



Gyanmanjari
Innovative University

Syllabus

Gyanmanjari Institute of Science

Semester-3 (B. Sc.)

Subject: Creative and Critical Thinking (BSC1XX13207)

Type of course: Ability Enhancement Course (AEC)

Prerequisite: N/A

Rationale:

The rapid advancement of Artificial Intelligence, digital technologies, and interdisciplinary science requires graduates to possess more than subject knowledge. They must think critically, solve problems creatively, make evidence-based decisions, and adapt to complex real-world challenges. This course develops intellectual independence by integrating critical thinking, creative thinking, psychology, philosophy, scientific reasoning, ethics, and innovation. Through case studies, simulations, reflective practices, and problem-solving activities, students will strengthen their analytical, decision-making, and leadership skills while preparing for higher studies, research, professional careers, and lifelong learning.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks		Total Marks
CI	T	P	C	SEE	CCE	
2	0	0	2	50	50	100

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; V – Viva; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.



Sr. No	Course Content	Hrs.	Weightage																				
1	Foundation of Human Thinking Theory Topics: • Evolution of Human Thinking • Why Thinking Matters • Critical and Creative Thinking • Observation, Questioning and Scientific Inquiry • Thinking in the AI Age Thinkers for Reference: Charles Darwin, Yuval Noah Harari, Socrates, Aristotle, Francis Bacon Practical: 1. Thinking Journal • Maintain a reflective journal documenting one important decision every week, analyzing assumptions, evidence, emotions, and outcomes. 2. Observation Laboratory • Observe a crowded public place (campus, market, or transport hub) and record twenty objective observations while avoiding assumptions or interpretations. 3. Belief Audit • Select five commonly held beliefs (social, scientific, cultural, or personal) and investigate the evidence supporting or contradicting each. 4. AI vs Human Thinking Exercise • Solve the same problem independently and then compare the approach with an AI-generated solution, identifying strengths, weaknesses, biases, and originality. 5. Case Analysis • Analyze a real-world incident involving misinformation, rumor, or viral social media content to distinguish facts, assumptions, opinions, evidence, and emotional persuasion. Evaluation Method: <table border="1"> <thead> <tr> <th>Sr. No</th><th>Component</th><th>SEE</th><th>CCE</th></tr> </thead> <tbody> <tr> <td>1</td><td>Case-Based Thinking Analyses</td><td>10</td><td>-</td></tr> <tr> <td>2</td><td>ALA 1- Thinking Journal</td><td>-</td><td>05</td></tr> <tr> <td>3</td><td>ALA 2 - Belief Audit Report</td><td>-</td><td>05</td></tr> <tr> <td></td><td>Total</td><td>10</td><td>10</td></tr> </tbody> </table>	Sr. No	Component	SEE	CCE	1	Case-Based Thinking Analyses	10	-	2	ALA 1- Thinking Journal	-	05	3	ALA 2 - Belief Audit Report	-	05		Total	10	10	T:02 P:04	20%
Sr. No	Component	SEE	CCE																				
1	Case-Based Thinking Analyses	10	-																				
2	ALA 1- Thinking Journal	-	05																				
3	ALA 2 - Belief Audit Report	-	05																				
	Total	10	10																				



	1. Case-Based Thinking Analyses Students will be provided with a contemporary case involving scientific misinformation, social media influence, ethical conflict, or public decision-making. They will be required to: - distinguish facts from opinions; - identify assumptions and evidence; - evaluate reasoning; - suggest alternative perspectives; and - justify conclusions using logical arguments. 2. ALA 1 - Thinking Journal Students shall maintain a semester-long reflective journal documenting observations, decision-making processes, cognitive errors, and lessons learned. The journal will emphasize metacognition, self-reflection, and intellectual growth. 3. ALA 2 - Belief Audit Students shall critically investigate selected beliefs using books, scientific literature, reliable online sources, interviews, and AI-assisted research tools. The final report must evaluate the credibility of evidence rather than merely present opinions.		
2	Logic, Scientific Reasoning and Decision Making Theory Topics: - Arguments and Reasoning - Scientific Reasoning - Logical Fallacies - Cognitive Biases - Evaluating Information in the Digital Age Thinkers for Reference: Aristotle, Francis Bacon, René Descartes, Karl Popper Practical 1 - Fallacy Detection Laboratory Students will analyze - advertisements - political speeches - courtroom arguments - YouTube debates - social media posts to identify logical fallacies, emotional manipulation and unsupported claims.	T:02 P:04	20%



Practical 2- Scientific Investigation Laboratory

Students shall investigate a commonly accepted claim such as

- "Energy drinks improve concentration."
- "Multitasking increases productivity."
- "Handwriting improves memory."

Students will

- formulate hypotheses
- collect evidence
- evaluate sources
- draw conclusions.

Practical 3 - Evidence Evaluation Challenge

Students will receive mixed evidence from

- news reports
- research articles
- eyewitness statements
- AI-generated summaries

They shall rank evidence according to credibility and justify their reasoning.

Practical 4 -Decision Simulation

Students will solve simulated scenarios involving

- disaster management
- medical emergencies
- forensic investigations
- business decisions
- environmental problems

using structured decision-making frameworks.

Practical 5 -AI Fact Verification Exercise

Students shall compare

- AI-generated responses
- scientific literature
- government reports
- peer-reviewed articles

and evaluate accuracy, bias, hallucinations and reliability.



Evaluation Method:

Sr. No	Component	SEE	CCE
1	Case-Based Logic & Reasoning Application	10	-
2	ALA 3 - Evidence Evaluation Portfolio	-	05
3	ALA 4 - Fallacy Detection Challenge	-	05
	Total	10	10

1. Case-Based Logic and Scientific Reasoning Application

Students shall analyze two real-world cases.

Case I

A scientific claim or media report.

Students shall

- identify assumptions
- distinguish observation from inference
- evaluate evidence
- identify logical errors
- propose justified conclusions.

Case II

A decision-making scenario involving uncertainty.

Students shall compare multiple options using structured reasoning and justify the most appropriate course of action.

2. ALA 3- Evidence Evaluation Portfolio

Students shall prepare a portfolio containing analyses of

- one scientific article
- one newspaper report
- one AI-generated response
- one social media post

Each analysis must evaluate

- credibility
- evidence quality
- logical consistency
- possible biases.

3. ALA 4 - Fallacy Detection Challenge

Working individually or in teams, students shall collect examples of logical fallacies from advertisements, political campaigns, online discussions or media content.

Each submission shall

- identify the fallacy
- explain why it is fallacious
- reconstruct the argument logically.



3	Psychology of Thinking, Judgment and Human Behaviour 1. The Psychology Behind Human Thinking How the brain makes decisions, Rational vs Emotional Thinking, Dual Process Theory (System 1 & System 2), Attention and selective perception, Memory and reconstruction of events 2. Cognitive Biases and Judgment Errors Confirmation Bias, Anchoring Bias, Halo Effect, Availability Heuristic, Framing Effect, Hindsight Bias, Dunning-Kruger Effect, Fundamental Attribution Error 3. Social Influence and Behaviour Conformity, Obedience, Authority, Groupthink, Peer Pressure, Social Identity, Diffusion of Responsibility 4. Psychology in Crime and Investigation (Foundation) Eyewitness testimony, False memories, Suggestibility, Deception and lie detection: myths vs evidence, Criminal profiling (Introduction only), Decision errors in investigations, Ethical interviewing principles 5. Human Behaviour in the Digital World Social media psychology, Echo chambers, Online disinhibition, Algorithmic influence, Digital addiction (overview), AI and human trust Practical 1- Cognitive Bias Laboratory Students perform experiments demonstrating biases such as: • Anchoring • Confirmation bias • Framing effect • Availability heuristic They compare predicted behaviour with actual outcomes and explain why biases occur. Practical 2 -Eyewitness Memory Experiment Students observe a short staged incident or video. After varying time intervals, they independently record: • sequence of events • descriptions • objects • conversations The class compares responses to examine memory distortion, confidence versus accuracy, and the effects of suggestion	T:02 P:04	20%
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Practical 3 -Social Influence Simulation

Students participate in controlled activities illustrating:

- conformity
- obedience
- peer influence
- group decision-making

They will analyze how social pressure affects independent judgment and discuss ethical implications.

Practical 4 -Behavioural Case Analysis

Students analyze real or adapted cases involving:

- wrongful convictions
- false confessions
- crowd behaviour
- misinformation
- organizational failures

They identify the psychological mechanisms influencing decisions and propose preventive strategies.

Evaluation Method:

Sr. No.	Component	SEE	CCE
1	Mini Psychological Investigation	10	-
2	ALA 5- Cognitive Bias Laboratory Record	-	05
3	ALA 6 - Eyewitness Investigation Report	-	05
	Total	10	10

1. Mini Psychological Investigation

Students will design a small investigation to examine a question related to human thinking, judgment, memory, cognitive bias, social influence, or digital behaviour. They must formulate a research question, propose a hypothesis, identify variables, design a simple method of investigation, collect or simulate appropriate data, and draw a conclusion based on evidence.

The examiner can then challenge the design

After the student presents it, the examiner may ask things like:

- "How will you control this variable?"
- "How do you know your result isn't caused by something else?"
- "What would make your hypothesis wrong?"
- "Is your sample sufficient?"
- "Could confirmation bias affect your interpretation?"
- "What ethical issue could arise?"
- "If your result contradicts your hypothesis, what will you conclude?"



	2. ALA 5 - Cognitive Bias Laboratory Record Students shall maintain a laboratory record documenting: - the bias investigated; - experimental procedure; - observations; - psychological explanation; - personal reflection on how the bias influences everyday thinking. 3. ALA 6 - Eyewitness Investigation Report Students shall prepare an investigative report based on the eyewitness memory experiment, including: - factual observations; - discrepancies among witness accounts; - analysis of memory distortion; - implications for scientific and forensic investigations. Landmark Experiments and Case Studies Faculty may select from: - Asch Conformity Experiments - Milgram Experiment - Stanford Prison Experiment - Loftus and Palmer Experiment - The case of Ronald Cotton (eyewitness misidentification) - Selected contemporary examples of misinformation and online influence		
4	Strategic Thinking, Ethics and Leadership Theory Topics: - Ethical Decision Making - Professional Ethics - Leadership and Teamwork - Strategic Thinking - Responsible Artificial Intelligence Thinkers for Reference: Sun Tzu, Niccolò Machiavelli, Aristotle, Immanuel Kant, John Stuart Mill, Chanakya Practical 1- Ethical Decision Laboratory Students shall analyze ethical dilemmas from - healthcare - forensic science - research - business - environmental science They shall justify their decisions using different ethical frameworks.	T:02 P:04	20%



Practical 2 -Crisis Management Simulation

Students work in teams to manage a simulated crisis such as

- disease outbreak
- cyberattack
- chemical spill
- scientific misconduct
- public misinformation

Each team prepares an action plan and defends its decisions.

Practical 3 -Negotiation Laboratory

Students participate in structured negotiations involving

- resource allocation
- workplace conflict
- environmental policy
- scientific collaboration

Assessment focuses on strategy, communication, ethics and consensus building.

Practical 4 -Leadership Challenge

Students rotate as team leaders during a collaborative project.

Each leader must

- assign responsibilities
- resolve disagreements
- motivate team members
- present outcomes

Peers provide structured feedback using predefined leadership criteria.

Practical 5 -AI Ethics Debate

Students investigate one emerging issue, such as

- AI-generated evidence in courts
- autonomous vehicles
- facial recognition
- surveillance technologies, AI in healthcare

Teams debate the benefits, risks, ethical concerns and regulatory approaches.

Evaluation Method:

Sr. No	Component	SEE	CCE
1	Strategic Thinking & Ethics Practical Challenge	10	-
2	ALA 7 - Leadership & Negotiation Portfolio	-	05
3	Ethical Dilemma Presentation	-	05
	Total	10	10



	1. Strategic Thinking & Ethics Practical Challenge Students will apply selected Machiavellian (or any other thinker from this module) principles of power, influence, persuasion, and strategic behaviour to persuade another person to accept a given proposition or decision. After the interaction, the student must explain the strategies used, justify their effectiveness, and critically reflect on the ethical boundary between persuasion, influence, and manipulation. 2. ALA 7 - Leadership and Negotiation Portfolio Students shall maintain a portfolio documenting their participation in leadership, negotiation, and team decision-making activities. The portfolio shall include: • leadership roles undertaken; • negotiation strategies; • reflections on successes and failures; • peer feedback; • lessons learned. 3. Ethical Dilemma Presentation Students shall individually or in groups analyze a contemporary ethical issue and present: • background of the issue; • stakeholders involved; • ethical conflicts; • alternative courses of action; • justified recommendations.		
5	Creativity, Innovation and Future Thinking Theory Topics: • Creativity and Innovation • Human-AI Collaboration • Adaptability and Resilience • Future Thinking • Lifelong Learning Thinkers for Reference: Edward de Bono, Carol Dweck, Viktor Frankl, Friedrich Nietzsche, Swami Vivekananda Practical 1 - Innovation Challenge Student teams identify one real-world problem from their campus, community, laboratory, or society. Using Design Thinking, they shall: • define the problem; • investigate stakeholders; • generate multiple solutions;	T:02 P:04	20%



- prototype one solution (conceptual or physical);
- present the final innovation.

Practical 2 -Reverse Innovation Laboratory

Students select an existing product, service, or scientific process and redesign it by:

- reducing cost;
- improving usability;
- increasing sustainability;
- incorporating AI;
- enhancing accessibility.

Practical 3 -AI Collaboration Studio

Students solve complex interdisciplinary problems by combining:

- independent human reasoning;
- AI-assisted research;
- evidence verification;
- creative refinement.

The final submission shall explicitly identify which contributions originated from the student and which were AI-assisted.

Practical 4 -Future Scenario Workshop

Students develop plausible future scenarios for one domain such as:

- forensic science;
- biotechnology;
- healthcare;
- environmental science;
- education;
- transportation.

Each scenario must identify opportunities, risks, ethical concerns, and skills required for success.

Practical 5 -Innovation Portfolio

Throughout the semester, students shall maintain an innovation portfolio containing:

- observations;
- ideas;
- sketches;
- failed attempts;
- improvements;



- Reflections;
- AI-assisted explorations.

The portfolio demonstrates the evolution of creative thinking rather than only successful outcomes.

Evaluation Method:

Sr. No	Component	SEE	CCE
1	Innovation Under Constraint	10	-
2	Innovation Portfolio (ALA)	-	05
3	Future Scenario Presentation (ALA)	-	05
	Total	10	10

1. Innovation Under Constraint

Students will design and create an original product, prototype, service model, system, or functional concept that addresses a given human or societal problem. Students may bring basic materials required for construction, but the final solution must not be pre-built or commercially purchased as a ready-made product. During the examination, the examiner will introduce one or more unexpected constraints, requiring the student to adapt, modify, or redesign the solution.

Important rules

- Students may bring basic/raw materials in advance.
- They may prepare rough sketches, ideas, or design concepts beforehand.
- The final product/prototype must be created or assembled during the examination.
- Students cannot bring a completed prototype or commercially available product and present it as their innovation.
- The solution should demonstrate originality, usefulness, feasibility, and creative thinking.
- The examiner may introduce an unexpected change or constraint.
- Students must explain what they changed, why they changed it, and how the change improved the solution.



	2. Innovation Portfolio Students shall maintain a semester-long portfolio documenting the development of ideas, creative processes, experimentation, revisions, and reflections. The emphasis shall be placed on iterative learning rather than only final outcomes. 3. Future Scenario Presentation Students shall prepare a presentation on an emerging technological or societal trend, analyzing: • future opportunities; • possible challenges; • ethical implications; • interdisciplinary solutions; • personal preparedness.		
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Suggested Specification table with Marks (Theory): 50

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	10%	20%	30%	20%	10%	10%

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.



Course Outcome:

After learning the course, the students should be able to:	
CO1	Apply critical, creative, and scientific thinking to analyze problems and make informed decisions.
CO2	Evaluate arguments, evidence, and information using logical reasoning while identifying cognitive biases and logical fallacies.
CO3	Explain the influence of psychological processes on human behavior, judgment, and decision-making, with applications to scientific and forensic contexts.
CO4	Apply ethical reasoning, strategic thinking, and leadership principles to solve professional and societal challenges.
CO5	Design innovative, sustainable, and AI-assisted solutions to real-world problems using interdisciplinary approaches.

Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, task-based and activity-driven learning strategies, role play, Quiz, brainstorming, MOOCs etc.

Teachers will use audio-visual aids, mock simulations, lab assignments, real-life scenarios, and peer learning tools.

Platforms such as Google Forms, PPTs, Quizizz, and Google Docs may be used for assessments.

Students will engage in active learning through ALAs, peer feedback, and role-based activities.

10–15% of topics may be delivered using flipped classroom or self-learning videos (SWAYAM/NPTEL/dictionary apps).

Continuous assessment via ALAs, portfolios, peer review.

Reference Books:

- [1] Critical Thinking: A Concise Guide – Tracy Bowell & Gary Kemp. Routledge.
- [2] Thinking, Fast and Slow – Daniel Kahneman. Farrar, Straus and Giroux.
- [3] The Republic – Plato.
- [4] Lateral Thinking – Edward de Bono. Penguin Books.
- [5] Influence: The Psychology of Persuasion – Robert B. Cialdini. Harper Business.



Suggestive Evaluation Criteria:

SEE	Topic	Part	Criteria	Marks	Description
SEE 1	Foundation of Human Thinking	Part A – Case Analysis	Identification & Analysis	5	Identifies facts, opinions, assumptions, and evidence and critically analyzes the given case.
		Part B – Critical Response	Reasoning & Conclusion	5	Evaluates the reasoning, considers alternative perspectives, and provides a logical, evidence-based conclusion.
SEE 2	Logic, Scientific Reasoning & Decision Making	Part A – Evidence & Reasoning	Logical and Scientific Analysis	5	Identifies assumptions, distinguishes observation from inference, evaluates evidence, and identifies logical errors.
		Part B – Decision Making	Alternative Evaluation & Justification	5	Compares possible options and justifies the most appropriate decision using structured reasoning.
SEE 3	Psychology of Thinking, Judgment & Human Behaviour	Part A – Investigation Design	Research Question, Hypothesis & Method	5	Frames a relevant research question and hypothesis, identifies variables, and designs an appropriate investigation.
		Part B – Findings & Interpretation	Evidence, Psychological Analysis & Conclusion	5	Presents/analyses findings, applies relevant psychological concepts, and draws an evidence-based conclusion with reflection.
SEE 4	Strategic Thinking,	Part A – Strategic Application	Strategy & Persuasion	5	Applies strategic principles, persuasion, influence, and communication techniques



	Ethics & Leadership				effectively to the given situation.
		Part B – Ethical Reflection	Effectiveness & Ethical Reasoning	5	Explains the effectiveness of the strategy and critically examines the ethical boundary between persuasion, influence, and manipulation.
SEE 5	Creativity, Innovation & Future Thinking	Part A – Innovation Development	Problem, Creativity & Solution	5	Identifies the problem and develops an original, useful, feasible, and creative solution/prototype.
		Part B – Constraint Adaptation	Adaptability & Justification	5	Adapts or redesigns the solution in response to the examiner's unexpected constraint and explains the improvement.

