The Ohio State University College of Medicine, Department of Biomedical Informatics
BMI 7810 – Design and Methodological Approaches in Biomedical Informatics
3 credit hours – Spring 2014

Course Director: Po-Yin Yen, RN, PhD
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E-mail: po-yin.yen@osumc.edu
Office Hours: By appointment: po-yin.yen@osumc.edu

Class Time: Mondays and Wednesdays, 3:55 – 5:15 PM.
Location: Room 245, Lincoln Tower

Course description: This course is an introduction to research design and methods in Biomedical Informatics. It is organized around elements of qualitative and quantitative study design. We will be surveying aspects of research, including the formulation of research questions, testable hypotheses, the selection of appropriate research designs and methods, data collection and analysis. The culminating project will incorporate both quantitative and qualitative methods in writing a study proposal.

Class Format: Lectures (Mondays) and roundtable discussions (Wednesdays) about relevant articles pertaining to the quantitative and qualitative analysis of data found in the field of Biomedical Informatics. Guest lecturers will be brought into the class as content experts to discuss innovative research currently going on within the Wexner Medical Center and academic community.

Course Objectives: The course objectives are centered around the development of a full-scale research project aligned to the National Institute of Health (NIH)’s guidelines for review of grant submissions: Significance, Investigators, Innovation, Approach, and Environment.

1. Significance & Innovations (2 weeks)
   - Understanding how successful framing improves significance
   - Creating responsive research by focusing on aims and outcomes
   - Explaining impact of successful research
   - Presenting original and innovative research
   - Highlighting novel concepts, approaches, methodologies, tools, or technologies

2. Investigators & Environment (1 week)
   - Putting together an impactful team
   - Scoping the strategic advantage of your environment
   - Writing a compelling environment section

4. Approach (9 weeks)
   - Identify the overall strategy for gathering information
   - Understand qualitative and quantitative studies
   - Noting weaknesses and strengths to the data collection strategy
   - Analysis methods (qualitative, quantitative and mixed methods) for varying data types
   - Toolsets for data analysis (Morae, nVivo, Stata, etc.)
   - Protection of human subjects from research risks

5. Compelling writing (2 week)
   - Putting the material together in compelling ways
Core Competencies:
- Discuss various approaches/strategies for identification, response and intervention to address and attempt to resolve common public health issues.
- Discuss core biomedical informatics theories, methods, and practice areas from individual and population-based perspectives.
- Interpret applicable research articles.

Text/Readings:
- Other materials assigned for each week.

Grading: During the course of the semester, students will be graded on:
1. Home assignments due before class of the next week (30%)
2. Review and critique of peers’ project proposal (20%)
3. Final project write-up (20%)
4. Final project presentation (20%)
5. Class participation (10%)

Exams: There will be no exams in this course.

General Guidelines for Written Work: Written work will be graded for both content and quality. That is, grammar, punctuation, spelling, coherence, style, and organization will be considered. A concise style is essential. Corporate executives repeatedly emphasize the need for business schools to do a better job of preparing MBAs to write in an organizational context. The standards applied to writing quality will approximate those applied to major corporate documents that have been prepared for broad distribution among senior executives.

Written work in class: There will be both individual and group projects in class which will require written responses. Please bring necessary note paper (or blue books if you choose to use them.) A written response is expected to be complete and concise and as grammatically correct as possible. I realize that timed exercise responses will not be as complete as a take-home project, but an answer should be reasonably structured. While short answers might be acceptable, continual use of incomplete sentences and phrases or fragmented wording generally will not be. Please put a cover sheet on all written work, and include your name, or names of the group, along with the date and subject of the project.

Assignments: Homework assignments will be an integral part of each educational module. Assignments will be handed out at the beginning of each section and they will be due for grading on the first day of the next week. Assignment materials will be posted to Carmen in the content section. Any alterations to assignments or delivery due dates will be discussed in class and conveyed by email to the class.

The goal of homework assignments is to build up student competencies in areas of quantitative and qualitative analysis as relates to the strategic aims mentioned in the objective section above. Homework assignments will include both write-ups based off of in-class discussions and lab assignments to learn specific tools used in design and methodological approaches in BMI.

Culminating Project: The course will culminate with a final project. All students are required to discuss with the instructor for advice and selection of their research projects. Each student is required to submit a final report in the form of:
1) A 6 page study proposal focusing upon a research question agreed upon in advance with the course instructor (single-spaced, 10-point font, 0.5” margins); and
2) A 20-30 minute oral presentation summarizing the findings of the study proposal

This final project will be due the final week of the semester.
Carmen: Carmen will be the primary delivery method for lecture notes, additional reading assignments, and guidelines for the final project. Readings will be posted one week in advance of class room participation; lectures will be posted before class for students to review and bring to class for note-taking purposes.

Class Policies: What you take away from this course will be a direct function of the effort you put forth inside and outside of class. While voluntary contribution is preferred, you can expect that you may be called upon at any time. After each class, the instructor will take notes on students’ contributions to the class session. If you do not attend class, it is impossible to receive credit for class participation.

Effective class contribution entails providing good answers to questions. Effective comments add to our understanding of the underlying conceptual material, challenge, and clarify the ideas expressed by others, integrate material from past class work or other courses, and shows evidence of analysis rather than mere opinion or “gut feeling”. Effective responses demonstrate that you have thought deeply about the material and can develop creative and innovative insights through this analytic effort.

Office of Disability Services
Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please contact the Office for Disability Services at 614-292-3307 in 150 Pomerene Hall to coordinate reasonable accommodations for students with documented disabilities.

Academic integrity: Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University, the College of Public Health, and the Committee on Academic Misconduct (COAM) expect that all students have read and understood the University’s Code of Student Conduct and the School’s Student Handbook, and that all students will complete all academic and scholarly assignments with fairness and honesty. The Code of Student Conduct and other information on academic integrity and academic misconduct can be found at the COAM web pages (http://oaa.osu.edu/coam.html). Students must recognize that failure to follow the rules and guidelines established in the University’s Code of Student Conduct, the Student Handbook, and in the syllabi for their courses may constitute "Academic Misconduct."
The Ohio State University’s Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: “Any activity that tends to compromise the academic integrity of the University, or subvert the educational process.” Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Please note that the use of material from the Internet without appropriate acknowledgement and complete citation is plagiarism just as it would be if the source were printed material. Further examples are found in the Student Handbook. Ignorance of the Code of Student Conduct and the Student Handbook is never considered an “excuse” for academic misconduct.
If I suspect a student of academic misconduct in a course, I am obligated by University Rules to report these suspicions to the University’s Committee on Academic Misconduct. If COAM determines that the student has violated the University’s Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in the course and suspension or dismissal from the University. If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.
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<thead>
<tr>
<th>Days</th>
<th>Topic</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>1/06 &amp; 1/08</td>
<td>1/06: Course Introduction, what is research, an overview of qualitative, quantitative and mixed methods</td>
<td>Yen</td>
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<td>1/13 &amp; 1/15 (R)</td>
<td>1/13: Aims, hypothesis, research questions, and understanding the domain of fundable research 1/15: (BMI retreat)</td>
<td>Lai</td>
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<td>1/20 (h) &amp; 1/22</td>
<td>1/20: holiday 1/22: Funding success: Team science, interdisciplinary and the power of a bad idea (p.s. innovation is also powerful too)</td>
<td>Payne</td>
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<td>1/27 &amp; 1/29</td>
<td>The anatomy of a grant and selling your idea</td>
<td>Huerta</td>
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<td>2/03 &amp; 2/05</td>
<td>Approach 1: Modeling &amp; Theory 1/27: Information theory 1/29: Theories and conceptual frameworks in Biomedical Informatics, and theoretical substruction</td>
<td>Payne, Yen</td>
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<td>2/10 &amp; 2/12</td>
<td>Approach 2: Quantitative - study design</td>
<td>Payne, Yen</td>
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<td>2/17 &amp; 2/19</td>
<td>Approach 3: Quantitative - data collection and analysis</td>
<td>Yen</td>
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<td>2/24 &amp; 2/26</td>
<td>Approach 4: Quantitative - information retrieval, sensitivity and specificity</td>
<td>Borlawsky-Payne</td>
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<td>3/03 &amp; 3/05</td>
<td>Approach 5: Qualitative - study design Project 1 due: Quantitative study proposal</td>
<td>Yen</td>
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<td>3/10 &amp; 3/12</td>
<td>SPRING BREAK. NO CLASSES</td>
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<td>3/17 &amp; 3/19</td>
<td>Approach 6: Qualitative - interview and focus group</td>
<td>Yen</td>
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<td>3/24 &amp; 3/26</td>
<td>Approach 7: Qualitative - data analysis</td>
<td>Yen</td>
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<td>3/31 &amp; 4/02</td>
<td>Approach 8: Qualitative - usability, cognitive evaluation, heuristic evaluation, task analysis</td>
<td>Yen, Lai</td>
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<td>4/07 &amp; 4/09</td>
<td>Review and critique of peers’ project proposal Project 2 due: Qualitative study proposal</td>
<td>Yen</td>
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<td>4/14 &amp; 4/16</td>
<td>Review and critique of peers’ project proposal</td>
<td>Yen</td>
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<tr>
<td>4/21 &amp; 4/23</td>
<td>Final project write-ups due</td>
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Course Outline (detailed)

Days: January 06 & 08 (Week 1)
Instructors: Yen
Topic: Course Introduction and an overview of qualitative, quantitative, and mixed methods
Learning Objectives: Students will understand expectation for the course
Content and Readings:
  • Syllabus (Yen)
  • What is research (Yen)
Readings:
  • TBD
Assignments (due 1/13): What is your research question (s)?
  • Draft out a title or a research question of your interest.
  • Describe how you may conduct your study using qualitative, quantitative or mixed methods.

Days: January 13 & 15 (Week 2)
Instructors: Lai
Topic: Aims, hypothesis, research questions, and understanding the domain of fundable research
Learning Objectives: Students will gain knowledge of the domain of sponsored research through exploration of funded research at federal agencies
Content:
  • How to form research questions, write aims and hypotheses?
  • Who are the funders?
Readings:
  • TBD
Assignments (due 1/22): start your final project proposal
  • Draft out 1-2 page (single space) of your proposal, including background, project goals, aims, and significance.
**NO CLASS on January 15th. We will attend to BMI department retreat at Biomedical Research Tower**

Days: January 22 (Week 3)
Instructors: Payne
Topic: Funding success: Why should we fund you?
Learning Objectives: students will understand the importance of team science
Content and Readings:
Discussing your environment as a competitive advantage: Team science and interdisciplinary research
Assignments (due 1/27):
**NO CLASS on January 20th.**

Days: January 27 & 29 (Week 4)
Instructors: Huerta
Topic: The anatomy of a grant and selling your idea
Learning Objectives: Students will understand the basic structure of an NIH grant, and how reviewers are expected to approach assessment. Additionally, students will apply that knowledge in the context of framing a significance section.
Content and Readings:
  • The grant review process (Huerta)
  • Selling your idea vs. selling your approach (Huerta)
Readings:

Assignments (due 1/29): *How the government funds research*
Go to the federal online award databases and find 10 abstracts in an area of research you are interested in.
1. Write one page about why you chose these items and found them interesting
2. Write one page taking one example and talking about how you would build a study to explore the question

Some federal award databases that might be useful:
- [http://grants.nih.gov/grants/funding/funding_program.htm](http://grants.nih.gov/grants/funding/funding_program.htm)
- [http://projectreporter.nih.gov/reporter.cfm](http://projectreporter.nih.gov/reporter.cfm)
- [http://gold.ahrq.gov/projectsearch](http://gold.ahrq.gov/projectsearch)

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Approach 1: Modeling & Theory

Learning Objectives:
Content:
Information theory, Theories and conceptual frameworks in Biomedical Informatics, and theoretical substruction

Readings: TBD

Assignments (due 2/03):
- Find a theoretical framework for your project
- Describe how it will guide your research

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Days: February 3 & 5 (Week 5)
Instructors: Payne & Yen
Topic: Approach 2: Quantitative Research – study design

Learning Objectives:
Content:

Readings: TBD

Assignments:

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Days: February 10 & 12 (Week 6)
Instructors: Yen
Topic: Approach 3: Quantitative Research – data collection and analysis

Learning Objectives:
Content:

Readings: TBD

Assignments:

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Days: February 17 & 19 (Week 7)
Instructors: Borlawsky-Payne
Topic: Approach 4: Quantitative Research – information retrieval, sensitivity and specificity

Learning Objectives:
Content:

Readings: TBD

Assignments:
Days: February 24 & 26 (Week 8)
Instructor: Yen
Topic: Approach 5: Qualitative Research – study design
Learning Objectives:
Content:

Readings:
Assignments:

Days: March 3 & 5 (Week 9)
Instructor: Yen
Topic: Approach 6: Qualitative Research – interview and focus group
Learning Objectives:
Content:

Readings:
Assignments:

Days: March 10 & 12 (Week 10)
**SPRING BREAK. NO CLASS * 

Days: March 17 & 19 (Week 11)
Team Instructors: Yen
Topic: Approach 7: Qualitative Research – data analysis
Learning Objectives:
Content:

Readings:
Assignments:

Days: March 24 & 26 (Week 12)  
Team Instructors: Lai, Yen
Topic: Approach 8: Qualitative Research – cognitive evaluation, heuristic evaluation, time-motion study and task analysis
Learning Objectives:
Content:

Readings:
Assignments:

Days: March 31 & April 2 (Week 13)  
Team Instructors: Yen
Topic: Approach 9: Qualitative Research – Mixed Methods
Learning Objectives:
Content:

Readings
Assignments:
Days: April 7 & 9 (Week 14)
Instructors: Yen
Topic: Review and critique of peers’ project proposal
Learning Objectives:
Content:

Readings:

Assignments:

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Days: April 14 & 16 (Week 15)
Instructors: Yen
Topic: Review and critique of peers’ project proposal
Learning Objectives:
Content:

Readings:

Assignments:

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Days: April 21 & 23 (Week 16)
Instructors: Yen
Topic: Review and critique of peers’ project proposal
Learning Objectives:
Content:

Readings:

Assignments: