



**KAMPALA INTERNATIONAL UNIVERSITY,
KAMPALA**

**SCHOOL OF MATHEMATICS AND COMPUTING
STUDY GUIDE FOR BACHELORS IN COMPUTER SCIENCE AND
INFORMATION YRCHNOLOGY**

COS 3201: ARTIFICIAL INTELLIGENCE

COURSE INSTRUCTOR:

MR. TUSABE LAWRENCE: (MScs, BScs)

Introduction

COS 3201 (Artificial Intelligence) teaches about Artificial Intelligence (AI). AI is a fast-moving technology with impacts and implications for both our individual lives and society as a whole. In this course, students will get a basic introduction to the building blocks and components of artificial intelligence, learning about concepts like algorithms, machine learning, and neural networks. Students will also explore how AI is already being used, and evaluate problem areas of AI, such as bias.

The course also contains a balanced look at AI's impact on existing jobs, as well as its potential to create new and exciting career fields in the future. You will leave the course with a solid understanding of what AI is, how it works, areas of caution, and what they can do with the technology.

Recommended Study Time

This course is a 3-unit course divided into 8 study units. You are enjoined to spend at least 3 hours in studying the content of each study unit.

UNIT – 1

Introduction: History Intelligent Systems, Foundations of Artificial Intelligence, Sub areas of AI, Applications.

UNIT – 2

Intelligent Agents and Robots: Definition, types, environment, performance and sensors, Game playing (puzzle, chess)

UNIT – 3

Expert System and Applications: Introduction, Phases in Building Expert Systems Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and tools.

UNIT – 4

Machine - Learning Paradigms: Introduction, Machine learning System, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees, Deductive Learning, Clustering, Support Vector Machines.

UNIT – 5

Problem Solving - State - Space Search and Control Strategies: Introduction, General Problem-Solving Characteristics of problem, Exhaustive Searches, Heuristic Search Techniques, Iterative-Deepening A*, Constraint Satisfaction.

UNIT – 6

Logic Concepts and Logic Programming: Introduction, Propositional Calculus Propositional, Logic, Natural Deduction System, Axiomatic System, Semantic Table, A System in Propositional Logic, Resolution, Refutation in Propositional Logic, Predicate Logic, Logic Programming.

UNIT – 7

Knowledge Representation: Introduction, Approaches to knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT – 8

Natural Language Processing: Introduction, Sentence Analysis Phases, Grammars and Parsers, Types of Parsers, Semantic Analysis, Universal Networking Knowledge.

Course Outcome

At the end of the course the students will be able to

- 1) Describe the fundamental concepts of AI
- 2) Illustrate basic search techniques with
- 3) Solve crypt-arithmetic problems.
- 4) Illustrate mini-max algorithm and alpha-beta pruning.

- 5) Apply resolution and resolution refutation techniques in propositional and predicate logic.
- 6) Represent knowledge using semantic network, extended semantic network and frames.
- 7) Explain the concepts of expert systems and its applications.
- 8) Implement Naïve Bayes and Bayesian networks on basic problems.
- 9) Describe elaborately about machine learning paradigms.
- 10) Explain the idea of ANN.
- 11) Discuss case grammars and semantic nets.
- 12) Specify the steps of natural language processing.

Course Objectives

On completing this course, you should be able to:

- a) Learn the fundamentals of AI. Gain Insights into informed and uninformed search techniques with illustrations.
- b) Understand principles of knowledge representation basics and advanced methods like case grammars and semantic web.
- c) Apply propositional and predicate logic to infer sentences in knowledge base.
- d) Understand the use and applications of expert systems.
- e) Understand how the AI system process natural language.

Working through this course

In order to have a thorough understanding of the course study units, you will need to read and understand the contents and practice what is discussed in this module.

This course is designed to cover approximately fifteen weeks and it will require your devoted attention. You should do the exercises in the Tutor-Marked Assignments and submit to your tutors via the lms platform or email tusabe.lawrence@kiu.ac.ug

Teaching – Learning Materials

- Course Guide
- Printed Lecture materials
- Text Books
- Interactive videos and audios
- Electronic Lecture materials via LMS
- Tutor Marked Assignments
- LMS.
- Whiteboard and markers
- Interactive Lectures

The printed lecture material consists of 8 study units broken down into sub-units;

References and Additional Reading Materials

The following texts and Internet resource links will be of enormous benefit to you in learning this course:

1. M. Negnevitsky, Artificial Intelligence: A Guide to Intelligent Systems, 2nd edition, Addison Wesley, 2004.
2. P. Norvig, Artificial Intelligence: A Modern Approach, 3rd edition, Prentice Hall, 2010.
3. Saroj Kaushik, Artificial Intelligence, Cengage Learning India, First Edition, 2011.
4. Russell, Norvig, Artificial Intelligence: A Modern Approach, Pearson Education, 2nd Edition, 2004.

5. Rich, Knight, Nair, Artificial Intelligence, Tata McGraw Hill, 3rd Edition 2009.
6. iii. Online Course materials. <http://aima.cs.berkeley.edu>

Assessment

There are two aspects to the assessment of this course. First, there are tutor marked assignments and second the written examination. Therefore, you are expected to take note of the facts, information and problem solving gathered during the course. The tutor marked assignments must be submitted to your tutor for formal assessment in accordance to the deadline given. The work submitted will count for 40% of your total course mark.

At the end of the course, you will need to sit for a final written examination. This examination will account for 60% of your total score. You will be required to submit some assignments by uploading them to COS 3201 page on the LMS.

Tutor-Marked Assignment (TMA)

There are TMAs in this course. You need to submit all the TMAs. The best 10 will therefore be counted. When you have completed each assignment, send them to your tutor as soon as possible and make certain that it gets to your tutor on or before the stipulated deadline. If for any reason you cannot complete your assignment on time, contact your tutor before the assignment is due to discuss the possibility of extension. Extension will not be granted after the deadline, unless on extraordinary cases.

Final Examination and Grading

The final examination for COS 3201 will last for a period not more than 2 hours and has a value of 60% of the total course grade. The examination will consist of questions which reflect the Self-Review Questions (SRQs), In-text Questions (ITQs) and Tutor Marked Assignments (TMA) that you have previously encountered. Furthermore, all areas of the course will be examined. It would be better to use the time between finishing the last

study unit and sitting for the examination to revise the entire course. You might find it useful to review your TMAs and comment on them before the examination. The final examination covers information from all parts of the course. Final examinations will be conducted either via Computer Based Testing (CBT) or Pen on Paper (PoP) or both combined.

Tutors and Tutorials

There are few hours of face-to-face tutorial provided in support of this course. You will be notified of the dates, time and location together with the name and phone number of your tutor as soon as you are allocated a tutorial group. Your tutor will mark and comment on your assignments, keep a close watch on your progress and on any difficulties, you might encounter and provide assistance to you during the course. You must submit your tutor marked assignment to your tutor well before the due date. At least two working days are required for this purpose. They will be marked by your tutor and returned as soon as possible via the same means of submission.

Do not hesitate to contact your tutor by telephone, e-mail or discussion board if you need help. The following might be circumstances in which you would find help necessary: contact your tutor if:

- You do not understand any part of the study unit or the assigned readings.
- You have difficulty with the self-test or exercise.
- You have questions or problems with an assignment, with your tutor's comments on an assignment or with the grading of an assignment.

You should endeavor to attend the tutorials. This is the only opportunity to have face-to-face contact with your tutor and ask questions which are answered instantly. You can raise any problem encountered in the course of your study. To gain the maximum benefit from the course tutorials, have some questions handy before attending them. You will learn a lot from participating actively in discussions.

GOODLUCK!