
CS 792

INTRODUCTION TO HEALTH INFORMATICS AND DATA STRUCTURE

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Dr. Helen Chen, helen.chen@uwaterloo.ca

DESCRIPTION

This course focuses on health data as a key component of all health informatics systems. Topics include architecture of electronic health records, ontologies and other classification taxonomies found in health systems, data standards and data exchange framework, technology for capturing, storage and usage of health data, and privacy and security regulations governing the appropriate use of health data.

COURSE OVERVIEW

This course provides an overview of major health informatics topics. The focus is on health data types, standards, methodologies and technologies to properly handle the health data. Challenges associated with health informatics applications and emerging trends and technologies are also discussed. The course is taught via a combination of online and in class lectures and hands-on practices of designing and implementing a health informatics solution to solve a real world problem.

The lectures cover the following topics

- Health data types and format
- Security and privacy protection standards and ethnics of using health data
- Terminology standards including international, national and domain specific standards.
- Electronic health record data model and information architecture
- Imaging informatics and standards
- Health data exchange framework
- Structure/non-structure health data and Natural language process
- Clinical knowledge presentation and decision support
- Health data analytics and future trend

LEARNING OUTCOMES:

At the end of the course, students should be able to:

1. **Identify** major health data types and its applications in public health and healthcare
2. **Describe** data models and standards for electronic medical records and health data exchange
3. **Propose** health informatics ideas, designs and functionalities using proper languages and methods
4. **Question** the feasibility and impact of information technology in relation to socioeconomic benefits and health information protection
5. **Appraise** health informatics research or technology solution
6. **Design** and prototype a health informatics solution to meet a real-world health data need

MATERIALS AND RESOURCES

TEXTBOOK(S) REQUIRED

- No required textbook.

RECOMMENDED READING

- Benson, T., Grieve, G, **Principles of Health Interoperability, SNOMED, HL7 and FHIR**, 4th Edition, 2020, Springer, Print ISBN 9783030568825, eBook ISBN- 9783030568832
This book contains practical instruction for understanding the interoperability and standardization. It provides introductions to SNOMED, HL7 and now widely used FHIR standards.
- Shortliffe, E. H., L. E. Perreault, G. Wiederhold, and L. M. Fagan. **Medical Informatics: Computer Applications in Health Care and Biomedicine**. 4th ed. New York, NY: Springer, 2013. ISBN: 978-1-4471-4473-1; ISBN 978-1-4471-4474-8 (eBook).
Shortliffe is considered the "father of HI". He is one of those MDs with a PHD in computer science. The book provides a good overview on the major topics in biomedical informatics field.

OTHER MATERIALS

The following major HI standards are accessible on the web. If you want to incorporate them into your project, you can download some portion of computable specifications on a UW repository. This repository will also host some de-identified health data for research/education purposes. You will be provided with the access the repository after the course starts.

- HL7 FHIR (<http://fhir.org/>)
- HL 7 Standards (<https://www.hl7.org/implement/standards/index.cfm?ref=quickLink>)
- Integrating the Healthcare Enterprise (IHE) (<http://www.ihe.net/Profiles/>)

- SNOMED Clinical Terms <http://www.ihtsdo.org/snomed-ct/>
- DICOM (<http://www.dclunie.com/dicom-status/status.html>)
- ICD 10-CM (<http://www.cdc.gov/nchs/icd/icd10cm.htm>)
- ICD 10 – CA
(http://www.cihi.ca/cihi-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+coding/codingclass_icd10)
- Health Canada Drug Product Databases
(<http://www.hc-sc.gc.ca/dhp-mps/prodpharma/databasdon/index-eng.php>)

ASSESSMENT:

There are 10 graded assessments in this course. A brief description of each assessment and grade breakdowns are listed below:

1. Quizzes

- Online Quiz 1:** (0%) –on security and personal health information protection regulations and practices to demonstrate their understanding of HIPPA/PIPEDA standards.
 - Online Quiz 2** (10%) – on clinical terminology standards, including SNOMED, MeSH and ICDx
 - Online Quiz 3:** (0%) – on health information model of electronic health record.
 - Online Quiz 4:** (10%) - on health data exchange standards to demonstrate understanding of HL7.
 - Online Quiz 5:** (5%) – on medical imaging standards to demonstrate their understanding of DICOM and PACS systems.
 - Online Quiz 6:** (0%) – on IHE and interoperability
- Assignment 1** (20%) - Literature Review: Students will conduct an investigation on a selected HI research topic, present the state-of-the-art report in a recorded presentation, provide a list of key references on the topic, and write a critique on one key literature of the subject.
 - Presentation
 - Reference List
 - Assignment 2** (15%) –Proposal: A group of 2-3 students will write a proposal to support their innovation in health informatics
 - Assignment 3-1** (15%) – Final Project: The team will design and implement a prototype system according to their grant proposal. The prototype system will be demonstrated in 2 live sessions, one in-class and one Adobe Connect session.
 - Design
 - Implementation and demo
 - Presentation and QA
- Assignment 3-2** (15%) – Documentation: produce documentation on your research findings or the design and functionality of your prototype

Assignment 3-3 Critique and Evaluation (10%)**Assignment 3-3-a (5%) Critique of project demo and presentation****Assignment 3-3 b (5%) Peer assessment of individual contribution to the project****COURSE SCHEDULE**

Week	Title	Activities and Assignment	Begin Date	End Data	Weight (%)
Week 1	Health Informatics: Past, Current and Future Trend	Assignment 1 starts: a literature review	Jan. 11	Jan. 15	
Week 2	Privacy, Security and Ethics Consideration in Health Informatics	Assignment 1 complete: Literature Review	Jan. 18	Jan. 22	
Week 3	Standards for Clinical Terminologies	Quiz 2 (Terminology)	Jan. 25	Jan. 29	10
Week 4	EHR Conceptual Information Architecture	Quiz 3 (EHR Information Model), Assignment 1 due: Literature Review	Feb. 1	Feb. 5	20 (Assig 1)
Week 5	Health Data Exchange Standard (HL7)	Quiz 4 (HL7/V2/V3/FHIR)	Feb. 8	Feb. 12	10
Reading Week (Saturday, February 13, 2021 to Sunday, February 21, 2021)					
Week 6	Medical Knowledge Representation and Application	Assignment 2: Project Proposal	Feb. 22	Feb. 26	15
Week 7	Imaging and Structured Informatics	Quiz 5 (DICOM)	Mar. 1	Mar. 5	5
Week 8	Unstructured Health Data	Proposal feedback	Mar. 8	Mar 13	
Study Days (Saturday, March 13, 2021 to Tuesday, March 16, 2021), Project Consultation					
Week 9	Health Informatics Exchange Framework (IHE)	Quiz 6 (IHE)	Mar 17	Mar 19	0
Week 10	Reflect	Project consultation	Mar 22	Mar 26	
Week 11	Health data analytics and decision support	Project team work	Mar 29	Apr. 2	
Week 12	Project Presentation/Demo (Demo or Research findings reports)	Assignment 3-1: Project Demo Assignment 3-3-a Peer evaluation	Apr. 5	Apr. 10	10 5
Week 13	Research findings/Reports	Assignment 3-2 Documentation Peer review	Apr 12 April 12	Apr 16	15 10