ECE4420/6420: Knowledge Engineering (Introduction to Intelligent Systems)
Summer Session I 2016
Extended Syllabus

Dr. Robert J. Schalkoff

Professor

Electrical and Computer Engineering

334 Fluor Daniel Engineering Innovation Building

Clemson University

Clemson, SC 29634-0915

rjschal@g.clemson.edu

Preliminary; rev. 2-18-2016 *

---

*Note that this syllabus will be accompanied by a video lecture once the session begins.

Contents

1 Course Overview / Goals and Objectives

1.1 Course Description

This course concerns the evolution of Artificial Intelligence (AI) into Intelligent Systems (IS) and selected IS applications and tools.

1.2 Course Outline by Topics

We will explore a **subset** of the following topics:

1. Introduction and History

2. Review of Intelligent Systems (AI) Fundamentals

3. (Human) Cognitive Processes

4. Representation and Manipulation, including Ontologies

5. Problem State Space (and Search)

6. Constraint Satisfaction Problems (CSPs)

7. Natural Language Understanding

8. Logic, Modus Ponens and Chaining

9. Intelligent Systems Development Experience in `clips` and SOAR

10. Search Quantification and Approaches, Including Heuristics

11. Planning

12. Explicitly Incorporating Uncertainty in Intelligent Systems

13. Multivalued Logic and Related

14. Learning Approaches and Implementation (Rule Induction, ID3)

15. Biologically-inspired Computing Approaches

16. Agents

17. Temporal Reasoning

18. Other Relevant Topics

1.3 Course Pragmatics

Instructor: Dr. R.J. Schalkoff

If you want to see a recent picture of me with some background information, please visit:

`http://www.clemson.edu/ces/departments/ece/faculty_staff/faculty/rschalkoff.html`

Office: EIB 334, 864-656-5913, *rjschal@g.clemson.edu*

Web Page: We will be using Blackboard extensively. You will find this syllabus as well as other related materials and resources on the ECE 4420/6420 Blackboard page. *Be sure you can access this, since it will be the source of lecture videos, handouts, software, assignments and other information.* This repository will evolve over the session.

Text: Schalkoff, R.J., *Intelligent Systems: Principles, Paradigms and Pragmatics*, Jones and Bartlett, 2009, ISBN 978-0-7637-8017-3. Required.

Office Hours: M,T,W,Th,F 11:00AM-12:00PM (by phone), unless notified otherwise. You can contact me by email (rjschal@g.clemson.edu) anytime.

1.4 Course Progress

Although I will try to help you stay in sync with this course, a very important point is:

> **You and I are 'in this together' for the session. *However, your progress is up to you.***

1.5 Attendance

ECE 4420/6420 is an on-line course. There will be no meetings of this course in a traditional classroom. However, you should be checking your email and

Blackboard daily.

1.6 Prerequisites

ECE 3520 is recommended.

2 Course Schedule

As noted, numerous attempts and tools will be used to help keep you 'on schedule' throughout the session. Some are illustrated below.

2.1 Overall Session Summary Calendar

```
ECE 4420/6420
SS I:
      May 2016
Su Mo Tu We Th Fr Sa
 1  2  3  4  5  6  7
 8  9 10 11 12 13 14  Course starts May 11
15 16 17 18 19 20 21
22 23 24 25 26 27 28
29 30 31
      June 2016
Su Mo Tu We Th Fr Sa
          1  2  3  4
 5  6  7  8  9 10 11
12 13 14 15 16 17 18  June 14 is last lecture
19 20 21 22 23 24 25  June 15 is study day
26 27 28 29 30        June 16 final exam (Quiz #3)
```

The course Blackboard page contains a more detailed online calendar indicating day-by-day lectures, deliverables and significant course activities.

2.2 Critical Summer Session I Dates for ECE 4420/6420

These are probably the most important dates to put on your 2016 calendar. Note Mondays and Tuesdays are especially important.

- Wednesday May 11: Course Starts

- **Friday May 13:** Proctor Approval Form Due (See below)

- **Thursday May 19:** Takehome #1 Assigned

- **Tuesday May 24:** Quiz #1

- **Tuesday May 31:** Takehome #1 Due

- **Thursday June 2:** Takehome #2 Assigned

- **Tuesday June 7:** Quiz #2

- **Tuesday June 14:** Takehome #2 Due

- **Thursday June 16:** Quiz #3; Course Ends

2.3   Daily Reminder Via email

You will get email from me every morning with the header:

`rjschal-44206420SSI2016: <date>: Goals and Notes`

indicating previous, current and future ECE 4420/6420 issues. These emails are aligned with the Blackboard course calendar. This is to help keep you up-to-date with respect to the ECE 4420/6420 course schedule.

3   Course Grading Procedures

3.1   Quizzes and Assignments

There will be 3 quizzes and 2 Takehome Assignments. They will determine 100% of your final grade. Thus there are 5 scores recorded. Quizzes are equally weighted. No re-tests are given, and no additional work will be assigned. I will use all 5 scores recorded in computing your final grade[1].

We need to be careful about the conditions under which collaboration may occur. To this end **all quizzes are an individual effort**.

---

[1] In other words, no scores are dropped.

3.2   Takehome Assignments (2)

In order to provide some 'hands-on' Knowledge Engineering experience, you will undertake 2 Takehome Assignments as part of your graded submissions. They will be graded on the basis of functionality, completeness and correctness **and must be submitted by the due date**. (Please read the previous sentence again.) For some students, the takehomes are the most challenging part of the course. For some students, the takehomes are the most rewarding part of the course. Your motivation and time management will determine which one it is for you.

There is also an early, non-graded, but required 'Takehome #0', which is just a test of your ability to upload an archive to Blackboard. It will be posted on Blackboard and should only take a few minutes to complete.

Languages/software tools we will use for the 2 takehomes are:

1. Protege Ontology Editor(`http://protege.stanford.edu/`)

2. c-Language Integrated Production System or `clips` (Versions will be posted on Blackboard)

You are **not** expected to be familiar with these IS development paradigms. Both are open source and free. It would not hurt to have these software tools installed prior to the course start, in order to allow more time during the session for completion. I'll point out in the lectures (and the book) where to get them and how to install them.

3.3   Students with Disabilities: Requesting Accommodations

Students with disabilities requesting accommodations should make an appointment the Director of Disability Services in the SDS Office to discuss specific needs **immediately**.

3.4   Proctors

- If you will be on or near campus (within 25 miles), you will take the quizzes in a classroom in Riggs Hall.

- **If you will be off-campus, you will need to find a proctor who is willing to supervise your taking of the quizzes**. We will send the quiz to the proctor the night before the quiz date via email as a PDF attachment. The proctor will be asked to provide you with a quiet place to take the quiz, enforce the rules of the quiz, scan your solution and send it back to me via email as a PDF attachment[2].

- A proctor must be a person of trust who agrees to supervise your taking of quizzes. Basically, the proctor must be a person you trust to be responsible and I have reason to trust. You must trust them to be available to receive, administer and return the quiz to me in a timely manner. I need to be reasonably sure they will enforce the constraints on taking the quiz.

- Detailed information regarding qualifications and duties of a proctor are described in the ECE proctor information and approval form, specifically the section 'Online Summer Program Proctor Information' which is posted on the course Blackboard page. You are to recommend a proctor using the Proctor Approval/Agreement Form. Fill out this form in concert with your proctor, scan it, and submit it via Blackboard no later than Friday, June 26.

4 Course Structure

4.1 The Master Slide-Video Catalog and Schedule

Since this course is online, your progress is largely self-paced. To coordinate lecture slides with associated lecture videos and recommended viewing dates, a file:

`44206420-slide-video-schedule-2016.pdf`

is available on the course Blackboard page. **This document is your course 'lifeline', and provides a reference on where you should be lecture-wise at any point in the session.** This document is so important it comprises a separate Blackboard content item with additional discussion.

_____

[2]Please note that, due to course enrollment, we will not be accepting FAXed quizzes. Keep this in mind when nominating your proctor.

4.2   Course Materials Related to Schedule

Once the class begins, I will begin releasing course material on Blackboard in modular form. Modules consist of a combination of book reading, slide sets, corresponding video sets, auxiliary references (typically publications), web references, code examples, and perhaps non-graded questions.

5   Additional Remarks and Frequently Asked Questions

5.1   Incorporation

The *Clemson Announcements* contains additional information and guidelines on a number of important and related topics, including special needs and **academic integrity**. These guidelines are incorporated into ECE 4420/6420 by reference.

5.2   Interaction Notice

In this online course, you will interact with the content and instructor on at least a weekly basis through course assignments, asynchronous discussions, and/or synchronous sessions as indicated in the syllabus.

5.3   Title IX Statement for Undergraduate Syllabi

Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veterans status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This policy is located at http://www.clemson.edu/campus-

life/campus-services/access/title-ix/. Mr. Jerry Knighton is the Clemson University Title IX Coordinator. He also is the Director of Access and Equity. His office is located at 111 Holtzendorff Hall, 864.656.3181 (voice) or 864.565.0899 (TDD).

5.4   Teaching Philosophy

My teaching philosophy may be summarized in these remarks:

- The class (you) and I are 'in this together' for the session. **However, your progress is up to you**.

- Sometimes we can have fun with the material; sometimes work is required. Not everything can be made simple or fun.

- Academic integrity is a serious issue.

- There are standards for academic achievement, and they should be employed. Excessive whining has never been shown to facilitate the installation, creation or debugging of software.

- All our interactions should be conducted within a framework of mutual respect.

- *The time to put effort into ECE4420/6420 is before the quizzes and before the course is over.*

5.5   General FAQs

The course Blackboard page contains several FAQs, including a more comprehensive version of the General FAQ below. Each SDE will have an associated FAQ, summarizing previously asked questions. Be sure to check the FAQs frequently since they are updated throughout the session.

- What Should I Expect?

- How Hard is The Class?

- What is Required?

- This class requires active participation.

- This class requires self-motivation and (sometimes) perseverance.

- Remark:

    I am not here to simply 'help you'.

    but ...

    I am here to help you learn how to help yourself.

- This class requires following instructions and meeting (takehome) deadlines.

- This class requires installing and using software and reading manuals.

- This class requires designing, implementing, testing and submitting 2 software-based takehomes that work correctly.

• Any Helpful Hints for Success?

- Complete the modules.

- Stay up to date (or even slightly ahead).

- Read the book.

- Pay attention to the examples. Try the examples. Modify the examples.

- Read the takehome assignments **early, carefully and repeatedly**.

- Plan your takehome assignment effort. ('It is never to early to get started'). Beginning the night before the assignment is due is usually a contraindication to success.