SYLLABUS for CHIP 490.387 – Human Factors in Healthcare, Spring 2024

INSTRUCTOR
Prithima Reddy Mosaly, PhD MHA

EMAIL
prithima_mosaly@med.unc.edu

DAY & TIME
Remote, Asynchronous

OFFICE HOURS
By appointment

READINGS
Available on Canvas and the library.

OVERVIEW
Complex health care systems often challenge providers, patients, and other health system participants, contributing to problems that threaten patient and provide safety, increase provider workload, reduce quality of care, and increase the cost of health care. This course overviews research that applies theories and methods from human factors and cognitive science to understand the and analyze the sources of these problems to develop and evaluate design and training interventions for safe and quality care to the patients and improve the well-being of the care providers.

An introduction to health care problems and accidents related to human factors is followed by an overview of concepts and methods from the fields of human factors and cognitive science. This background provides a foundation for considering specific topics related to human factors in health care. Topics range from provider and patient interaction with medical devices to collaboration and teamwork, concluding with broader socio-technical issues such as the impact of health information technology on clinical work.

LEARNING OBJECTIVES and OUTCOMES
Students will be able to apply human factors engineering, including its principles in healthcare setting. Students will be able to evaluate product or process problems, using human factors engineering concepts and methods. Students will be able to critique scientific articles and other readings on human factors engineering and synthesize knowledge from different areas of human factors engineering to solve a contemporary healthcare problem.

Students will be able to develop and communicate a research study proposal to apply human factors engineering in a healthcare context.

Reading Assignments
All reading materials are posted on Canvas. There is no required textbook for this course. All students are responsible for reading all the material posted on Canvas.

Evaluation
Individual questions (25 points).
For each week, there will be an individual submission of the readings for that class. For each article, you should summarize the main points (a brief paragraph about the goals, key findings, and conclusions) and write 2 questions. Questions can be about specific aspects of the article (e.g., a study’s procedure or findings) or how the article relates to other papers and concepts covered in the course. A good journal entry is complete (summary and 2 questions) and reflects an attempt to work through the material. Your goal in these assignments is to ensure and demonstrate that you critically read the article and integrate it with concepts from other articles, lectures, and discussions. Using Canvas, the summaries and questions will be uploaded in that week’s assignment folder no later than 11:59 am the Sunday of the week.
Online Group discussion of Articles (15 points)
All submitted questions will be posted on Canvas by 11:59am the Monday of the week for open discussion. Students are expected to read the posted questions and engage in active discussion online, providing individual thoughts and elaborate on the paper in some way (e.g., presenting related or updated material from the web or from your own experience), and integrate with other course concepts. Grading of the content discussion is based on adequacy of the article summary, elaboration, and relevance. The discussions should be posted on Canvas no later than 11:59am on Friday of that week.

Semester Project (60 points)
The major class assignment is the semester project that involves the evaluation, redesign, and testing of an existing system. Students may work individually or in groups up to 2 for this assignment. The assignment provides an opportunity to ‘drill down’ and work with course concepts of interest to better understand aspects of patient safety related to human factors covered in the course. You will identify an important problem related to patient safety (for example, a type of adverse event such as wrong-site surgery or giving the wrong medication to a patient; the impact of EHRs on clinical workload etc.), analyze why it occurs, and develop an approach to address the problem. There are four parts to the project.

1. **Introduction and Background.** This part has two sub-sections. First, describe in detail a specific case/example of the problem, based on literature, media reports, or other sources. For example, in addition to describing the general problem that nurses can confuse patient medications, also describe and analyze an actual incident that you think is representative of the problem. This would include an analysis of factors contributing to the incident (a “root cause analysis”). Second, conduct a literature review to find out what is already known about this type of problem (more generally), focusing on human factors issues related to preventable errors and other factors that contribute to the problem and its consequences.

2. **Develop an approach to address the problem.** How (and why) will this approach reduce the likelihood that the problem will occur, and/or mitigate the effects of this problem if it does occur?

3. **Describe how you would evaluate the effectiveness of your approach.** The evaluation should involve one (or likely more) of the following methods: direct observation, analysis of incident/error reports or patient records; interviewing participants, usability testing, experiment (e.g., involving simulation of the target activities), or modeling of the processes involved. This section will also include expected results from the evaluation, and what new procedures, technology, or other products would result from your project.

4. **Conclusion.** This part summarizes the main points in the paper. It should also include possible new procedures, technology, or other products that might result from your project. Ideally, this project would involve going to an actual health care setting to study the problem and perhaps evaluate changes that address the problem, but this would be hard to do in one semester, so we’ll stick with the hypothetical!

Project Deliverables:
- Research Topic proposal – following form on Canvas, due 02/14/2024 (10 points). *Students must send the topic proposals to me for approval by 02/07/2024*. Remember, the topic should be practical and feasible for data collection (interviews/observations), analysis, development of approaches for improvement, and must be completed in one semester. See [SEMESTER PROJECT](#) section for details
• Project outline – following the four sections above, with bullet outline for each, due 03/13/2024 (15 points). See Project Outline section for details.
• Conducting the study (data collection, analysis, and HFE improvements) – execute the study, gather and analyze data, and propose alternative solutions for improvement. A weekly email update to me must be provided by each team or individual describing project progress, updates, roadblocks, and advice. Collected data and analysis, discussion of the results and conclusions should be drafted and sent to me via email 04/17/2024 (25 points).
• Project Report/Paper (10 points) – The report takes the form of a written paper, which should be 10-15 pages, 12-pt font and double-spaced. Include a title page (this doesn’t count toward page limits). When using information from published sources in the presentation and report (this will often be course readings, but you can certainly use other sources as well), include citations and references, which also do not count toward page limits. Use APA format for citations and references, and list references at the end of the paper. Finally, it always helps to include pictures and/or diagrams to illustrate the system and how you would redesign it!! More information will be provided about this project later in the semester. The final report should be submitted no later than 05/05/2024 (10 points)

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<th>Assignment</th>
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<tr>
<td>Individual Questions</td>
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<td>Online Group Discussion</td>
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<td>Semester Project – Research Topic Proposal for approval</td>
<td>Email to <a href="mailto:prithima_mosaly@med.unc.edu">prithima_mosaly@med.unc.edu</a>, 02/07/2024</td>
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<td>Semester Project – Research Topic Proposal Submission (Final)</td>
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<td>Semester Project – Project Outline</td>
<td>On Canvas, 03/13/2024</td>
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<td>Semester Project – Study Execution draft</td>
<td>• Email Weekly progress/status updates to <a href="mailto:prithima_mosaly@med.unc.edu">prithima_mosaly@med.unc.edu</a>,</td>
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<td>• On Canvas, Draft of analyzed results, discussion and conclusion due by 04/19/2024, 11:59 am</td>
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<td>Semester Project – Project Report</td>
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**Grading**
Grades for all assignments will be returned via Canvas. Individual assignment grades will combine to determine your final semester grade. Semester grades will follow the standard UNC grading system as outlined by the Office of the University Registrar.

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Policies

Participation

Active participation in online discussion and semester projects are key elements of this course. All students are expected to become engaged, participate in all class exercises, and contribute to group discussions. If you know in advance that you will miss the assignment or submission due dates, please let me know ahead of time. Repeated missing assignments and due dates will negatively impact your class participation grade. If you don't understand something, ask questions by posting on Canvas! You can make an appointment to meet with me.

"Quality is better than quantity." Class participation is part of your grade for this course. However, there are many ways to participate.

Academic integrity and Diversity

UNC-Chapel Hill has had a student-administered honor system and judicial system for over 100 years. Because academic honesty and the development and nurturing of trust and trustworthiness are important to all of us as individuals, and are encouraged and promoted by the honor system, this is a most significant University tradition. You are responsible for being familiar with the UNC-Chapel Hill Honor System. If you or your team is having difficulty with some aspect of your project, please reach out to me. One of the educational outcomes of this class should be an increase in your effectiveness in getting advice from more experienced colleagues.

The Honor Code, which prohibits giving or receiving unauthorized aid in the completion of assignments, is in effect in this class. The Instrument of Student Judicial Governance gives examples of actions that constitute academic dishonesty. There are also some specific guidelines for this class:

You may give and receive assistance regarding the use of hardware and software.

You are welcome to work together on class preparation, discussing articles, walking through examples, working on exercises, etc. You may also ask your classmates for clarification of class notes.

All work you submit should be your own.

Individual homework assignments are to be done individually. You may consult the course readings and slides, your notes, and even other print or web sources. (Keep in mind, however, that what you find in other sources may not be consistent with what I want you to do.) You may not consult your classmates or other people; all questions should be addressed to me.

Team assignments are to be done as a team, with the team taking responsibility for all products. Work on the project should be distributed equitably among team members. I expect team members to discuss, consult, and even debate with each other about the project throughout the term.

In support of the University's diversity goals and the mission of the School of Information and Library Science, SILS embraces diversity as an ethical and societal value. We broadly define diversity to include race, gender, national origin, ethnicity, religion, social class, age, sexual orientation and physical and learning ability. As an academic community committed to preparing our graduates to be leaders in an increasingly multicultural and global society we strive to:

- Ensure inclusive leadership, policies, and practices
- Integrate diversity into the curriculum and research
- Foster a mutually respectful intellectual environment in which diverse opinions are valued
- Recruit traditionally underrepresented groups of students, faculty, and staff; and
- Participate in outreach to underserved groups in the State.
The statement represents a commitment of resources to the development and maintenance of an academic environment that is open, representative, reflective, and committed to the concepts of equity and fairness.

SEMESTER PROJECT DETAILS

Overview
The course includes an two parts to the semester project, one is identification of the project topic and project execution. A research proposal is a document that describes a specific research project – from the justification (why are you doing this?) to the research question(s), also known as a proposal statement (what will you investigate?), to the method (how are you doing this?) to limitations (what are you not doing, and why?). You can think of it as a document containing the introductory, background, and methods chapter of a regular thesis, e.g., a bachelor’s or master’s thesis, with a few extra bits at the end for limitations, contributions, and, of course, references.

All individual proposals will be shared with the class. A voting system will be conducted to select 4 individual proposals for group projects (See Group Project). The class will be divided into 4 teams to execute the proposals.

Semester topic proposal:
It is important to keep in mind that the actual empirical investigation(s) outlined in the proposals will not be conducted! A proposal, in general, is a detailed plan that is typically reviewed by a committee of senior faculty before the student can proceed with implementing the research.

Proposal requirements:
The overall topic of the proposal must be in line with the course syllabus. It must not be a topic that has been selected for this particular course iteration, and other topics may be permissible. These may include:

- Human factors field work methods in emerging settings
- Emerging topics in sensing, augmented reality, and virtual reality
- Technologies spanning personal and clinical computing
- Health and the Web
- Individual and team situation awareness
- Human-system integration
- Physical ergonomics issues and product design
- Cognitive task analysis
- Health literacy and numeracy in the context of human factors engineering
- Automation and trust in sociotechnical systems
- HCI models for health information technology

The scope of the research outlined in the proposal should be reasonable to complete in a semester for one student. The research should be feasible given the resources typically available to students conducting such project or thesis courses, although some creative liberties are allowed (e.g., assuming access to certain equipment, systems, environments, or study populations). As for the research itself, you have a lot of liberty in your choice. The research can be oriented towards a practical, domain-related problem or towards basic research. The methodology can be controlled experiments, field studies, ethnographic research, etc. The research may be quantitative or qualitative, hypothesis testing or exploratory. You are free to, within reason, choose your own method based on the nature of the question you ask (keeping in mind the feasibility criterion described previously). It is important to keep in mind that this is a research proposal, not a project proposal. You should in your work outline the academic value of conducting this particular research and try to position it within the broader literature on the topic. As such, you do not need to add project specifications such as number of work hours, budget or a time plan. The general criteria for the proposal can thus be summarized as follows:

The topic of the proposal must be relevant to the course syllabus, i.e. the scientific fields of human factors in healthcare
The proposal must outline an explicit and clear likely contribution to the scientific body of knowledge about the particular topic or question.

The proposed empirical investigation (e.g., study design) is suitable to answer the research question(s).

The proposal is feasible in that it could conceivably, with some assistance, be conducted by one master’s student in one semester.

Project Outline:
The written proposal should contain the following sections (page numbers are guidelines rather than limits):

- Title page
- Abstract (300 words)
- Introduction (1-2 pages)
- Background (2-3 pages)
- Research statement (one page)
- Method (2-3 pages)
- Limitations (1-2 pages)
- Contributions (1 page)
- References
- (Appendices)

The title page must list the proposal title, author name, course name, course code, date, and course instructor. The title must be informative of the proposed research and must not be longer than 25 words in length (including a subtitle, if applicable). The author’s name should only appear on the title page.

The abstract should clearly and accurately summarize the research proposal in 300 words or less. The purpose, research question(s), method, and potential contributions should all be covered in the abstract. The abstract should appear on its own page.

The introduction should introduce the general topic to the reader and provide a high-level justification for the proposed research. This justification can either be grounded in a practical or domain-specific problem or a basic research-oriented problem. The introduction should be about one to two pages.

The background section should review prior peer-reviewed literature on the specific topic of research. This background section should be specific and relevant to the research statement. For example, it is more relevant to describe the knowledge gaps left by current studies than the history of the field. The background section should be ca 3-4 pages.

The research statement is the section where you explain what you propose to do. It should include the hypotheses or research questions derived from the reviewed literature in the background section. The statement should be specific and scientifically interesting. This section should be about one page.

The method section should be written in future tense and be very specific and detailed. In essence, this section should read as a detailed description of an already conducted study, although, of course, none has actually been conducted. Explicit references to design choices that are yet to be made can be included as long as the method for making that choice is outlined. For example, if you are proposing a planned experiment where you will play an auditory stimulus and you do not know how loud this stimulus must be you can explicitly state that the specific loudness (dB) will be determined through pilot testing. This section should include the usual headings for participants, apparatus, procedure, etc. (see the APA manual for additional headings typically used). The section should also include a subheading for the planned analyses and describe how those will be conducted. The length of this section may vary, but 2-4 pages is a guideline. Additional material (such as informed consent forms, questionnaires, balance sheets, software screenshots, manuscripts with instructions to read to participants, etc.) should be included in appendices.

The limitations section should detail the various planned as well as unavoidable limitations on the proposed research. This includes both the theoretical background, the scope of the research, and the methodological choices. This section
should be about 1, perhaps 1-2 pages. The contributions section should outline the (likely, or potential) contributions the proposed research will achieve. This can, for instance, be answering specific research questions, discovering new knowledge about some phenomenon, or settling a conflict in prior research.

The contributions should be clearly outlined in relation to past research (as reviewed in the background section) and be generalized appropriately given the limitations. This section should be no more than one page in length.

**Technical requirements:**
The entire proposal should be about 8 to 10 pages in length (excluding title page, abstract, references and appendices) and written with Times New Roman, 12 pts, single line spacing. This is not a strict page limit but rather a general guideline that should fit most proposals. In general, brevity is preferred over wordiness, but the proposal must contain sufficient detail to be accurately graded.

The proposal should follow an accepted formatting guideline for the references. I recommend the American Psychology Association’s publication manual, version 6 (available as a reference work at the university library). Please be aware that online sources for the APA manual may be outdated! Always check that the information is correct according to the latest standard.

The proposal should be written in a clear and comprehensible manner. The text should have a logical flow and structure. Spelling mistakes and grammatical errors should be virtually nonexistent. The text should be written in a formal and technical language and avoid colloquialisms. Specific terminology should be used, and vague unsupported claims avoided. In short, the proposal should be written to a high academic standard as befitting a master’s level course.

**Grading rubric for the written proposal:**
The grading rubric for the project report is available in Appendix B. There are seven criteria in the rubric for content, and three for mechanics. The proposal can either exceed, meet, or fail to meet the standard in each criterion. A holistic assessment is made based on how well the proposal meets these criteria. Proposals may receive a failing grade if they fail to meet key criteria, or if it receives a score of “No evidence” for any criteria.

**Semester Project:**
It is important that the actual empirical investigation(s) outlined in the proposals will be conducted in this part. Your team will employ the “Methods” that you prosed in the proposal.

In this part, you will start data collection to perform the actual study.

**Report Requirement**
You will build on your “Topic Proposal”. You will add the collected data, how you analyzed data, and the findings from data analysis to the report. This report documents your findings, recommendations, and justifications for the entire project.

Submit the final project report on Canvas.

**Report Structure**
The final written proposal should contain the following sections added to the initial individual proposal report:

- Data Analysis
- Results
- Discussion
- Conclusion
- References - Updated
- (Appendices) - Updated
Technical Requirements
The report takes the form of a written paper, which should be 10-15 pages, 12-pt font and double-spaced. Include a title page (this doesn’t count toward page limits). When using information from published sources in the presentation and report (this will often be course readings, but you can certainly use other sources as well), include citations and references, which also do not count toward page limits (excluding title page, abstract, references and appendices).

The same technical requirements apply to the final report.

Grading rubric for the final report
The same grading rubric is applied to the final report (refer to Appendix B).