Syllabus

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Course Description

This module is also available as a concatenated page, suitable for printing or saving as a PDF for offline viewing.

MET CS580

Health Informatics

The CS580 course presents the fundamental principles, concepts, and technological elements that make up the building blocks of Health Informatics. It introduces fundamental characteristics of data, information, and knowledge in the domain, the common algorithms for health applications, and IT components in representative clinical processes. It also introduces the conceptual framework for handling the collection, storage and the optimal use of biomedical data. It introduces the concepts of population health and precision medicine and the information systems that support them. It covers basic principles of knowledge management systems in biomedicine, various aspects of Health Information Technology standards, and IT aspects of clinical process modeling. There is also a term project to access students' ability to understand and implement simple Health Informatics solutions. One or two guest speakers with many years of experience in health IT will be invited to share their first-hand experience with students.

Course Overview

Health informatics is a multi-disciplinary field at the intersection of information science, computer science, and health care. Health informatics is growing at a rapid pace and will continue to grow well into the future. A brief introduction to health informatics covers the key concepts, background disciplines, historical overview, and challenges ahead. Students will be introduced to the definitions and concepts of knowledge hierarchy: data, information, knowledge and wisdom, and the building blocks of Health Informatics: algorithms, medical decision-making, and clinical process modeling. Knowledge management systems and health IT standards will be also covered. A selection of case studies will be used to illustrate the applications of the concepts and algorithms.

The assessment will consist of weekly assignments, quizzes, and discussions that will test students' familiarity with study material and understanding of the concepts addressed in the materials and case studies. A final project tests students' overall understanding of the course content and requires students to develop a specific Health Informatics solution. The final exam will be based on the material covered in the course.

This course has been designed in accordance with Master's Degree curriculum requirements within the Accreditation Standards for Health Informatics and Health Information Management educational programs.

Course Objectives

This course will enable you to:

- Become familiar with the basic definitions, key concepts, terminology, and historical context of Health Informatics
- Understand fundamental characteristics of data, information, and knowledge in the Health Informatics domain
- Become familiar with common algorithms for health applications and IT components in representative clinical processes
- Develop understanding of population health and precision medicine
- Understand basic principles of knowledge management systems in biomedicine
- Develop understanding of various aspects of Health Information Technology standards
- Become familiar with IT aspects of clinical process modeling and health information systems

Course Outline

This course is presented as a series of weekly modules. The course material is grouped in six modules. The seventh module represents the week of the Final Examination. Each of the Modules 1–5 will have one or two lectures, one discussion topic, one quiz, and one assignment. There is also a term project to access the students' ability to understanding and implement simple Health Informatics solutions. Module 6 will be a review session covering the key points taught in the course and student project presentations.

Readings - Each week there are online lessons and research paper readings. Your professor may suggest additional readings during the running of the course.

Discussions - There will be graded weekly discussions between you and your classmates. These discussions are moderated by facilitators and professors. Postings for each discussion should be completed by the assigned due dates. Again, check the calendar for these due dates. There are also general discussions boards, which are not graded, for you to use to discuss any issues with your classmates. Please see the Discussion module on the home page for more details.

Assignments - There will be weekly assignments throughout the course. Please check the Study Guide for due dates.

Assessments - The weekly quizzes they will be listed in the Study Guide. Be sure to check it to ensure that you complete them before the due date. Quizzes may be a combination of True/False, single/multiple choice, and short essay questions.

Module One – **Introduction to Health Informatics & Data, Information, and Knowledge**

Lecture One:

- Introduction to health informatics and its significance
- Definitions and key concepts in health informatics
- Background disciplines, historical overview, and future challenges

Lecture Two:

- Introduction to knowledge hierarchy: Data, information, and knowledge
- The definitions of healthcare data and information
- Types of healthcare information (internal versus external data and information)
- The major purposes of maintain patient records
- The content and uses of patient records and claim content
- The common issues related to healthcare data quality
- The challenges associated with measuring and ensuring healthcare data quality
- Quality assessment including total quality management and data quality
- Introduction to biomedical research and publicly available resources

Module Two – **The National Landscape of Healthcare IT & History of Healthcare Information System**

Lecture Three:

- The major influences shaping the health IT landscape in the US
- The roles played by the major government initiatives and private sectors in advancing health IT in the US
- The major events that have influences the adoption of health IT and systems

Lecture Four:

- History and evolution of healthcare information systems (HCIS)
- The major advances in information technology and significant federal initiatives that influenced the adoption of healthcare information systems
- The major types of administrative and clinical information systems used in healthcare
- Current issues pertaining to the use HCIS

Module Three – Medical Algorithms & Medical Decision Making

Lecture Five:

- Various ways to describe algorithms, such as flowchart, pseudocode, and conceptual graph
- Introduction to medical algorithms
- Algorithms in computer science, such as decision tree and regression
- Calculation of measurements of classification performance—sensitivity and specificity

Lecture Six:

- Decision-making process

- Medical decision-making process (diagnosis, treatment, monitoring, prognosis)
- Informatics in clinical decision-making
- Introduction to evidence-based medicine

Module Four – **Modeling and Simulations & Population Health and Precision Medicine**

Lecture Seven:

- Develop understanding of modeling and simulation
- Become familiar with applications of modeling and simulation in biomedicine

Lecture Eight:

- Data and information needs of health systems in managing population health
- Key health IT tools and strategies for population health management
- Concepts of precision medicine

Module Five – **Standards in Health Informatics**

Lecture Nine:

- Introduction to standards
- The Need for Health Informatics Standards
- The role of federal initiative and legislation that that have significant impact on the adoption of healthcare information standards in the United States
- Major types of healthcare information standards and the organization that develop or approve them
- The importance of healthcare IT standards to the future of the US health care delivery system

Module Six – **Knowledge management system & Organizing Health IT services**

Lecture Ten:

- Introduction to knowledge management
- Knowledge discovery, data mining and text mining
- Knowledge management and decision making support in biomedicine

Lecture Eleven:

- The roles, responsibilities, and major functions of the IT department in healthcare organizations
- The roles, responsibilities, and major functions of the IT leaders
- The various ways to organize IT services
- The key attributes of highly effective IT departments
- The role and major function of the data analytics department

- Developing plans for evaluating the effectiveness of the IT function
- The components of an IT strategic plan
- How to develop an IT strategic plan
- The Gartner Hype Cycle

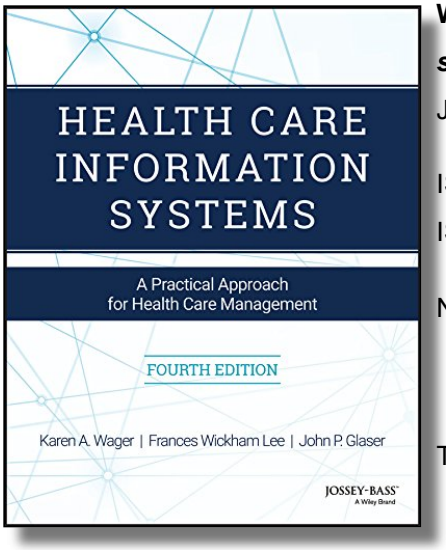
Module Seven - Prepare for and take the final exam

You will prepare for and take the proctored final exam.

The course will remain open two weeks, after the final exam, so that you can continue discussions and ask any questions about database technology, your grades, or the course. This is also a time when we enter into a dialog where we endeavor to learn from you how we can modify the course so that it better meets your needs.

Course Materials

Required textbook:



Wager, K. A., Lee, F. W., & Glaser, J. P. (2017). ***Health care information systems: A practical approach for health care management*** **-4th Edition.** Jossey-Bass.

ISBN-13: 978-1119337188.
ISBN-10: 1119337186.

Note:

- This is also the required textbook for CS781.

This book can be purchased from Barnes and Noble at Boston University.

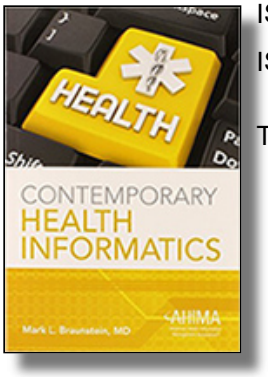
Recommended textbook:

Trotter, F. and Uhlman, D. (2011). ***Hacking healthcare: A guide to standards, workflows, and meaningful use.***
O'Reilly Media.

ISBN-13: 978-1449305024.
ISBN-10: 1449305024.

This book can be purchased from Barnes and Noble at Boston University.

Braunstein, M. L. (2014). ***Contemporary Health Informatics*****.**
American Health Information Management Association.



ISBN-13: 978-1584260318.

ISBN-10: 1584260319.

This book can be purchased from Barnes and Noble at Boston University.

Boston University Library Information

Boston University has created a set of videos to help orient you to the online resources at your disposal. An introduction to the series is below:

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All of the videos in the series are available on the Online Library Resources page, which is also accessible from the Campus Bookmarks section of your Online Campus Dashboard. Please feel free to make use of them.

As Boston University students, you have full access to the BU Library. From any computer, you can gain access to anything at the library that is electronically formatted. To connect to the library, use the link http://www.bu.edu/library. You may use the library's content whether you are connected through your online course or not, by confirming your status as a BU community member using your Kerberos password.

Once in the library system, you can use the links under “Resources” and “Collections” to find databases, eJournals, and eBooks, as well as search the library by subject. Some other useful links follow:

Go to http://www.bu.edu/library/research/collections to access eBooks and eJournals directly.

If you have questions about library resources, go to http://www.bu.edu/library/help/ask-a-librarian to email the library or use the live-chat feature.

To locate course eReserves, go to http://www.bu.edu/library/services/reserves.

Please note that you are not to post attachments of the required or other readings in the water cooler or other areas of the course, as it is an infringement on copyright laws and department policy. All students have access to the library system and will need to develop research skills that include how to find articles through library systems and databases.

Free Tutoring Service

Free online tutoring with SMARTHINKING is available to BU online students for the duration of their courses. The tutors do not rewrite assignments, but instead teach students how to improve their skills in the following areas: writing, math, sciences, business, ESL, and Word/Excel/PowerPoint.

You can log in directly to SMARTHINKING from Online Campus by using the link in the left-hand navigation menu of your course.

YouTube

Please Note

SMARTHINKING may be used only for current Boston University online courses and career services. Use of this service for purposes other than current coursework or career services may result in

deactivation of your SMARTHINKING account.

Study Guide

Module 1 Study Guide and Deliverables

Readings:

Required Readings: (Wager, et al, 2017)
Chapter 2: Health Care Data

Recommended readings:

Chapter 1 The US Healthcare System (Braunstein, 2014)
Haux R. Medical informatics: past, present, future. Int J Med Inform. 2010, 79(9):599-610.

Fridsma DB. The scope of health informatics and the Advanced Health Informatics Certification. J Am Med Inform Assoc. 2016, 23(4):855-6.

Discussions: Discussion 1 postings end February 6 at 6:00 PM ET

Assignments: Assignment 1 due February 6 at 6:00 PM ET

Assessments: Quiz 1 due February 6 at 6:00 PM ET

Module 2 Study Guide and Deliverables

Readings:

Required readings: (Wager, et al, 2017)
Chapter 1: The National Health Information Technology landscape
Chapter 3: Health Care Information Systems

Appendix A: Overview of the Healthcare IT industry

Recommended readings:

Wetterneck, T. B., Walker, J. M., Blosky, M. A., Cartmill, R. S., Hoonakker, P., Johnson, M. A., ... & Carayon, P. (2011). Factors contributing to an increase in duplicate medication order errors after CPOE implementation. Journal of the American Medical Informatics Association, 18(6), 774-782.

Kuperman, G. J., Bobb, A., Payne, T. H., Avery, A. J., Gandhi, T. K., Burns, G., ... & Bates, D. W. (2007). Medication-related clinical decision support in computerized provider order entry systems: a review. Journal of the American Medical Informatics Association, 14(1), 29-40.

Discussions: Discussion 2 postings end February 20 at 6:00 PM ET

Assignments: Assignment 2 due February 20 at 6:00 PM ET

Assessments: Quiz 2 due February 20 at 6:00 PM ET

Module 3 Study Guide and Deliverables

Readings:

Recommended readings:

Fitzmaurice, J. M., Adams, K., & Eisenberg, J. M. (2002). Three decades of research on computer applications in health care: medical informatics support at the Agency for Healthcare Research and Quality. Journal of the American Medical Informatics Association, 9(2), 144-160.

Djulbegovic, B., & Guyatt, G. H. (2017). Progress in evidence-based medicine: a quarter century on. The Lancet.

Sheridan, D. J., & Julian, D. G. (2016). Achievements and limitations of evidence-based medicine. Journal of the American College of Cardiology, 68(2), 204-213.

Discussions: Discussion 3 postings end March 6 at 6:00 PM ET

Assignments: Assignment 3 due March 6 at 6:00 PM ET

Assessments: Quiz 3 due March 6 at 6:00 PM ET

Module 4 Study Guide and Deliverables

Readings: **Required readings:** (Wager, et al, 2017)
Chapter 4: Information Systems to Support Population Health Management

Recommended readings:
Chapter 8 Population Health Management (Braunstein, 2014)

Kindig, D., & Stoddart, G. (2003). What is population health?. American journal of public health, 93(3), 380-383.

König, I. R., Fuchs, O., Hansen, G., von Mutius, E., & Kopp, M. V. (2017). What is precision medicine? European Respiratory Journal, 50(4), 1700391.

Discussions: Discussion 4 postings end March 27 at

6:00 PM ET

Assignments: There is no assignment for this module

Assessments: Quiz 4 due March 27 at 6:00 PM ET

Module 5 Study Guide and Deliverables

Readings: **Required readings:** (Wager, et al, 2017)
Chapter 11: Health Care Information System Standards

Recommended readings:
Chapter 5: Data and Interoperability Standards (Braunstein, 2014)
Chapter 11: Interoperability (Trotter and Uhlman, 2011)
Chapter 12: HIPAA: the far-reaching healthcare regulation (Trotter and Uhlman, 2011)

Discussions: No discussion

Assignments: Assignment 5 due April 10 at 6:00 PM ET
Term Project due April 24 at 6:00 PM ET

Assessments: Quiz 5 due April 10 at 6:00 PM ET

Module 6 Study Guide and Deliverables

Readings: **Required readings:** (Wager, et al, 2017)
Chapter 8 Organizing Information Technology Services

Chapter 12 IT Alignment and Strategic Planning

Course Grading Information

Course Structure

This course is presented as a series of weekly modules. The course material is grouped in six modules. Each module consists of one or two lectures. There are five discussion topics, five quizzes, and four assignments. There is also a term project to assess students' understanding and implementing simple Health Informatics solutions.

Reading materials—Introduced in each module.

Assignments—This course will have four graded assignments.

Discussions—There are 5 graded weekly discussion forums that involve posting and reviewing the answers to the discussion topics. Discussion topics are moderated by your facilitator. Each posting should be completed during the week when the material is covered. Please see the discussion module on the home page for more details.

Term Project—The term project will test students' overall understanding and grasp of the course content.

Final Examination—The final exam will be comprehensive and will cover material from the entire course. It will be an open-book proctored exam consisting of questions similar to the ones in the quizzes and assignments.

Grade Weighting

The final grade for this course will be based on the following:

Deliverable	Weight
Quizzes	15%
Discussions	15%
Assignments	20%
Term Project	20%
Final Exam	30%

Letter Grade

The final letter grade in the course will correspond approximately with the following numeric grade range:

A	≥ 94
A−	≥ 90 < 94
B+	≥ 86 < 90
B	≥ 81 < 86
B−	≥ 76 < 81
C+	≥ 71 < 76
C	≥ 66 < 71
C−	≥ 61 < 66
D	≥ 56 < 61
F	< 56

Course Policies

Attendance & Absences: This is an online course and students are required to access the material regularly.

Assignment completion & late work:

1. All assignments have to be submitted by the due dates. Each 24 hours of delay will result in 10% penalty.
2. Graded exercises need to be completed by the due date, which is one week after the beginning of the module. Each 24 hours of delay will result in 10% penalty.

Academic Conduct Code: http://www.bu.edu/met/for-students/met-policies-procedures-resources/academic-conduct-code/

Discussion Grading Rubric

The discussion grading rubric below is the guide we use to evaluate your discussion contributions.

Criteria	65–69	70–79	80–89	90–94	95–100
Participation	Very limited participation	Participation generally	Reasonably useful relevant	Frequently relevant and	Continually relevant and consistent

		lacks frequency or relevance	participation during the discussion period	consistent participation throughout the discussion period	participation throughout the discussion period
Community	Mostly indifferent to discussion	Little effort to keep discussions going or provide help	Reasonable effort to respond thoughtfully, provide help, and/or keep discussions going	Often responds thoughtfully in a way that frequently keeps discussions going and provides help	Continually responds thoughtfully in a way that consistently keeps discussions going and provides help
Content	No useful, on-topic, or interesting information, ideas, or analysis	Hardly any useful, on-topic, or interesting information, ideas, or analysis	Reasonably useful, on-topic, and interesting information, ideas, and/or analysis	Frequently useful, on-topic, and interesting information, ideas, and analysis	Exceptionally useful, on-topic, and interesting information, ideas, and analysis
Reflection and Synthesis	No significant effort to clarify, summarize, or synthesize topics raised in discussions			Contributes to group's effort to clarify, summarize, or synthesize topics raised in discussions	Leads group's effort to clarify, summarize, or synthesize topics raised in discussions