



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

COGNITIVE COMPUTING								
V Semester: CSE (AI & ML)								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACAD10	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	40	60	100
Contact Classes: 48	Tutorial Classes: NIL	Practical Classes: Nil			Total Classes: 48			
Prerequisite: Computer Networks								

I. COURSE OVERVIEW:

Cognitive Science combines the interdisciplinary streams of cognitive science into a unified narrative in an all-encompassing introduction to the field. This course presents cognitive science as a discipline in its own right, and teaches students to apply the techniques and theories of the cognitive scientist's 'toolkit' - the vast range of methods and tools that cognitive scientists use to study the mind. Thematically organized, rather than by separate disciplines, Cognitive Science underscores the problems and solutions of cognitive science, rather than those of the subjects that contribute to it - psychology, neuroscience, linguistics etc.

II. COURSES OBJECTIVES:

The students will try to learn:

- I. The basic concepts and approaches in the field of cognitive science.
- II. The concepts of planning, reasoning and learning models in cognitive applications.
- III. The language and semantic models of cognitive process.

III. COURSE OUTCOMES:

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

- CO1 Recognize the concepts and approaches in the field of Cognitive science for Artificial intelligence to learn the basic theories and techniques.
- CO2 Identify the learning in cognitive systems and classification techniques for planning and learning methods in cognitive science.
- CO3 Build the dynamic systems and consciousness of cognitive science to evaluate information to determine the quality of an action.
- CO4 Compare the Reasoning methods and ethics of learning by converting mistakes of Artificial Intelligence for Reasoning Methods.
- CO5 Illustrate the classification models of Rationality and symbolic reasoning and decision making under uncertainty for paradigm of cognitive models.
- CO6 Develop Theory and Techniques and use different tools for cognitive disciplines- psychology neuro science and linguistics.

IV. COURSE CONTENT:

MODULE – I: INTRODUCTION TO COGNITIVE SCIENCE (09)

Fundamental concepts of cognitive science – Computers in Cognitive Science – Applied Cognitive Science – The Interdisciplinary Nature of Cognitive Science – Artificial Intelligence: Knowledge representation, semantic networks, frames, conceptual dependency, scripts, Ontology Understanding, Common Sense Reasoning.

MODULE – II: PLANNING AND LEARNING METHODS (09)

Planning – Situation Logic- Learning in Cognitive Systems- Rote Learning – Learning by Examples - Incremental Concept Learning – Inductive Learning - Classification Techniques – Statistical Reasoning- Bayesian Classification- Bayesian Networks- Concept Learning- Version Spaces - Discrimination Trees

MODULE – III: DYNAMICAL SYSTEMS AND SITUATED COGNITION (09)

Dynamical systems and situated cognition – Cognitive science and dynamical systems, Applying dynamical systems: Two examples from child development, Situated cognition and bio-robotics, Architectures to behavior-based robotics.

The cognitive science of consciousness, The challenge of consciousness, Consciousness and information processing, Information processing without conscious awareness.

MODULE – IV: REASONING METHODS (09)

Reasoning by analogy, Explanation based reasoning, Case based reasoning, Constraint Satisfaction, Constraint Propagation, Temporal reasoning, Temporal Constraint Networks Spatial reasoning, Visual Spatial reasoning, Meta reasoning, Learning by correcting mistakes AI ethics.

MODULE – V: MODELING PARADIGM (09)

Modelling select aspects of cognition, Classical models of rationality, symbolic reasoning and decision making under uncertainty, Formal models of inductive generalization causality, Categorization and similarity analysis.

V. TEXT BOOKS:

1. José Luis Bermúdez, “Cognitive Science: An Introduction to the Science of the Mind”, Cambridge University Press, New York, 2014.
2. Mallick, Pradeep Kumar, Borah, Samarjeet, "Emerging Trends and Applications in Cognitive Computing", IGI Global Publishers, 2019.

VI. REFERENCE BOOKS:

1. Elaine Rich, Kevin Knight, Shivashankar B. Nair, “Artificial Intelligence”, Tata McGraw-Hill Education, 3rd Edition, 2012.
2. Stuart Russell and Peter Norvig, “Artificial Intelligence A Modern Approach”, Pearson Education, 2nd Edition, 2010.
3. Paul Miller, “An Introductory Course in Computational Neuroscience”, MIT Press, 2018.
4. Jerome R. Busemeyer, Zheng Wang, James T. Townsend, Ami Eidels (Ed), “The Oxford Handbook of Computational and Mathematical Psychology”, Oxford University Press (2015).
5. Neil Stillings, Steven E. Weisler, Christopher H. Chase and Mark H. Feinstein, “Cognitive Science: An Introduction”, MIT press, 2nd Edition, 1995.

VII. WEB REFERENCES:

1. <http://books.nap.edu/catalog/6160.html>
2. <http://www.emtech.net/links/construc.htm>
3. <http://www.house.gov/science/research/may10/halpern.htm>

VIII. MATERIAL ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. PowerPoint presentation
11. E-Learning Readiness Videos (ELRV)