


## COURSE OUTLINE

<b>ADDISABABA UNIVERSITY</b>		<b>College of Natural and Computational Sciences Department of Computer Science</b>
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<b>Course Title</b>	<b>Introduction to Artificial Intelligence</b>			
<b>Course Code</b>	<b>COSC4011</b>			
<b>Enrollment</b>	Regular			
<b>Program</b>	B.Sc in Computer Science			
<b>Credit hours</b>	<b>3</b>	<b>Lecture</b>	<b>Laboratory</b>	<b>Tutorial</b>
		2	3	2
<b>Credits</b>	5ECTS			
<b>Module Title</b>	Intelligent Systems			
<b>Module Code</b>	CoSc-M3081			
<b>Prerequisite(s)</b>	None			
<b>Year</b>	IV			
<b>Semester</b>	I			
<b>Course Status</b>	Compulsory			
<b>Teaching &amp; Learning Methods</b>	Lectures, Laboratory, Individual and group Assignments			

<b>Attendance Requirements</b>	75%
<b>Lecturer</b>	<b>Samuel G</b>
<b>Course Objectives</b>	<p><b>On completion of this course students should be able to:</b></p> <ul style="list-style-type: none"> <li>- Understand reasoning, knowledge representation and learning techniques of artificial intelligence</li> <li>- Evaluate the strengths and weaknesses of these techniques and their applicability to different tasks</li> <li>- assess the role of AI in gaining insight into intelligence and perception</li> <li>- know classical examples of artificial intelligence</li> <li>- know characteristics of programs that can be considered "intelligent"</li> <li>- understand the use of heuristics in search problems and games</li> <li>- know a variety of ways to represent and retrieve knowledge and information</li> <li>- know the fundamentals of artificial intelligence programming techniques in a modern programming language</li> <li>- consider ideas and issues associated with social technical, and ethical uses of machines that involve artificial intelligence</li> <li>- Introduce students for powerful learning algorithms and their applications.</li> <li>- Letting students to develop simple AI powered applications either in robotics, NLP or games.</li> </ul>

<b>Course Description</b>	The purpose of this course is to give students an understanding of Artificial Intelligence methodologies, techniques, tools and results. Students will use python programming language to demonstrate laboratory exercises. Students will learn the theoretical and conceptual components of this discipline and firm up their understanding by using AI and Expert System tools in laboratory sessions, projects and home assignments.
<b>Course Outline</b>	<p><b>Chapter 1: Introduction to AI (3 hrs)</b></p> <ul style="list-style-type: none"> <li>1.1. Objectives/Goals of AI</li> <li>1.2. Types of AI(General and Specific AI)</li> <li>1.3. Approaches to AI – making computer: <ul style="list-style-type: none"> <li>1.3.1. Think like a human ( Thinking humanly)</li> <li>1.3.2. Act like a human (Acting humanly)</li> <li>1.3.3. Think rationally (Thinking rationally)</li> <li>1.3.4. Act rationally (Acting rationally)</li> </ul> </li> <li>1.4. The Foundations of AI</li> <li>1.5. Bits of History and the State of the Art</li> <li>1.6. Proposing and evaluating Application of AI</li> </ul> <p><b>Chapter 2: Intelligent Agents (4 hrs)</b></p> <ul style="list-style-type: none"> <li>2.1 Foundation of Agents</li> <li>2.2 Agents and Environments</li> <li>2.3 Acting of Intelligent Agents (Rationality)</li> <li>2.4 Structure of Intelligent Agents <ul style="list-style-type: none"> <li>2.4.1 Agent Types</li> <li>2.4.2 Simple reflex agent</li> <li>2.4.3 Model-based reflex agent</li> <li>2.4.4 Goal-based agent</li> <li>2.4.5 Utility-based agent</li> </ul> </li> <li>2.5 Multi agent systems</li> </ul>

	<p>2.6 Learning agent</p> <p><b>Chapter 3: Searching and Planning (6 hrs)</b></p> <p>3.1 Solving Problems by Searching and planning</p> <p>3.2 Constraint Satisfaction Problem</p> <p>3.3 Problem Solving Agents</p> <p>3.4 Problem spaces and search</p> <p>3.5 Knowledge and rationality</p> <p>3.6 Heuristic search strategies</p> <p>3.7 Search and optimization (gradient descent)</p> <p>3.8 Adversarial search</p> <p>3.9 Planning and scheduling</p> <p>3.10 Avoiding Repeated States</p> <p>3.11 Dynamic game theory</p>
	<p><b>Chapter 4: Knowledge Representation and Reasoning (8 hrs)</b></p> <p>4.1 Logic and Inference</p> <p>4.2 Logical Agents</p> <p>4.3 Propositional Logic</p> <p>4.4 Predicate (First-Order)Logic</p> <p>4.5 Inference in First-Order Logic</p> <p>4.6 Knowledge Representation</p> <p>4.7 Knowledge Reasoning</p> <p>4.8 Bayesian reasoning</p> <p>4.9 Probabilistic reasoning</p> <p>4.10 Temporal reasoning</p> <p>4.11 Knowledge-based Systems</p> <p>4.12 Case study: Medical diagnosis</p>

	<p><b>Chapter 5: Machine Learning Basics (3 hrs)</b></p> <p>5.1 Knowledge in Learning</p> <p>5.2 Learning Probabilistic Models</p> <p>5.3 Supervised learning</p> <p>    5.3.1 Linear classification models</p> <p>    5.3.2 Probabilistic models</p> <p>5.4 Unsupervised learning</p> <p>    5.4.1 Clustering models</p> <p>5.5 Reinforcement learning</p> <p>5.6 Deep Learning</p> <p>    5.6.1 Neural networks and back-propagation</p> <p>    5.6.2 Convolution neural networks</p> <p>    5.6.3 Recurrent neural networks and LSTM</p>
	<p><b>Chapter 6: Natural Language Processing (NLP) Basics (3 hrs)</b></p> <p>6.1 Intro to Natural Language Processing</p> <p>6.2 Machine learning Application in NLP</p> <p>6.3 Natural language interaction</p> <p>6.4 Computer vision and Image processing</p> <p>6.5 Case study: Sentiment Analysis, speech recognition, Chabot</p>

	<b>Chapter 7: Robotic Sensing and Manipulation (3 hrs)</b> 7.1 Introduction to robotics <ul style="list-style-type: none"> <li>7.1.1 Sensing</li> <li>7.1.2 Manipulation</li> <li>7.1.3 Human-robot interaction</li> </ul> 7.2 Navigation and path planning <ul style="list-style-type: none"> <li>7.2.1 Autonomous robotic systems</li> </ul>
	<b>Chapter 8: Ethical and Legal Considerations in AI (2 hrs)</b> 8.1 Privacy 8.2 Bias 8.3 AI and the future of work 8.4 Appropriate uses of AI
<b>Text books &amp; References</b>	<b>Text Book;</b> <b>1. Russell, S. and P. Norvig (2010) <u>Artificial Intelligence: A Modern Approach</u> Prentice-Hall. Third Edition</b>

	<b>Reference</b> <ol style="list-style-type: none"> <li>2. Luger, G. (2002) Artificial Intelligence, 4th ed. Addison-Wesley.</li> <li>3. Bratko, Ivan (1990) PROLOG Programming for Artificial Intelligence, 2nd ed. Addison-Wesley, 1990</li> <li>4. Winston, P.H. (1992) Artificial Intelligence Addison-Wesley.</li> <li>5. Ginsberg, M.L. (1993) Essentials of Artificial Intelligence. Morgan Kaufman.</li> </ol>
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### Assessment Arrangements:

List the assessment methods along with weight distribution.

Type of Assessment	Weight
Quiz/Assignment	10
Mid Test	20
Project	20
Final examination	50