



**JOMO KENYATTA UNIVERSITY
OF
AGRICULTURE AND TECHNOLOGY**

COURSE OUTLINE

Unit Code & Name	BCT 2403: KNOWLEDGE BASED SYSTEMS
Prerequisite	None
Cohort	BCT Y4S1, May – August 2021
Lecturer	J. Wainaina
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Purpose

The unit seeks to impart an understanding of knowledge based concepts and techniques, translating requirements into knowledge models and then generating these using expert systems. Students will be provided with theoretical foundations and practical techniques to build knowledge based systems.

Learning Outcomes:

Upon successful completion of this course, the student should be able to:

The students should be able to;

- Have a general understanding of A. I. concepts
- Use the various search mechanisms to solve a problem.
- Understand knowledge acquisition techniques
- Use knowledge representation methods.
- Use inference techniques to improve prediction and decision support.
- Apply artificial intelligence methods such as fuzzy learning, Baye's method etc., to handle uncertainty
- Design and develop expert systems using PROLOG language.

Course Description

History, scope and limits of KBS. Social ethical and legal aspects. Expert systems and shells. Speech and vision systems. Robotics and planning. Architectures and techniques for artificial intelligence and their applications. Functional programming (LISP). Logic programming (PROLOG). Strategies for space search such as data and goal - driven, and heuristics. Inference strategies, knowledge representation, rule based systems, fuzzy logic, and evolutionary algorithms. Game theory. Experiential learning Systems. Intelligent knowledge based systems. Expert system shells

WEEK	DETAILS	HOURS
Week 1	Introduction to Intelligence and Artificial Intelligence Overview of Artificial Intelligence History of Artificial Intelligence Characteristics of AI Programs Symbolic processing, Knowledge Representation Search, Heuristics Applications of Artificial Intelligence	5
Week 2	Search Process of Searching Representing search problems Search strategies Uninformed (blind) search Informed (heuristic) search	5

Week 3	Introduction to Knowledge Based System Data, Information and knowledge Types of knowledge Types of knowledge based systems	5
Week 4	Knowledge Representation Definition Knowledge representations schemes: Logic Representation Propositional logic	5
Week 5	Knowledge Representation (<i>contd...</i>) Predicate logic Logic Programming Introduction to PROLOG	5
Week 6	Knowledge Representation (<i>contd...</i>) Semantic networks Frames	5
Week 7	Productions and Rule based systems Architecture of a Production System Execution in a Production System Comparison of the Various Knowledge Schemes	5
Week 8	Knowledge Acquisition Sources of Knowledge Categories of Knowledge Acquisition Methods Top-Down Methods and Bottom-Up Methods Knowledge Acquisition Modes	5
Week 9	Base techniques of knowledge-based systems rule-based techniques inductive techniques hybrid techniques symbol-manipulation techniques case-based techniques	5
Week 10	Expert Systems Definition Structure of An Expert System A methodology for the development of expert system Expert System Shells	5
Week 11	Case-based reasoning (CBR) Case Case – indexing Main components of case-based systems	5
Week 12	Inference Definition Inference Strategies in Artificial Intelligence Applications Rule-based inference controls: Forward chaining, Backward chaining	5
Week 13	Knowledge Based Systems Software Lifecycles Software Life Cycles Characteristics of KBS Projects Commonalities in KBS The Waterfall Model KADS Methodology	5
Week 14	Uncertainty AI classification of uncertainty Handling Uncertainty	5

	Confidence/Certainty Factors Bayes' Theorem	
Week 15 & 16	Examinations week	

Teaching Methodology

Lectures, practical and tutorial sessions in Computer Laboratory, individual and group assignments, exercises and project work

Instructional Materials

Overhead projector and computer, handouts, white boards, textbooks, appropriate software.

Course Assessment

- Written End of semester Exams 70%
- Two Cats 15%
- Project and assignments 15%

Course Text Books

1. Russell, S. and Norvig, P. Artificial Intelligence: A Modern Approach. Third edition. Prentice Hall. 2010. ISBN-10: 0136042597, ISBN-13: 978-0136042594.
2. Gonzalez, A. J. and Dankel, D. D. The Engineering of Knowledge-based Systems. Prentice Hall, 1993. ISBN-10: 0132769409, ISBN-13: 978-0132769402.
3. Artificial Intelligence – Elaine Rich, Kevin Knight
4. Durkin, J., Expert Systems: Design and Development. Prentice Hall, New York, NY, 1994. ISBN-10: 0023309709, ISBN-13: 978-0023309700.

Reference Text Books

1. Puppe, F. Systematic Introduction to Expert Systems: Knowledge Representations and Problem-Solving Methods. Springer. 2011. ISBN-10: 3642779735, ISBN-13: 978-3642779732.
2. Mitchell, T. Machine Learning. McGraw-Hill. 1997. ISBN-10: 0070428077, ISBN-13: 978-0070428072.
3. Witten, I. H., Frank, E., and Hall, M. A. Data Mining: Practical Machine Learning Tools and Techniques. Third edition. 2011. ISBN-10: 0123748569 | ISBN-13: 978-0123748560.

Support Material and resources

- PROLOG programming language software, Internet.