SCICOMP203, Artificial Intelligence
[June 2021]
[online edition][intensive course edition]

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[June 2020]
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Classroom no: **online**
Class times: **mornings 9-11** (extended to 12 on some occasions)
afternoons 1:30-3:30 (extended to 4:30 on some occasions)

Instructor: **Dr. Andrew Brooks**
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Office hours: **online appointments - use Moodle scheduler**

I. Track information

a) Prerequisites for this course: C grades or better in SCICOMP102 and ACCRMET101 Methods & Statistics I.
b) Students not meeting the prerequisites can take the course subject to the approval of the instructor.
c) This course is not a prerequisite for other courses.

This course is part of the Computer Science track. For further information about the track, please see the track document available in Moodle.

II. Course description

The application of artificial intelligence has already impacted several sectors of society: communications, industry, commerce, medicine, and transportation. Smart cities will be able to optimize resource use and make themselves more sustainable. Emergent technologies now support research into the building of machines that learn and think like people.

This course aims to provide the student with foundational abilities in: knowledge representation, learning, planning, reasoning, and searching by agents. The course will involve several laboratories and projects, so it is important students have their own laptops and know how to program. Experience will be gained constructing a small-scale intelligent system. Homework exercises will explore historical and recent developments as well as societal impacts. There is only a Final exam in this course, no Midterm.

By the end of the course a student will have obtained an understanding of how artificial intelligence helps shape the modern world.

III. Study Load

This course earns students four credits (equivalent to 7.5 ECTS). The class meets as follows: June 1st-25th 2021 (30 sessions on 15 days), mornings 9-11 (extended to 12 on some

occasions), and afternoons 1:30-3:30 (extended to 4:30 on some occasions). Days free of sessions will be advertised in Moodle. Outside of class meetings, students will be fully occupied with coursework.

IV. Course materials

Course materials will be drawn primarily from the following:
(i) https://artint.info Artificial Intelligence: Foundations of Computational Agents [AIFC]
(ii) https://leanpub.com/javaai Practical Artificial Intelligence Programming With Java [PAIPJ]
(iii) https://staff.fnwi.uva.nl/u.endriss/teaching/pss/prolog.pdf Lecture Notes An Introduction to Prolog Programming [Prolog] Permission has been obtained to use these materials.
(iv) http://www.evolutionarycomputation.org/ Introduction to Evolutionary Computing [EC] Permission has been obtained to use these materials.
(i)–(iv) can be viewed online at no cost.

Course materials based on other Internet and digital library sources will be made available or linked to in Moodle. (See an example in the Appendix.)

V. Course organization and requirements

The first session of each day will cover content. This session will involve a mix of lecturing, discussion-based learning, and various other in-class activities.

The second session of each day will be a laboratory in which exercises are undertaken. The instructor will provide assistance where needed and sign out completed exercises when they have been successfully demonstrated.

Homework and laboratories will be issued approximately every one to two days. If the number of issued homework or laboratories exceeds 10, the additional work will count as extra-credit. Other extra-credit opportunities may be available at the instructor's discretion.

Students are expected to:

(i) attend class meetings in Zoom with their own fully-charged laptops
(ii) participate actively in class meetings when asked to do so
(iii) monitor Moodle, the official mode of communication, on a daily basis
(iv) attend class meetings and inform the instructor beforehand if they cannot attend because of illness or some other urgent reason
(v) work consistently on the laboratory exercises outside of class if necessary
(vi) tackle all assessment individually unless the task is explicitly described as group-based or the instructor gives explicit guidance on acceptable collaborations
(vii) be able to explain the programming code they have written or made use of
(viii) not use mobile devices in class other than their own laptops for class work
(ix) not redistribute materials made available in Moodle to third parties
(x) attend office hours for help and guidance on any aspect of the course when required

The deadline for homework and laboratories issued during a week is 5pm Friday of that week. Project deadlines will be advertised in Moodle. **Due the intensive nature of the course, all deadlines are firm.**

This course is subject to UCR academic rules and procedures. Both students and instructors are required to know and follow these rules and procedures. Students should not commit acts of plagiarism or collusion. Students are advised that if they miss more than 6 class sessions they will receive an automatic F (**i.e. 6 absences only are permissible**). Two hours of lateness in attending class meetings will count as one absence.

VI. Assessment

assessed component	value	
laboratories (10 each at 2%)	20%	
homework (10 each at 2%)	20%	some may be issued with different value
projects (2 each at 10%)	20%	
final project	20%	choice of project
Final exam	20%	sample questions will be provided

Homework, laboratories, and the Final exam will be assessed on correctness of answers. Partial credit will be awarded for partial correctness.

Comprehension questions will be asked of homework and laboratory work. Partial credit will be awarded when comprehension questions are not fully answered.

The Final exam may incorporate wild card questions (up to 2% of the 20%). Wild-Card questions can take many forms. For example: You may be shown a figure or table and asked to explain what is shown by the figure or table. You may be asked a question drawn from homework, laboratory, or project work.

Projects are assessed on a sliding scale of accomplishment. Full marks are awarded only if all the project specifications (for example: design, implementation, and evaluation) are met and all comprehension questions are fully answered. Full project specifications are available in Moodle.

VII. Course schedule

The course schedule and topics may be subject to change.

If things are progressing very well, it might be possible to tackle more material on any particular day or in any particular week.

If a particular software stack proves unsuitable for use on student laptops, the associated topic may be downgraded in terms of coverage.

Week	**Topics to be discussed**	**Course materials used**	**Assignments and assessment**
Week 1	agent design space; agent architectures; searching for solutions;	see Moodle and [AIFC] and [PAIPJ]	homework & laboratory
Week 2	reasoning with constraints; propositions and inference; planning with certainty;	see Moodle and [AIFC] and [Prolog]	homework & laboratory project 1
Week 3	expert systems; genetic algorithms; neural networks; *V&V of an intelligent agent*	see Moodle and [EC] and [PAIPJ]	homework & laboratory project 2
Week 4	agent-based modeling; ontologies; *explainable AI;*	see Moodle and [AIFC]	homework & laboratory final project Final exam

V&V of an intelligent agent and explainable AI materials are developed by the instructor which may be addressed earlier in the schedule indicated above.

VIII. Student learning outcomes

Upon successfully completing this course, a student should be able to:

- SLO 1 demonstrate a knowledge and understanding of the history and development of artificial intelligence
- SLO 2 demonstrate a knowledge and understanding of the societal impacts of artificial intelligence
- SLO 3 compare and contrast the different ways knowledge can be represented and reasoned with by an intelligent agent
- SLO 4 recite and trace the execution of several search algorithms
- SLO 5 recite and trace the execution of several constraint satisfaction algorithms
- SLO 6 demonstrate a knowledge and understanding of the challenges involved verifying and validating an intelligent agent
- SLO 7 design, implement and evaluate a small-scale intelligent system (likely built using a framework or toolkit on top of Java, Python, Prolog, or C/C++)
- SLO 8 demonstrate a knowledge and understanding of two or more of the following topics: neural networks, machine learning, agent-based modeling, ontologies, and explainable AI

Appendix: example of additional course materials available in Moodle