SN	Course Title	Course Code	University Code	Program Outcomes (PO's)												PS
				PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
1	Chemistry -I	EC101	BS-CH101	-	-	-	-	-	-	-	-	3	3	-	3	-
2	Mathematics -IB	EC102	BS-M102	3	3	-	-	-	-	-	-	3	-	-	3	3
3	Basic Electrical Engineering	EC103	ES-EE101	2	2	-	-	-	-	-	-	-	-	-	2	2
4	Chemistry _I Laboratory	EC104	BS-CH191	2	2	-	-	2	-	-	2	2	2	-	2	2
5	Basic Electrical Engineering Laboratory	EC105	ES-EE191	2	2	-	-	-	-	-	-	-	-	-	2	2
6	Engineering Graphics & Design	EC106	ES-ME191	3	3	-	-	-	-	-	3	3	3	-	3	3
7	Physics -I	EC201	BS-PH201	-	-	-	-	3	-	-	3	3	3	-	3	-
8	Mathematics -IIB	EC202	BS-M202	-	-	-	-	-	3	3	3	3	-	-	3	-
9	Programming for Problem Solving	EC203	ES-CS201	3	3	-	-	-	-	-	-	3	-	-	-	-
10	English	EC204	HM-HU201	3	3	-	-	-	-	-	3	3	3	-	3	3
11	Physics -I Laboratory	EC205	BS-PH291	1	1	-	-	-	-	-	-	-	-	-	1	1
12	Programming for Problem Solving Laboratory	EC206	ES-CS291	3	3	-	-	3	-	-	3	3	3	-	3	3
13	Workshop/Manifacturing Practices	EC207	ES-ME292	2	2	-	-	-	-	-	-	-	-	-	2	2
14	Language Laboratory	EC208	HM-HU291	3	-	0	-	-	-	-	3	3	3	-	3	3
15	Probality and Satistics	EC301	BSM301	1	1	-	-	-	-	-	-	-	-	-	1	1
16	Electronic Devices	EC302	EC 301,	1	1	0	0	0	0	0	0	1	0	0	0	1
17	Digital System Design	EC303	EC302	1	1	2	1	1	0	0	0	1	1	0	0	1
18	Signals & Syatems	EC304	EC 303	2	2	-	-	-	-	-	-	-	-	-	-	2
19	Network Theory	EC305	EC 304	2	2	0	0	2	0	0	1	1	2	0	0	2
20	Data Structure & Algorithms	EC306	ES-CS301	1	1	1	0	0	0	0	0	1	0	0	1	0
21	Numerical Methods (BS)	EC401	BS M401	1	1	-	-	1	-	-	1	1	1	-	1	1
22	Analog Communication	EC402	EC 401	2	2	0	0	0	0	0	0	2	0	0	0	2
23	Analog Electronics	EC403	EC 402	1	2	0	0	0	0	0	0	2	0	0	0	1
24	Microprocessor & Microcontroller	EC404	EC 403	1	-	2	-	-	1	-	-	1	-	-	1	1
25	Design and Analysis of Algorithm	EC405	ES CS 401	1	2	2	-	-	-	-	-	1	-	-	-	2
15	Analog Communication	EC501	EC501	2	2	0	0	0	0	0	0	0	0	0	0	2
16	Microprocessor & Microcontroller	EC502	EC502	2	2	2	1	2	-	-	-	2	1	-	1	2
17	CONTROL SYSTEMS	EC503	EC 503	3	2	1	0	2	0	0	0	0	0	0	0	3
18	Data Structure & C	EC504	EC 504B	1	1	0	0	0	0	0	0	1	1	1	1	1
19	Economics for Engineers	EC505	HU501	0	2	2	2	2	2	3	3	2	2	3	2	0
20	Digital Communication	EC601	EC 601	2	2	2	1	1	0	0	0	0	0	0	0	2
21	Digital Signal Processing	EC602	EC 602	2	2	-	-	-	-	-	-	2	-	-	-	2
22	Telecommunication System	EC603	EC 603	1	1	0	0	0	0	2	0	0	0	0	0	1

23	Information Theory & Coding	EC604	EC 604B	2	2	-	-	-	-	-	-	-	-	-	1	2
35	Wireless Communication and Networks	EC701	EC 701	2	2	0	0	1	0	0	0	0	0	0	1	1
36	Moicroelectronics and VLSI Design	EC702	EC 702	1	2	0	3	0	0	0	0	2	0	0	0	1
37	RF & Microwave Engg	EC703	EC 703A	3	2	1	-	-	-	-	-	-	-	1	-	2
38	Embedded Systems	EC704	EC 704B.5	1	1	2	0	2	0	0	0	1	0	0	0	1
39	Database Management System	EC705	EC 705C	1	1	1	1	3	2	2	-	2	-	2	2	1
40	Power Electronics	EC706	EC 705D	1	2	2	3	3	2	2	0	2	0	2	2	2
41	Group Discussion	EC707	HU 781	0	0	0	0	0	0	0	1	2	3	1	1	0
42	Project part I	EC708	EC782	3	2	3	3	3	2	2	1	2	0	2	2	3
43	Digital Image Processing	EC801	EC 801B	1	1	0	1	1	0	0	0	0	0	0	0	1
44	Material Science & Engineering	EC802	EC801B	2	2	2	3	0	0	0	0	0	0	0	0	2
45	Renewable Energy	EC803	EC 802C	2	2	-	1	-	1	2	-	-	-	-	2	1
46	Design Lab	EC804	EC 881	3	3	2	2	3	2	0	2	0	2	0	2	3
47	Organizational Behaviour:	EC805	HU801	-	-	-	-	-	0	-	-	2	2	2	-	-
48	Project Part II	EC806	EC882	3	2	3	3	3	2	2	1	2	0	2	2	3
SN	Course Title	Course Code	University Code	Program Outcomes (PO's)												PS
				PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO-PO ATTAINMENT				1.88	1.86	1.8	1.81	2	1.8	2.1	2.1	2.01	2.15	1.69	1.91	1.82
CO-PO ATTAINMENT (TARGET)				1.96	1.93	1.89	1.86	2.08	1.8	2.1	2.12	2.1	2.23	1.72	1.96	1.87

SO	
PSO2	Attainment Marks
-	**3**
-	3
-	**3**
2	**3**
-	3
-	**3**
-	3
-	3
3	3
-	**3**
-	3
3	**3**
-	3
-	**3**
-	**3**
1	**2**
1	**2**
0	**3**
2	**3**
1	**2**
1	**2**
2	**3**
1	**3**
1	**3**
2	**3**
2	**3**
2	**3**
2	**3**
1	**2**
0	**3**
2	**3**
2	**3**
0	**3**

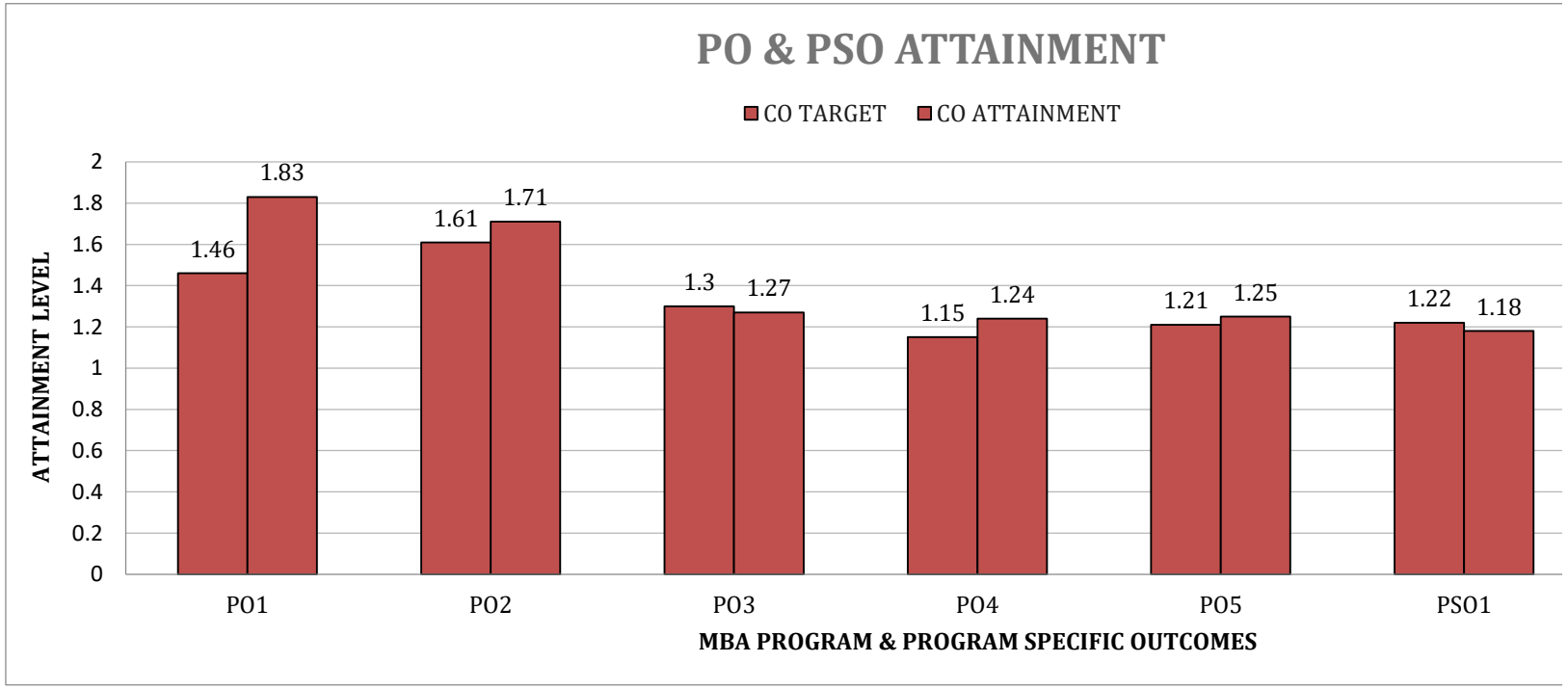
-	**3**
0	**3**
2	**3**
2	**3**
2	**3**
3	**3**
3	**3**
0	**3**
2	**3**
1	**2**
2	**3**
-	**3**
2	**3**
-	**3**
2	**3**
SO	**3**
PSO2	**3**
1.75	**3**
	3
1.83	

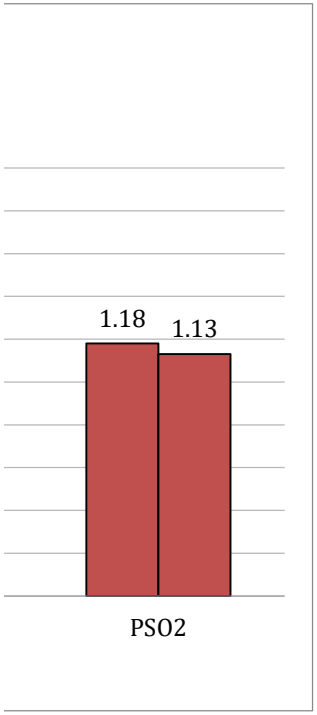
2

M.B.A	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
CO TARGET	1.46	1.61	1.3	1.15	1.21	1.22	1.18
CO ATTAINMENT	1.83	1.71	1.27	1.24	1.25	1.18	1.13

See CO-PO TARGET

See CO-PO ATTAINMENT




1.18
1.13
PSO2

Course Handout for 04 Years B.Tech PROGRAM

Name of the Faculty:Mrs. Ankita Sinha
E-mail: **ethosankita@gmail.com**

Course Title	: Artificial Intelligence
Course Code	: PEC-IT 501B
L-T-P-S Structure	: 3-0-0
Credits	: 3
Pre-requisite	: Basic Data Structure & Design and Analysis of Algorithm
Course Coordinator	: Mrs. Ankita Sinha

Course Objective:

1. To understand the meaning of AI, its alternative approaches.
2. To expand knowledge about inform and uniform search heuristics search, genetic algorithm, planning and learning algorithms.
3. To understand the basic methods in planning and reasoning using both logic and uncertain inference.
4. To know different way to represent the knowledge and information.

COURSE OUTCOMES (COs):

CO No	Course Outcome (CO)	Blooms Taxonomy Level (BTL)	Target %
PEC-IT 501B.1	**Explain** the various types of AI agent and search algorithm (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms, game playing).	**(BT-Level 2)**	60%
PEC-IT 501B.2	**Develop** the basic knowledge-based system with the help of knowledge representation.	**(BT-Level 3)**	60%
PEC-IT 501B.3	**Analyze** the working knowledge of reasoning in the presence of probabilistic approaches.	**(BT-Level 4)**	60%
PEC-IT 501B.4	**Describe** the notion of machine learning techniques.	**(BT-Level 4)**	60%

PROGRAM OUTCOMES (POs):

PO Number	Description
1. **Engineering Knowledge**	Engineering knowledge: Apply the knowledge of mathematics, science, Electronics & Communication engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis**	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and Electronics & Communication engineering sciences.
3. **Design/ development of solutions**	Design/development of solutions: Design solutions for complex Electronics & Communication engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions in the field of Electronics & Communication Engineering.
5. **Modern tool usage**	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex Electronics & Communication engineering activities with an understanding of the limitations.

PO Number	Description
6. **The engineer and society**	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Electronics & Communication engineering practice.
7. **Environment and sustainability**	Environment and sustainability: Understand the impact of the professional Electronics & Communication engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**	Communicate effectively on complex Electronics & Communication engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**	Demonstrate knowledge and understanding of the Electronics & Communication engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
PEC-IT 501B.1	1	2	--	--	2	--	--	--	--	--	2	1	1	1	1
PEC-IT 501B.2	2	2	2	--	2	--	--	--	2	--	2	1	1	1	1
PEC-IT 501B.3	2	2	2	--	2	--	--	--	--	--	2	1	1	---	1
PEC-IT 501B.4	1	2	2	--	2	1	--	--	2	--	2	1	1	1	1
PEC-IT 501B	**1**	**2**	**2**	--	**2**	1	--	--	**2**	--	**2**	**1**	**1**	**1**	**1**

1 = courses in which the student will be exposed to a topic
2 = courses in which students will gain competency in that area
3= courses in which students will master that skill

SYLLABUS:

CHAPTER-1
Introduction - Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem. [2L]
Intelligent Agents - Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents. [2L]
Problem Solving - Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs. [2L]

CHAPTER-2

Search techniques - Solving problems by searching: problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. [5L]
Heuristic search strategies - Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems. [5L]
Adversarial search - Games, optimal decisions & strategies in games, the mini-max search procedure, alpha-beta pruning, additional refinements, iterative deepening. [3L]

CHAPTER-3
Knowledge & reasoning - Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation. [3L]

CHAPTER-4
Using predicate logic - Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction. [2L]
Probabilistic reasoning - Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics. [4L]

CHAPTER-5
Natural Language processing - Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing. [2L]
Learning - Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning. [2L]
Expert Systems - Representing and using domain knowledge, expert system shells, and knowledge acquisition. [2L]

TEXT BOOKS:

1. "Artificial Intelligence", Ritch & Knight, TMH.
2. "Artificial Intelligence- A Modern Approach", Stuart Russel Peter Norvig Pearson.
3. "Artificial Intelligence", A Classical Approach, Munish Chandra Trivedi, Khanna Publishing.
4. "Introduction to Artificial Intelligence & Expert Systems", Patterson, PHI

REFERENCE BOOKS:

5. "Poole, Computational Intelligence", OUP.
6. "Logic & Prolog Programming", Saroj Kaushik, New Age International.
7. "Expert Systems", Giarranto, VIKAS.
8. "Introduction to Artifical Intelligence", Rajendra Akerkar, PHI

COURSE DELIVERY PLAN:

Week	Sess. No.	CO	Topic (s)	Book No [CH No] [Page No]	Teaching-Learning Methods	Planned Date	Execution Date
1	1	1	Introduction to the Syllabus and basic concept of artificial intelligence, its applications, few examples, Problems of AI, AI technique	1[1][3]	T: Chalk & Talk L: Observes understands	17.7.23	

	2	1	Tic- Tac -Toe problem, Agents & environment, nature of environment and types of environment,	2[2] [35-37] 2[2] [43-45]	T:Questioning /Discussion L: Answering questions, Participates	19.7.23	
	3	1	Types of agents-structure of agents, goal-based agents, utility-based agents, learning agents	8[12] [260-270]	T: Lecturing L: Observes understands	21.7.23	
2	4	2	Problems, Problem Space & search: Defining the problem as state space search	1[2][29-36]	T: Lecturing L: Observes understands	24.7.23	
	5	2	Production system, problem characteristics, issues in the design of search programs.	1[2] [44-58]	T: Lecturing L: Observes understands	26.7.23	
	6	2	Solving problems by searching: problem solving agents, searching for solutions, Type of search	2[3] [81-88]	T: Lecturing L: Observes understands	28.7.23	
3	7	3	Uniform search strategies: breadth first search, depth first search,	2[3] [81-88]	**T:** Chalk & Talk L: Observes understands, Problem solving	31.7.23	
	8	3	Depth limited search,	2[3] [89-92]	**T:** Chalk & Talk L: Observes understands, Problem solving	2.8.23	
	9	3	Bidirectional search, comparing uniform search strategies.	2[3] [92-100]	**T:** Chalk & Talk L: Observes understands, Problem solving	4.8.23	
4	10	3	Heuristic search strategies: Greedy best-first search	1[3][63-79] 2 [4][120-129]	**T:** Chalk & Talk L: Observes understands, Problem solving	7.8.23	
	11	3	A* search, memory bounded heuristic search: local search algorithms	8[6][127-130]	**T:** Chalk & Talk L: Observes understands, Problem solving	9.8.23	
	12	2	Optimization problems: Hill climbing search,	8[6][125-126]	**T:** Chalk & Talk L: Observes understands	11.8.23	
5	13	2,3	Simulated annealing search, local beam search	8[6][130-134]	**T:** Chalk & Talk L: Observes understands	14.8.23	
	14	1	Genetic algorithms	Web Source	T: PPT	16.8.23	

				(https://www.tutorialspoint.com/genetic_algorithms/genetic_algorithms_introduction.htm)	L: Observes understands		
	15	2	Constraint satisfaction problems,	1[3][68-72]	**T:** Chalk & Talk L: Observes understands	18.8.23	
	16	2	local search for constraint satisfaction problems.	8[6][137-138]	**T:** Chalk & Talk L: Observes understands	21.8.23	
	17	*2,3*	Adversarial search : Games, optimal decisions & strategies in games,	1[12][231-232]	**T:** Chalk & Talk L: Observes understands, Problem solving	23.8.23	
	18	2	The minimax search procedure	1[12][233-235]	**T:** Chalk & Talk L: Observes understands, Problem solving	25.8.23	
6	19	2	Alpha-beta pruning,	1[12][236-239]	**T:** Chalk & Talk L: Observes understands, Problem solving	28.8.23	
	20	2	Additional refinements, iterative deepening.	1[12][239-243]	T: Lecturing L: Observes understands	30.8.23	
	21	2	Knowledge representation issues, representation & mapping,	8[3][49-50]	**T:** Chalk & Talk L: Observes understands, Problem solving	1.9.23	
7	*22*	*2*	Different approaches for knowledge representation	8[3][50-55]	**T:** Chalk & Talk L: Observes understands	4.9.23	
	23	2	Issues in knowledge representation.	8[3][55-58]	T: Chalk & Talk L: Observes understands	6.9.23	
	24	2,3	Representing simple fact in logic, representing instant & ISA relationship,	8[3][58-64]	T: Chalk & Talk L: Problem based learning	8.9.23	
8	*25*	1	Computable functions & predicates, resolution, natural deduction.	8[3][64-68]	T: Lecturing L: Problem based learning	11.9.23	

	26	*2*	Representing knowledge in an uncertain domain, the semantics of Bayesian networks	8[5][96-98]	T: Lecturing L: Observes understands	13.9.23	
	27	2	Dempster-Shafer theory	8[5][100-103]	T: PPT L: Observes understands	15.9.23	
9	28	2,3	Fuzzy sets & fuzzy logics	8[5][108-111]	T: PPT L: Observes understands	18.9.23	
	29	1	Natural Language processing: Introduction, Syntactic processing,	1[15][285-299]	T: PPT L: Observes understands	20.9.23	
	30	1	Natural Language processing: semantic analysis, discourse & pragmatic processing.	1[15][300-320]	T: PPT L: Observes understands	22.9.23	
10	31	2	Learning : Forms of learning, inductive learning, learning decision trees, explanation based learning	1[17][347-364]	T: PPT L: Observes understands	25.9.23	
	32	2	Learning : learning using relevance information, neural net learning & genetic learning	1[15][365-373]	T: PPT L: Observes understands	27.9.23	
	33		Revision Lesson		T: PPT L: Observes understands	29.9.23	
11	34		Revision Lesson		T: PPT L: Observes understands	4.10.23	
	35		Previous years questions discussion		T: PPT L: Observes understands	6.10.23	

COURSE TIME TABLE:

Day	Monday	Wednesday	Friday
Timing	3:00 PM – 3:50 PM (07 Periods)	10:50 AM – 11:40 AM (02 Period)	10:00 AM-10:50 AM (01 Period)

REMEDIAL CLASSES:
Supplement course handout, which may perhaps include special lectures and discussions that would be planned, and schedule notified accordingly.

EVALUATION: AS PER MAKAUT GUIDELINES

Schedule for Continuous Assessment (CA):

CA	Assessment By	Schedule
CA-I	Presentation, Quiz, Group Discussion	11.08.23 – 14.08.23
CA-II	Report writing	11.09.23 – 14.09.23
CA-III	Class test in pen and paper mode to be conducted at the College Level	03.14.23 – 06.10.23
CA-IV	Centralized online test to be	As per Academic Calendar

	arranged by theUniversity	

ATTENDANCE POLICY

Every student is expected to be responsible for regularity of his/her attendance in class rooms and laboratories, to appear in scheduled tests and examinations and fulfil all other tasks assigned to him/her in every course. For Promotion, a Minimum of 50% of internal marks must be obtained. In every course, student has to maintain a minimum of 75% attendance to be eligible for appearing in Semester end examination of the course, for cases of medical issues and other unavoidable circumstances the students will be condoned if their attendance is between 60% to 75% in every course, subjected to submission of medical certificates, medical case file and other needful documental proof to the concerned departments.

DETENTION POLICY

In any course, a student has to maintain a minimum of75% attendance and must secure a minimum of 50% marks in In-Semester Examinations to be eligible for appearing to the Semester End Examination, failing to fulfill these conditions will deem such student to have been detained in that course.

PLAGIARISM POLICY

Use of unfair means in any of the evaluation components will be dealt with strictly, and the case will be reported to the examination committee.

COURSE TEAM MEMBERS, CHAMBER CONSULTATION HOURS AND CHAMBER VENUE DETAILS:

Each instructor will specify his / her chamber consultation hours during which the student can contact him / her in his / her chamber for consultation.

S.No.	Name of Faculty	Chamber Consultation Day (s)	Chamber Consultation Timings for each day	Chamber Consultation Room No:	Signature of Course faculty
1.	Ankita Sinha		As per prior appoinment	Faculty cubicle-II	

GENERAL INSTRUCTIONS

Students should come prepared for classes and carry the text book(s) or material(s) as prescribed by the Course Faculty to the class.

NOTICES

All notices will be communicated through the institution email.
All notices concerning the course will be displayed on the respective Notice Boards.

Signature of COURSE COORDINATOR:

HEAD OF DEPARTMENT:

Approval from: Head of the Institutions
(Sign with Office Seal)