**Biomedical Sciences and Health IT**

CS570

Course Format (Online)

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Office hours: by appointment

**Course Description**

This course is designed for IT professionals, and those training to be IT professionals, who are preparing for careers in healthcare-related IT (Health Informatics). This course provides a high-level introduction into basic concepts and terminologies of biomedicine and provide insights into the structure and organization of the American healthcare system and how it is intertwined with IT. The course introduces medical terminology, human anatomy and physiology, disease processes, diagnostic modalities, and treatments used to manage some common diseases. IT case studies demonstrate the key roles of health informatics and how IT tools and resources help medical professionals integrate multiple sources of information to make diagnostic and therapeutic decisions.

In each session the students will first be introduced to biological function, pathology, laboratory medicine, diagnostic imaging and therapeutic interventions covering specific medical specialties. On this basis the students will gain an understanding as to the types of information being gathered and what is important to the clinical professionals. The second part of each module will consist of a case study demonstrating the overlap of biology, medicine, and health informatics. Throughout the modules, the students will also be introduced to various aspects of American healthcare system and healthcare IT.

**Recommended textbook**

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| Please see the free online textbook  [Anatomy & Physiology – Open Textbook (oregonstate.education)](https://open.oregonstate.education/aandp/)     * Trotter, F. and Uhlman, D. (2011). Hacking healthcare: A guide to standards, workflows, and meaningful use. O'Reilly Media. ISBN 9781449305024.   This textbook can be purchased from [Barnes & Noble at Boston University](http://bu.bncollege.com/).     * Jane Rice. (2014) Medical Terminology for Health Care Professionals. 8th Edition. Prentice Hall. ISBN 978-0133429541   This textbook can be purchased from [Barnes & Noble at Boston University](http://bu.bncollege.com/).   * Einbinder L, Lorenzi  NM, Ash J, Gadd CS, Einbinder J. (2010). Transforming Health Care Through Information: Case Studies. 3rd edition, Springer. (Available electronically through BU library). |

**Course Learning Objectives**

• Identify the anatomy, physiology, and pathophysiology of human body systems

• Recognize common diagnostic methods, treatments, and medical procedures

• Understand medical decision making in the diagnosis and treatment of human organ system disease

• Predict the IT needs of healthcare providers as they diagnose and treat common diseases

• Describe IT systems needed to support modern diagnostic imaging

• Understand the transfer of information from various sources to the centralized electronic health record

• Learn the basic delivery, financial and legal aspects of the American healthcare system

**Class Policies**

1. **Attendance & Absences** – Full attendance and participation is encouraged.
2. **Assignment Completion & Late Work** – All assignments should be submitted on time. If there is a delay, the student must be in touch with the instructor. Late submissions without reasons will result in grade deduction.
3. **Academic Conduct Code** –Cheating and plagiarism will not be tolerated in any Metropolitan College course. They will result in no credit for the assignment or examination and may lead to disciplinary actions. Please take the time to review the Student Academic Conduct Code: <http://www.bu.edu/met/metropolitan_college_people/student/resources/conduct/code.html>.

NOTE: [This should not be understood as a discouragement for discussing the material or your particular approach to a problem with other students in the class. On the contrary – you should share your thoughts, questions and solutions. Naturally, if you choose to work in a group, you will be expected to come up with more than one and highly original solutions rather than the same mistakes.]

**Grading Criteria**

* Quizzes - This course will have 4 to 5 graded quizzes.
* Assignments - This course will have 4 to 5 graded assignments.
* Discussions – There are 5 graded discussion forums that involve posting and reviewing the answers to the discussion topics.
* 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 assignments and the class project.

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

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| **Deliverable** | **Weight** |
| Quizzes | 25% |
| Assignments | 30% |
| Participation | 10% |
| Final Exam | 35% |

**Module 1 - Introduction to Biomedicine and the U.S. Healthcare System**

* Lecture One: Introduction to Biomedical Science
* Lecture Two: Introduction to Laboratory Medicine

Learning Objectives:

* The human body is made of systems and systems are made of organs that are interdependent. This interdependency is very finely balanced and requires constant data sampling of its environment and numerous feedback mechanisms.
* How things go wrong— genotype and phenotype polymorphism, stem cells and differentiation, developmental problems, the effects of aging, infectious disease, and cancer.
* The basis of measuring what is wrong when things go wrong—laboratory medicine, data generation and imaging enabling arrival at a diagnosis.
* The basics of health informatics
* The basics of healthcare system and the structure of the U.S. healthcare system
* The problems of and future challenges to the U.S. healthcare system

**Module 2 - How we are structured: the Muscular, Skeletal, Skin, and Digestive Systems**

* Lecture Three: Muscular, Skeletal, and Integumentary Systems
* Lecture Four: The Digestive System

Learning Objectives:

* General understanding of the structural organization of the human body and the functionality of the digestive system.
* Exploration of diagnostic methods and imaging procedures to identify disorders.
* The role of IT in data and image analysis, transfer and presentation.
* The Health Insurance Portability and Accountability Act of 1996 (HIPAA)

**Module 3 - Energy, Energy Distribution and Product Disposal: the Cardiovascular and Respiratory Systems**

* Lecture Five: The Cardiovascular System
* Lecture Six: The Pulmonary System

Learning Objectives:

* Basic understanding of the structure, function and interdependency of the heart and the lung functions.
* Basic comprehension of the multiple cardiovascular and respiratory regulatory checkpoints and how aberrations in a single functionality can cascade to generate a complex pathology.
* Appreciation of imaging techniques and therapeutic options available for diagnosing and treatment of cardiovascular and respiratory problems.
* The role and limitation of paper records
* Some considerations when implementing an IT system to replace paper forms
* Basics of Health Information Systems

**Module 4 - The Nervous System and Immunity**

* Lecture Seven: The Nervous System
* Lecture Eight: The Immune System

Learning Objectives:

* Recognition and understanding of the basic structure and functionality of the nervous system.
* An understanding of the pathophysiology of the nervous system together with common diagnostic methods and treatments
* An understanding of the development of the various cells of the blood, their relation to immunity, and to the established lymphoid structures including the lymphatics, lymph nodes, spleen, tonsils and thymus. The integration of the immune system with the barriers to the outside world: the skin, gut and respiratory epithelial lining.
* An understanding of the immune response to infection
* An understanding of the pathophysiology of the immune system together with common diagnostic methods and treatments
* Basic understanding of patient-facing software applications, such as personal health record

**Module 5 - Renal, Urinary and Reproductive Systems, and Cancer**

* Lecture Nine: The Renal and Urinary Systems
* Lecture Ten: Cancer

Learning Objectives:

* The structure, function and basic physiology of the renal and urinary systems
* Have a basic appreciation of the means to measure and image functions and pathologies of these systems
* An understanding of therapies available and possible medical interventions
* Understand the basics of how tumors arise: disposition and multi‐step insults to the cell
* Identify common diagnostic methods, treatments, and procedures associated with these disorders
* Imaging techniques to aid differentiation of normal tissue from neoplastic tissue
* Various possible human errors in healthcare delivery process

**Module 6 - The Endocrine System**

* Lecture Eleven: The Endocrine System in control of reproduction and development
* Lecture Twelve: The Endocrine System in control of normal physiology

Learning Objectives:

* Recognition of the fundamental importance of endocrine messaging to every stage of human development, subsequent homeostasis and reproduction.
* An appreciation of cascading errors of varying severity depending upon the level at which an endocrine pathway is disturbed.
* Diagnostic assays to assess endocrine malfunctions; integration of physical changes and biochemical parameters to conclude a differential diagnosis

Therapeutic options and measures of success

**Instructor Biography**

Adjunct Associate Professor

Derin B Keskin, Ph.D.

Derin Keskin is the Principal Scientist at The Translational Immunogenomics Lab (TIGL) of Dana Farber Cancer Institute. He is a T cell immunologist investigating vaccine development against viruses and cancers. He also teaches at Harvard Medical School, Denmark Technical University and Boston University. Derin earned his PhD discovering IDO inhibition of T cell immune responses in the laboratory of Andrew Mellor at the Medical College of Georgia in 2002. He did his postdoctoral studies in the laboratory of Jack Strominger at Harvard University and later in the Laboratory of Ellis Reinherz at Dana Farber Cancer Institute. Derin currently investigates neoantigen based cancer vaccines at Dana Farber Cancer Institute. He has authored over 90 peer-reviewed scientific publications and has multiple patents.

**Boston University Library Link**

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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. 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>.

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