

GS02 1063: Fundamental anatomy, physiology, and biology for medical physicists

Syllabus, Fall Semester 2026

Lectures: MWF 8:00 – 9:00 am
FCT14.5059

Course coordinator

David Flint, Ph.D.

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Office

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Other lecturers as listed on schedule

Office hours

Contact dbflint@mdanderson.org to make an appointment.

GSBS important dates

August 31, 2026: Classes start

September 7, 2026: Labor Day holiday

November 26-27, 2026: Thanksgiving Holiday

December 11 2026: Last day of classes

Grades

Final grades will be based on the following weighting:

Exams (75%), quizzes (10%), assignments (10%), and participation (5%)

Exams (75%)

Each exam will be weighted equally.

Assignments, quizzes, participation (25%)

A variety of activities other than formal exams will be used to engage students and assess class progress. Of course, you must be present to participate.

Grading scale

A: 86.7 – 100

B: 73.3 – 86.6

C: 60 – 73.2

F: < 60

Textbooks

Required:

Basic Clinical Radiobiology (5th ed.), Michael Joiner and Albert van der Kogel. CRC Press (2018) ISBN 9781444179637

Highly recommended:

Molecular Biology of the Cell (7th ed.), Bruce Alberts et al. Garland Science (2022) ISBN 0393884821

The Biology of Cancer (2nd ed.), Robert A. Weinberg. Garland Science (2013) ISBN 9780815342205

You might find these useful:

Lehninger Principles of Biochemistry (8th ed.), David L. Nelson, Michael M. Cox (2021) ISBN 1319228003

Lippincott Illustrated Reviews: Biochemistry (8th ed.), Abali et al. Lippincott, Williams, & Wilkins (2021) ISBN 9960717313

It should be noted that our knowledge of the subjects covered by these textbooks, for the most part, does not evolve at such a rate that past editions become obsolete within a year. Thus, an edition within 1 or 2 of the current one should suffice.

Online resources:

www.openstax.org

<https://www.ncbi.nlm.nih.gov/books/>

Earlier editions of Molecular Biology of the Cell are available from NCBI bookshelf, and maybe others.

<https://www.imaios.com/en/e-Anatomy>

(must be connected to MD Anderson network to access e-Anatomy for free)

Course materials

This course uses Canvas to organize all course materials.

Learning objectives

1. Review basic biochemistry, cellular physiology, and cellular biology to form a foundation for understanding the application of these principles to medical physics.
2. Discuss how cells interact with other cells and the extracellular matrix and how such interactions lead to the formation and repair of tissues.
3. Examine the response of cells and tissues to radiation.
4. Combine these principles to understand how radiation is used to treat cancer and how it affects normal tissues.

Date	Lecture Title	Lecturer(s)	Comment
8/31/2026	Welcome / Basic Biochemistry and Biomolecules	Flint	
9/2/2026	Thermodynamics and Bioenergetics	Flint	
9/4/2026	Enzymes and Kinetics	Flint	
9/7/2026	HOLIDAY – NO CLASS	Labor Day	
9/9/2026	The eukaryotic cell	Jones	TBD
9/11/2026	DNA and the genome	Bright	TBD
9/14/2026	Protein synthesis	Tang	
9/16/2026	Cellular energetics and glycolysis	S Millward	TBD
9/18/2026	Aerobic respiration and anaerobic glycolysis	NZ Millward	TBD
9/21/2026	Non-carbohydrate metabolism	S Millward	TBD
9/23/2026	Regulation and dysregulation of metabolism	NZ Millward	TBD
9/25/2026	Metabolism problem session	Millwards	TBD
9/28/2026	EXAM 1		
9/30/2026	The cell cycle and mitosis	Jones	TBD
10/2/2026	Immunology and the immune system I	Jones	TBD
10/5/2026	Immunology and the immune system II	Jones	TBD
10/7/2026	Cell death: Apoptosis, autophagy, and necroptosis (with specific mention of radiation)	S Millward	TBD
10/9/2026	Cancer biology I	Flint	
10/12/2026	Cell-cell and cell-substratum interactions	Farach-Carson	
10/14/2026	Cell interactions with extracellular matrix	Farach-Carson	
10/16/2026	Cell communications in complex tissues	Farach-Carson	
10/19/2026	Controls of cell fate and decision making	Farach-Carson	
10/21/2026	Cell and matrix responses to stress: wound healing	Farach-Carson	
10/23/2026	Cancer biology II (incl. stem cells)	Farach-Carson	
10/26/2026	EXAM 2		
10/28/2026	Introduction to radiobiology and significance of radiotherapy for cancer treatment	Flint	
10/30/2026	Target theory and cell survival curves	Flint	
11/2/2026	DNA maintenance and repair, with specific consideration of cell response to radiation	Bright	
11/4/2026	LET and RBE	Sawakuchi	TBD
11/6/2026	Radiochemistry	Flint	
11/9/2026	QUIZ 1		
11/11/2026	Dose-response relationships in radiotherapy	Flint	
11/13/2026	Response of tumors to radiation	Flint	
11/16/2026	Fractionation: the linear quadratic approach	Flint	
11/18/2026	The linear quadratic approach in clinical practice	Flint	
11/20/2026	Modified fractionation	Flint	
11/23/2026	The dose rate effect	Flint	
11/25/2026	NO CLASS	NO CLASS	
11/27/2026	HOLIDAY - NO CLASS	NO CLASS	

11/30/2026	The oxygen effect and therapeutic approaches to tumor hypoxia	Scheuler	TBD
12/2/2026	FLASH radiotherapy	Schueler	TBD
12/4/2026	Outcome Prediction Modeling Part I	Niedzielski	TBD
12/7/2026	Outcome Prediction Modeling Part II	Niedzielski	TBD
12/9/2026	Pathogenesis of normal tissue side effects and time factors in normal tissue response to radiation & re-radiation--Dose-toxicity concepts for clinical physicists. Part I	Fuller	TBD
12/11/2026	Pathogenesis of normal tissue side effects and time factors in normal tissue response to radiation & re-radiation--Dose-toxicity concepts for clinical physicists. Part II	Fuller	TBD
TBD	FINAL EXAM		