyticswithOracle R			
OnlineResources				
1.	http://www.bdbanalytics.ir/media/1121/big-data-analytics_turning-big-data-into-big-money.pdf			
2.	https://www.techtarget.com/searchbusinessanalytics/definition/big-data-analytics			
3.	https://www.tutorialspoint.com/hadoop/hadoop_big_data_overview.htm			

COURSEOUTCOME

Uponsuccessfulcompletionofthissubjectstudentsshouldbeableto:

- Demonstratethe functional/operationalaspectsofcryptocurrencyECOSYSTEM.
- DescribeemergingabstractmodelsforBlockchainTechnology.
- Design,build,anddeployadistributedapplication.
- Evaluatesecurity,privacy,andefficiencyofagivenblockchainsystem.
- Identifymajorresearchchallengesandtechnicalgapsexistingbetweentheoryandpracticeincryptocurrencydomain

A. OUTLINEOFTHECOURSE

Unit No.	Titleoftheunit	TimerequiredfortheUnit(Hours)
1.	**Theconsensusproblem&cryptographicbasics**	**08**
2.	**Blockchain**	**08**
3.	**DistributedConsensus**	**08**
4.	**Ethereum**	**07**
5.	**CryptocurrencyRegulation**	**07**

B. DETAILEDSYLLABUS

Unit	UnitDetails
1.	**Theconsensusproblem&cryptographicbasics**
	- DistributedDatabase,TwoGeneralProblem,ByzantineGeneralproblemandFaultTolerance,HadoopDistributed FileSystem,Distributed HashTable,ASICresistance,Turing Complete. - Cryptography:Hashfunction,DigitalSignature-ECDSA,MemoryHardAlgorithm,ZeroKnowledgeProof.
2.	**Blockchain**
	Introduction, Advantage over conventional distributed database, Blockchain Network, MiningMechanism,DistributedConsensus,MerklePatriciaTree,GasLimit,TransactionsandFee,Anonymity,Reward,ChainPolicy,LifeofBlockchainapplication, Soft&HardFork,PrivateandPublicblockchain
3.	**DistributedConsensus**
	Nakamotoconsensus,ProofofWork,ProofofStake,ProofofBurn,DifficultyLevel,SybilAttack,Energyutilizationandalternate
4.	**Ethereum**
	History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum VirtualMachine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts -, DAO, Smart Contract, GHOST,Vulnerability,Attacks, Sidechain, Namecoin

5.	CryptocurrencyRegulation
	• Stakeholders,RootsofBitcoin,LegalAspects-CryptocurrencyExchange,ZeroKnowledgeproofsandprotocolsinBlockchain, Blockchain ApplicationsinIoTandDNS etc.

C. RECOMMENDEDSTUDY MATERIAL

S.No	TextBooks:	Author	Edition	Publication
	BitcoinandCryptocurrencyTechnologies: AComprehensiveIntroduction	Arvind Narayanan,Joseph Bonneau,Edward Felten,AndrewMillerand StevenGoldfeder	2016edition	PrincetonUniversityPress
ReferenceBooks:				
1.	Antonopoulos,MasteringBitcoin:UnlockingDigitalCryptocurrencies			
2.	SatoshiNakamoto,Bitcoin: APeer-to-PeerElectronicCashSystem			
3.	DR.GavinWood,"ETHEREUM:ASecureDecentralizedTransactionLedger,"Yellowpaper.2014.			
4.	NicolaAtzei,Massimo Bartoletti,andTizianaCimoli,AsurveyofattacksonEthereumsmartcontracts			
5.	JosephBonneauetal,SoK:ResearchperspectivesandchallengesforBitcoinandcryptocurrency,IEEESymposiumonsecurityand Privacy, 2015 (articleavailable forfree download)			
6.	.A.Garayetal,Thebitcoinbackboneprotocol-analysisandapplicationsEUROCRYPT2015LNCSVOl9057,(VOLII), pp281-310.(Alsoavailable at eprint.iacr.org/2016/1048)			
7.	R.Passetal,AnalysisofBlockchainprotocolinAsynchronousnetworks,EUROCRYPT 2017,(eprint.iacr.org/2016/454)			
8.	R.Passetal,Fruitchain,afair blockchain,PODC2017(eprint.iacr.org/2016/916)			
OnlineResources				
1	https://www.w3schools.in/blockchain/tutorials/			
2	https://nptel.ac.in/courses/106105082			

COURSEOUTCOME

Studentswillbeableto:

- CreateabasicAndroidApplicationusingvariouscontrols.
- ImplementthetasksatbackgroundusingAsyncTaskandServices.
- StorethedatainthebackgroundusingSharedPreference,FirebaseandSQLite
- DevelopanapplicationusingServices,ContentProviderandSQLite.
- ExecutetheconceptoftheFunctionalityofcrossplatformApplicationDevelopment

B. OUTLINEOFTHECOURSE

UnitNo.	TitleofTheUnit	TimerequiredfortheUnit(Hours)
1.	**IntroductiontoAndroid**	08
2.	**UserExperience**	09
3.	**BackgroundProcessing**	10
4.	**DataManagement**	07
5.	**Introductiontocrossplatformapplicationdevelopment**	06

C. DETAILEDSYLLABUS

Unit	UnitDetails
1.	**IntroductiontoAndroid**
	- IntroductionofUnit - Introductionto mobileapplicationdevelopment - Androidplatform,AndroidArchitecture - AndroidSDK,AndroidDevelopmentTools(ADT) - AndroidVirtualDevices(AVDs) - Emulators,DalvikVirtualMachine - DifferencebetweenJVMandDVM - StepstoinstallandconfigureAndroidStudioandSDK - understandingprojectstructure - InstallingandrunningapplicationsonAndroidStudio - ConclusionofUnit
2.	**UserExperience**
	- IntroductionofUnit - ApplicationContext, Activities,Services,Intents - ReceivingandBroadcastingIntents - AndroidManifestFileanditscommonsettings - IntentFilter,Permissions. - Layouts:Linearand RelativeLayouts - AndroidUserInputControls:Button,TextField,Seekbar,Checkbox,RadioButton,ToggleButton - ConclusionofUnit
3.	**BackgroundProcessing**

		• IntroductionofUnit

		• Creatingbackgroundtasks:AsyncTask,AsyncTaskLoader;
		• NetworkConnections.
		• Programmingparadigms
		• ApplicationComponentsPart2:Services –bound/unboundservices,Startingandstopping
		• Services,Broadcastreceivers,Contentproviders.
		• Triggering,schedulingandoptimizingbackgroundtasks:Notifications,Alarms,
		• TransferringdatabetweenActivities
		• GoogleAPI
		• ConclusionofUnit
4.	**DataManagement**	
		• IntroductionofUnit
		• DataAccessandStorage: SharedPreferences
		• Appsettings,Files&theAndroidFilesystem,
		• SQLiteDatabase,Loaders
		• Firebase.Programmingparadigms
		• ContentProvidersandContentResolvers
		• ConclusionofUnit
5.	**Introductiontocrossplatformapplicationdevelopment**	
		• IntroductionofUnit
		• IntroductiontoIonicandphonegap
		• Framework–SupportandFeatures
		• XamarinStudiofordevelopingcross-platformNativeAppsforAndroidand iOS
		• UnderstandtheXamarinfunctionalityfordesigningtheUserInterfaceoftheapp
		• ConclusionofUnit

D. **RECOMMENDEDSTUDY MATERIAL**

S.No	TextBooks:	Author	Edition	Publication
1	AndroidProgramming:TheBigNerdRanchGuide	Bill PhillipsChrisStewart KristinMarsicano, BrianGardner	4thEdition	BigNerdRanch Guides
2	AndroidCookbook	IanF.Darwin	2nd Edition	O'ReillyMedia
3.	PragmaticFlutter:BuildingCross-PlatformMobileAppsforAndroid,iOS,Web&Desktop	PriyankaTyagi	1stEdition	CRSpress
ReferenceBook				
1.	AndroidProgramming:TheBigNerdRanchGuide			
2.	PragmaticFlutter:BuildingCross-PlatformMobile AppsforAndroid,iOS,Web &Desktop			
OnlineResources				
1.	https://www.youtube.com/watch?v=fis26HvvDII			
2.	https://www.mygreatlearning.com/mobile-app-development/free-courses			
3.	https://www.udacity.com/course/new-android-fundamentals--ud851			

Ability Enhancement Courses (AEC)

| Code: MULCHU3201 | Spoken English & Communication Skills II | 1Credit [LTP: 0-0-2] |

COURSE OUTCOMES

Students would be able to:

- Demonstrate depth of understanding, observing complexity, improve insight and develop independent thought and persuasiveness.
- **Determine** the main ideas of the text by using key details and compare & contrast the most important points with the help of their perspective.
- Practice the qualities of writing style by applying the concepts of sentence conciseness, accuracy, readability, coherence and by avoiding wordiness or ambiguity.
- Distinguish words and phrases as per their intonation patterns and interpret the audios based on different situations
- Demonstrate the understanding of impactful conversational skills, presentation skills & telephonic conversation by considering the need of the audience

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Advanced Listening & Speaking Skills**	12
2	**Advanced Reading & Writing Skills**	6
3	**Art of Negotiation Skills**	2
4	**Email Etiquettes**	2
5	**Group Discussion**	2

LIST OF LABS	
1	Listening Skills II: Analysis of videos/audios by famous personalities
2	Speaking Skills II: Extempore, Debate etc.
3	Public Speaking: Key Concepts, Overcoming Stage Fear
4	Story-Telling Skills: Techniques of Story Telling, Prompts for story creation
5	Situational Conversational Skills
6	PowerPoint Presentation Skills-II
7	Reading Skills II: Technical Writings, Research Papers& Articles
8	Writing Skills II: Blog Writing &Review Writing
9	Picture Perception & Discussion
10	Art of Negotiation: Identify the qualities of successful and unsuccessful negotiators. Identify different negotiation situations to practice during class.
11	Email Etiquettes
12	Group Discussion: Dos &Don'ts, Informal GD

Code: MULCSE3201	Skill Enhancement Generic Course –III	1Credit [LTP: 0-0-2]

COURSEOUTCOMES: On completion of the course a student will be able to:

- Understand basic problems based on arithmetic and soft skills area which are asked in aptitude test taken by companies
- Effectively solve these problems by applying the knowledge earned.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

LIST OF ACTIVITIES	
1	Objective Building, Parts of speech, Nouns, Numbers & Genders, Importance of soft skills
2	Logarithms, Number Theory
3	Tenses
4	Number system- Fractions & Decimals
5	Stress Management Techniques, Critical Thinking
6	Modal Verbs & Conditional Tense, Working under pressure
7	Boosting brain power for fast learning & unlearning
8	Pronouns, Adverbs & Adjectives
9	Emotional Intelligence, 5 levels of listening
10	Remainder Theoram
11	Points, lines & angles
12	Article Writing

SEMESTER-IV

Code: MULCSE4201   **Skill Enhancement Generic Course- IV**   **1Credit [LTP: 0-0-2]**

COURSEOUTCOMES: On completion of the course a student will be able to:
- Understand basic problems based on arithmetic and soft skills area which are asked in aptitude test taken by companies
- Effectively solve these problems by applying the knowledge earned.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

	LIST OF ACTIVITIES
1	Averages, Mean, Median and Mode
2	Cognitive learning theory, Body Language basics
3	Heights & Distances
4	Sitting Arrangements
5	Fill Ups(Grammar based)
6	Error Detection, Confusing words
7	Alphanumeric Series
8	Verbal Analogy, One word substitution
9	Dices
10	Sentence Correction, Subject-Verb agreement
11	Statement & Assumptions, Setting SMART goals,
12	Persuasion Skills, Interview Preparation