BMI 502
Foundations of Biomedical Informatics Methods I

Fall | 2023 | Session B

Course Description:

First semester of a two-semester course surveying the methods and theories underlying the field of biomedical informatics.

Credit Hours: 3.0

Enrollment Requirements: Prerequisite(s): Degree- or Nondegree-seeking graduate. Credit is allowed for only BMD 502 or BMI 502

Course Format: Hybrid (in-person and online)

Course meeting time and location: TBA

Course Access: Regardless of how this course is presented, you may still be expected to log into Canvas, the Learning Management System (LMS). This requires a computer, a stable internet connection, and in some cases a webcam and microphone.

Your ASU courses can be accessed by both my.asu.edu and myasucourses.asu.edu; bookmark both in the event that one site is down.

INSTRUCTOR INFORMATION

Name: Hassan Ghasemzadeh

Office/room: Health Futures Center (HFC) Room 306F

Phone number: 480-884-2639

Email address: hassan.ghasemzadeh@asu.edu

Office hours: By appointment

Preferred method of contact: email (hassan.ghasemzadeh@asu.edu)

COURSE BASICS
Expected Learning Outcomes

This course will consist of three main topic areas: research study design, medical decision science, and biomedical data mining.

For research study design students will be able to:

- Appraise journal articles based on study design including observational and experimental (Randomized Controlled Trial)
- Calculate different measures of effect including prevalence, incidence, relative risk, and odds ratio
- Critique journal articles for error and bias in research as well as validity (external vs. internal)
- Explain qualitative research methods
- Explain issues related to research ethics

For medical decision science students will be able to:

- Explain components of diagnostic reasoning
- Design decision models including decision trees
- Explain cognitive processes and biases in medical decision-making

For data mining students will be able to:

- Analyze biomedical datasets using data mining approaches
- Compare different data mining approaches including supervised rules and unsupervised learning
- Generate data mining models using Weka software

What is a "hybrid" class?

This class format, also known as a "flipped classroom", provides you the flexibility to do a lot of the work and assignments online while still having the opportunity to engage with your instructor and fellow classmates. Typically, classes meet in-person once or twice a week. Instructors usually use this time to dive deep and explore concepts through discussions and other group activities like debates. To get the most out of this class, you must complete all pre-class assignments, so you are prepared for the discussions and activities.

[Click here to watch a short video that describes this class format. The video is about 3 minutes long.](#)

See the Student Success Tips section to prepare you further for this class format.

Alignment with other outcomes: N/A

Does this class have an Honors contract? No

NOTE: You must make the Student Accessibility and Inclusive Learning Services (SAILS) aware if you require accommodations due to a disability. Review the **ASU Policies** section for more information.

Textbook, Special Materials and Co-curricular Activities

- Research Study Design Module: Designing Clinical Research 4th Edition (Paperback) by Stephen B. Hulley, Steven R. Cummings, Warren S. Browner, Deborah G. Grady and Thomas B. Newman. (Wolters Kluwer/Lippincott Williams & Wilkins 2013).
- Medical Decision Sciences Module: Decision Making in Health Care: Theory, Psychology, and Applications, 1st Edition (Paperback) by Gretchen B. Chapman and Frank A. Sonnenberg (Cambridge Series on Judgment and Decision Making, 2003).
- Biomedical Data Mining Module: Data Mining: Practical Machine Learning Tools and Techniques, 4th Edition by Ian H. Witten, Eibe Frank, Mark A. Hall, Christopher J. Pal. (Morgan Kaufmann Publishers 2017). Additional reading as assigned by the lecturers through the session

Special materials and technology: N/A

Co-curricular activities: N/A

Grading Policy

Final course grades will be rounded to the nearest integer. For example, a grade of 96.5% will be rounded up to 97%.

Grading scale:

The following table shows how final letter grades will be calculated.

Letter grade	Numerical Equivalent
A	93-100
A-	90-92
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	70-76
D	60-69
E	< 60

Grading breakdown

Evaluation types for this course include written assignments and tests. You must allocate at 18 hours per week to be successful in taking the course. Please plan accordingly. A breakdown of the grading is shown below:

Topic	Points
Syllabus Quiz	10
Discussion Forum Participation (15 pts * 8)	120
Assignment 1: Classification of Research Design and Group Presentation	15
Assignment 2: Critical Appraisal of Research Design	30

Assignment 3: Diagnostic Reasoning	40
Assignment 4: Data Mining	40
Final Exam	65
Total	**320**

While every effort is made to keep the course evaluation process consistent with what is in the initial syllabus, it is possible that slight changes may have to be made as the semester progresses. These changes will be communicated thoroughly to the students and although total points may potentially fluctuate, the percentages remain constant, meaning there is no intention of harm to the student's grades. Any changes to the course evaluation process will be posted on Canvas as part of an announcement; however, it is the student's responsibility to be aware of the points and their grade and be proactive in speaking to the instructor if there are questions or concerns. Students should not rely on Canvas or other students if they have a question on their grade in class, contact the instructor.

Make-up work/late submission general policy:
A late penalty of 10% will be assessed for late submissions within the next 24 hours of the submission deadline. For submissions after 24 hours, allowance is made on a case-by-case basis. Students must coordinate with instructor for approval to be granted.

Course Schedule
Schedule of required readings, video views, assignments, and exams:

Activities/Assignments • All assignments are due at 11:59 pm AZ MST on dates shown	Due Dates (Changes Every Semester)
Getting Started	
Review: Course syllabus, course tour videos, and all pertinent course information	October 12
Post: • Initial post to *Welcome and Introductions* Forum • Post responses to peers	October 14 October 16

Complete:	
● Browser Check	October 12
● Syllabus Quiz	October 14
MODULE 1: RESEARCH DESIGN	
WEEK 1 - Introduction to Research Design October 13-19	
Read:	
● Hulley - Chapters 1-2, 7-8	October 14
● ASU e-Book: *Introduction to epidemiology*, by Carneiro and Howard (https://lib.asu.edu/newlsp, search *9780335244621*) - Chapter 2 *Measuring the frequency of outcomes* & Chapter 3 *Measures of association and impact*	October 14
View: Lecture - Quantitative Research Methods	October 15
Start: Planning for Classification of Research Design Assignment and Presentation	October 16
Post:	
● Initial Post to Week 1 Discussion	October 16
● Post response(s) to peers	October 18
WEEK 2: Research Design Continued October 20-26	
Read: Hulley - Chapters 6, 9, 10, 13, 14, & 16	October 20
View: Lecture- Validity in Research, Qualitative Design, Research Ethics	October 21
Submit: Assignment 1: Classification of Research Design	October 23
Post:	
● Initial post to Week 2 Discussion	October 23
● Post response(s) to peers	October 25
Submit: Assignment 2: Critical Appraisal of Randomized Trials in Biomedical Informatics	October 25
MODULE 2: DECISION SCIENCE	
WEEK 3: Introduction to Decision Science October 27 - November 2	
Read:	
● Chapman and Sonnenberg - Chapters 1 and 2	October 27
● ASU e-Book: Biomedical Informatics: Computer Applications in Health Care and Biomedicine, by Shortliffe EH and Cimino JJ (https://lib.asu.edu/newlsp	October 27

search 9780387362786) - Chapter 3. Biomedical Decision Making: Probabilistic Clinical Reasoning	
View: Lecture - Decision Making in Health Care	October 28
Post: • Initial post to Week 3 Discussion • Post response(s) to peers	October 30 November 1
Submit: Assignment 3 - Diagnostic Reasoning	November 1
WEEK 4: Decision Science Continued **November 3-9**	
Read: Chapman and Sonnenberg - Chapters 4, 6, and 7	November 3
View: Lecture - Decision Modeling	November 4
Post: • Initial post to Week 4 Discussion • Post response(s) to peers	November 6 November 8
MODULE 3: DATA MINING	
WEEK 5: Introduction to Data Mining **November 10-16**	
Read: • Witten and Frank - Chapters 1-3, Appendix B (The Weka workbench) • Article: Artificial intelligence in research (https://lib.asu.edu/newlsp search 10.1126/science.357.6346.28)	November 10 November 10
View: • Lecture - Biomedical Data Mining, 1-3 • Weka Data Mining Tutorial (https://wekatutorial.com/)	November 12 November 12
Post: • Initial post to Week 5 Discussion • Post response(s) to peers	November 13 November 15
Activity: • Download and install Weka software (https://www.cs.waikato.ac.nz/ml/weka/)	November 12 November 15

• Begin Data Mining Assignment	
WEEK 6: Data Mining Continued **November 17-23**	
Read: Witten and Frank - Chapters 4-7, 11	November 17
View: Lecture - Biomedical Data Mining, 4-6	November 18
Post: • Initial post to Week 6 Discussion • Post response(s) to peers	November 20 November 22
Submit: Assignment 4: Data Mining	November 22
WEEK 7: Developing a Research **Question November 24-30**	
Read: Article - Research questions, hypotheses and objectives (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2912019/)	November 25
View: Lecture - Developing a Research Question	November 26
Post: • Initial post to Week 7 Discussion • Post response(s) to peers	November 27 November 29
Final exam	November 30
Submit: Final Exam	N/A

Note: While every effort is made to keep the course evaluation process consistent with what is in the initial syllabus, it is possible that slight changes may have to be made as the semester progresses. These changes will be communicated thoroughly to the students and although total points may potentially fluctuate, the percentages remain constant, meaning there is no intention of harm to the student's grades. Any changes to the course evaluation process will be posted on Canvas as part of an announcement; however, it is the student's responsibility to be aware of the points and their grade and be proactive in speaking to the instructor if there are questions or concerns. Students should not rely on Canvas or other students if they have a question on their grade in class, contact the instructor.

CLASS EXPECTATIONS

Classroom Behavior Policy

Classroom discussion should be civilized and respectful to everyone and relevant to the topic we are discussing. Communicate in a professional manner in all forms, and at all times, whether verbal, non-verbal or written.

Disruptive and violent behavior is not tolerated. Read more about this policy in the **ASU Policies** section.

Attendance Policy

Some absences are excused in accordance with ASU policy. They include accommodations for religious practices, University-sanctioned activities, and death of a family member. Read more about university-excused absences in the **ASU Policies** section.

Number of excused absences (other than those excused by ASU for specific reasons): As many as you need and as few as you possibly can. Strive for perfect attendance! Each class is important for your learning so attend all to get the maximum experience for your education.

In the event the instructor fails to indicate a time obligation, the time obligation will be 15 minutes for class sessions lasting 90 minutes or less, and 30 minutes for class sessions lasting more than 90 minutes. Students may be directed to wait longer by someone from the academic unit if they know the instructor will arrive shortly.

Required Technology, Technical Support and Internet Outage Plan

Although there is an in-person component to this class, you are expected to complete a large portion of work using Canvas, the Learning Management System, LMS. This requires a computer, a stable internet connection, and in some cases a webcam and microphone.

Required Technology

1. Desktop or laptop computer, **current within the last 5 years**
   - *Note: Canvas does have an app that can be used with mobile devices, but the app is limited. Please access Canvas primarily through a desktop or laptop computer.*
   - Do not use a Chromebook or Netbook, since it cannot run Respondus, which is used for tests.
2. Stable, high-speed internet access
3. Web browser updated to the most recent version. Chrome is the preferred browser for Canvas.
4. Audio speakers and/or headphones attached or built-in to the computer
5. Webcam (external or internal with microphone)
6. Word processing software. (Students have access to Google Docs with their ASUrite. In addition, Microsoft 365 is free to ASU Students)
7. Smartphone or other mobile device that can download apps.

Please inform the instructor if any of the above present a hardship for you. ASU may have some resources to help students in need.

Technical Support

You have access to 24/7 technical support. It is recommended to use Chrome when accessing Canvas.

Internet Outage Plan

Network and internet outages are never expected. Be prepared and have a plan in case you find yourself without internet.

Campus Network Outage and Technical Support

When access to Canvas is not available for an extended period of time (greater than one entire evening) you can reasonably expect that the due date for assignments will be changed to the next day (assignment still due by 11:59pm).

To monitor the status of campus networks and services, please visit the System Health Portal (http://syshealth.asu.edu/).

Technical Support

This course uses Canvas to deliver content. You can access Canvas through your MyASU portal.

To contact the help desk you have two options:

- o For immediate assistance, call ASU at 1-855-278-5080.
- o Visit the ASU Experience Center (https://uto.asu.edu/experiencecenter) to get personalized support through 24/7 live chat or by submitting your request online (https://my.asu.edu/service).

For more information on Canvas the following resources are suggested:

- Canvas Course Tour Video
- Canvas Student guide
- Digital Portfolios Help Resources
- Library Resources for Students
- Best Practices for Setting Course Notifications
- Canvas Student App - Download through Google Play (Android) or the App Store (iOS)
  - o Android Guide
  - o iOS Guide

Other useful links

- o Undergraduate Academic Advising
- o ASU Email Guide
- o ASU Wireless Network

Add/Drop/Withdraw

Access the University Registrar page for information on grades, the academic calendar, and add/drop/withdrawal options among other things. NOTE: if you are considering withdrawing, please check with financial aid as it may be impacted by a withdrawal.

Student Success Tips:

Time Management

Your success in this class depends greatly on the time you spend on independent study and completion of assignments. In general, expect to spend a minimum of **3 hours** for **each** credit hour **per week** studying outside of class. So, for a 3-credit class set aside 9 hours per week for just that one class. Add on extra time around mid-terms and finals. How much time does that leave you for work, relaxation, and other commitments? Here are some resources to help you get organized and create a study plan.

Calculate Your Available Study Time

Discover How Many Hours You Should be Studying

Study Techniques

It's important that you attend all classes and complete all assignments to be successful in your college career. To support this, you should take a look your study habits. Consider *where*, *when,* and *how* you study. For example, trying to read a complex paper in a loud coffee shop may be too distracting for you to really understand the material. Waiting until the last minute to write a paper rarely yields good results. Take a look at the guide provided below for more suggestions to optimize your study time.

Guide for How to Study in College

Active Reading

You will have to read a lot throughout your degree! It's common practice to highlight content as you read it to help remember it. Studies show, however, that this is not as effective as previously thought. A much better way to help you process and retain the information is to write down the important points and quiz yourself as you read. This is known as "active reading." Download the handout provided below to get started on this simple technique that can help you from day one at ASU.

Active Reading Technique Guide

Available Academic Resources

ASU has a wealth of resources to enable your success. Access the University Academic Success Programs website for information on the writing center, tutoring, supplemental instruction, graduate academic support and more.

Academic Integrity

Academic honesty is expected of all students in all examinations, papers, laboratory work, academic transactions and records. The ASU Student Academic Integrity Policy is strictly enforced for students found in violation. Read more about this policy in the **ASU Policies** section.

ASU Student Resource on Academic Integrity

Mental Health

Students may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These emotional health concerns or stressful events may diminish academic performance and/or reduce the ability to participate in daily activities. ASU Counseling Services provides counseling and crisis services for students who are experiencing a mental health concern. Any student may call or walk-in to any ASU counseling center for a same day or future appointment to discuss any personal concern. ASU's dedicated crisis line is available 24/7 for crisis consultation by calling 480-921-1006.

Third-Party Software and FERPA

During this course you might have the opportunity to use public online services and/or software applications sometimes called third-party software such as a blog or wiki. While some of these are required assignments, you need **not** make any personally identifying information on a public site. Do not post or provide any private information about yourself or your classmates. Where appropriate you may use a pseudonym or nickname. Some written assignments posted publicly may require personal reflection/comments, but the assignments will not require you to disclose any personally identifiable/sensitive information. If you have any concerns about this, please contact your instructor.

ASU POLICIES

ASU Academic Policies – January 6, 2020

University Excused Absences

Accommodation for Religious practices in accordance with ACD 304-04

The university community should, in all its activities, be sensitive to the religious practices of the various religious faiths represented in its student body and employees. Faculty are asked to recognize the obligations of their students who may be participating in the observance of religious holidays. Students should notify faculty at the beginning of the semester about the need to be absent from class due to religious observances.

Missed class due to University-sanctioned activities in accordance with ACD 304-02

Students who participate in university-sanctioned activities that require classes to be missed, shall be given opportunities to make up examinations and other graded in-class work. However, absence from class or examinations due to university-sanctioned activities does not relieve students from responsibility for any part of the course work required during the period of the absence.

Disability Accommodations:

Reasonable accommodations are determined on a case-by-case, course-by-course basis to mitigate barriers experienced due to a disability (SSM 701-02). Students with disabilities who require accommodations must register with the Student Accessibility and Inclusive Learning Services and submit appropriate documentation. It is recommended students complete this process at the beginning of the term and communicate as appropriate with their instructor.

- *Email: Student.Accessibility@asu.edu*
- *Phone: (480) 965-1234*
- *FAX: (480) 965-0441*

Academic Integrity and Student Code of Conduct:

ASU expects and requires its students to act with honesty, integrity, and respect. Required behavior standards are listed in the Student Code of Conduct and Student Disciplinary Procedures, the Computer, Internet, and Electronic Communications Policy, the ASU Student Academic Integrity Policy, and outlined by the Office of Student Rights & Responsibilities. Anyone in violation of these policies is subject to sanctions.

Academic Integrity

Academic honesty is taken very seriously. While interaction among students is encouraged, students are expected to adhere to the ASU Student Academic Integrity Policy. Plagiarism of any kind will not be tolerated. Students must properly cite sources used for assignments. Students must take exams independently without assistance from others. Students may not submit papers written by persons other than themselves. Students must submit original work for this course and may not submit papers previously submitted to another class. Consequences of non-compliance can be significant, including: failing the assignment or course, receiving a permanent "XE" grade for the course, removal from a major or program of study, expulsion from the university, among others.

The ASU Student Academic Integrity Policy lists violations in detail. These violations fall into five broad areas that include, but are not limited to:

1. *Cheating on an academic evaluation or assignment.*
2. *Plagiarizing.*
3. *Academic deceit, such as fabricating data or information.*
4. *Aiding academic integrity policy violations and inappropriately collaborating.*
5. *Falsifying academic records.*

Information on the Academic Integrity procedure within the College of Health Solutions can be found at https://catalog.asu.edu/policies/chs.

Student Code of Conduct

Violations of the ASU Student Code of Conduct, other than the provision concerning academic dishonesty, are more generally considered inappropriate behavior. The [Office of Student Rights and Responsibilities](#) reviews and sanctions these matters. If a student violates both the academic integrity provision and additional provisions of the Student Code of Conduct, both the college and the Office of Student Rights and Responsibilities will review the matter. Each independently makes determinations concerning violations and appropriate sanctions.

Disruptive or Violent Behavior

In the classroom and out, students are required to conduct themselves in a manner that promotes a safe environment that is conducive to learning and conducting other university-related business. All incidents and allegations of violent or threatening conduct by an ASU student will be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students. Such incidents will be dealt with in accordance with the policies and procedures described in Section 104-02 of the Student Services Manual, available at [http://www.asu.edu/aad/manuals/ssm/ssm104-02.htm.](http://www.asu.edu/aad/manuals/ssm/ssm104-02.htm) Be advised that an instructor may withdraw a student from the course when the student's behavior disrupts the educational process per Instructor Withdrawal of a Student for Disruptive Classroom Behavior (http://www.asu.edu/aad/manuals/usi/usi201-10.html).

Health Equity and Inclusion

The College of Health Solutions is on a mission to improve the mental and physical health of our larger and immediate communities by better understanding the challenges that individuals and populations face, while striving to be part of the solution. The college is committed to the idea that every member of our society should have the opportunity for good health and wellness throughout their lifespans. In an effort to actualize this ideal, we embrace and support greater justice, diversity, equity, and inclusion in everything we do, including teaching, research, service and clinical practice.

Learn more about the College of Health Solutions' commitments to justice, equity, diversity and inclusion at https://chs.asu.edu/about/justice-equity-diversity-inclusion.

Prohibition Against Discrimination, Harassment, & Retaliation

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs.

Copyright

This syllabus is subject to change with reasonable advance notice. Please consult the syllabus on Canvas regularly.