ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL
Faculty of Electrical Engineering and Computer Science
COURSE SYLLABUS
ARTIFICIAL INTELLIGENCE

1. **CODE AND NUMBER OF CREDITS** *(Institutional identification of the course and the relation between academic and practical credits)*

CODE	CCPG1014	
NUMBER OF CREDITS	**Theoretical:** 3	**Practical:** 0

2. **COURSE DESCRIPTION** *(This section contains what the course aims to cover; its importance in terms of the professional training in the degree program; and how this course fits into the curriculum of the degree program. The description must be clear and concise. Maximum 10 lines. This information will be published in the institution´s academic catalogue.)*

This course describes the artificial intelligence techniques as a tool for analyzing and solving non-conventional problems. During the course, different knowledge representation methods are defined and identified; also, diverse mechanisms for searching and artificial reasoning are discussed and applied to solve problems. Knowledge based system architecture is analyzed as well as its development cycle.

3. **PRE-REQUISITES AND CO-REQUISITES** *(Courses that must have been passed in order to take this course and courses that must be taken simultaneously with this course. Indicate the codes of these courses.)*

PRE-REQUISITES	1. LENGUAJES DE PROGRAMACIÓN
CO-REQUISITES	

4. **CORE TEXT AND OTHER REQUIRED REFERENCES FOR THE TEACHING OF THE COURSE** *(The text is the main book to be consulted and studied by the students. Its content ought to correspond to a large extent to the established program for this course and should be up-to-date. Other references may be included as complementary material to enhance the learning of the students. Both the core text and the other references must be listed with the following fields: author, title of the book, number of the edition, year of publication and editorial.)*

CORE TEXT	1. George F. Luger, Artificial Intelligence Structures and Strategies for Complex Problem Solving, Sixth Edition, Addison Wesley, 2009.
REFERENCES	1. Michael R. Genesereth & Nils J. Nilson, Logical Foundations of Artificial Intelligence, 2003, Morgan Kaufmann Publishers, Inc. 2. W. Bibel, J. Schneeberger & E. Elver, Knowledge Engineering Vol. I – Fundamentals. Representation of Knowledge, 2001, McGraw-Hill Inc. 3. Course notes and current papers published

5. **COURSE STUDENT LEARNING OUTCOMES** *(These can cover knowledge, abilities, values and attitudes. It is recommended that there are no more than 8. Ask yourself: what do I want the students to know at the end of the course? And, what do I expect the students to be able to do with what they know? It should be clear here the level (Bloom´s taxonomy) to which the students are to be exposed.)*

At the end of the course, the student will be able to:

1. Know and applied different knowledge representation methods;

2. Evaluate, contrast and select the appropriate search algorithm for trees and proper artificial reasoning techniques for modeling intelligent behavior of a system, based on the definition of user and computational requirements identified during the process of analysis;

3. Design, implement and evaluate the solution of a problem based on artificial inference mechanisms.
4. The student will develop a course project working as a member of a team and will develop a technical written report, which will also be orally presented at the end of the course.

6. COURSE PROGRAM *(The general subjects to be covered in the course (chapters) must be listed, and then for each subject the details of the topics to be covered indicating the number of hours per chapter.)*

I. **Fundamentals of Artificial Intelligence** (1 session: 3 hours)
   a. Creating a learning community, course syllabus, schedule and agenda.
   b. Introduction to AI, definitions and history

II. **Techniques for solving AI problems and phases of development** (2 sessions: 6 hours)
   a. Data-Driven and Goal-Driven Search
   b. Blind search
   c. Heuristic search
   d. A and A* type algorithms
   e. Admissibility Theorem
   f. Graphs And–Or
   g. Backtrack algorithm

III. **Knowledge representation** (1 session: 3 hours)
   a. Logic and Propositional Calculus
   b. Predicates
   c. First order predicate calculus
   d. Semantics in predicate calculus
   e. Applications
   f. Other knowledge representation methods
   g. Semantic networks, frames, rules, maps
   h. Comparison of knowledge representation methods

IV. **Artificial reasoning and inference** (1 session: 3 hours)
   a. Unification
   b. Inference rules
   c. Applications

V. **The artificial reasoning process** (4 sessions: 12 hours)
   a. The resolution theorem
   b. Application
   c. Conversion from predicates to clauses
   d. Answer extraction in the resolution process and refutation
   e. Management of uncertainty
   f. Cognitive Maps

VI. **Knowledge based systems** (1 sessions: 3 hours)
   a. Introduction to Expert Systems, characterization and structure
   b. Intelligent Systems development cycle

VII. Machine Learning (1 session: 3 hours)
   a. Introduction, Regression, Classification. Neural Nets, Biological vs Artificial

VIII. **Neural networks** (2 sessions: 6 hours)
   a. Introduction to neural networks
   b. Biological neural networks
   c. Artificial neural network, the Perceptron
   d. Transfer functions
   e. Topologies of neural networks
   f. Learning

g. Neural networks applications h. Applications IX. **Genetic algorithms** (2 sessions: 6 hours) a. Brief history b. Evolution process c. What are they and how do they work? d. Structure of the algorithm, basic concepts e. Representation methods f. Selection methodologies g. Exchange methodologies h. Advantages and limitations i. Applications X. **Revision and evaluation of the course project** (1 sessions: 3 hours) a. Evaluation and review of project in groups
XI.

7. WORKLOAD: THEORY/PRACTICE *(The number of class sessions per week and the length of each session must be indicated, both to cover theoretical material and practical exercises)*

One session per Week, 3 hours per session 16 sessions in the semester 48 hours face to face activities 92 self-study hours No practice sessions

8. CONTRIBUTION OF THE COURSE TO THE EDUCATION OF THE STUDENT *(This section must describe how this course contributes to the academic and professional training of the student. Any connection or relationship with other courses in the curriculum can be highlighted. Indicate also if this course corresponds to basic or professional training, or social skills development.)*

In this course different algorithms for searching trees and artificial inference based on first order logic and heuristics are analyzed. Diverse algorithms and knowledge representation structures are revised and applied during the design of "intelligent" systems. Also, different problem solution techniques for intelligent systems are analyzed. Students analyze and design a software solution for a real non-conventional problem, and then it is implemented based on an artificial intelligent technique. Non-conventional advance solution techniques are analyzed, in particular for problems with uncertainty, based on programming techniques covered in previous courses. Students present prototypes of the proposed solution before the classmates and teacher, where they have to justify the decisions taken during the design and implementation of the solution. Students present a final written report of the project, with emphasis on what they have learned in the proposed solution, the techniques used and results. During the process of analysis, design and implementation, students discuss the different possibilities for implementing the project, taking into account ethical considerations and productivity once the solution is implemented.

BASIC TRAINING	PROFESSIONAL TRAINING	SOCIAL SKILLS DEVELOPMENT
	X	

9. THE RELATIONSHIP BETWEEN THE STUDENT OUTCOMES OF THE COURSE AND THE STUDENT OUTCOMES OF THE DEGREE PROGRAM *(The student outcomes of the degree program are*

declarations that describe what the students are expected to know and are capable of doing at the end of the degree course. They are obtained through the contribution that each course in the curriculum makes. These contributions must be indicated in the following table, according to categories: High: when the student demonstrates a full command of the knowledge, abilities, values and attitudes; Medium: when a student demonstrates partial command of the knowledge, abilities, values and attitudes; and Low: when the student demonstrates a basic or elementary command of the knowledge, abilities, values and attitudes. It is important to indicate adequately the high contributions given that it is with these that the student outcomes will subsequently be measured and they must be reflected in the final column of the table.)

STUDENT OUTCOMES OF THE DEGREE PROGRAM*	CONTRIBUTION (High, Medium, Low)	STUDENT OUTCOMES OF THE COURSE**	THE STUDENT MUST:
a. An ability to apply knowledge of computing and mathematics appropriate to the discipline	high	**2**	Evaluate, contrast and selected a search algorithm in trees and proper artificial reasoning techniques for modeling intelligent behavior of a system.
b. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution	high	**1, 3**	Identify user and computational requirements acquired during the process of analysis and propose a design of the solution.
c. An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs	high	**1,3**	Design, implement and evaluate a problem solution based on artificial inference mechanisms.
d. An ability to function effectively on teams to accomplish a common goal.	Low	**4**	As a member of a team analyze, design and implement a solution of a problem through the semester.
e. An understanding of professional, ethical, legal, security, and social issues and responsibilities	Low	**4**	Identify and understand the ethical and social aspects of developing a solution of a problem, as well as the productivity and security in the context of an organization and individually.
f. An ability to communicate effectively with a range of audiences.	Low	**4**	Students present the products (prototype and written report) at the end of the semester, developed in a team.
g. An ability to analyze the local and global impact of computing on individuals, organizations and society.	------		
h. Recognition of the need for, and an ability to engage in, continuing	------		

professional development.			
i. An ability to use current techniques, skills, and tools necessary for computing practices.	Low	**1**	Identify and apply different knowledge representation methods as well as other current mechanisms and good practices for solving non-conventional problems.
j. An ability to lead, manage and undertake projects.	-------		

(This column must also include the common curricular outcomes (cross-curricular outcomes) that the institution approved on 16th February 2012 via resolution CP 12-02-078 of 23rd February 2012 (CAc-2012-034))*
*(** Only the NUMBER corresponding to section 5 of this document must be written.)*

10. EVALUATION OF THE COURSE *(The evaluation methods that have been planned for this course must be marked.)*

Evaluation activities		First Evaluation	Second Evaluation	Third Evaluation
Exams	**X**	60	45	100
Tests	**X**	10	05	
Homework/tasks	**X**	10	05	
Projects	**X**		35	
Laboratory/Experiments				
Class participation	**X**	10	05	
Visits				
Other: Discussions	**X**	10	05	

11. METODOLOGY AND ORGANIZATION OF THE COURSE

This is a face-to-face course and demands 48 hours of attendance which are distributed in 16 sessions of 3 hours each, and 96 hours of individual work.

Each session has been designed following the constructivist paradigm; it starts with a re-construction of what has been learned previously to continue the development of new knowledge. Each class has diverse activities, such as presentations of topics, projection of videos, group activities and plenary discussions, to help construct together solution strategies to problems, discover and define concepts, and so on, as well as evaluating what has been learned.

All learning resources are available through the course web site in: www.sidweb.espol.edu.ec.

In this site there is also available the reports from homework and projects.

12. PERSON RESPONSIBLE FOR THE CREATION OF THE SYLLABUS AND THE DATE OF ITS CREATION (Coordinator/Head of the subject if it be the case)

Created by	**Enrique Peláez Jarrín**
Date	**October 10, 2016**