Course Description:
The course will cover fundamental theories and principles of health informatics including: an overview of the health care system, computer systems (hardware & software), communications and information technologies, data types, data acquisition, data standards, data quality and data uses and users. The course will introduce students to the wide range of health informatics applications and uses of computers in health care with an emphasis on various clinical support and clinical information systems and the electronic health record and its achievability. This course will also develop an appreciation of how data are collected, processed and used in healthcare settings and the role that data play in decision making (including an understanding of the complexities involved in transforming data into information and knowledge).

Course Goal:
To become familiar with the field and practice of health informatics and the range of activities it encompasses. To understand how data are collected, processed and used in health care settings. To appreciate the complexities involved in transforming data into information and knowledge. To be familiar with various clinical support and clinical information systems. To understand how decision support systems are modeled and used within the health care system to assist in decision making in an administrative or clinical setting.

Major Objectives:
Upon the completion of the course, the students should:

1. Have a general understanding of the health care system in Canada; its governance, administration, personnel, and financing.
2. Have a general level of computer literacy and understand the terminology used in describing computer hardware, software and networks.
3. Have a general level of information literacy and understand how to assess and evaluate information needs, information sources, and information quality.
4. Appreciate the number of different types of data that are collected and measured within the health care system and the complexity of transforming data into information and knowledge.
5. Have an understanding of how health data and clinical information are collected, recorded and analyzed in an electronic format, including text, biosignals and images, structured and unstructured data.
6. Appreciate the different health system uses and users of health data and information within the health care system; differentiate between primary (care, diagnosis and therapy) and secondary uses (disease surveillance, research, policy, management and decision making).
7. Understand the need for a variety of data standards for optimum utilization of data across disparate systems, i.e., data technology standards, data terminology standards, data transmission standards, data privacy and security standards.
8. Identify and describe the general characteristics of clinical support and clinical information systems.
9. Understand and critique the use of decision support systems (e.g., mobile health applications, clinical guides) in various health care settings.
10. Discuss the status and implications of applying information and communication technology in health care delivery and management, in particular how the EHR, telehealth, public health informatics, consumer health informatics and bioinformatics will shape the future health system.

Lectures/tutorials will be supplemented by guest lecturers who will share their experiences and knowledge, and demonstrations of various digital applications. An interactive class environment will be encouraged and occasionally in-class exercises will be conducted and based on material from the suggested readings.

Course outline, assignments and presentations will be placed on OWL (https://owl.uwo.ca/portal) which you can access using your UWO user name and password. Links to web sites and additional reading material that pertain to each week’s lesson will also be posted there. You are also expected to actively take part in discussions in the Forum.
Assignments and Grading

The final grade will be based on marks obtained in five assignments and on participation in class and in the on-line discussion forum.

Assignment #1 – Definition of Health Informatics  
Explore the definition of health informatics and how the field intersects with health information management and health information science.

Assignment #2 – What is ‘Big Data’ and how will it affect Health Care  
Data analytics and the use of high volumes of data are having an impact in medicine as well as business, purchasing habits, etc. What are the implications of this ‘big data’ movement for healthcare service delivery and improvement? What factors need to be in place for optimal use of data in healthcare (e.g., fully electronic, interoperable systems; data analysts; high quality data, privacy and security of data). How can data be used to improve healthcare delivery and health status?

Assignment #3 – The Impact of Technology  
An opportunity to practice communication skills (interview and presentation) based on an interview with someone working in healthcare and an assessment of how they use technology and how it has changed or shaped their job.

Assignment #4 - Critique of a Selected Decision Support System or the Development of a Decision Support Tool  
You may select an existing decision support tool/system or mobile health application to critique or alternatively submit a proposal and/or prototype of a decision support tool for clinical, administrative or consumer use.

Assignment #5 - Emerging Trends in Technology  
What do you see as the emerging trends in technology over the next 5 years; what will have the greatest impact on healthcare. Essays will be expected to show evidence of independent research, insight and foresight, and accompanied by a reference list.

Participation Mark – Discussion Board  
Topics for discussion will be posted weekly on the discussion board and students will be marked on the basis of both quantitative and qualitative participation in the forum and in class discussions.
Readings:
There is no required text for the course. Several good books on health informatics are available but deal either with the American health care system or approach the subject with a medical/clinical emphasis. I have listed readings from two books in the outline, the textbook by Enrico Coiera, "Guide to Health Informatics" Third edition (2015) and the text of "Biomedical Informatics: Computer Applications in Health Care and Biomedicine, Fourth Edition " by Edward H. Shortliffe and James J. Cimino (2014). There are a number of excellent health informatics journals, many available online, and journal articles that supplement the course notes will be posted to the OWL course site for download. A variety of sites related to the field of health informatics and health information management are also listed below.

**Biomedical Informatics: Computer Applications in Health Care and Biomedicine (BMI)**
Fourth Edition
Edward H. Shortliffe & James J. Cimino
Springer, 2014
ISBN
(indicated as BMI in reading list)

An excellent reference text on (bio)medical informatics edited by one of the pioneers in the field of informatics in US health care system (Shortliffe). Very good overview of the field and some in depth consideration of specific components of informatics research and development (imaging, natural language processing, decision support, bioinformatics).

Note: A free e-copy of the Shortliffe text is available to students for download through Western Libraries through the library portal and using your Western account.
1- [http://guides.lib.uwo.ca/az.php?a=s](http://guides.lib.uwo.ca/az.php?a=s)
2- Find "Springerlink Archive - computer science" and click on it.
3- Once in Springerlink, click on Springerlink logo on top left to remove existing search filters.
4- Search for the book title and download it.

Alternatively here is a direct link for the book:

**The Guide to Health Informatics (HI)**
Third Edition
Enrico Coeira
CRC Press, 2015
(indicated as HI in reading list)

Another good, authoritative text that covers most of the field, but again with a heavy emphasis on 'medical' informatics. Good overview of the field, clinical implications, etc.

Informatics is now considered a necessary competency for nursing and pharmacy students. The national organizations in Canada, CASN – the Canadian Association of Nurses and AFPC – the Association of Faculties of Pharmacy of Canada have developed health informatics competencies and resource guides. The online ‘book’ for pharmacy students is particularly helpful and is accessed through Moodle via a free registration.

Informatics for Pharmacy Students - [http://afpc-education.info/moodle/](http://afpc-education.info/moodle/)

A new book has just been published (August 2018) & available through Canadian Scholar's Press:

**An Introduction to Health Informatics: A Canadian Perspective**
Christo El Morr
[https://www.canadianscholars.ca/books/introduction-to-health-informatics](https://www.canadianscholars.ca/books/introduction-to-health-informatics)
Journals

See general resources in the Research Guides through Western's Taylor Library – under Undergraduate Medical Education → http://guides.lib.uwo.ca/undergraduatemedicaleducation
AND
Health Information Sciences → http://guides.lib.uwo.ca/healthinformationscience/

You may also find the resources under Clinical Outreach useful as well
http://guides.lib.uwo.ca/clinicaloutreach

BMC Medical Informatics and Decision Making
http://www.biomedcentral.com/bmcmedinformdecismak

HealthCare Informatics Online
http://www.healthcare-informatics.com

JAMIA (Journal of the American Medical Informatics Association)
http://jamia.bmj.com/

Journal of Medical Internet Research (JMIR)
http://www.jmir.org/

Modern Healthcare
http://www.modernhealthcare.com/

Canadian Healthcare Technology
http://www.canhealth.com/

Electronic Healthcare
http://www.longwoods.com/articles/electronichealthcare/

Health Information Management and Communications Canada
http://www.healthcareimc.com/

Canadian Organizations

Centre for Global eHealth Innovation
http://www.ehealthinnovation.org/

CHI (Canada Health Infoway)
http://www.infoway-inforoute.ca/en/

CHIMA (Canadian Health Information Management Association)
http://www.echima.ca

Digital Health Canada (Canada's Health Informatics Association; formerly COACH)
https://digitalhealthcanada.com/

CIHI (Canadian Institute for Health Information)
http://www.cihi.ca
American Organizations

AHIMA (The American Health Information Management Association)
http://www.ahima.org

AMIA (American Medical Informatics Association)
http://www.amia.org/

American Telemedicine Association
http://www.americantelemed.org

HIMSS (Healthcare Information and Management Systems Society)
http://www.himss.org/ASP/index.asp

The Office of the National Coordinator for Health Information Technology (ONC)

International Organizations

IMIA (The International Medical Informatics Association)
http://imia-medinfo.org/wp/

IFHIMA (The International Federation of Health Information Management Associations)
http://ifhima.org/

Blogs


The Informatics Professor - http://informaticsprofessor.blogspot.com/ [William Hersh]

Twitter

AMIA@amiainformatics

#WhyInformatics
# MHI 4100F/9100F – HEALTH INFORMATICS
## Course Outline

Weekly two hour lecture – Wednesday, 8:30 – 10:30 am, MSB M190  
Weekly one to two hour lab/tutorial session – Friday, 9:30 – 11:30 am, DSB 4007  
Course Instructor: Candace Gibson, PhD, CHIM

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings</th>
<th>Web Sites</th>
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</thead>
</table>
| Week 1     | Health Informatics – Introduction & Overview                          | **HI**  
             | Goals, Objectives, Introductions, Resources                           | Introduction to health informatics – the systems science of healthcare | CIHI – [http://www.cihi.ca](http://www.cihi.ca) |
|            |                                                                       | **BMI**  
|            |                                                                       | **Additonal Readings:**  
             |                                                                       | AMIA See statement on definition of "biomedical informatics" - [http://www.amia.org/about-amia/science-informatics](http://www.amia.org/about-amia/science-informatics) |
|            |                                                                       | CHIMA - [http://www.echima.ca](http://www.echima.ca)                     | CHIMA - [http://www.echima.ca](http://www.echima.ca) |

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<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings</th>
<th>Web Sites</th>
</tr>
</thead>
</table>
| Week 1     | Introduction & Overview of Course                                     | **HI**  
             | Health Informatics                                                     | Introduction to health informatics – the systems science of healthcare | CIHI – [http://www.cihi.ca](http://www.cihi.ca) |
|            |                                                                       | **BMI**  
|            |                                                                       | **Additonal Readings:**  
             |                                                                       | AMIA See statement on definition of "biomedical informatics" - [http://www.amia.org/about-amia/science-informatics](http://www.amia.org/about-amia/science-informatics) |
|            |                                                                       | CHIMA - [http://www.echima.ca](http://www.echima.ca)                     | CHIMA - [http://www.echima.ca](http://www.echima.ca) |
| Sept 14 | **Context - Canada’s Health Care System**  
  ♦ A review and general overview of Canada’s health care system. | From the Advisory Panel on Healthcare Innovation:  
**UNLEASHING INNOVATION: Excellent Healthcare for Canada**  
*BMI*  
Ch. 12 – Electronic Health Record Systems  
Ch. 14 – Management of Information in Healthcare Organizations | Unleashing Innovation –  
Executive Summary; Full Report -  
Health Canada -  
MOHLTC, Ontario -  
CIHI –  
[http://www.cihi.ca](http://www.cihi.ca) |
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<tr>
<td><strong>Foundations of Health Informatics</strong></td>
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</table>
| **Week 2** | **Computer Systems/Computer Literacy**  
♦ **Computing Hardware**  
   ○ Input / Output / Mobile Devices  
♦ **Computing Software**  
   ○ Operating systems / Applications  
♦ **Networks**  
   ○ Web 2.0, Medicine 2.0, Health 2.0  
   ○ Social networks  
♦ **Adoption of New Technologies** | **HI**  
..Ch. 18 – Communication Systems Basics  
..Ch. 19 – Information and Communication Networks  
Ch. 10 – The Electronic Health Record  
Ch. 11 - Designing and evaluating information and communication systems  
*BMI*  
Ch 5 – Computer Architectures for Health Care and Biomedicine  
Ch. 6 – Software Engineering for Health Care and Biomedicine  
Ch 12 – Electronic Health Record Systems  
Ch 13 – Health Information Infrastructure  
Ch. 14 – Management of Information in Health Care Organizations |  
| **Sept 19** |  |  |
| **Sept 21** | **Health Information Science: A Personal View**  
Sadiq Raji, HIS PhD student  
FIMS  
Western University | CHIMA -  
[http://www.echima.ca](http://www.echima.ca)  
Digital Health Canada –  
[https://digitalhealthcanada.com](https://digitalhealthcanada.com)  
NIHI –  
[http://www.nihi.ca](http://www.nihi.ca) |  |
| Week 3 | Information/Communication Theory  
Information Literacy  
Consumer Health Informatics  
Health Information Needs and Resources  
Personal Health Records  
The Quantified Self  
Evaluating Health Information Resources | HI  
Part 2 – Informatics skills  
HI  
Ch. 32 – Consumer health informatics  
BMI  
Ch. 17 – Consumer Health Informatics and Personal Health Records  
Ch. 12 – Evaluation of Biomedical and Health Information Resources |  |
| --- | --- | --- |
| Sept 28 | Information Searching Skills  
Clinical Queries  
Research Questions  
Mobile Health Applications and General Health Information Resources | Kelly Hatch – Weldon Library Instruction Room  
NOTE: We will meet in the Weldon Library Instruction Room at 8:30 am  
HI  
Part 2 – Informatics skills  
Ch. 4 – Communicating  
Ch. 5 – Structuring  
Ch. 6 – Questioning  
Ch. 7 – Searching  
Ch. 8 – Making Decisions  
BMI  
Ch. 21 – Information Retrieval and Digital Libraries | UWO Library Databases by Subject – see Under Health Information Science |
| Assignment 1 Due – by Friday, September 28 at 5 p.m. |  |  |
| Data in Health Care |  |  |
| Week 4 | Health Information Framework – Why we collect data  
Primary and Secondary Uses of Data – Health System Use of Data  
Big Data in Health Care | BMI  
Ch. 2 – Biomedical Data: Their Acquisition, Storage, and Use  
Ch. 11 – Evaluation of Biomedical and Health Information Resources | CIHI – [http://www.cihi.ca](http://www.cihi.ca)  
(see section under “Data Collection”)  
eHealth Ontario - [http://www.ehealthontario.on.ca/en/](http://www.ehealthontario.on.ca/en/) |
## Data Collection & Measurement
- Text, Numeric, Images, Biosignals
- Structured versus Unstructured Data

### Data Quality & Data Integrity

<table>
<thead>
<tr>
<th>Oct 5</th>
<th>Tutorial: Databases in Health Care and the challenges of ‘big data’ in health care</th>
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<tbody>
<tr>
<td></td>
<td>A look at some of the current databases in use in the Canadian health care system (at regional, provincial, and national level).</td>
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### Reading Week - October 8 - 12

<table>
<thead>
<tr>
<th>Week 6 Oct 17</th>
<th>Data Standards</th>
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<tbody>
<tr>
<td></td>
<td>♦ Technological</td>
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<td></td>
<td>♦ Data (Coding &amp; Classification)</td>
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<td>♦ Security, Privacy &amp; Confidentiality</td>
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<td>The Standard Setting Process</td>
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<tr>
<th>HI</th>
<th>Part 6 - Language, coding and classification</th>
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<tbody>
<tr>
<td></td>
<td>Ch. 22 - Terms, codes and classification</td>
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<tr>
<td></td>
<td>Ch. 23 - Healthcare terminologies and classification systems</td>
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<thead>
<tr>
<th>BMI</th>
<th>Ch. 2 – Biomedical Data: Their Acquisition, Storage, and Use</th>
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<tr>
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<td>Ch. 7 – Standards in Biomedical Informatics</td>
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| CIHI – [http://www.cihi.ca](http://www.cihi.ca) (see section under “Standards”) |


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<tr>
<th>Oct 19</th>
<th>Data Standards (cont’d)</th>
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<tbody>
<tr>
<td></td>
<td>TBA</td>
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### Assignment 2 Due – Friday, October 19, 5 p.m.

### Applications of Technology in Health Care

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<thead>
<tr>
<th>Week 7 Oct 24 &amp; 26</th>
<th>Clinical Information Systems</th>
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<tbody>
<tr>
<td></td>
<td>♦ Clinical Support Systems</td>
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<td>♦ Biosignal and Image Analysis</td>
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<thead>
<tr>
<th>BMI</th>
<th>Ch. 9 – Biomedical Imaging Informatics</th>
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<tbody>
<tr>
<td></td>
<td>Ch. 20 – Imaging Systems in Radiology</td>
</tr>
<tr>
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<td>Ch. 19 – Patient Monitoring Systems</td>
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<tr>
<th>Week 8</th>
<th>Clinical Information Systems</th>
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<tr>
<td>Oct 31</td>
<td>◆ Clinical Support Systems</td>
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<td></td>
<td>◆ Clinical and Administrative Departmental Systems</td>
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**HI**
- Ch. 28 – Patient monitoring and control

**BMI**
- Ch. 14 – Management of Information in Health Care Organizations
- Ch. 19 – Patient Monitoring Systems

- Canada Health Infoway - [https://www.infoway-inforoute.ca/en/](https://www.infoway-inforoute.ca/en/)

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<tr>
<th>Nov 2</th>
<th>Guest Speaker</th>
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<td>TBA – Radiology or Cardiology</td>
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Assignment 3 - Impact of Technology Presentations

<table>
<thead>
<tr>
<th>Week 9</th>
<th>Health Information Systems</th>
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<tbody>
<tr>
<td>Nov 7 &amp; 9</td>
<td><strong>Electronic Health Record</strong></td>
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<td></td>
<td>◆ Background &amp; Overview</td>
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**HI**
- Part 3 – Information systems in healthcare
- Ch. 9 - Information management systems
- Ch.10 - The electronic health record
- Ch. 11 - Designing and evaluating information and communication systems
- Ch. 12 - Implementation
- Ch. 13 - Information system safety
- Ch. 14 - Information economics

**BMI**
- Ch. 12 – Electronic Health Record Systems
- Ch. 13 – Health Information Infrastructure
- Ch. 14 – Management of Information in Health Care Organizations

- Canada Health Infoway - [http://www.infoway-inforoute.ca/](http://www.infoway-inforoute.ca/)
- eHealth Ontario - [http://www.ehealthontario.on.ca/en/](http://www.ehealthontario.on.ca/en/)

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<tr>
<th>Nov 16</th>
<th>cSWO Regional HIS</th>
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<tbody>
<tr>
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<td>Guest Speaker: TBC</td>
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<tr>
<td></td>
<td>Ted Alexander</td>
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<td>VP, eHealth Centre of Excellence</td>
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<th>Week 10</th>
<th>Decision Support Systems</th>
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<tr>
<td>Nov 14</td>
<td>◆ Models &amp; Systems</td>
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<tr>
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<td>◆ Supporting Evidence-Based Practice &amp; Management</td>
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<tr>
<td></td>
<td>◆ Clinical and Administrative Support Systems</td>
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**HI**
- Part 7 - Clinical decision support and analytics
- Ch. 25 - Clinical decision support systems
- Ch. 26 - Computational reasoning methods

- Canada Health Infoway - [http://www.infoway-inforoute.ca/](http://www.infoway-inforoute.ca/)
- eHealth Ontario - [http://www.ehealthontario.on.ca/en/](http://www.ehealthontario.on.ca/en/)

- Canadian EMR – [http://www.canadianemr.ca](http://www.canadianemr.ca)
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<th>Date</th>
<th>Topic</th>
<th>Details</th>
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</table>
| Nov 23     | Decision Support – Decision Making         | Guest Speaker  
Dr. Dan Lizotte  
Assistant Professor, Computer Science/Epidemiology & Biostatistics |
| Nov 28     | Decision Support – Mobile Apps             | Mobile Applications - Evaluation |
| Nov 30     | Telehealth / Telemedicine                  | Definitions  
Examples |
|           |                                            | Hi  
Ch. 21 - Telehealth and mobile health  
BMI  
Ch. 18 – Telehealth |
|           |                                            | http://www.otn.ca  
Some additional links there for telehealth resources. |
| Week 12    |                                            | Assignment 4 Due – Friday, November 30 by 5 p.m. |
| Week 13    | Bioinformatics                             | Hi  
Ch. 30 – Bioinformatics  
Ch. 31 - Clinical bioinformatics and personalized medicine  
BMI  
Ch. 24 – Bioinformatics |
| Dec 7      | The Future of Health Technology            | BMI  
Ch. 28 – The Future of Informatics in Biomedicine |
|           |                                            | Final Assignment 5 Due – by Friday, December 7 by 5 p.m. |