159.302 Paper Outline – 2008 Semester 2

MASSEY UNIVERSITY
COLLEGE OF SCIENCES

Paper Number & Title: 159.302 Artificial Intelligence

Points Value: 12.5   **Semester:** S2

Campus: Albany   **Mode** Internal

Paper Coordinator
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Other Contributing Staff : None

Aim
To study how we use computers to solve complex problems that are often thought to
require intelligence.

Calendar Prescription:
AI programming, State space representation and search. Heuristics. Planning. Game
playing. Knowledge representation. Knowledge based systems. Natural language
processing. Machine learning. Reasoning under uncertainty. Image processing and
pattern recognition. Philosophical issues.

Learning Outcomes:
On successful completion a student should be able to:
☐ Describe the main Artificial Intelligence techniques used in computing.
☐ Design and program computers to store and manipulate knowledge.
☐ Describe, and in some cases program, the special techniques that can be used to
   perform intelligent tasks such as searching game playing, natural language
   processing and machine learning by computers.
☐ Identify the advantages and disadvantages of applying various AI techniques in
   solving real world problems.

Pre- and Co-requisites:
To take this course you **must** have passed 159.201 since C or C++ knowledge is
required to complete the assignments

Assessment:

The course will be assessed by a combination of practical and theoretical work.
There will be 2 practical assignments and one three hour exam.

The marks for this course will be divided as follows:

Item	% of Total
Assignment 1	15
Assignment 2	15
Final Exam	70

The final exam is a three-hour closed book exam.

Requirements to Successfully Complete the Paper:
A satisfactory performance in the assignments and exam are required to pass this paper.

Learning Programme and Schedule:
A student completing this paper will:-
☐ Build upon knowledge and skills developed in 200-level papers, particularly 159.201 Algorithms & Data Structures
☐ Understand the time and space complexities in solving real-world problems
☐ Be adequately prepared to apply AI techniques in implementing solutions for real-world problems
☐ Be adequately prepared to study 400-level papers for the Computer Science Major, particularly Intelligent Robotics, Automata Theory, Machine Vision and Neural Networks.

(chapter references from Russel & Norvig 2nd Edition)

1. Introduction
Introduction (chap 1), Philosophical Issues (chap 26 & 27), Intelligent Agents (chap 2).
2. Agent Based Approaches (chap 2)
Agent programs, reflex agents, Goal based agents, Environments
3. Search (chap 3 & 4)
Search Trees, Breadth and Depth First Search, Iterative Deepening, Best First Search, Heuristics, A* and IDA*, Iterative Improvement, Hill Climbing.
4. Logic (chap 7)
First order logic, Logical Agents, Deduction
5. Fuzzy Logic
Fuzzy logic operators, Fuzzy rules, Inference
6. Game Playing (chap 6)
Game Trees, Minimax, Alpha Beta Pruning.
7. Expert Systems
First Order Logic (chap 8), Knowledge bases & engineering (chap 10), Inference (chap 9)
8. Planning (chap 11, 12)
Representations, Hierarchical Decomposition, Conditional Planning
9. Machine Learning (chap 18 & 19)
Learning from Observations, Genetic Programming, Neural Networks, Unsupervised Learning.
10. Natural Language (chap 22 & 23)
Practical applications, Parsing, Grammar, Ambiguity, Discourses
11. Machine Vision (chap 24)
Image Properties, Edge Detection, Non-Linear Operators, feature Detection.
12. Automatic Theorem Provers (chap 10)
Logic and theorem proving.

Conditions for Aegrotat Pass and Impaired Performance:

If you are prevented by illness, injury or serious crisis from attending an examination (or completing an element of assessment by the due date), or if you consider that your performance has been seriously impaired by such circumstances, you may apply for aegrotat or impaired performance consideration. You must apply on the form available from the Examinations Office, the Student Health Service or the Student Counseling Service. To qualify for an aegrotat pass on your final examination your performance in the other elements of assessment must be well above the minimum pass standard.

Student Time Budget:
Assessment – related:
- Assignment 1   25.0
- Assignment 2   25.0
- Final examination   3.0

Formal Scheduled Learning:
- Lectures   36.0

Non-Scheduled Learning
- Personal study and reading(~6 hours per week)   75.0
- Preparation for final examination   24.0
TOTAL   188

Textbook and Other Recommended Reading:
Russell, S. and Norvig, P., Artificial Intelligence A Modern Approach, Second Edition, (Prentice Hall 2003)
It is highly recommended that you buy this book.
Lecture Notes & course information is available at
http://cs-alb-pc3.massey.ac.nz

Timetable:

Lectures:	Monday	10:00 am AT7
	Thursday	11:00 am AT7
Tutorial:	Wednesday	3:00 pm AT7
Office hours:		Immediately after lectures (QA2.52)

Deadlines and Penalties:

Deadlines for assignments will be given when the assignments are distributed. You will be given 4 weeks to complete each assignment. Late submissions (up to 1 week) will be penalised by 10%.

Proposed Feedback and Support for Student Learning:

The turnaround time for assignments will be no more than three weeks from the due date. It is important to note that the specified timeframe applies only to those assignments submitted by the due date, and does not necessarily apply to those submitted late.

All staff contributing to this paper will be available within "office hours" specified by the individuals concerned. Students are encouraged to access staff by personal approach. The paper co-ordinator can also be contacted by email (**M.J.Johnson@massey.ac.nz**)

Additional Costs: None

Grievance Procedures:

A student who claims that he/she has sustained academic disadvantage as a result of the actions of a University staff member should use the University Grievance Procedures. Students, whenever practicable, should in the first instance approach the University staff member concerned. If the grievance is unresolved with the staff member concerned, the student should then contact the College of Sciences office on his/her campus for further information on the procedures, or read the procedures in the University Calendar.