COMP329

Knowledge Systems

S2 Evening 2015

Dept of Computing

Contents

Disclaimer

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

General Information

Unit convenor and teaching staff
Unit convenor
Rolf Schwitter
rolf.schwitter@mq.edu.au
Contact via rolf.schwitter@mq.edu.au
E6A 333
Mondays, 1-2 pm, or by prior appointment.

Lecturer
Abhaya Nayak
abhaya.nayak@mq.edu.au
Contact via abhaya.nayak@mq.edu.au
E6A 382
Tuesdays, 1-2 pm, or by prior appointment

Credit points
3

Prerequisites
39cp and (COMP125(P) or COMP249(P))

Corequisites

Co-badged status

Unit description
This unit examines selected topics in artificial intelligence (AI) and expert systems. One of the main AI languages is Prolog, that involves programming in a declarative rather than in the usual procedural manner. Since Prolog is based upon first order logic, an introduction is given to various aspects of logic – this forms a good basis upon which to understand Prolog and how it works. The unit also covers topics in artificial intelligence.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

Use appropriate tools for representing knowledge in different domains, and solve

relevant problems in those domains;

Demonstrate understanding of the basic concepts that underlie representation of both certain and uncertain knowledge, and

Demonstrate ability for sound reasoning from knowledge represented in appropriate format, both in certain and uncertain domains.

Assessment Tasks

Name	Weighting	Due
Diagnostic Assessment	10%	Week 4
Assignment 1	20%	Week 7
Assignment 2	20%	Week 12
Final Examination	50%	TBA

Diagnostic Assessment

Due: **Week 4**
Weighting: **10%**

In Week 2, a set of exercises will be made available online on the unit website on iLearn. You are expected to attempt all the exercises in this assessment and submit your solutions electronically (in the form of a pdf or text file) on iLearn before 6pm on Friday of Week 4.

Late tasks will be accepted up to 48 hours after the submission deadline.There will be a deduction of 20% of the total available marks made from the total awarded mark for each 24 hour period or part thereof that the submission is late (for example, 25 hours late in submission – 40% penalty). This penalty does not apply for cases in which an application for special consideration is made and approved.

On successful completion you will be able to:
• Use appropriate tools for representing knowledge in different domains, and solve relevant problems in those domains;

Assignment 1

Due: **Week 7**
Weighting: **20%**

The first assignment will require demonstrating your skill in (1) representing knowledge and reasoning in formal language(s), and (2) programming in Prolog.

You have to submit the solutions to these tasks as soft copies via iLearn by the due date.

Late tasks will be accepted up to 48 hours after the submission deadline.There will be a deduction of 20% of the total available marks made from the total awarded mark for each 24 hour period or part thereof that the submission is late (for example, 25 hours late in submission – 40% penalty). This penalty does not apply for cases in which an application for special consideration is made and approved.

On successful completion you will be able to:

- Use appropriate tools for representing knowledge in different domains, and solve relevant problems in those domains;
- Demonstrate understanding of the basic concepts that underlie representation of both certain and uncertain knowledge, and
- Demonstrate ability for sound reasoning from knowledge represented in appropriate format, both in certain and uncertain domains.

Assignment 2

Due: **Week 12**
Weighting: **20%**

The second assignment will require you to work in problem solving, and submit your solution together with a written document (in the form of a pdf file) answering several fundamental questions that test your understanding of the relevant material. The problem may involve logic programming, probabilistic reasoning, or both.

You have to submit the solutions to these tasks as soft copies via iLearn by the due date.

Late tasks will be accepted up to 48 hours after the submission deadline.There will be a deduction of 20% of the total available marks made from the total awarded mark for each 24 hour period or part thereof that the submission is late (for example, 25 hours late in submission – 40% penalty). This penalty does not apply for cases in which an application for special consideration is made and approved.

On successful completion you will be able to:

- Use appropriate tools for representing knowledge in different domains, and solve relevant problems in those domains;
- Demonstrate understanding of the basic concepts that underlie representation of both certain and uncertain knowledge, and
- Demonstrate ability for sound reasoning from knowledge represented in appropriate format, both in certain and uncertain domains.

Final Examination

Due: **TBA**
Weighting: **50%**

The final examination will assess all the three the learning outcomes #1, #2 and #3. With regards to learning outcomes #1, it allows to accurately assess the appreciation of good logic programming and problem solving skills. With regards to learning outcome #2 and #3, it will assess students' understanding of fundamental concepts such as different types of search and inferences.

On successful completion you will be able to:

- Use appropriate tools for representing knowledge in different domains, and solve relevant problems in those domains;
- Demonstrate understanding of the basic concepts that underlie representation of both certain and uncertain knowledge, and
- Demonstrate ability for sound reasoning from knowledge represented in appropriate format, both in certain and uncertain domains.

Delivery and Resources

CLASSES

Each week you should attend three hours of lectures, a tutorial class and a practical session. For details of days, times and rooms consult the timetables webpage. Students are urged to actively participate in the tutorials; this helps enhancing the understanding by students.

Note that practicals and tutorials commence in week 2.

You should have selected a practical session and a tutorial session during enrolment. **You should attend the sessions you are enrolled in**. If you do not have a class, or if you wish to change one, you should see the enrolment operators in the E7B courtyard during the first two weeks of the semester. Thereafter you should go to the Student Centre.

Please note that you are **required** to hand in all the assessed work in this unit. Failure to do so may result in you failing the unit or being excluded from the exam.

REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

Textbook

There is no set textbook for the unit. The following are recommended readings. Lecturers may recommend other references.

1. I. Bratko. Prolog Programming for Artificial Intelligence, Fourth Edition, Pearson, 2012.
2. S. Russell and P. Norvig. Artificial Intelligence: A Modern Approach, Prentice-Hall, 2009.
3. Poole, D. and Mackworth, AK. Artificial Intelligence - Foundations of Computational Agents. Cambridge University Press 2010: I-XVII, 1-662. (Available free of charge at: htt

p://artint.info/html/ArtInt.html under a Creative Commons Attribution-Noncommercial-No Derivative Works 2.5 Canada License.)

For some parts of learning, the necessary reading (book chapters, software documentation, papers, etc.) will be made available on iLearn.

UNIT WEBPAGE AND TECHNOLOGY USED AND REQUIRED

Websites

The web page for this unit can be found on iLearn.

Echo360

Digital recordings of lectures will be made available via Echo360 within iLearn. Note that depending on the lecture-room, facilitiies may be available for audio recording alone. Read these instructions for details

Technology

In this unit you will will be exposed to the following technology and tools

- SWI-Prolog

Discussion Boards

The unit will make use of discussion boards hosted within iLearn. Please post questions there, they will be monitored by the staff on the unit.

Unit Schedule

1	Overview
2-7	Prolog Programming; Knowledge Representation and Reasoning in AI
8-10	Problem Solving as AI
11-12	Uncertain Inferences in AI
13	Revision

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students

should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

Special Consideration

Special Consideration is intended for a student who is prevented by serious and unavoidable disruption from completing any unit requirements in accordance with their ability. Consult the Disruption to Studies Policy for procedural details if you are considering applying for special consideration. Depending on the circumstances presented, the convenor may choose to give you an alternate assessment, additional time for an assessment, make-up exam, etc. If a Supplementary Examination is granted as a result of the Special Consideration process the examination will be scheduled after the conclusion of the official examination period. For details of the Special Consideration policy specific to the Department of Computing, see the Department's policy page.

Grade Appeal

In case of problems arising with your final grade, the first step is to organise a review. The Department recommends that you request an appointment with the convenor of the unit in order to review your grade. If the review does not solve the problem, a formal Grade Appeal can be lodged. See the grade appeal policy.

Academic Honesty and Plagiarism

Plagiarism involves using the work of another person and presenting it as one's own. The

Department, in line with University policy, treats all cases seriously. In particular, the Department, keeps a record of all plagiarism cases. This record is referred to so that an appropriate penalty can be applied to each case. For concrete examples, see this page.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Use appropriate tools for representing knowledge in different domains, and solve relevant problems in those domains;
- Demonstrate understanding of the basic concepts that underlie representation of both

certain and uncertain knowledge, and

- Demonstrate ability for sound reasoning from knowledge represented in appropriate format, both in certain and uncertain domains.

Assessment tasks

- Diagnostic Assessment
- Assignment 1
- Assignment 2
- Final Examination

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

- Demonstrate understanding of the basic concepts that underlie representation of both certain and uncertain knowledge, and
- Demonstrate ability for sound reasoning from knowledge represented in appropriate format, both in certain and uncertain domains.

Assessment tasks

- Assignment 1
- Assignment 2
- Final Examination

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcome

- Use appropriate tools for representing knowledge in different domains, and solve relevant problems in those domains;

Assessment tasks

- Diagnostic Assessment
- Assignment 1
- Assignment 2
- Final Examination

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Use appropriate tools for representing knowledge in different domains, and solve relevant problems in those domains;

- Demonstrate understanding of the basic concepts that underlie representation of both certain and uncertain knowledge, and

- Demonstrate ability for sound reasoning from knowledge represented in appropriate format, both in certain and uncertain domains.

Assessment tasks

- Diagnostic Assessment
- Assignment 1
- Assignment 2
- Final Examination

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Use appropriate tools for representing knowledge in different domains, and solve relevant problems in those domains;
- Demonstrate understanding of the basic concepts that underlie representation of both certain and uncertain knowledge, and
- Demonstrate ability for sound reasoning from knowledge represented in appropriate format, both in certain and uncertain domains.

Assessment tasks

- Diagnostic Assessment
- Assignment 1
- Assignment 2
- Final Examination

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Demonstrate understanding of the basic concepts that underlie representation of both certain and uncertain knowledge, and
- Demonstrate ability for sound reasoning from knowledge represented in appropriate format, both in certain and uncertain domains.

Assessment tasks

- Assignment 1
- Assignment 2
- Final Examination

Changes from Previous Offering

This year we will improve the allignment of COMP329 with the requirements of the BIT-GDD degree. Malcom Ryan will hold a guest lecture on Motion Planning in Week 10.

Assessment Standards

Four standards, namely Developing, Functional, Proficient, and Advanced, summarize as many different levels of achievement. Each standard is precisely defined to help students know what kind of performance is expected to deserve a certain mark. The standards corresponding to the learning outcomes of this unit are given below:

LO#1. *Use logic programming tools for representing knowledge in different domains, and solve relevant problems in those domains.*	Represents a student who has limited problem solving skills	Represents a student who has capability to design and develop functional problem solutions using logic programming tools	Represents a student who has capability to design and develop functional and highly maintainable problem solutions, with good documentation	Represents a student who has capability to design and develop functional and highly maintainable problem solutions, with good documentation and has exceptional ability to solve challenging problems
LO#2. *Demonstrate understanding of the basic concepts that underlie representation of both certain and uncertain knowledge.*	Represents a student who has demonstrated inaccurate knowledge of knowledge system concepts.	Represents a student who has demonstrated broad knowledge of knowledge system concepts but with limited understanding	Represents a student who has demonstrated critical analysis skills in fundamental knowledge system concepts	Represents a student who has demonstrated critical analysis skills in fundamental knowledge system concepts who also has exceptional analytical and critical thinking capability
LO#3. *Demonstrate ability for sound reasoning from knowledge represented in appropriate format, both in certain and uncertain domains.*	Represents a student who has not adequately demonstrated ability for sound reasoning from knowledge represented in appropriate format, both in certain and uncertain domains.	Represents a student who has demonstrated some ability for sound reasoning from appropriately represented knowledge in either certain or uncertain domain.	Represents a student who has demonstrated ability for sound reasoning from appropriately represented knowledge in both certain and uncertain domain, as well as strong analytical and critical thinking capability.	Represents a student who has demonstrated exceptional ability for sound reasoning from appropriately represented knowledge in both certain and uncertain domain reflecting exceptional analytical and critical thinking capability

Grading

At the end of the semester, you will receive a grade that reflects your achievement in the unit

- **Fail (F)**: does not provide evidence of attainment of all learning outcomes. There is missing or partial or superficial or faulty understanding and application of the fundamental concepts in the field of study; and incomplete, confusing or lacking communication of ideas in ways that give little attention to the conventions of the discipline.
- **Pass (P)**: provides sufficient evidence of the achievement of learning outcomes. There is demonstration of understanding and application of fundamental concepts of the field of study; and communication of information and ideas adequately in terms of the conventions of the discipline. The learning attainment is considered satisfactory or adequate or competent or capable in relation to the specified outcomes.
- **Credit (Cr)**: provides evidence of learning that goes beyond replication of content knowledge or skills relevant to the learning outcomes. There is demonstration of substantial understanding of fundamental concepts in the field of study and the ability to apply these concepts in a variety of contexts; plus communication of ideas fluently and clearly in terms of the conventions of the discipline.
- **Distinction (D)**: provides evidence of integration and evaluation of critical ideas, principles and theories, distinctive insight and ability in applying relevant skills and concepts in relation to learning outcomes. There is demonstration of frequent originality in defining and analysing issues or problems and providing solutions; and the use of means of communication appropriate to the discipline and the audience.
- **High Distinction (HD)**: provides consistent evidence of deep and critical understanding in relation to the learning outcomes. There is substantial originality and insight in identifying, generating and communicating competing arguments, perspectives or problem solving approaches; critical evaluation of problems, their solutions and their implications; creativity in application.

In this unit, your final grade depends on your performance in each part of the assessment. For each assessment task, you receive a mark that combines your standard of performance regarding each learning outcome assessed by this task. Then the different component marks are added up to determine your total mark out of 100. Your grade then depends on this total mark and your overall standards of performance.

On occasion your raw mark for the unit may not be the same as the Standardised Numeric Grade (SNG) which you receive as the result. Under the Senate guidelines, raw marks may be scaled to ensure that there is a degree of comparability across the university, so that units with the same past performances of their students should achieve similar results.

Concretely, **in order to pass the unit**, you must

- obtain an overall total mark of 50% or higher, and a mark of 40% or higher in the final

examination;

- make a reasonable attempt and submit a solution to the exercises in the diagnostic assessment;
- reach a Functional level or higher in both assignments.

In order to obtain a higher grade than a Pass, you have to fulfill additional conditions. Namely, you must demonstrate and consistently apply the knowledge you have acquired in this unit:

- at an Advanced level and have a total mark of 85% or higher to obtain **High Distinction**;
- at least at a Proficient level and have a total mark of 75% or higher to obtain **Distinction**;
- at least at a Proficient level and have a total mark of 65% or higher to obtain **Credit**.