

INFO B642
Clinical Decision Support Systems

Department of BioHealth Informatics
Indiana University School of Informatics and Computing, Indianapolis
Spring 2020

Section No.: 21750

Credit Hours: 3

Time: Course is online; Assignments are due Sundays at 11:59pm

Location: Course is online

Prerequisites: B530 & B535 or instructor permission

Faculty Instructors: Robin Chisholm, PhD, RN

Communication policies:

- 1) Your email **must contain “B642” in the subject line (no space, no dash)**. Failure to include this may result in the e-mail not being read or replied to.
- 2) **Office hours are by appointment.** Phone, Canvas chat or Skype-based appointments are available but must be made by appointment. TA office hours will be announced

Dr. Chisholm’s Office Hours and Contact Information

Office Hours: By appointment

Office: Virtual Only

Contact: (317) 852-4821 (home) call or text

Email: rlchisho@iu.edu

Course Description

This course provides a state-of-the-science overview of computer-based Clinical Decision Support (CDS) and CDS Systems (CDSS). Topics include: the design principles behind clinical decision support systems, CDSS usability and cognitive support, implementation science, mathematical foundations of the knowledge-based systems and pattern recognition systems, clinical vocabularies, legal and ethical issues, patient centered clinical decision support systems, and applications of clinical decision support systems in clinical practice.

Readings

Required and optional readings will be defined for each session and can be found in the weekly module. The readings consist of journal articles, a topic narrative, and slides. Additional independent readings may be recommended.

(1) Required Textbooks:

Greenes, R.A. (Ed.) Clinical Decision Support: The Road to Broad Adoption. 2014. Waltham, MA: Academic Press. ISBN: 978-0-12-398476-0

***Note: this is 2014 2nd edition of this book.** The 2014 2nd edition is available as a Kindle book or in hardcover and as an e-book from the IUPUI library.

Berner, Eta (Ed.) Clinical Decision Support Systems Theory and Practice. 3rd edition 2016. Switzerland: Springer International Publishing. ISBN 978-3-319-31913-1. This book is available as a Kindle book or in hardcover and as an e-book from the IUPUI library.

(2) Articles: Articles are provided by the instructor. Required readings will be made available in Canvas within the weekly module.

(3) Slides and topic narrative: Each week the slides and topic narrative will be posted online in the weekly module. It is highly recommended that students read any required articles or book chapters before reviewing the slides and narrative.

Learning Objectives:

Course Objectives	AMIA Functional domains	Proposed competency driven objectives	Miller's Pyramid(mapping)	Class activities	Assessment
1. Define computer-based clinical decision support (CDS)	F4	The student will be able to develop a prototype computer-based clinical decision support system derived from advanced diagnostic, predictive, and prescriptive analytic approaches	SHOWS HOW	Reading, Online discussions, Narratives	Weekly Assignments, Homework, Papers
2. Describe the infrastructure	F4	The student will be able	KNOWS HOW	Reading, Online	Weekly Assignments

and components of a CDS system		to evaluate the infrastructure and the role of different components of a CDS system.		discussions , Narratives	, Homework, Papers
3. Outline and discuss health care decision-making processes	F4	The student will be able to analyze the role of CDS in health care decision making	KNOWS	Reading, Online discussions , Narratives	Weekly Assignments , Homework, Papers
4. Apply the mathematical foundations of CDS to health care decision-making processes and the design of a CDS system	F5	The student will be able to apply the advanced analysis skills in the design of CDS systems	DOES	Reading, Online discussions , Narratives	Weekly Assignments , Homework, Papers
5. Describe different applications of CDS and application-specific issues	F2	The student will be able to differentiate CDS according to different health care settings	KNOWS	Reading, Online discussions , Narratives	Weekly Assignments , Homework, Papers
6. Identify cognitive support, usability, and implementation problems and best practices related to CDS	F4	students will be able to solve the problems in different domains and practices in healthcare	KNOWS	Reading, Online discussions , Narratives	Weekly Assignments , Homework, Papers

		by using knowledge gain from CDS			
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Course Outcomes:

Upon the successful completion of the course, the student should be able to:

- Define computer-based clinical decision support (CDS)
- Describe the infrastructure and components of a CDS system
- Outline and discuss health care decision-making processes
- Apply the mathematical foundations of CDS to health care decision-making processes and the design of a CDS system
- Describe different applications of CDS and application-specific issues
- Identify cognitive support, usability, and implementation problems and best-practices related to CDS

Software used:

Canvas (web), MS PowerPoint, MS word, Adobe PDF, Adobe Connect (web), EndNote

Course Content and Instructors

Course content, timing, and readings may change. Updates will be posted on Canvas. Information in the Modules is the most current.

Week #	Topic	Readings
1	Definition, Scope and History of CDS [Lit Review topics posted]	Greenes: Ch 1, 2
2	Knowledge Management [Lit Reivew Topic selection due]	Greenes: Ch 4, 10, 11
3	Evidence Based Practice	Greenes: Ch 12
4	Guidelines and Workflow	Greenes: Ch 16,19
5	Bayes' Theorem and Decision Theory	Berner: Ch2 (online)
6	Decision Rules and Engines, Ontologies, and Data Models CDS System Implementation	Greenes: Ch 15, 17, 18
7	Humans and CDS: Cognitive Support and Usability	Greenes: Ch 3, 22
8	Consumer CDS	Greenes: Ch:27
9	Midterm Case Analysis Paper	none

-	Spring break	-
10	Legal, Regulatory, and Financial Issues	Greenes: Ch: 24, 26
11	CDS Adoption	Greenes: Ch 5,6,7
12	CDS System Implementation	Greenes: Ch 23, 25
13	Evaluation of CDS Systems	Articles in module
14	Emerging and Future Directions, Part 1: Public & Personal Health Decision Support	Greenes: Ch 13, 14, 30
15	Wrap-up and final draft of papers due	none

TBD=to be determined

Teaching Strategies/Methods

The course is offered online.

Students will be asked to complete a variety of assignments.

Evaluation and Assessment

Grades will be based on a weighted scale distributed as follow:

#	Assessment Method	Percent
1	Weekly Discussions	30
2	Homework	30
3	Papers	40
	Total	100

(1) Weekly Assignments: Each week students will be required to complete an assignment to demonstrate comprehension of course material as well as participation. Examples include: an online post and discussion; critical analysis of a recent CDS peer-reviewed article; and/or practice problems related to weekly topics. Assignments are due on the date and time listed in Canvas; generally, these will be due at 11:59pm on Sundays. The first post for discussions is due no later than Thursday at 8:00am to allow classmates to comment. Failure to post to the discussion by the Thursday deadline will result in a 50% penalty for the discussion that week.

Students **will not** receive credit for late assignments or failing to submit an assignment unless arrangements are made **prior** to the due date. Do not email your instructor on or after the due date to request an extension.

(2) Homework: Students will be periodically assigned tasks to complete that will require work beyond the timeframe of a single week. Homework may include tasks such as the analysis of CDS data extracted from real-world alert logs; development of CDS alert logic;

establishing weights for a Bayesian network; execution of scripts for processing health care data or alerts; locating information on clinical guidelines; or generating reports on CDS system activity. Students will complete the assigned tasks then submit their results and/or a report detailing their results/experiences. Homework reports are due on the date and time listed in Canvas; these will be due at 11:59pm on Sundays. Late work will not be accepted.

(3) Papers: Students will be asked to complete 2 papers during the course. The Case Study analysis will be in place of a midterm exam and will require critical reading, research, application of skills learned to date, and professional writing. The literature review (final exam substitute) will focus students on researching a particular topic in the area of CDS, critically analyzing some aspect of CDS systems, and summarizing their analysis in a written form. Students will select a topic by the end of the second week of the semester and have the remainder of the semester to complete the review. All written assignments will be submitted to Turnitin for originality checks. Scores >50% will receive a zero grade, scores between 25% and 50% will be reviewed by the instructor for the degree of plagiarism and scored accordingly. Papers are due on the date and time listed in Canvas; these will be due at 11:59pm on Sundays. Late work will be accepted but students will receive a 10% penalty for the first 24 hours, 20% penalty for the second 24 hour period and zero after that. The final paper will count as a final exam and as such will not be accepted late.

Note: International students are **strongly encouraged** to have their paper reviewed prior to submission by the IUPUI Writing Center. Graduate students can receive up to three (3) 1-hour sessions each week with a mentor at the Writing Center throughout the semester to address writing skills. Students are encouraged to contact the Writing Center early in the semester to schedule time before time slots at the end of the semester are filled. English writing skills are very important to success in any career. **Improper use of the English language will result in a loss of points in this course. Do not use translation software and assume it will be adequate.**

Grading Scale

The final grade will be a weighed composite of many smaller grades. This should create a fair result.

The conversion table from numerical format to letter grades is followed:

Grade	Percentage
A+	97-100
A	93-96
A-	90-92
B+	87-89
B	83-86
B-	80-82
C+	77-79

C	73-76
C-	70-72
D	60-69
F	0-59

Grading Principles and Policies

Students should review all grading forms that will be used by the instructor to grade projects, presentations, papers, and other assignments. If students want to see their grades at any time during the semester, they should contact the instructor by phone or email.

Criteria to evaluate written assignments:

Exceptional quality (not quantity): (90-100 %)

- Evident that individual has completed all requirements
- Demonstrates applied level of understanding through personal reflections
- Answer is well-developed and logically reasoned
- Provides original insights or responses; extends comments of others
- Supports and leads others in discussion; respects others and their ideas

Superior quality (not quantity): (80-89%)

- Evident that individual has completed all requirements
- Demonstrates applied level of understanding through personal reflections
- Answer is provided; logic may not be clear
- Provides original insights or responses
- Makes connections to what others say; respects others and their ideas

Satisfactory quality and quantity: (60-79 %)

- Evident that individual has completed all requirements
- Primarily consists of summary or paraphrasing of readings
- Answer is not fully developed; logic is not clear
- Contribution is primarily a response to others; minimal originality
- Is respectful of others and their ideas

Does not meet expectations: (< 60%)

- Not clear that individual has completed all requirements
- Only consists of summary or paraphrasing of readings
- Minimal effort put into answer
- Is not respectful of others and their ideas

Requirements not completed (0)

Rubrics can be found attached to the assignment for all written work.

Late work

Assignments are due by the date and time posted in Canvas. Severe weather rarely results in cancellation of classes or changes in due dates/times of assignments. As such, previously assigned work will still be due as posted in Canvas. Please clarify with the

instructor regarding due dates of future assignments. All late assignments (even one minute) will receive a 10% reduction on that assignment. Assignments later than 24 hours will receive an additional 10% reduction. Assignments later than 48 hours will receive a zero. If there are circumstances that will require late submissions, the instructor must be notified a minimum of 24 hours before the due date (see below).

Extensions

Extensions may be granted in the case of exceptional circumstances. You must discuss these circumstances with your instructor at least 24 hours before the assignment is due. (Note: Discussing the situation is not the same as merely informing your instructor.) In order for a late assignment to receive full marks, it must include a note from the instructor confirming the extension date. An instructor note, attached to your assignment, can include a printed copy of an e-mail exchange between instructor and student indicating that an extension has been granted. Medical reasons for a late assignment must be documented by a doctor's note. Under normal circumstances (according to university regulations) medical excuses must be presented promptly (within two weeks from the date of the illness).

Backup copies

Please keep an electronic copy and a hard copy of your work.

Plagiarism^[1]

Plagiarism is defined as presenting someone else's work, including the work of other students, as one's own. Any ideas or materials taken from another source for either written or oral use must be fully acknowledged, unless the information is common knowledge. What is considered "common knowledge" may differ from course to course.

(1) A student must not adopt or reproduce ideas, opinions, theories, formulas, graphics, or pictures of another person without acknowledgment.

(2) A student must give credit to the originality of others and acknowledge indebtedness whenever:

- Directly quoting another person's actual words, whether oral or written;
- Using another person's ideas, opinions, or theories;
- Paraphrasing the words, ideas, opinions, or theories of others, whether oral or written;
- Borrowing facts, statistics, or illustrative material; or
- Offering materials assembled or collected by others in the form of projects or collections without acknowledgment.

Please refer to http://www.psych.iupui.edu/capstone/plagiarism/what_is_it.htm for some tips about how to avoid plagiarism.

Equipment needed

Computer with email and web access for participating in the online parts of the course (notes, supplemental material, assignments, etc.). Any appropriate equipment to create papers, homework, and presentations. Practical assignments can be carried out on various equipment, including own PC or Laptop, general computer labs and IUPUI Unix servers.

Reliable internet connection is essential for success in this course. Please proactively find a backup internet connection for emergencies. Computer and/or connection issues are not excuses for late work.

Software used

Most materials are provided in either Microsoft PowerPoint or Acrobat PDF. Assignments should be submitted in a Microsoft Word document format.

Assignments may require the use of additional software available from IU Ware and/or open source software web sites. Please refer to the class schedule for information on special software needed. You will be expected to download and install any necessary software prior to class on the weeks indicated in the class schedule.

University Policies

There are a number of campus-wide policies governing the conduct of courses at IUPUI. These can be found at http://registrar.iupui.edu/course_policies.html

Administrative Withdrawal Policy

A basic requirement of this course is that you will participate in all class meetings and conscientiously complete all required course activities and/or assignments. Keep in touch with me if you are unable to attend, participate, or complete an assignment on time. If you miss more than half of the required activities within the first 25% of the course without contacting me, you may be administratively withdrawn from this course.

Our course meets once per week; thus *if you miss more than two classes in the first four weeks, you may be withdrawn*. Administrative withdrawal may have academic, financial, and financial aid implications. Administrative withdrawal will take place after the full refund period, and if you are administratively withdrawn from the course you will not be eligible for a tuition refund. If you have questions about the administrative withdrawal policy at any point during the semester, please contact me.

Attendance:

A basic requirement of this course is that you will participate in all class meetings, whether online or face-to-face, and conscientiously complete all required course activities and assignments.

Only the following are acceptable excuses for absences: death in the immediate family (e.g. mother, father, spouse, child, or sibling), hospitalization or serious illness; jury duty; court ordered summons; religious holiday; university/school coordinated athletic or scholastic activities; an unanticipated event that would cause attendance to result in substantial hardship to one's self or immediate family.

Absences must be explained with the submission of appropriate documentation to the satisfaction of the instructor, who will decide whether missed work may be made up. Absences that do not satisfy the above criteria are considered unexcused. To protect your privacy, doctor's excuses should exclude the nature of the condition and focus instead on how the condition impacts your attendance and academic performance.

Missing class reduces your grade through the following grade reduction policy: You are allowed two excused or unexcused absences. Each additional absence, unless excused, results in a 5% reduction in your final course grade. More than four absences result in an F in the course. Missing class may also reduce your grade by eliminating opportunities for class participation. For all absences, the student is responsible for all covered materials and assignments.

Incomplete:

The instructor may assign an Incomplete (I) grade only if at least 75% of the required coursework has been completed at passing quality and holding you to previously established time limits would result in unjust hardship to you. All unfinished work must be completed by the date set by the instructor. Left unchanged, an Incomplete automatically becomes an F after one year.

<http://registrar.iupui.edu/incomp.html>

Deliverables:

You are responsible for completing each deliverable (e.g., assignment, paper, discussion) by its deadline and submitting it by the specified method. Deadlines are outlined in the syllabus or in supplementary documents accessible through the learning management system (e.g., Canvas).

Bringing your children to class

Although not applicable to online classes, it should be stated that “Children are not permitted to attend class with parents, guardians, or childcare providers. This conduct has the effect of unreasonably interfering with an individual’s work or academic performance creating an offensive learning environment.”

Academic Dishonesty/Integrity and Plagiarism

Using another student’s work on a project or assignment, cheating on a test, or any other form of dishonesty or plagiarism will result in a grade of zero on that assignment and possibly an “F” in the course, and will be referred to the Dean of Students. All students should aspire to high standards of academic honesty.

Values and Ethics

Profanity or derogatory comments about or towards the instructor or any members of the class will NOT be tolerated. Violating this rule will result in a warning and if the offence continues, administrative action will be taken.

Disabilities Policy

In compliance with the Americans with Disabilities Act (ADA), all qualified students enrolled in this course are entitled to ‘reasonable accommodations’. Please notify the instructor during the first week of class of any accommodations needed for the course. Students with learning disabilities must provide written verification for this policy to be recognized. If you need any special accommodation due to a disability, please contact Adaptive Education Services at 317-274-3241. The office is located at CA 001E.

CODE OF CONDUCT

All students should aspire to the highest standards of academic integrity. Using another student's work on an assignment, cheating on a test, not quoting or citing references correctly, or any other form of dishonesty or plagiarism shall result in a grade of zero on the item and possibly an F in the course. Incidences of academic misconduct shall be referred to the Department Chair and repeated violations shall result in dismissal from the program.

All students are responsible for reading, understanding, and applying the *Code of Student Rights, Responsibilities and Conduct* and in particular the section on academic misconduct. Refer to *The Code > Responsibilities > Academic Misconduct* at

<http://www.indiana.edu/~code/>. All students must also successfully complete the Indiana University Department of Education "How to Recognize Plagiarism" Tutorial and Test. <https://www.indiana.edu/~istd> You must document the difference between your writing and that of others. Use quotation marks in addition to a citation, page number, and reference whenever writing someone else's words (e.g., following the *Publication Manual of the American Psychological Association*). To detect plagiarism instructors apply a range of methods, including Turnitin.com. <http://www.ulib.iupui.edu/libinfo/turnitin>

Academic Misconduct:

1. **Cheating:** Cheating is considered to be an attempt to use or provide unauthorized assistance, materials, information, or study aids in any form and in any academic exercise or environment.
 - a. A student must not use external assistance on any "in-class" or "take-home" examination, unless the instructor specifically has authorized external assistance. This prohibition includes, but is not limited to, the use of tutors, books, notes, calculators, computers, and wireless communication devices.
 - b. A student must not use another person as a substitute in the taking of an examination or quiz, nor allow other persons to conduct research or to prepare work, without advanced authorization from the instructor to whom the work is being submitted.
 - c. A student must not use materials from a commercial term paper company, files of papers prepared by other persons, or submit documents found on the Internet.
 - d. A student must not collaborate with other persons on a particular project and submit a copy of a written report that is represented explicitly or implicitly as the student's individual work.
 - e. A student must not use any unauthorized assistance in a laboratory, at a computer terminal, or on fieldwork.
 - f. A student must not steal examinations or other course materials, including but not limited to, physical copies and photographic or electronic images.
 - g. A student must not submit substantial portions of the same academic work for credit or honors more than once without permission of the instructor or program to whom the work is being submitted.

- h. A student must not, without authorization, alter a grade or score in any way, nor alter answers on a returned exam or assignment for credit.
2. **Fabrication:** A student must not falsify or invent any information or data in an academic exercise including, but not limited to, records or reports, laboratory results, and citation to the sources of information.
3. **Plagiarism:** Plagiarism is defined as presenting someone else's work, including the work of other students, as one's own. Any ideas or materials taken from another source for either written or oral use must be fully acknowledged, unless the information is common knowledge. What is considered "common knowledge" may differ from course to course.
 - a. A student must not adopt or reproduce ideas, opinions, theories, formulas, graphics, or pictures of another person without acknowledgment.
 - b. A student must give credit to the originality of others and acknowledge indebtedness whenever:
 1. directly quoting another person's actual words, whether oral or written;
 2. using another person's ideas, opinions, or theories;
 3. paraphrasing the words, ideas, opinions, or theories of others, whether oral or written;
 4. borrowing facts, statistics, or illustrative material; or
 5. offering materials assembled or collected by others in the form of projects or collections without acknowledgment
4. **Interference:** A student must not steal, change, destroy, or impede another student's work, nor should the student unjustly attempt, through a bribe, a promise of favors or threats, to affect any student's grade or the evaluation of academic performance. Impeding another student's work includes, but is not limited to, the theft, defacement, or mutilation of resources so as to deprive others of the information they contain.
5. **Violation of Course Rules:** A student must not violate course rules established by a department, the course syllabus, verbal or written instructions, or the course materials that are rationally related to the content of the course or to the enhancement of the learning process in the course.
6. **Facilitating Academic Dishonesty:** A student must not intentionally or knowingly help or attempt to help another student to commit an act of academic misconduct, nor allow another student to use his or her work or resources to commit an act of misconduct.

OTHER POLICIES

1. **Right to revise:** The instructor reserves the right to make changes to this syllabus as necessary and, in such an event, will notify students of the changes immediately.
2. **IUPUI course policies:** A number of campus policies governing IUPUI courses may be found at the following link: http://registrar.iupui.edu/course_policies.html
3. **Classroom civility:** To maintain an effective and inclusive learning environment, it is important to be an attentive and respectful participant in lectures, discussions, group

work, and other classroom exercises. Thus, unnecessary disruptions should be avoided, such as ringing cell phones engagement in private conversations and other unrelated activities. Cell phones, media players, or any noisy devices should be turned off during a class. Texting, surfing the Internet, and posting to Facebook or Twitter during class are generally not permitted. Laptop use may be permitted if it is used for taking notes or conducting class activities. Students should check with the instructor about permissible devices in class. IUPUI nurtures and promotes “a campus climate that seeks, values, and cultivates diversity in all of its forms and that provides conditions necessary for all campus community members to feel welcomed, supported, included, and valued” (IUPUI Strategic Initiative 9). IUPUI prohibits “discrimination against anyone for reasons of race, color, religion, national origin, sex, sexual orientation, marital status, age, disability, or [veteran] status” (Office of Equal Opportunity). Profanity or derogatory comments about the instructor, fellow students, invited speakers or other classroom visitors, or any members of the campus community shall not be tolerated. A violation of this rule shall result in a warning and, if the offense continues, possible disciplinary action.

4. **Bringing children to class:** To ensure an effective learning environment, children are not permitted to attend class with their parents, guardians, or childcare providers.
5. **Email:** Indiana University uses your IU email account as an official means of communication, and students should check it daily for pertinent information. Although you may have your IU email forwarded to an outside email account, please email faculty and staff from your IU email account.
6. **Disabilities Policy:** In compliance with the Americans with Disabilities Act (ADA), all qualified students enrolled in this course are entitled to reasonable accommodations. Please notify the instructor during the first week of class of accommodations needed for the course. Students requiring accommodations because of a disability must register with Adaptive Educational Services (AES) and complete the appropriate AES-issued before receiving accommodations. The AES office is located at UC 100, Taylor Hall (Email: aes@iupui.edu, Tel. 317 274-3241). Visit <http://aes.iupui.edu> for more information.
7. **Administrative Withdrawal:** A basic requirement of this course is that students participate in all class discussions and conscientiously complete all required course activities and/or assignments. If a student is unable to attend, participate in, or complete an assignment on time, it is the student’s responsibility to inform the instructor. If a student misses more than half of the required activities within the first 25% of the course without contacting the instructor, the student may be administratively withdrawn from this course. Administrative withdrawal may have academic, financial, and financial aid implications. Administrative withdrawal will take place after the full refund period, and a student who has been administratively withdrawn from a course is ineligible for a tuition refund. Contact the instructor with questions concerning administrative withdrawal.
8. **Emergency Preparedness:** Safety on campus is everyone’s responsibility. Know what to do in an emergency so that you can protect yourself and others. For specific information, visit the emergency management website. <http://protect.iu.edu/emergency>

MISSION STATEMENT

The Mission of IUPUI is to provide for its constituents excellence in

- Teaching and Learning;
- Research, Scholarship, and Creative Activity; and
- Civic Engagement.

With each of these core activities characterized by

- Collaboration within and across disciplines and with the community;
- A commitment to ensuring diversity; and
- Pursuit of best practices.

IUPUI's mission is derived from and aligned with the principal components—Communities of Learning, Responsibilities of Excellence, Accountability and Best Practices—of Indiana University's Strategic Directions Charter.

STATEMENT OF VALUES

IUPUI values the commitment of students to learning; of faculty to the highest standards of teaching, scholarship, and service; and of staff to the highest standards of service. IUPUI recognizes students as partners in learning. IUPUI values the opportunities afforded by its location in Indiana's capital city and is committed to serving the needs of its community. Thus, IUPUI students, faculty, and staff are involved in the community, both to provide educational programs and patient care and to apply learning to community needs through service. As a leader in fostering collaborative relationships, IUPUI values collegiality, cooperation, creativity, innovation, and entrepreneurship as well as honesty, integrity, and support for open inquiry and dissemination of findings. IUPUI is committed to the personal and professional development of its students, faculty, and staff and to continuous improvement of its programs and services.