

# **Introduction to Artificial Intelligence**

**1st year undergraduate degrees with AI and/or CS**

<http://www.cs.bham.ac.uk/~jxb/iai.html>

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# AI at Birmingham

*AI* is the part of *CS* concerned with designing *intelligent* computer systems.

There are *two routes* for studying AI at Birmingham:

1. Take a joint honours degree including AI (e.g., BSc AI & CS, BSc Maths & AI)
2. Take a CS degree and choose AI options (e.g., BSc CS, BEng/MEng CS/SE )

Either way, the *Introduction to AI* module provides the foundations for your future studies. It is a prerequisite for many optional AI modules.

Even if you do not want to study AI in more detail later, AI techniques are increasingly being used in standard software applications, and having a basic grounding in how they work is now important for *all* computer scientists.

For up-to-date details of which further AI modules are available for each particular degree programme, refer to the School's web-site.

## Outline

This module provides a general introduction to artificial intelligence, its techniques, and main sub-fields. The principal focus of the module will be on the common underlying ideas, such as knowledge representation, rule based systems, search, and learning. It will provide a foundation for further study of specific areas of artificial intelligence.

## Aims

The aims of this module are to:

1. Provide a general introduction to AI, its techniques and its main sub-fields.
2. Give an overview of key underlying ideas, such as knowledge representation, rule based systems, search, and learning.
3. Demonstrate the need for different approaches for different problems
4. Provide a foundation for further study of specific areas of AI.

# Learning Outcomes

On completion of this module, the student should be able to:

1. Recognise the important features of AI systems and structure the field of AI into its main sub-fields.
2. Explain some of the most important knowledge representation formalisms and why they are needed, discussing their advantages and disadvantages. Apply these knowledge representation formalisms to simple unseen examples.
3. Describe and apply some simple search algorithms.
4. Outline the processes involved in rule-based Expert Systems and in building such systems.
5. Discuss the importance of learning in intelligent systems, and how it might be implemented.
6. Provide examples of different types of AI systems, and explain their differences, common techniques, and limitations.

## Syllabus / Lecture Plan

Week	Session 1 Tuesdays 16:00-17:00	Session 2 Tuesdays 17:00-18:00	Session 3 Wednesdays 11:00-12:00
1	Module Organisation	–	–
2	The Roots, Goals and Sub-fields of AI	Exercise Session 1	Evolutionary Computation (Thorsten Schnier)
3	Biological Intelligence and Neural Networks	Exercise Session 2	Neural Network Applications (Peter Tino)
4	Building Intelligent Agents	Exercise Session 3	Interacting Agent Based Systems (Dean Petters)
5	Knowledge Representation	Exercise Session 4	AI and Philosophy (Aaron Sloman)
6	Semantic Networks and Frames	Exercise Session 5	Natural Language Processing (Mark Lee)
7	Production Systems	Exercise Session 6	Intelligent Robotics (Jeremy Wyatt)
8	Search	Exercise Session 7	Vision (Ela Claridge)
9	Expert Systems	Exercise Session 8	Computer Chess (Colin Frayn)
10	Treatment of Uncertainty	Exercise Session 9	AI for Computer Games (Nick Hawes)
11	Machine Learning	Exercise Session 10	Machine Learning Applications (Ata Kaban)

Colour coding: Black = Regular Lecture, Green = Exercise Session, Blue = Guest Seminar.

## Recommended Books

Title	Author(s)	Publisher, Year	Comments
Artificial Intelligence: A Modern Approach	Stuart Russell & Peter Norvig	Prentice Hall, 2003	This is the book that ties in most closely with the module
Artificial Intelligence (2nd ed.)	Elaine Rich & Kevin Knight	McGraw Hill, 1991	Quite old now, but still a good second book
Artificial Intelligence: A New Synthesis	Nils Nilsson	Morgan Kaufmann, 1998	A good modern book
Artificial Intelligence (3rd ed.)	Patrick Winston	Addison Wesley, 1992	A classic, but not advanced enough now
Artificial Intelligence	Michael Negnevitsky	Addison Wesley, 2002	A good modern approach
Artificial Intelligence	Rob Callan	Palgrave Macmillan, 2003	A good modern book
Artificial Intelligence (5th ed.)	George Luger	Addison Wesley, 2004	Some students may prefer this one
Introduction to Expert Systems (3rd ed.)	Peter Jackson	Addison Wesley, 1999	The best book on Expert Systems

If you can only afford to buy one AI book, I would recommend Russell & Norvig.