

**The Ohio State University College of Medicine,
Department of Biomedical Informatics
BMI 5710 – Introduction to Biomedical Informatics
3 credit hours – Autumn 2018**

Instructor: Courtney Hebert, MD, MS

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**Response time for e-mails and telephone calls – within 72 hours during regular school hours*

Class Time and Location: Tuesdays and Thursdays, 3:55 – 5:15 PM. 245 Lincoln Tower

Instructor's Office Hours: By appointment.

Course Teaching Assistant: TBD

Teaching Assistant Office Hours: By appointment.

Course description:

The goal of this course is to introduce trainees to the basic definitions, theories, and methods that serve as the foundations for the broad field of Biomedical Informatics (BMI). In this context, we will define BMI as: *"the field that is concerned with the optimal use of information, often aided by the use of technology and people, to improve individual health, health care, public health, and biomedical research"*.

Examples of major topics to be discussed in this class include: 1) the definition of BMI and its sub-disciplines; 2) the design and use of clinical information systems; 2) biomedical data management; 3) syntactic and semantic processing of heterogeneous data, information, and knowledge resources; 4) the role of informatics in supporting clinical, translational, and population-level research; and 5) future directions for the field of BMI.

While there are no strict requirements, a successful student should have basic knowledge of the following areas:

1. Computer science principles
2. Statistical methods
3. Biomedical terminology

Course Objectives: Upon completion of this course, students will be able to:

1. Differentiate biomedical informatics as a unique scientific discipline;
2. Articulate the contributing theoretical frameworks that underlie the sub-disciplines of biomedical informatics;
3. Distinguish the core sub-disciplines of biomedical informatics (clinical informatics, clinical research informatics, bioinformatics, translational bioinformatics, public health informatics, imaging informatics) and their relationship to driving biological and clinical problem areas;
4. Generalize processes related to information retrieval, text mining, and natural language processing;
5. Summarize the theoretical as well as practical aspects of big data and data science

6. Justify standards and terminologies related to biomedical informatics
7. Produce written evaluations of presentations related to biomedical informatics
8. Develop in-depth analysis of a biomedical informatics related topic

Class Format: Lectures (Tuesdays) and Labs/critical understanding sessions (Thursdays). Guest lecturers will be brought into the class as content experts to demonstrate various aspects of the clinical and translational research informatics scientific domain.

Text/Readings:

Shortliffe, E. H., & In Cimino, J. J. (2014). Biomedical informatics: Computer applications in health care and biomedicine. (4th edition)

Electronic copies of the textbook may be downloaded from The Ohio State University library eBook collection:

<https://link.springer.com/book/10.1007%2F978-1-4471-4474-8>

In addition, each Unit may have additional articles, videos, and/or podcasts for you to review and these will be available on Carmen. These materials are required and will be included in assignments and assessments. Please make sure you ask any questions that arise as you progress through the material.

Grading: During the course of the semester, students will be graded on:

Assignment	Weight	Points Possible
Unit Questions	10%	100
Class Participation	10%	100
<i>Attendance</i>	6%	60
<i>Class Participation</i>	4%	40
Article presentation	10%	100
Written Summaries/Labs (12 total)	25%	250
Review Project	45%	450
<i>Paper Draft</i>	15%	150
<i>Final Paper</i>	20%	200
<i>Presentation</i>	10%	100
Total	100%	1000

Grading: Letter grades will be assigned using the following on a 1000-point scale, based upon the preceding weighted axes).

Grade	Score Range	Points
A	93-100	930-1000
A-	90-92.9	900-929
B+	88-89.9	880-899
B	84-87.9	840-879
B-	80-83.9	800-839
C+	78-79	780-799
C	72-77	720-779
C-	70-71	700-719
D	60-69	600-699
E	<60 fail	<600

Assignment Review:

Unit Questions - You will write 2 questions based on the reading material and topics of the week. This is to help you be prepared to engage in discussion for the week. Your questions should show an understanding of the reading. These questions will be answered during the assignment that week. If the lectures and discussion do not cover your questions, you will have a chance to ask them on Tuesday at the end of class and Thursday at the beginning of class.

Class Participation - 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.

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.

The class participation grade will be a combination of attendance (2 points per class session) and overall in-class participation assessed twice (20 points each) during the course.

Written Summaries/Labs - Written Summaries will be focused on the topics presented during the week and will be due the Sunday of each Unit. The main objective here is to synthesize information learned from the Unit. Some weeks you will have a hands-on **Lab** assignment instead of a written summary. At the beginning of these **summaries** and **lab** assignments, you will answer the questions you posed at the beginning of the week as well as one question posted by a peer.

Article Presentation – Once during the class each student will present a journal article to the rest of the class. This will be in collaboration with at least one other student, but will be graded individually. The journal article chosen should reflect that week’s topic and should have been published in the previous 2 years. Questions about an appropriate paper can be

discussed with the course director. The presentation will be 15 minutes at the beginning of the class on Thursday. The presentation should be divided so that each student gets an equal time to present.

Review Project – This project will be on a topic approved by the course director. It will consist of a 10-12-page review paper and a 10-15 minute oral presentation summarizing the findings of the review paper. The review project will be due the final week of the semester and is worth 45% of your of your total grade. A draft of the project is worth 15%, the paper is worth 20%, and the presentation is worth 10%. The main objective of this assignment is to apply the knowledge acquired through the course.

Late Policy: Although unforeseen circumstances arise, you are expected to submit all work on time. You are required to let your instructor know 24 hours AHEAD of time if you are going to miss a deadline if you are seeking any type of extension. Ten percent will be deducted from the score of any assignment that is submitted late and no assignment will be accepted after 5 days.

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. (<http://www.ods.ohio-state.edu>)

Mental Health & Student Support Services:

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or at suicidepreventionlifeline.org.

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.

Tentative Course Schedule: The course schedule provides a general plan for the course, deviations may be necessary.

Week	Session Dates	Instructor	Topics	Aligned Course Learning Objective(s)	Aligned CEPH Foundational Knowledge (1 - 12)	Aligned Foundational (Core) Competencies (1 - 22)	Aligned Specialization Competencies	Readings/ Other Assignments	Student Evaluation Activity for Assessment
1	8/21/18	Hebert	Introduction to the course and	1,2,3,7	1, 4, 6	5,12	MPH: 5 MS: 1,8	Chapter 1, Biomedical Informatics; A stimulus to define health informatics and health information technology	1. In class discussion and participation 2. Written summary
	8/23/18		Biomedical Informatics as a scientific discipline						
2	8/28/18	Hebert	Security, Ethics, and Social Issues in the Context of Electronic Health Information	5,7	1	12	MPH: 7 MS: 9	Crossing the health IT chasm JAMIA Privacy and human behavior in the age of information Science Review.pdf	1. Unit questions 2. In class discussion and participation 3. Written summary
	8/30/18								
3	9/4/18	Hebert Hebert	Standards in Biomedical Informatics	2, 6,7	3	3	MPH: 4,5 MS: 7,8,9	Chapter 7: Standards in Biomedical Informatics	1. Unit questions 2. In class discussion and participation 3. ICD 9-10 classification and conversion exercise
	9/6/18								

4	9/11/18	Powell	Imaging informatics (asked her to do 10/2 instead);	3, 6,7; 8	3, 5		MPH: 5 MS: 8	Chapter 9 and 20 of, Biomedical Informatics	<ol style="list-style-type: none"> Unit questions In class discussion and participation Written summary Research topic
	9/13/18	Powell	Research topic due						
5	9/18/18	Rayo	Human-computer interaction	2,7	3	3	MPH: 5 MS: 8	Norman - DOET - Chapter 1 - The Psychopathology of Everyday Things.pdf Rayo HFES 2017 - new heuristics agentive design v2.doc Krug DMMTchapter09 usability.pdf	<ol style="list-style-type: none"> Unit questions In class discussion and participation In class usability lab with take home written assignment
	9/20/18	Rayo							
6	9/25/18	Hebert	Information retrieval, Text Mining and Natural Language Processing	2,4,5,7	3	3	MPH: 4,5,6 MS: 7,8,9	Chapter 21: Information Retrieval and Digital Libraries (focus on 21.1, 21.4.1, 21.4.2, 21.4.3, 21.5, 21.6) Chapter 8: Natural Language Processing in Healthcare and Biomedicine	<ol style="list-style-type: none"> Unit questions In class discussion and participation Literature review lab write up
	9/27/18	Abel							
7	10/2/18	Hebert	Introduction to Clinical Informatics	3,7	3, 4, 5	5	MPH: 2, 5 MS: 8	Clinical Decision Support Systems - State of the Art.pdf JED40073.pdf	<ol style="list-style-type: none"> Unit questions In class discussion and participation Written summary
	10/4/18	NCH faculty							

8	10/9/18	Hebert	Discussion of project ideas	8	6	19	MPH: 4, 6 MS: 2,7	www.ncbi.nlm.nih.gov/pmc/articles/PMC3715443/pdf/pcbi.1003149.pdf	1. Presentation of project idea
9	10/16/18	Hebert	Clinical Research Informatics	3,5,67	3, 6	3	MPH: 4 MS: 4,7,8,9	nihms-784741.pdf ymi-10-0174.pdf	1. Unit questions 2. In class discussion and participation 3. Clinical data lab with write up
	10/18/18	Thomas							
10	10/23/18	Mathe	Introduction to Bioinformatics	2, 3, 7	3, 8		MPH: 3,5 MS: 8	nejmoa041588.pdf nejmoa1400029.pdf Next Generation Sequencing (NGS) How to sequence the human genome Next Generation Sequencing (NGS) genome biology	1. Unit questions 2. In class discussions and participation 3. Written summary
	10/25/18	Mathe							
11	10/30/18	Mathe	Translational Bioinformatics	2, 3, 7	3, 8		MPH: 3, 5 MS: 8, 9	Translational bioinformatics. Past, Present, and Future	1. Unit questions 2. In class discussions and participation 3. Written summary
	11/1/18	?							
12	11/6/18	Motiwala	Public Health Informatics	3, 7	1, 2, 3, 6, 10	3,9	MPH: 1,2,3,4 MS: 1,7,9	PHI applications[1].pdf Chapter 16: Public Health informatics	1. Unit questions 2. In class discussions and participation 3. Lab write-up
	11/8/18	Motiwala							
13	11/13/18	White	Big Data	5, 7	3, 6		MPH: 2, 3 MS: 8, 9	"Will a machine be my new doctor?" Review of big data in healthcare	1. Unit questions 2. In class discussion and participation

	11/15/18	Hebert	The future of BMI	3, 5	6	19	MPH: 5 MS: 9		1. In class, small group discussion and presentation
14	11/20/18	Hebert	Final project presentations	8		19	MPH: 4,5,6 MS: 6, 7, 8		1. Presentation
15	11/27/18	Hebert	Final project presentations	8		19	MPH: 4,5,6 MS: 6, 7, 8		1. Presentation
	11/29/18	Hebert							
16	12/4/18	Hebert	Final project presentations	8		19	MPH: 4,5,6 MS: 6, 7, 8		1. Final Paper