Artificial intelligence Course Specifications

Faculty: Computer and Informatics
Department: Scientific Computing

Program(s) on which the course is given	**:**	Bachelor in Computer and Information Sciences
Major or Minor element of programs	**:**	All majors
Department offering the program	**:**	Scientific Computing
Department offering the course	**:**	Computer Science
Academic year / Level	**:**	3rd Year / B.Sc.
Date of specification approval	**:**	10/3/2010

A. Basic Information

Title: Artificial intelligence **Code:** CSC 343

Lectures: 3 hrs/week **Tutorial:** --- **Practical:** 2 hrs/week

Credit Hours: --- **Total:** 5 hrs/week

B. Professional Information

1. Overall Aims of Course:

To introduce students to the ways in which specific aspects of human intelligence can be emulated by computer programs and to provide them with experience in writing such programs. The course also provides an introduction to the declarative language Prolog which is the technology underlying many AI programs.

2. Intended Learning Outcomes of Course (ILOs):

a. Knowledge and Understanding:

a1- Know and understand the principles and techniques of a number of application areas informed by the research directions of the subject, such as artificial intelligence, databases and computer graphics.

a2- Show a critical understanding of the principles of AI, image, and pattern recognition.
a3- Understanding of fundamental topics in Computer Science, including hardware and software architectures, software engineering principles and methodologies, operating systems and software tools.
a4- Selected advanced topics to provide a deeper understanding of some aspects of the subject, such as hardware systems design, object-oriented analysis and design, and artificial intelligence.
a5- Have a comprehensive knowledge and critical awareness of selected specialist fields at the forefront of computer science, studied at master's level.
a6- Use high-level programming languages.
a7- Understand the principles computer programming, networking, computer organization, computer architecture, networks, artificial intelligence, graphics, computer interfacing, databases, embedded applications and computer and network security and operating systems.

b. Intellectual Skills:

b1- Define traditional and non-traditional problems, set goals towards solving them, and. observe results.
b2- Perform comparisons between (algorithms, methods, techniques...etc).
b3- Create and/or justify designs to satisfy given requirements (synthesis, evaluation, application).
b4- Distinguish the different types of algorithm paradigms and evaluate when an algorithmic design situation calls for it.
b5- Solve computer science problems with pressing commercial or industrial constraints.
b6- Summarize the proposed solutions and their results.
b7- Restrict solution methodologies upon their results.
b8- Establish criteria, and verify solutions.
b9- Identify a range of solutions and critically evaluate and justify proposed design solutions.
b10- Solve IT problems with pressing commercial or industrial constraints.
b11- Generate an innovative design to solve a problem containing a range of commercial and industrial constraints. Design and implement a software or hardware system of significant size.
b12- Identifying main ideas.
b13- Identifying errors.
b14- Predicting (best solution, source of errors, etc.).

c. Professional and Practical Skills:

c1. Use appropriate programming languages, web-based systems and tools, design methodologies, and database systems.
c2. Work effectively as an individual and as a member of a team.

c3. Perform independent information acquisition and management, using the scientific literature and Web sources.
c4. Specify, design, and implement computer-based systems.
c5. Work effectively as an individual and as a member of a team.
c6. Apply the principles of human-computer interaction to the evaluation and construction of a wide range of materials including user interfaces, web pages, and multimedia systems.
c7. Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems.
c8. Build software necessary for applying different mining techniques.
c9. Perform independent information acquisition and management, using the scientific literature and Web sources.
c10. Prepare technical reports, and a dissertation, to a professional standard.
c11. Use IT skills and display mature computer literacy.
c12. Specify, design, and implement IT and computer-based systems.
c13. Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem.
c14. Apply the principles of human-computer interaction to the evaluation and construction of a wide range of materials including user interfaces, web pages, and multimedia systems.
c15. Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems.
c16. Use appropriate computer-based design support tools.
c17. Use symbolic software to develop approximate and closed form solutions.
c18. Use computing tools and techniques, such as database, web-based and graphic tools and techniques.

d. General and Transferable Skills:

d1. Work in stressful environment and within constraints.
d2. Demonstrate efficient IT capabilities.
d3. Search for information and adopt life-long self-learning.
d4. Apply improved problem solving skills to basic real world situations.
d5. Present a timeline for the project plan.
d6. Discuss the problem and how to deal with it as a data to be processed.
d7. Write and present effective computer programs that employ efficient algorithms.
d8. Collaborate effectively within multidisciplinary team.
d9. Search for information and adopt life-long self-learning.
d10. Use current technology in laboratories.
d11. Be capable of applying both traditional and new concepts and skills.
d12. Use of browsers, and search engines for effective information-retrieval.
d13. Use of general ICT tools and facilities.
d14. Work within and contribute to a team, apply management skills such as co-ordination, project design and evaluation and decision processes.
d15. Discuss the applicability of various standard protocols.

d16. Understand the geometrical problems and discuss how to deal with it as a data to be processed.

e. Attitude:

e1- A knowledge and respect of ethics and ethical standards in relation to a major area of study.
e2- Relationship Emphasis a successful with other students.
e3- Learn how to make relation with other, and the limit of this relation.
e4- Demonstrate an ethical behaviour toward software copyrights
e5- Explain the nature of privacy and how it is protected by the Data Protection.

3. Contents:

Topic	No. of hours	Lecture	Tutorial/ Practical
A Fundamental of AI: Introduction, The AI Problems, History of AI.	5	3	2
A Fundamental of AI: Inspirations, Representations/Languages Used, General Tasks to Accomplish, Generic Techniques Developed, AI's Applications and Products.	5	3	2
Problems, Problem Spaces and Search: Problem and Problem spaces concepts, Define the problem as a state space search.	5	3	2
Problems, Problem Spaces and Search: Define the problem as a state space search, Characteristics of problem spaces.	5	3	2
Search Techniques: Introduction, Uninformed Search Strategies, Breadth First Search, Depth First Search.	5	3	2
Search Techniques: Uninformed Search Strategies, Iterative Deepening Search, Bidirectional Search, Uniform Path Cost Search. Heuristic Search Strategies,	5	3	2

Best First Search, A* Search.			
Search Techniques: Heuristic Search Strategies, IDA* Search, Hill Climbing, Simulated Annealing, Random Search, Problem Reduction Search.	5	3	2
Knowledge Representation: Introduction, The Role of Knowledge, Semantic Networks.	5	3	2
Knowledge Representation: Frames, Propositional Logic, Deductive Reasoning with Propositional Logic, Limitations of Propositional Logic.	5	3	2
Knowledge Representation: First-Order Logic (Predicate Logic), Atomic Sentences, Compound Sentences, Variables, Quantifiers.	5	3	2
Machine Learning: What is Machine Learning? Machine Learning Algorithms.	5	3	2
Machine Learning: Supervised Learning, Learning with Decision Trees, Creating a Decision Tree, Characteristics of Decision-Tree Learning.	5	3	2
Machine Learning: Unsupervised Learning, Markov Models, Word-Form Learning with Markov Chains, Word Generation with Markov Chains, Other Applications of Markov Chains, Nearest Neighbour Classification, 1NN Example, k-NN Example.	5	3	2
Machine Learning: Example of Famous machine learning algorithm, Neural Network, Genetic Algorithm.	5	3	2