



# BMEN 605

## Biomedical Imaging

### Syllabus, Fall 2021-22

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#### 1. Course Administration

**Course Coordinator:** Dr. Jason Amatory

**Email:** [ja106@aub.edu.lb](mailto:ja106@aub.edu.lb)

**Office:** Raymond Ghosn Bldg (RGB) 413

**Virtual Office:** <https://aub.webex.com/meet/ja106>

**Office hours:** Wed/Thurs 3:15-4.30pm or by email appointment

#### 2. Course Description [3 credits]

Biomedical imaging offers an unprecedented view into the structure and function of a living body, and as such plays an essential role in medical practice and research. This course will provide students with an overview of the key concepts underlying the primary diagnostic biomedical imaging modalities, including: ultrasound, x-ray, computed tomography and magnetic resonance imaging. Students will gain an understanding of the physical principles and theoretical bases governing the operation of each imaging modality, the technology that translates theory into practice, and the basic methods involved in image formation. Students will also learn the limitations of each imaging procedure, while being exposed to their applications in the clinic and research.

#### 3. Prerequisites

- Desirable
  - anatomy/physiology
  - undergraduate physics
  - signal processing & analysis

#### 4. Course Schedule

**Time:** TTr 2:00-3:15 pm

**Room:** IOEC 224C (when/if we return to campus)

In the first instance, course lectures will be delivered live online using Cisco WebEx (link available on Moodle), with recordings made available for subsequent access. If the situation permits and we return to campus, sessions will move to the allocated classroom.

## 5. Course Material

- Lecture notes and other selected material will be made available via Moodle
- There is no required textbook for the course, though the below will be regularly referenced and serve as great references (available via AUB library):
  - Bushberg, Jerrold T., and John M. Boone. The essential physics of medical imaging, 3<sup>rd</sup> ed., Lippincott Williams & Wilkins, 2011.
  - Suetens, Paul. Fundamentals of medical imaging, 2<sup>nd</sup> ed., Cambridge University Press, 2009.
  - Prince JL and Link JM. Medical imaging signals and systems, 2nd ed., Pearson, 2015.
  - McRobbie et al, MRI: From Picture to Proton, 3<sup>rd</sup> ed., Cambridge University Press, 2017

## 6. Course Learning Outcomes

By the end of this course, students should be able to:

- Describe the fundamental principles governing the operation of common imaging modalities
- Demonstrate an understanding of the concepts and methods in image acquisition and reconstruction
- Explain the basic engineering and technology underlying each imaging modality
- Critique each image modality in terms of advantages and disadvantages, limitations, and safety considerations
- Explain and evaluate the influences of image quality for each modality
- Describe clinical and research applications of each imaging modality

## 7. Course Schedule (subject to change)

- Part 1
  - Introduction to Biomedical Imaging
  - Image Properties and Quality
  - General overview of anatomy & physiology
- Part 2: Ultrasound Imaging
- Part 3: Planar Radiography (X-ray) Imaging
- Part 4: Computed Tomography (CT) Imaging
- Part 5: Magnetic resonance imaging (MRI)

*Note that for each imaging modality, we will essentially cover physics, image formation, technology and applications.*

## 8. Student Assessment (subject to change)

<b>Major Assignment</b>	<b>35%</b>
<b>Other Assignments/Quizzes</b>	<b>50%</b>
<b>Flipped classroom Assessment (“turning the table”)</b>	<b>10%</b>
<b>Participation (online discussion forums, in-class)</b>	<b>5%</b>

## 9. Moodle

You are expected to check Moodle (and email) daily for course updates. Moodle will host all course related material, including course announcements, online lecture/video links, lecture handouts, assignments, discussion forums, etc.

## 10. Course Evaluation

Student feedback helps to continually shape and refine courses offered by the biomedical engineering program. These can be provided directly to your instructor throughout the semester, or at the end of semester with the overall course evaluation that you will be requested to complete via AUB's Office of Institutional Research & Assessment (OIRA) system. You are highly encouraged to provide honest course evaluations and offer any additional comments and suggestions.

## 11. Academic Integrity

**Any act of cheating or plagiarism will not be tolerated.** An automatic zero will be applied to assessments where cheating or plagiarism are detected. Please refer to the student handbook on plagiarism for more information.

## 12. Academic Accessibility

AUB strives to make learning experiences as accessible as possible. If you anticipate or experience academic barriers due to a disability (including mental health, chronic or temporary medical conditions), please inform me immediately so that we can privately discuss options. In order to help establish reasonable accommodations and facilitate a smooth accommodations process, you are encouraged to contact the Accessible Education Office: [accessibility@aub.edu.lb](mailto:accessibility@aub.edu.lb); +961-1-350000, x3246; West Hall, 314.

## 13. Title IX, Non-Discrimination, and Anti-Harassment at AUB

AUB is committed to facilitating a learning environment that is free of all forms of prohibited discrimination. The University's non-discrimination policy and Title IX apply to, and protect, all students, faculty, and staff. Under Title IX, discrimination based on sex and gender, including sexual harassment, is prohibited. If you think you have experienced discrimination or harassment, including sexual misconduct, we encourage you to tell someone promptly. If you speak to a faculty or staff member about an issue such as harassment, sexual violence, or discrimination, the information will be kept as private as possible, however, faculty and designated staff are required to bring it to the attention of the University's Title IX Coordinator. Faculty can refer you to fully confidential resources, and you can find information and contacts at [www.aub.edu.lb/titleix](http://www.aub.edu.lb/titleix).

To report an incident, contact the University's Title IX Coordinator Mitra Taukat 01-350000 ext. 2514, [titleix@aub.edu.lb](mailto:titleix@aub.edu.lb), or a Deputy Title IX Coordinator ([www.aub.edu.lb/titleix-people](http://www.aub.edu.lb/titleix-people)).

Reports may be submitted anonymously (or not) online through EthicsPoint at [www.aub.ethicspoint.com](http://www.aub.ethicspoint.com).

***By signing up for this course, you confirm that you have read and accepted the terms and provisions of AUB's Privacy Statement.***