



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COGNITIVE SCIENCE

VII Semester: CSE(AI & ML)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACAC24	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			

Prerequisite: There are no prerequisites to take this course

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. COURSE 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. SYLLABUS:

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: COGNITIVE MODELING (09)

Child concept acquisition - Child language learning, Acquisition of arithmetic skills, Distributed cognition and learning, Simple and complex decision making.
Reasoning under uncertainty, Natural language understanding, Natural language processing, Automated natural language generation.

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.

IV. 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.

V. 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.

VI. 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>