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| **BMI 506**  **Clinical Decision Support**  **Spring 2015**  Time: Mondays, 10:30 am – 1:15 pm  Location: EDBL1-26 (Payne Hall, Tempe | **Course Instructors:**  ***Robert A. Greenes, MD, PhD***  Professor and Ira A. Fulton Chair  In Biomedical Informatics  greenes[@asu.edu](mailto:greenes@asu.edu)  Cell Phone:(617)331-7715  ***Anita C. Murcko, MD, FACP***  Adjunct Faculty  anita.murcko[@asu.edu](mailto:dyauch@asu.edu)  Office Phone: (602)549-8610 |
|  | ***Buffy Lloyd***  Teaching Assistant  bbaker5@asu.edu |
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**Course Description**

The course will provide an in-depth analysis of computer-based approaches to supporting clinical decision making for providers and patients throughout the care continuum. The course will use a project-oriented framework as a basis for exploring the spectrum of methodologies and approaches of the field of computer-based clinical decision support (CDS), learning its history and understanding the practical issues and impediments to widespread implementation, and the challenges and opportunities ahead, including the roles of standards and infrastructure and directions of current research.

**How this Course will be conducted**

This course employs a "hands-on" approach using student-driven projects as the framework for exploring the many facets of CDS. The course is divided into stages that correspond to the lifecycle of project development, from initial knowledge generation to ongoing knowledge support. At each stage we will also cover timely topics and current events related to clinical decision support systems (CDSS.)

Class time will primarily be spent engaging in student-team projects, with instructor-moderated discussion. Therefore, students must ensure they are sufficiently prepared to engage in a free-flowing discussion of the weekly topics. Specifically, they must be familiar with the assigned readings for each stage and have performed a "*preview*" of the upcoming stage. Topics that arise during in-class discussion may be assigned for further exploration and report back to the class.

**Course Policies**

Attendance and Participation: Students are expected to attend each class session as an active participant. Absences from 2 or more class sessions is considered unsatisfactory. In the event that unsatisfactory participation is noted, the instructor or TA will contact the student for discussion.

Communication: Blackboard will be the course home and serve as the primary mode of formal notifications and communication. Students are expected to review and act upon Blackboard announcements in a timely fashion.

Academic Integrity and Honesty: Students are expected to act with honesty and integrity. Writings and presentations must appropriately cite external sources. Compliance with the ABOR Student Code of Conduct (<https://students.asu.edu/srr/code>) and the ASU Student Academic Integrity Policy is expected (available at: <https://provost.asu.edu/academicintegrity>) are required.

**Readings**

The textbook used for this course will be Greenes, R. A. (2014). *CLINICAL DECISION SUPPORT, 2nd Edition: The Road to Broad Adoption*. *Elsevier*. It is available through the ASU bookstore and online book sellers, or electronically through the ASU Library.

Each stage of the course will have several readings associated with it. These readings will be posted on the course Blackboard site. The reading list is organized by stage and by class session. It is expected that students will carefully read the materials associated with each class session before that session begins.

Students will also be expected to *preview* the readings for the upcoming stage, i.e., read the abstract or introduction (for a book chapter) and scan the remainder of the text, paying special attention to figures, highlighted terms, and recurring themes. The preview should not take more than 5-10 minutes per reading and is intended to help students acquire a “big picture” understanding of the upcoming course topics. The instructor may update the reading list by posting on Blackboard and sending a timely Blackboard announcement. Students are also encouraged to explore other literature, read about a topic of interest, and share highlights with class as appropriate.

**Projects**

Students will embark on student-driven projects at each stage. Each project will be comprised of several assignments and in-class exercises.

**Grading**

Class Attendance/Participation: 25%

Assignments/Projects (one per stage): 50%

Final Exam: 25%

**Grades:** We will use the +/- system. Grade assignment rules: (>96% A+, >92% A, >89% A-, >86% B+, >82% B, > 79% B- >76% C+, >72%C, > 69% C-,>66% D+, >62%D, > 59% D-<60% F)

**Late submissions**: all homework and projects should be submitted before class on the date specified, unless otherwise indicated. Late submissions of up to 24 hours will be subject to a 15% penalty. An additional penalty of 15% will be applied per 24 hours beyond the first 24. Late submission credit on an assigned paper reading will be accepted only for the report portion of the grade.

**Final Exam**

The course will conclude with a final examination that is intended to assess each student’s understanding of key topics discussed in class. Prior to the final exam, students will be given representative questions and/or lists of topics to be covered on the examination.

**Schedule**

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| **Stage** | **Dates** | **Description/Topics** | **Assignments** | **Readings\*** |
| N/A | 01/12 | Explanation of course organization  Introduction to CDS  History of computer-based CDS  Discussion of project ideas and opportunities |  | Do advance reading for 1/26 class |
|  | 1/19 | No class – Martin Luther King Day |  |  |
| 1 | 01/26 | Introduction to course projects  Introduction to Cerner Millennium and Discern Expert | Students will present their self-proposed projects (10 minutes + Q/A) | Chapters 1-3  Chapters 10-12 |
| 1 | 2/2  2/9 | Definition, scope and challenges. Introduction to ways to generate and formulate knowledge.  Discussion on probabilistic clinical reasoning  Clinical guidelines formalization: disambiguation, dissemination, adaptation and enactment. | Assignment 1 | Chapter 13  E. Shortliffe, J. Cimino, Chapter 3 from book Biomedical Informatics, Computer Applications in Health Care and Biomedicine  Chapter 16 |
| 2 | 2/16  2/23  3/2  3/9 | Case studies of successful CDS  Discern Expert – Deeper Dive: Methods for representing knowledge in Cerner Millennium.  Review of efforts to represent knowledge: decision rules and expressions, guidelines and workflow models, ontologies, vocabularies, data models, grouped knowledge elements, infobutton manager, and point of care access to knowledge. Also standardization efforts to facilitate knowledge sharing  No Class – Spring Break | Assignment 2 | Chapter 5-9  Chapters 15-21 |
| 3 | 3/16  3/23 | Conceptual model of CDS execution and implications for sharing and reuse of knowledge  Knowledge management approaches, as proposed and built by prominent health providers like Partners Healthcare System | Assignment 3 | Chapters 3 (section 3.2.2) and 29  Chapter 28 |
| 4 | 3/30  4/6 | Challenges related to the design, build, implementation  Session 2: Special topics – quality measurement, genomics, patient-provider CDS, external CDS services, new architectures and opportunities  Project Updates | Assignment 4 | Chapter 22-26  Additional reading +  Project specific reading  Chapters 4, 14 |
| 5 | 4/13 | New architectures and opportunities  The future: Drivers for adoption, new models, and new opportunities |  | Chapters 29-30 |
| 6 | 4/20 | Student Final Presentations (Please prepare and dress for outside guests) | Students will present their course projects |  |
|  | 4/27 | Student Final Presentations, Continued if needed  Exam Preparation Review |  |  |
|  | 5/4 | Final exam |  |  |

\*Book chapters are from Greenes, R. A. (2014). *CLINICAL DECISION SUPPORT, 2nd Edition: The Road to Broad Adoption* unless otherwise noted. Additional reading material can be found on Blackboard. In addition, specific reading material will be provided, based on the course projects.

**Student projects and assignments related to them**

Students will work on a semester-long hands-on project as the main activity of the course. Students will have a choice of working on (a) a project aimed at modeling a clinical guideline for management of a particular disease vs. (b) a student-driven project.

***(a) Clinical Guideline Modeling Project****:*

This project will involve analyzing a guideline for diabetes, exploring the processes of going through four phases identified in the assignments indicated below, ending up with steps needed for implementation of selected aspects of the guideline in a functioning electronic health record (EHR) system. Students who opt for this project will work as a team on it, with a maximum team size of 4 students.

Assignment 1: Perform meta-analysis of the most significant evidence related to decision points in the guideline.

Assignment 2: Disambiguate a guideline, find inconsistencies and redundancies. Analyze guideline’s correctness and completeness.

Assignment 3: Flow-based modeling of the guideline, including information model

Assignment 4: Propose some intervention approaches for present or future implementation of aspects of this guideline as Discern rules. Describe your understanding of the workflow that would require at Mayo Clinic to bring the proposed rule throughout the phases of development, implementation and testing.

***(b) Student-driven project***

Students can work individually or in teams of up to 4 students, and the project scope and teaming will need to be negotiated and approved by the instructors. The development of the project will go through four phases that will constitute assignments, during the course. This may vary, depending on the project, and the nature of the assignments will be negotiated with the instructor, but the general approach will be as follows:

Assignment 1: Problem selection (use case scenarios), state of the art review to determine innovation and significance. Possible identification of domain expert and/or sponsor for the project.

Assignment 2: Evidence review and disambiguation. Where your project must make a clinical recommendation, assess the state of the evidence through critical review of the literature.

Assignment 3: Knowledge base modeling. What are the knowledge elements of the project? How will you represent them? What standards are available and where are the gaps in standards? Justify your choice.

Assignment 4: Rule-based reasoning and testing for use case scenarios. Develop the necessary models for implementation to be able to evaluate how it will perform, including test cases designed to identify possible points of failure. Actual implementation is not expected, although it may be possible in some projects.