Your Dreams Our Goal

POORNIMA UNIVERSITY

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 WITH MINOR IN ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SCHEME & SYLLABUS

BATCH: 2023-25

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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:

Your Dreams Our Goal

POORNIMA UNIVERSITY

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

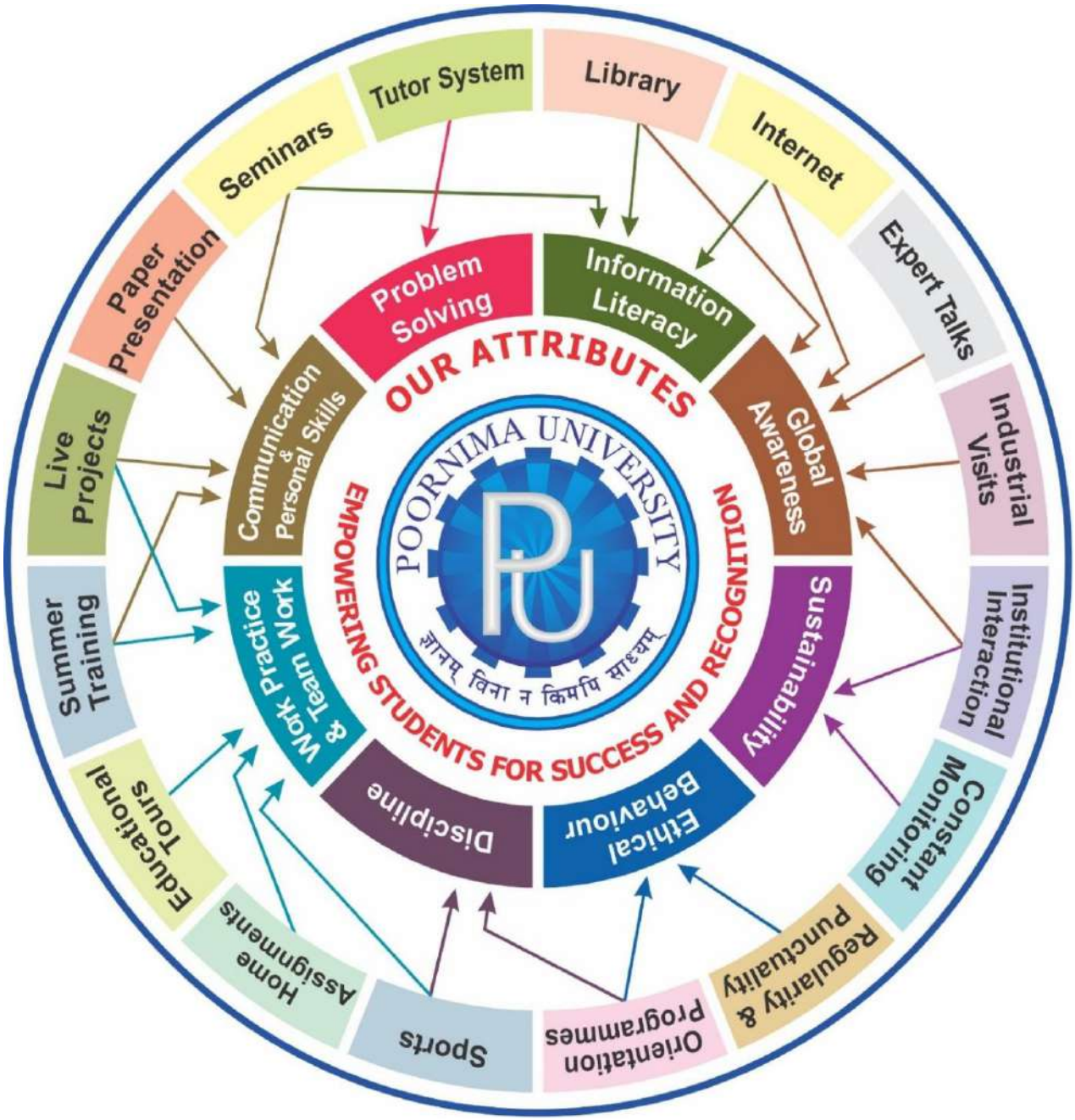
To evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication and commitment to excellence in all spheres of life.

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,orprocessesthatmeetspecifiedneedswithappropriateconsiderationforpublichealthandsafety,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.

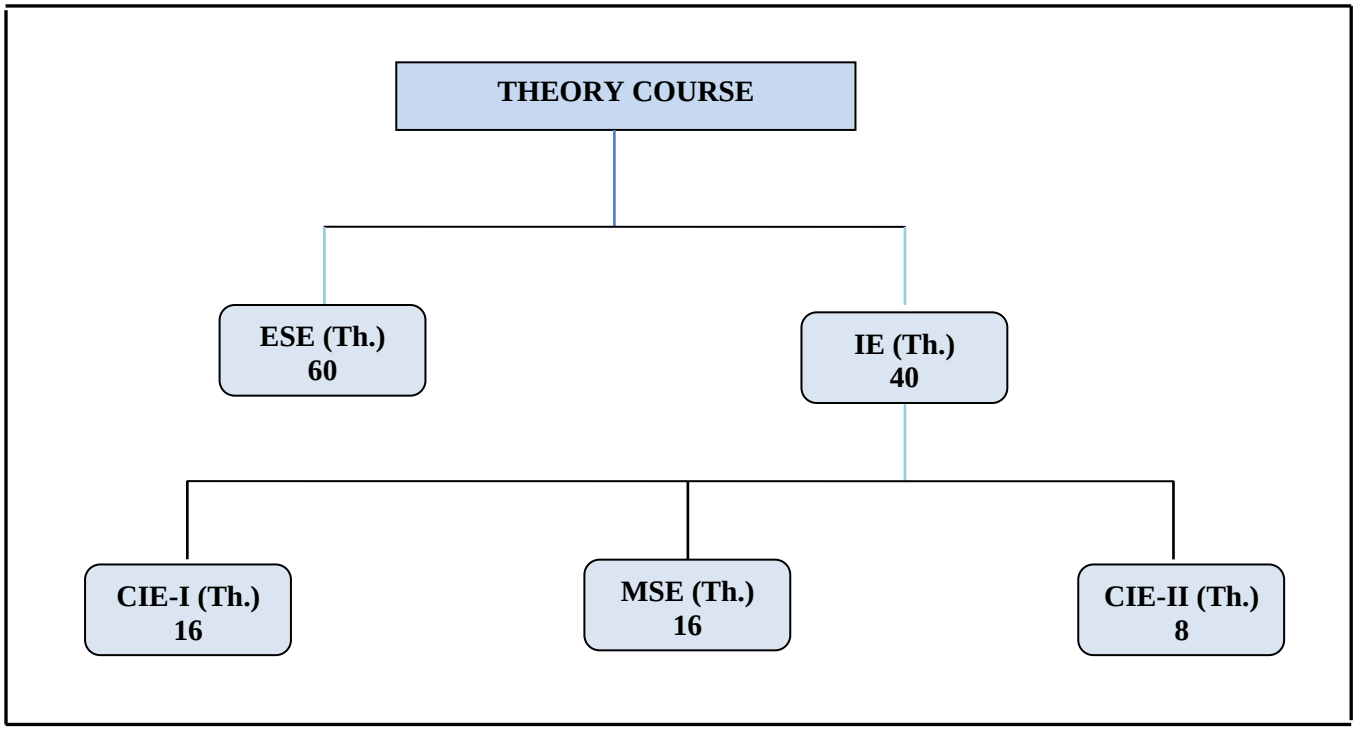
PO 10: Societal and Environmental Concern: Understand and assess societal, environmental,health, safety, legal, and cultural issues within local and global contexts, and the consequentialresponsibilitiesrelevant to professional computing practices.

PO11:IndividualandTeamWork: Functioneffectivelyasanindividualandasamemberorleaderindiverseteams and inmultidisciplinaryenvironments.

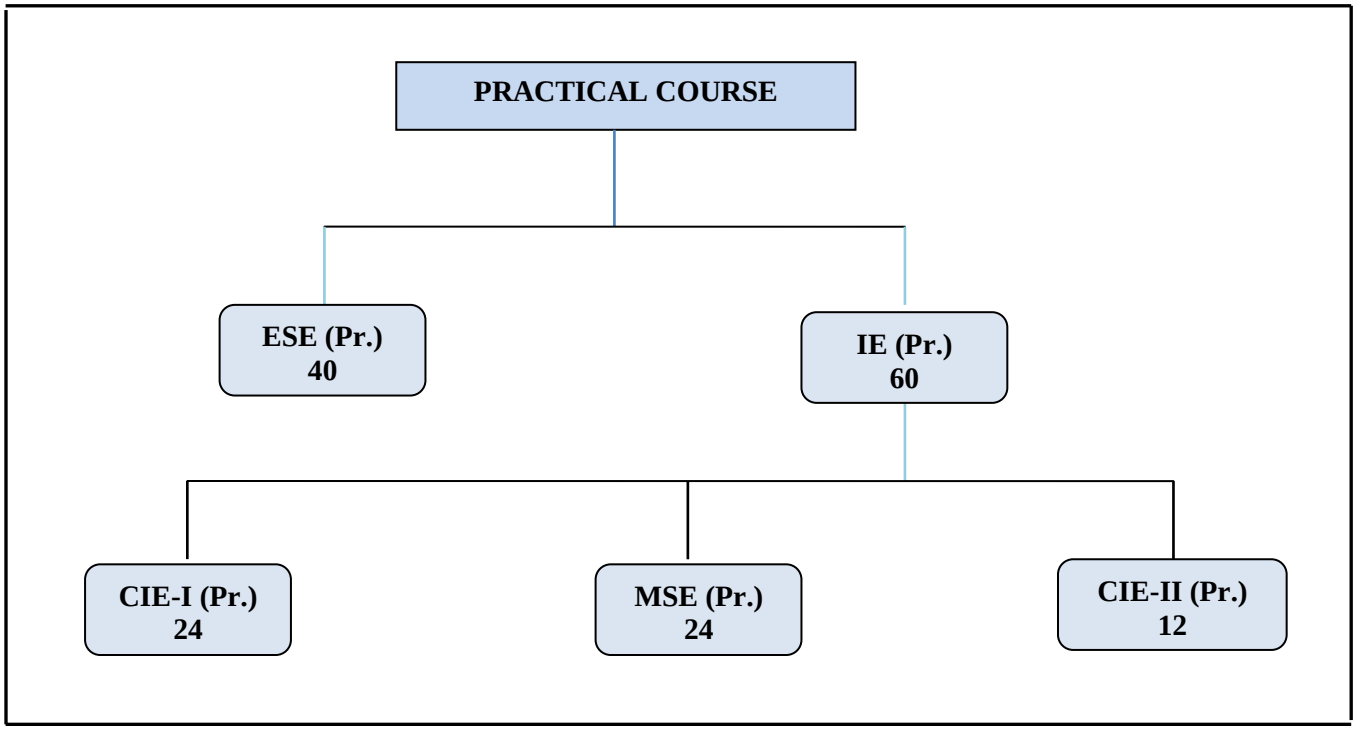
PO 12: Innovation and Entrepreneurship: Identify a timely opportunity and using innovation topursue that opportunity to create value and wealth for the betterment of the individual and society atlarge.

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

$$SGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

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

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

$$CGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

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

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≤ x ≤100
Excellent	A+	9	80≤ x <90
Very Good	A	8	70≤ x <80
Good	B+	7	60≤ x <70
Above Average	B	6	50≤ 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≤ x ≤100
Excellent	A+	9	80≤ x <90
Very Good	A	8	70≤ x <80
Good	B+	7	60≤ x <70
Above Average	B	6	50≤ x <60
Average	C	5	40≤ x <50
Pass	P	4	35≤ x <40
Fail	F	0	x <35
Absent	Ab	0	Absent

CGPA to percentage conversion rule:

Equivalent%ofMarksintheProgram=*CGPA10**

Award of Class

CGPA	Percentage	Equivalent Division
7.50 ≤ CGPA	75% or more	First Division with Distinction
6.00 ≤ CGPA < 7.50	60% ≤ x <75%	First Division
5.00 ≤ CGPA < 6.00	50% ≤ x <60%	Second Division
4.00 ≤ CGPA < 5.00	40% ≤ 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 Artificial Intelligence and Data Science **Duration: 2 years** **Total Credits: 82**

Teaching Scheme for Batch 2023-25

Semester-I

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**								
MCDCCA1101	Fundamentals of Artificial Intelligence and Data Science	**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 Artificial Intelligence and Data Science **Duration: 2 years** **Total Credits: 82**

POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

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**
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**
B.	**Minor Stream Courses**/Department Elective								
B.1	**Theory**								
MCDCCA2101	Data Science and Analytics	3			**1***	60	40	100	**3**
MCDCCA2102	Machine Learning	3			**1***	60	40	100	**3**
B.2	**Practical**								
MCDCCA2201	R Programming Lab			2		40	60	100	**1**
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 Artificial Intelligence and Data Science **Duration: 2 years** **Total Credits: 82**

Teaching Scheme for Batch 2023-25

Semester-III

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**								
MCACCA3101	Operating System	**3**			**1***	**40**	**60**	**100**	**3**
MCACCA3102	Computer Networks	**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**
B.	**Minor Stream Courses**/Department Elective								
B.1	**Theory**								
MCDCCA3101	NLP and Computer Vision	**3**			**1***	**40**	**60**	**100**	**3**
MCDCCA3102	Deep Learning and ANN	**3**			**1***	**40**	**60**	**100**	**3**
MCDCCA3103	Cloud Computing	3	-	-	**1***	**40**	**60**	**100**	**3**
B.2	**Practical**								
MCDCCA3201	NLP and Computer Vision Lab	-	-	**2**		**60**	**40**	**100**	**1**
MCDCCA3202	Deep Learning and ANN Lab	-	-	**2**		**60**	**40**	**100**	**1**
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 Artificial Intelligence and Data Science **Duration: 2 years** **Total Credits: 82**

Teaching Scheme for Batch 2023-25

Semester-IV

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**								
	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 • Exact Differential equation

	•	Conclusion of Unit
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	

C. RECOMMENDED 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. DETAILED 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

Code: MCACCA1103	Python Programming	3 Credits [LTP: 3-0-0]

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 descriptors, • system calls and device drivers. • Conclusion of Unit
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. No	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 Credit [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	Study of Linux basic commands: cal, date, echo, printf, bc, script, mailx, passwd, who, uname, tty, stty, pwd, cd, mkdir, rmdir, ls, cat, cp, rm, mv, more, file, wc, od, cmp,comm, diff, chmod, vi.
2	Study of vi editor
3	Write a Script to print "hello world"
4	Write a script to create function.
5	Write a script to implement local variables.
6	Write a script to implement if...else.
7	Write a script to study for, while and until
8	Write a script that finds the prime factors of a given number.
9	a) Write a script to check if the two strings are same or not. b) Write a shell script to check the given number is Odd/Even
10	Write a script that will print a message "Good Morning" or "Good Afternoon" according to the user login time
11	Linux Commands: cmp, find, grep, od, tar, ps, df, du, finge, kill, nice, nonhup, sleep, test, umask, who, cal, tee, expr, uname, fsck, xargs. Filters for stream handling features of the shell for input and output. E.g. pr, head, tail, cut, paste, sort, nl, uniq, tr.
12	a) Write a shell script to show the Palindrome number b) Write a script to show the Factorial value of the given value

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

Minor Courses

Theory

Code: MCDCCA1101 Fundamentals of Artificial Intelligence and Data Science 3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Describe the applications of Artificial Intelligence and subsets of Artificial Intelligence
- Analyze and solve real-world problems using Artificial Intelligence techniques
- Analyze formal methods of knowledge representation, logic and reasoning on real-world problems
- Determine the various aspects of data science and apply in various fields
- Apply Data preprocessing techniques for creation of datasets

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Artificial Intelligence**	**07**
2.	**Problem solving Methods**	**07**
3.	**Knowledge Representation**	**08**
4.	**Introduction to Data science**	**07**
5.	**Data Collection and Data Pre-Processing**	**07**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Artificial Intelligence**
	• Introduction to Artificial Intelligence • Definition, History and Applications of Artificial Intelligence • Future of Artificial Intelligence • Characteristics of Intelligent Agents • Typical Intelligent Agents • Problem Solving Approach to Typical AI problems. • Artificial Intelligence vs Machine learning vs Deep learning • Artificial intelligence vs big data vs Data science • Conclusion of Unit
2.	**Problem solving Methods**
	• Introduction to Problem solving Methods • Search Strategies: Uninformed, Informed and Heuristics

	• Local Search Algorithms and Optimization Problems • Searching with Partial Observations • Constraint Satisfaction Problems • Constraint Propagation • Backtracking Search • Game Playing: Minimax, alpha-beta pruning, water jug problem, chess problem, tiles problem, Hanoi Tower problem • Optimal Decisions in Games • Stochastic Games • Conclusion of Unit
3.	**Knowledge Representation**
	• Introduction to Knowledge Representation • First Order Predicate Logic • Prolog Programming • Unification • Forward Chaining-Backward Chaining • Resolution • Knowledge Representation • Ontological Engineering • Categories and Objects • Events : Mental Events and Mental Objects • Reasoning Systems for Categories • Reasoning with Default Information • Conclusion of Unit
4.	**Introduction to Data science**
	• Introduction to Data science • Evolution and Definition of Data science • Big Data and Data Science • Need for data science • Data Science Roles • Stages in a Data Science Project

	• Applications of Data Science in various fields • Data Security Issues. • Conclusion of the unit
5.	**Data Collection and Data Pre-Processing**
	• Introduction to Data Collection and Data Pre-Processing • Data Collection Strategies • Data Pre-Processing Overview • Data Cleaning • Data Integration and Transformation • Data Reduction • Data Discretization • Data Analysis in Data science • Conclusion of the unit

C.RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Artificial Intelligence: A Modern Approach	S. Russell and P. Norvig	Third Edition	Prentice Hall
2.	Prolog: Programming for Artificial Intelligence	I. Bratko	Fourth edition	Addison-Wesley Educational Publishers Inc
3.	Smarter Decisions : The Intersection of IoT and Data Science	JojoMoolayil		PACKT
4.	Doing Data Science	Cathy O'Neil and Rachel Schutt		O'Reilly
Reference Book				
1.	Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, M. Tim Jones.			
2.	The Quest for Artificial Intelligence, Cambridge University Press, Nils J. Nilsson.			
3.	Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, William F. Clocksin and Christopher S. Mellish.			
4.	Data Science and Big data Analytics", EMC 2013, David Dietrich, Barry Heller, Beibei Yang.			
5.	Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global, Raj, Pethuru.			
Online Resources				
1.	https://onlinecourses.nptel.ac.in/noc21_ge20/preview			

2.	https://www.coursera.org/learn/introduction-to-ai
3.	https://www.udemy.com/courses/development/data-science
4.	https://www.coursera.org/browse/data-science

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

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**	

	• Introduction of the topic • The role of communication in conflict/stress and conflict/stress management processes. • Analyse the components of conflict/stress that lead to constructive or destructive communication patterns. • Recommend effective conflict/stress management communication for a given situation • Practice Sessions. • Conclusion & Summary of the Unit	• Theory/Practical • Theory/Practical • Theory/Practical • Theory/Practical • Practical • Theory/Practical
4.	**Social Skills Development**	
	• Introduction of the topic • Listening Skills activities • Social Problem Solving • Being a part of the group and expression of feelings • Conclusion & Summary of the Unit	• Theory/Practical • Practical • Practical • Practical • Theory/Practical
5.	**Self Esteem Enhancement**	
	• Introduction of the topic • Face your Fear & Speak with Confidence • Case Study/Class Survey • Personal Growth & Development Session • Conclusion & Summary of the Unit	• Theory/Practical • Practical • Practical • Practical • 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
CO1	3		-	-	-	-	-	-	-	-	-	-	-	-	-
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. • 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

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

Code:MCACCA2202	Design & Analysis of Algorithms Lab	1 Credit [LTP: 0-0-2]

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.Computethetransitiveclosureofagivendirectedgraphusing Warshall'salgorithm.
4	Implement0/1KnapsackproblemusingDynamicProgramming.
5	Fromagivenvertexinaweightedconnectedgraph,findshortestpathstootherverticesusingDijikstra'salgorithm
6	FindMinimumCostSpanningTreeofagivenundirectedgraphusingKruskal'salgorithm.
7	A. Printallthenodesreachablefromagivenstartingnodeinadigraphusing BFSmethod. 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	ImplementanyschemetofindtheoptimalsolutionforthetravelingSalespersonproblemandthensolvethesameprobleminstanceusi ngany 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	-	-	-	-	-	-	-	-	-	-	-	-

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

Minor Courses
Theory

Code:MCDCCA2101	Data Science and Analytics	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Implement statistics and probability in data science
- Analyze the data using algorithms
- Design mathematical model for decision making using business intelligence
- Implement the techniques of web data analytics
- Apply social media analytics process and evaluate metrics.

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Statistics**	**08**
2.	**Data Analytics**	**07**
3.	**Business Intelligence**	**08**
4.	**Web Data Analytics**	**07**
5.	**Analytics in social Media**	**07**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Statistics**
	• Introduction of Unit • Introduction to Statistics and Probability • Basic terminologies, contingency table, frequency and cross table, graphs, histogram and frequency polygon, Random variables, statistical properties of random variables, Expectation, jointly distributed random variables, moment generating function, characteristic function, limit theorems, probability, trial, events, types of events, apriori probability, statistical or empirical probability, Bayes theorem, • Regression and Correlation • Introduction to linear model, properties of regression coefficients, Spurious regression concepts, significance of regression coefficients using t test and F test, concepts of auto correlation, multiple linear regression analysis, correlation analysis, properties of correlation coefficients, significance of single correlation coefficient, significance of multiple correlation coefficients, concepts of multiple correlation and partial correlation • Conclusion of Unit
2.	**Data Analytics**
	• Introduction of Unit • Data Analytics Lifecycle: Overview - Discovery - Data Preparation - Model Planning - Model Building - Communicate Results – Operationalize • Regression analysis • Classification techniques • Clustering

	• Association rules analysis • Conclusion of Unit
3.	**Business Intelligence**
	• Introduction of Unit • Business intelligence: Definition - Effective and timely decisions - data, information and knowledge – role of mathematical models - BI architectures. • Decision Support Systems: Definition - Representation of the decision-making process - Evolution of information systems - - development of DSS. • Mathematical models for decision making: Structure - development of a model - classes of models • Conclusion of Unit
4.	**Web Data Analytics**
	• Introduction to Web Analytics 2.0 • Clickstream • Multiple outcome analysis • Experimentation and testing • Voice of customer • Competitive intelligence • The tactical shift • Optimal strategy for choosing web analytics • Conclusion of Unit
5.	**Analytics in social Media**
	• Introduction to Analytics in social Media • Types of analytics. Dedicated Vs. Hybrid Tools • Data Integration Tools • Best Setup • Social Network Landscape: Concept and UX on social networks • Interactivity of social network • Content flow on social network • Interaction Pattern between users • Social Media as a two way channel. • Conclusion of Unit

C.RECOMMENDED STUDY MATERIAL

S. No	**Text Books:**	**Author**	**Edition**	**Publication**
1.	Data Smart: Using Data Science to Transform Information into Insight	John W. Foreman		Wiley Publication
2.	Introduction to probability Models	Sheldon M. Ross	Ninth Edition	Elsevier Publication
3.	Text Mining Classification, Clustering, and Applications	Ashok N. Srivastava, MehranSahami		CRC Press
4.	Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity	AvinashKaushik	1st Edition	Wiley Publishing
5.	Social Media Analytics Strategy - Using Data to Optimize Business Performance.	Alex Goncalves		APress
Reference Book				

1.	Data Science from Scratch: First Principles with Python, Joel Grus, PHI
2.	Principles of Data Science, SinanOzdemir, PACKT
3.	Mining Text Data, Charu C. Aggarwal, ChengXiangZhai, Springer Publication

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:MCDCCA2102	Machine Learning	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

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

- Demonstrate and distinguish between types of machine learning techniques
- Examine the correlation coefficient for a given data set
- Implement applications with classification and clustering techniques
- Examine the uses of appropriate performance metrics of machine learning
- Modify existing machine learning algorithms to improve classification efficiency

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Machine Learning**	**07**
2.	**Regression**	**08**
3.	**Classification**	**08**
4.	**Clustering**	**07**
5.	**Performance Metrics**	**07**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Machine Learning**
	• Introduction to Machine Learning • Definition of Machine Learning • Working principles of Machine Learning • Classification of Machine Learning : Supervised Learning, Unsupervised Learning, Reinforcement Learning • Supervised Learning: Classification and Regression • Unsupervised Learning: Clustering and Association • Reinforcement Learning • Types of Reinforcement learning : Positive Reinforcement and Negative Reinforcement • Working of Reinforcement learning • Markov Decision Process • Reinforcement Learning Algorithms: Q-Learning and State Action Reward State action (SARSA)

	• Application of Reinforcement Learning • Conclusion of Unit
2.	**Regression**
	• Introduction to Regression • Types of Regression: Linear regression, Logistics regression, Ridge Regression, Lasso Regression, Bayesian Linear Regression and Polynomial Regression • Regression and Correlation • Crosstabs and Scatterplots • Pearson's r • Regression – Finding The line • Regression – Describing the line • Contingency Tables • Conclusion of Unit
3.	**Classification**
	• Introduction of Unit • Classification model building • Types of Classification Algorithm: Binary Classification and Multi Class Classification • Logistic Regression • k-Nearest Neighbors • Decision Trees • Random Forest • Support Vector Machine • Naïve bayes • Conclusion of Unit
4.	**Clustering**
	• Introduction of clustering • Clustering Workflow • Types of Clustering: Centroid-based clustering, Density-based clustering, Distribution-based Clustering and Hierarchical clustering • K- means Clustering • Agglomerative Nesting or AGNES

	• Fuzzy C Means Algorithm – FANNY (Fuzzy Analysis Clustering) • Mean Shift Clustering • DBSCAN – Density-based Spatial Clustering • Gaussian Mixed Models (GMM) with Expectation-Maximization Clustering • Conclusion of Unit
5.	**Performance Metrics**
	• Introduction of Performance metrics • Performance metrics for Regression : Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), R-Squared, Adjusted R-squared • Performance metrics for classification: Accuracy, Confusion Matrix, Precision, Recall, F1 score, ROC AUC, Kappa, MCC (Matthews Correlation Coefficient) and Log-loss. • Performance metrics for clustering : Silhouette Score, Rand Index, Adjusted Rand Index, Mutual Information, Calinski-Harabasz Index and Davies-Bouldin Index • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Machine Learning – An Algorithmic Perspective, Chapman and Hall	Stephen Marsland	Second Edition	CRC Press
2.	Machine Learning	Tom M Mitchell	First Edition	McGraw Hill Education
Reference Book				
1.	Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, EthemAlpaydin.			
2.	Machine Learning: The Art and Science of Algorithms that Make Sense of Data, 1 st Edition, Cambridge University Press, Peter Flach.			
3.	Learning from Data", AML Book Publishers, Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin			
Online Resources				
	https://nptel.ac.in/courses/106106139			
	https://www.udemy.com/course/machine-learning-course/			
	https://www.javatpoint.com/machine-learning			

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

PRACTICAL

Code:MCDCCA2201	R Programming Lab	1 Credit [LTP: 0-0-2]

Course outcomes:

Students will be able to:

- Run the procedure to read and write different format of data set into R environment
- apply function in R programming language
- Implement different options in I/O operations in R programming Language,
- interpret of summary statistics and test hypothesis
- perform non-parametric testing of hypothesis in R

A. LIST of EXPERIMENTS

Part A	
	1. Install and configure R, set working directory. 2. Install Packages and calling installed packages 3. R studio environment and functionalities of R studio 4. Implement basic R operations (data input, missing values, importing data into R using different formats : xlsx, CSV, Text files) 5. Use R as a calculator 6. Explore various functionalities of dataframes. 7. Create data set using data frames, list and tables. 8. Create the contingency table for the given raw data. 9. Create the interactive user input code line in r using readline ( ) function. 10. Create the contingency table for the given vector format data. 11. Convert the contingency table to original format of the given data. 12. Analyse and give interpretation of summary statistics for the given data. 13. Calculate mean, median and mode for the grouped data and compare the results for the given data. 14. Analyse the given data for non-parametric tests and give the interpretations. 15. Use R for test the given data In order to compare the effectiveness of two sources of nitrogen, namely ammonium chloride (NH4Cl) and urea, on grain yield of Coarse cereal, an experiment was conducted. The results on the grain yield of Coarse Cereal (kg/plot) under the two treatments are given below.

NH4Cl : 13.4, 10.9, 11.2, 11.8, 14.0, 15.3, 14.2, 12.6, 17.0, 16.2, 16.5, 15.7.

Urea : 12.0, 11.7, 10.7, 11.2, 14.8, 14.4, 13.9, 13.7, 16.9, 16.0, 15.6, 16.0.

Assess which source of nitrogen is better for Coarse Cereal.

Part B

16. Before an increasing in exercise duty on tea, 800 persons out of a sample of 1000 persons were found to be tea drinkers. After an increasing in duty, 800 people were tea drinkers in a sample of 1200 people. Using SE of a proportion, state whether there is a significant decrease in consumption of tea after the increase in the exercise duty.

17. Use R for test the given data

A health status survey in a few villages revealed that the normal serum protein value of children in that locality is 7.0 g/100ml. A group of 16 children who received high protein food for a period of six months had serum protein values shown below. Can we consider that the mean serum protein level of those who were fed on high protein diet is different from that of the general population?

S.No. (Child No.)	1	2	3	4	5	6	7	8
Protein level (g%)	7.10	7.70	8.20	7.56	7.05	7.08	7.21	7.25

S.No. (Child No.)	9	10	11	12	13	14	15	16
Protein level (g%)	7.36	6.59	6.85	7.90	7.27	6.56	7.93	8.56

18. Students were selected to training. Their performance was noted by giving a test and the marks recorded out of 50. They were given effective 6 months training and again they were given a test and marks were recorded out of 50.

Students	1	2	3	4	5	6	7	8	9	10
Before training	25	20	35	15	42	28	26	44	35	48
After training	26	20	34	13	43	40	29	41	36	46

By applying the t-test can it be concluded that the students have benefited by the training?

19. 100 individuals of a particular race were tested with an intelligence test and classified into two classes. Another group of 120 individuals belong to another race were administered the same intelligence test and classified into the same two classes. The following are the observed frequencies of the two races:

Race	Intelligence		
Intelligent	Non-intelligent	Total	
Race I	42	58	100
Race II	55	65	120
Total	97	123	220

Test whether the intelligence is anything to do with the race.

20. Obtain the correlation coefficient between the heights of father(X) and of the son (Y) from the following data

X	65	66	67	68	69	70	71	72
Y	67	68	65	68	72	72	69	71

And also test its significance. Using R functions.

21. Consider the inbuilt data set cars.
22. Find Correlation between possible variables and pairwise correlation
23. Find regression line between appropriate variables
24. Display the summary statistics and comment on the results

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
	Beginning R: The statistical Programming Language	Dr. Mark Gardener	Latest Edition	John Wiley & Sons, Inc.
	The art of R programming	Norman Matloff	Latest Edition	no starch Press, San Francisco
	Advanced R	Ken Black	Sixth Edition	John Wiley & Sons, Inc.
Reference Book				
	Introduction to Probability and Statistics for Engineers and Scientists Owen Jones, Robert Maillardet and Andrew Robinson, CRC Press			
	The R Book, Hadley Wickham, CRC Press			
Online Resources				
	https://www.r-project.org/about.html			
	https://nptel.ac.in/courses/111104100			
	https://www.w3schools.com/r/			

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	-	2	-	1	1	-	-	-	-	-	-	-	-	-	-
CO3	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	3	2	2	1	-	-	-	-	-	-	-	-	-	-
CO5	1	3	2	1		-	-	-	-	-	-	-	-	-	-

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]

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

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

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 - I	1 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]

COURSE OUTCOME:
Students will be able to:

- Describe the structure and organization of the file system.
- Demonstrate a process synchronization and Scheduling.
- 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.	**Network Layer**
	• 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,	BehrouzA.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			

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	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: 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			

Minor Stream Courses
Theory

Code: MCDCCA3101	NLP and Computer Vision	3Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Demonstrate the significance of natural language processing and solve the real-world problems
- Examine semantics and pragmatics of English language for text processing
- Perform POS tagging for a given natural language and Select a suitable language modelling technique based on the structure of the language.
- Implement basic knowledge, theories and methods in image processing and computer vision.
- Identify, formulate and solve problems in image processing and computer vision.

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to NLP**	**06**
2.	**Language Modelling: N-gram and POS Tagging**	**09**
3.	**Syntactic and Semantic Parsing**	**09**
4.	**Introduction to Computer Vision**	**07**
5.	**Deep Learning and computer Vision**	**09**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to NLP**
	• Introduction to Unit • What is NLP? Why NLP is Difficult? • History of NLP, Advantages of NLP, Disadvantages of NLP • Components of NLP, Applications of NLP • The problem of ambiguity • Phases of NLP • Why NLP is Difficult? • NLP APIs • NLP Libraries • Difference Between Natural language and Computer language • Conclusion of unit
2.	**Language Modeling: N-gram and POS Tagging**
	• Introduction to Unit • Language Modeling with N-gram • Simple N-gram models, Smoothing (basic techniques)

	• Parts-of-speech Tagging • Rule based POS Tagging • TBL POS Tagging • POS tagging using HMM • Conclusion of Unit
3.	**Syntactic and Semantic Parsing**
	• Introduction to Unit • Basic concepts: top down and bottom up parsing • Treebank; • Syntactic parsing: CKY parsing; • Statistical Parsing basics: Probabilistic Context Free Grammar (PCFG); Probabilistic CKY Parsing of PCFGs. • Vector Semantics; Words and Vector; • Measuring Similarity; Semantics with dense vectors; • SVD and Latent Semantic Analysis; • Embedding from prediction: Skip-gram and CBOW • Introduction to Word Net • Conclusion of Unit
4.	**Introduction to Computer Vision**
	• Introduction of Unit • Cameras and optics • Pixels and image filters • Image Formation • Image pyramids and applications • Computer vision VS Image • Conclusion of Unit
5.	**Deep Learning and computer Vision**
	• Introduction to Unit • Deep Learning basics for computer Vision • Image Classification • Applications of Image Classification • Object Detection • Type of Object Detection • Applications of Object Detection • Semantic Segmentation • Applications of Semantic Image Segmentation • Face detection and tracking • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition",	Jurafsky D. and Martin J. H	2nd Edition	Upper Saddle River, NJ: Prentice-Hall, 2008
2.	Natural Language Processing with Python	Edward Loper, Ewan Klein, and Steven Bird	1st Edition	Pearson Education O'Reilly Media
3.	Computer Vision: Models, Learning, and Inference	Simon Prince	2nd Edition	Cambridge University Press
Reference Book				
1.	Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition",			
2.	Computer Vision: Models, Learning, and Inference			
Online Resources				
1.	https://www.nlp.com/nlp-online-course/			
2.	https://www.mygreatlearning.com/academy/learn-for-free/courses/introduction-to-natural-language-processing			
3.	https://www.futurelearn.com/courses/cloudswyft-msft-natural-language-processing-advanced			

Code: MCDCCA3102	Deep Learning and ANN	3Credits [LTP: 3-0-0]

COURSE OUTCOME

Students should be able to:

- Memorize the concepts of Artificial Neural Network .
- Describe the basics concepts of deep learning.
- Emphasize the knowledge on various deep learning algorithms.
- Implement the concept of CNN and RNN to model for real world applications.
- Acknowledge the various challenges involved in designing deep learning algorithms for varied applications

A. *OUTLINE OF THE COURSE*

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Artificial Neural Network**	**07**
2.	**Introduction to Deep Learning**	**08**
3.	**Convolutional Neural Networks**	**09**
4.	**Recurrent Neural Networks**	**07**
5.	**Deep Generative Models and Applications**	**09**

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Introduction to Artificial Neural Network**
	• Introduction to Artificial Neural Network • Artificial Neural Network (ANN) • Working principles of Neural Network Works • Perceptron • Multilayer Perceptron • Feed Forward • Gradient Descent and Stochastic Gradient Descent • Back propagation • Empirical Risk Minimization • Regularization • Autoencoders • Conclusion of Unit
2	**Introduction to Deep Learning**

	• Introduction to Deep Learning • Basics: Biological Neuron, Idea of computational units, McCulloch • Pitts unit and Thresholding logic • Linear Perceptron • Perceptron Learning Algorithm • Linear separability • Convergence theorem for Perceptron Learning Algorithm • Deep Learning Packages
	• Deep Learning Applications • Building Deep Learning Environment • Installing TensorFlow Locally • Working with Google Colab • Conclusion of Unit
3	**Convolutional Neural Networks**
	• Introduction of Convolutional Neural Network • Basic structure of Convolutional Network • Case studies: Alex net, VGG- Net, GoogLeNet • Applications of CNN– Object Detection, Content based image Retrieval • Conclusion of Unit
4	**Recurrent Neural Networks**
	• Introduction of Recurrent Neural Networks • Bidirectional RNNs • Deep Recurrent Networks • Recursive Neural Networks • The Long Short-Term Memory and Other Gated RNNs • Conclusion of Unit
5	**Deep Generative Models and Applications**
	• Introduction of Deep Generative Models • Boltzmann Machines • Restricted Boltzmann Machines • Introduction to MCMC and Gibbs Sampling • Gradient computations in RBMs • Deep Belief Networks • Deep Boltzmann Machines • Application • Large-Scale Deep Learning Computer • Speech Recognition • Natural Language Processing • Other Applications • Conclusion of Unit

C. *RECOMMENDED STUDY MATERIAL*

S. No	Text Books:	Author	Edition	Publication
1	Deep Learning	Ian Goodfellow, Yoshua Bengio, Aaron Courville	Latest	MIT Press
2	Deep Learning Made Easy with R: A Gentle Introduction for Data Science	N.D.Lewis	Latest	
3	Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms	Nikhil Buduma	Latest	O'Reilly publications.

Reference Books
1. Make your own neural network, Tariq Rashid 2. Hands-On Deep Learning with TensorFlow, Dan Van Boxel 3. Hands-on Machine Learning with Scikit-learn and Tensorflow, O'Reilly, Deron A.
Online Resources
1. https://nptel.ac.in/courses/106106184 2. https://www.javatpoint.com/deep-learning 3. https://www.coursera.org/specializations/deep-learning

Code: MCDCCA3103	Cloud Computing	3Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Describe the main concepts, key technologies, strengths, and limitations of cloud
- Demonstrate the architecture and infrastructure of cloud computing and various service models.
- Define the concept and application of virtualization
- Analyze the concept of service management in cloud computing
- Examine security and privacy issues in cloud computing

A. *OUTLINE OF THE COURSE*

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Introduction to Cloud Technologies**	**08**
2.	**Cloud Computing Architecture and Service Models**	**08**
3.	**Virtualization**	**06**
4.	**Service Management in Cloud Computing**	**06**
5.	**Cloud Security**	**06**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Cloud Technologies**
	Overview of computing paradigm: Recent trends in Computing - Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing. History of Cloud Computing, Evolution of cloud computing - Business driver for adopting cloud computing, Cloud service providers. Properties, Characteristics & Disadvantages - Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing.
2.	**Cloud Computing Architecture**
	Cloud Computing Architecture: Cloud computing stack - Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services. Service Models (XaaS) - Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS). Deployment Models, Public cloud, Private cloud, Hybrid cloud, Community cloud

3.	**Virtualization**
	Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine (VM). Resource Virtualization - Server, Storage, Network. Virtual Machine (resource) provisioning and manageability, storage as a service, Data storage in cloud computing (storage as a service). Renting, EC2 Compute Unit, Platform and Storage, pricing, customers. Service Oriented Architecture (SOA). Cloud Platform and Management – computation Web services, Web 2.0, Web OS
4.	**Service Management in Cloud Computing**
	Service Management in Cloud Computing: Service Level Agreements(SLAs), Billing & Accounting,
	Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously, Managing Data - Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud, Large Scale Data Processing
5.	**Cloud Security**
	Cloud Security: Infrastructure Security - Network level security, Host level security, Application level security. Data security and Storage - Data privacy and security Issues, Jurisdictional issues raised by Data location: Identity & Access Management, Access Control, Trust, Reputation, Risk, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Cloud Computing Bible	Barrie Sosinsky	Latest	John Wiley & Sons
2.	Cloud Computing: A Practical Approach	Velte Anthony T., Velte Toby J. and Elsenpeter Robert	Latest	McGraw Hill, Indian edition
3.	Cloud Computing: Principles and Paradigms	Rajkumar Buyya	Latest	John Wiley & Sons,

S. No	Text Books:	Author	Edition	Publication
1.	Cloud Computing Bible	Barrie Sosinsky	Latest	John Wiley & Sons
2.	Cloud Computing: A Practical Approach	Velte Anthony T., Velte Toby J. and Elsenpeter Robert	Latest	McGraw Hill, Indian edition
Reference Book				
1	Cloud Computing: Principles and Paradigms, Rajkumar Buyya, John Wiley & Sons			
Online Resources				
1	https://onlinecourses.nptel.ac.in/noc22_cs20/preview			
2	https://www.w3schools.in/cloud-computing			

Minor Stream Courses
Practical

Code: MCDCCA3201	NLP and Computer Vision Lab	1Credit [LTP: 0-0-2]

Course Outcome:-

Students will be able to:

- Develop systems for various NLP problems with moderate complexity.
- Familiarize various NLP software libraries and data sets publicly available.
- Implement semantics and pragmatics of English language for text processing
- Implement real time applications of computer vision.
- Design and develop practical and innovative image processing and computer vision applications or systems.

A. *LIST OF EXPERIMENTS:*

1	Write a program to tokenize the sentence into words for the further analysis (using Python Function)
2	Write a program to Normalize the sentence to eliminate the unwanted punctuation, converting into lower case or upper case of the entire document, expanding abbreviation, numbers into words and canonicalization
3	Write a program that splits the following string "Hello there SAM" into list and iterate over th list using 3 different methods • List as a Iterable • Using Range
4	Convert the following sentence into tokens "NLP is Fun ,you must learn it " into lowercase • Without splitting • With splitting
5	Write a program for Amazon review dataset to find the maximum number of words used. Get the output for the frequently occurred word in the given data? And also visualize the test data .
6	Write a program to Get the word cloud for the yelp Review data set
7	Perform the sentiment analysis, classifying comments using various machine learning model on IMDB review data set
8	Write a program to perform n-gram analysis on Amazon review data set and also compare result while performing different type of n-gram analysis on the given dataset
9	Write a program to display grayscale images using python

10	Write a python program to detect the edges of image
11	Write a python program to create a vision program to find histogram value and display histograph of a grayscale and color image.
12	Write a python program to create a program to eliminate the high frequency components of an image.

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	"Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition",	Jurafsky D. and Martin J. H	2nd Edition	Upper Saddle River, NJ: Prentice-Hall, 2008
2.	Natural Language Processing with Python	Edward Loper, Ewan Klein, and Steven Bird	1st Edition	Pearson Education O'Reilly Media
3.	Computer Vision: Models, Learning, and Inference	Simon Prince	2nd Edition	Cambridge University Press
Reference Book				
1.	"Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition",			
2.	Computer Vision: Models, Learning, and Inference			
Online Resources				
1.	https://www.nlp.com/nlp-online-course/			
2.	https://www.mygreatlearning.com/academy/learn-for-free/courses/introduction-to-natural-language-processing			
3.	https://www.futurelearn.com/courses/cloudswyft-msft-natural-language-processing-advanced			

Code: MCDCCA3202	Deep Learning and ANN Lab	1Credit [LTP: 0-0-2]

Course Outcome:-

Students will be able:

- Implement the various deep learning algorithms in Python.
- Apply different deep learning frameworks like Keras, Tensor flow and PyTorch, Caffe
- Design hyper parameters of CNN for achieving the desired outcomes.
- Design the test procedures to assess the efficacy of the developed model.
- Implement a real world application based object detection model by using CNN.

A. LIST OF EXPERIMENTS:

1	Implement a python program to recognize characters.
2	Use MNIST dataset for the same. Implement SVM / Softmax classifier for CIFAR-10 dataset: (i) using KNN, (ii) using 3 layer neural network..
3	Implement the concept of transfer learning to classify an image dataset by using pre trained model.
4	Study the effect of batch normalization and dropout in neural network classifier.
5	Improve the Deep learning model by tuning hyper parameters.
6 7 8	Implement the CNN based image segmentation using on the online available dataset by using : ● Mask RCNN, ● UNet, ● SegNet
9 10	Object detection with single-stage and two-stage detectors by using: ● Yolo, ● FRCNN
11	Image Captioning with LSTMs
12	Image generation using GAN.

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1	Deep learning with Python	Francois Chollet	2021 Edition	Manning Publications
Reference Book				
1	**Deep learning with TensorFlow: Explore neural networks with Python, Packt Publisher, 2017, Zaccone, Giancarlo, Md Rezaul Karim, and Ahmed Menshawy.**			
2	**Deep Learning with Keras, Packt Publishers, 2017, Antonio Gulli, Sujit Pal**			
Online Resources				
1	**https://www.tensorflow.org/datasets/catalog/mnist**			
2	**Online communities available at Stackoverflow, and Github**			
3	**https://www.youtube.com/watch?v=X_pCiVQ4c4E&list=PLZsOBAyNTZwbIjGnolFydAN33gyyGP7lT**			

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