IMPORTANT: This syllabus form should be submitted to OAA (gsbs_academic_affairs@uth.tmc.edu) a week before the start of each semester.

NOTE to STUDENTS: If you need any accommodations related to attending/enrolling in this course, please contact one of the Graduate School's 504 Coordinator, Natalie Sirisaengtaksin, PhD. We ask that you notify GSBS in advance (preferably at least 3 days before the start of the semester) so we can make appropriate arrangements.

Term and Year: **Fall 2025** Course Number and Course Title: **GS02 1193 Introduction to Medical Physics IV: The Physics of Nuclear Medicine** Credit Hours: **3** Meeting Location: **MD Anderson Main Main Bldg.** Building/Room#: **CPB5.3312** WebEx/Zoom Link: **N/A**	Program Required Course: **Yes** Approval Code: **Yes** **(If yes,** the Course Director or the Course Designee will provide the approval code.) Audit Permitted: **Yes** Classes Begin: **August 25, 2025** Classes End: **December 3, 2025** Final Exam Week: **December 8-12, 2025**

Class Meeting Schedule

Day	Time
Monday/Wednesdays	**2:00-3:30**

Course Director:

Name and Degree: **Rachel Barbee, PhD**
Title: **Associate Professor**
Department: **Imaging Physics**
Institution: **MDACC**
Email Address: **rbarbee@mdanderson.org**
Contact Number: **(713) 563-4712**

Course Co-Director/s: (if any)

Name and Degree: **Richard Wendt, PhD**
Title: **Professor**
Department: **Imaging Physics**
Institution: **MDACC**
Email Address: rwendt@mdanderson.org
Contact Number:

Instructors:

1. **Rachel Barbee, PhD**
   Institution: MD Anderson
   Email Address: rbarbee@mdanderson.org
2. **Richard Wendt, PhD**
   Institution: MD Anderson
   Email Address: rwendt@mdanderson.org
3. **William Erwin, MS**
   Institution: MD Anderson
   Email Address: werwin@mdanderson.org
4. **Osama Mawlawi, PhD**
   Institution: MD Anderson
   Email Address: OMawlawi@mdanderson.org
4. **Tinsu Pan, PhD**

NOTE: Office hours are available by request. Please email me to arrange a time to meet.

Teaching Assistant: (if any)

N/A
Name and Email Address

Institution: MD Anderson

Email Address: TPan@mdanderson.org

5. **Jim Simon, PhD**

Institution: Iso Therapeutics

Email Address: jimsimon@isotherapeutics.com

6. **Charles H. Manning, PhD**

Institution: MD Anderson

Email Address: HCManning@mdanderson.org

7. **Raymond Pahlka, PhD**

Institution: Texas Childrens Hospital

Email Address: rbpahlka@texaschildrens.org

8. Carly Hansen, MS

Institution: Texas Childrens Hospital

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9. **Benjamin Lopez, PhD**

Institution: MD Anderson

Email Address: bplopez@mdanderson.org

Course Description:

This course teaches the principles of medical physics that apply to nuclear medicine in both its diagnostic and therapeutic aspects. The fundamentals of atomic and nuclear physics, radioactive decay, and radiation detection are applied to the instrumentation that is used in nuclear medicine for quality control, non-imaging physiological measurements, and the imaging of single photon emissions and positron emissions using planar and tomographic acquisition means including X-ray computed tomography for attenuation correction and anatomical correlation. Radiopharmaceutical chemistry is introduced. Radiation internal dosimetry is developed and applied to therapeutic treatment planning.

Textbook/Supplemental Reading Materials (if any)

Simon R. Cherry, James A. Sorenson and Michael E. Phelps, *Physics in Nuclear Medicine: Fourth Edition*, Philadelphia: W.B. Saunders, 2012, ISBN 9781416051985. ~$130 [freely available from The Research Medical Library at MD Anderson Cancer Center]

Dale L Bailey, David Townsend, Peter E Valk, Michael N Maisey, *Positron Emission Tomography*, Springer London, 2005, ISBN 978-1-85233-485-7. ~$200

Jerrold T. Bushberg, J. Anthony Seibert, Edwin M. Leidholdt, Jr., and John M. Boone, *The Essential Physics of Medical Imaging*, 4th Ed., Philadelphia: Wolters Kluwer | Lippincott, Williams & Wilkins, 2011, ISBN 978-1975103224. ~$212 [BB in the readings]

SNMMI MIRD Committee, *MIRD Primer 2022*: *A complete guide to radiopharmaceutical dosimetry*, Society of Nuclear Medicine and Molecular Imaging. 2022 ISBN 9780932004031

Supplemental

Fred Mettler and Milton Guiberteau, *Essentials of Nuclear Medicine and Molecular Imaging*, 7th Ed., Saunders, 2018, ISBN 978-0323483193

Robert E. Henkin, et al., eds., *Nuclear Medicine*, St. Louis: Mosby, 1996, ISBN 0-8016-7701-7, Chapters 1-39 for basic science and others for clinical background.

Course Objective/s:
***Specific Learning Objectives*:**

1. Understand the physics and operation of clinical nuclear medicine and PET equipment.
2. Understand basic principles of radionuclide production and radiopharmaceutical chemistry.
3. Understand basic dosimetry of radiopharmaceutical therapy
4. Perform basic absorbed dose estimates for patients administered radiopharmaceuticals for therapy.

Student Responsibilities and Expectations:

1. Participate in and contribute to course discussions during lecture and review sessions.
2. Participate in lab sessions and prepare lab reports.
3. Prepare for and take a final examination based on the lecture and some reading material.

Students are expected to complete all assigned reading material prior to class. While you may work and discuss all course materials and assignments in groups, all writing assignments must be your own. Plagiarism and failure to properly cite scientific literature and other sources will not be tolerated and are grounds for dismissal from the course and further GSBS disciplinary action. Cheating or engaging in unethical behavior during examinations (quizzes and final) will be grounds for dismissal from the course without credit and further GSBS disciplinary action.

Grading System: Letter Grade (A-F)

Student Assessment and Grading Criteria : *(May include the following:)*

Percentage	Description
Midterm Exams (25 %)	
Final Exam (25 %)	
Lab Session + Report (25 %)	
Participation and/or Attendance (25 %)	

CLASS SCHEDULE

Date	Duration (Hour(s) taught by lecturer)	Lecture Topic	Lecturer/s
25 Aug	**1.5**	Course Overview & Review of Atomic and Nuclear Physics and Radioactive Decay	RB
27 Aug	**1.5**	Characteristics of Digital Images	RW
3 Sep	**1.5**	Radiation Detection and Counting Statistics	RP
8 Sep	**1.5**	Non-imaging Instrumentation	RB
10 Sep	**1.5**	Non-imaging Instrumentation Lab	RB, WE
15 Sep	**1.5**	Radionuclide Production and Characteristics	CM
17 Sep	**1.5**	Radiopharmaceutical Chemistry	JSi
22 Sep	**3**	Basic Radiolabeling Lab	JSi, RB, RW
24 Sep	**1.5**	Gamma Camera I	CM
29 Sep	**1.5**	Gamma Camera II	RW
1 Oct	**3**	Gamma Camera Lab	WE, RB, RW
6 Oct	**3**	Backprojection SPECT Reconstruction	WE
8 Oct	**1.5**	Iterative SPECT Reconstruction	WE
13 Oct	**1.5**	SPECT Lab	WE, RW, RB
15 Oct	**1.5**	Nuclear Medicine Quality Control	BL
20 Oct	**1.5**	NM Applications	RB
22 Oct	**3**	First Examination	RB
27 Oct	**1.5**	Hybrid Imaging I	TP
29 Oct	**1.5**	Hybrid Imaging II	TP
3 Nov	**1.5**	Positron Emission Tomography I	OM
5 Nov	**1.5**	Positron Emission Tomography II	OM
10 Nov	**1.5**	Positron Emission Tomography III	OM
12 Nov	**3**	PET and PET/CT Lab	TP, OM
17 Nov	**1.5**	Internal Dosimetry – I	RW
19 Nov	**1.5**	Internal Dosimetry - II	RW
24 Nov	**1.5**	Y-90 Lab	BL
1 Dec	**3**	Radionuclide Therapy Treatment Planning Lab	WE
3 Dec	**3**	Radionuclide Therapy Treatment Planning	WE
8 Dec	**1.5**	Final Exam	RB

RB/jal