

**IMPORTANT:** This syllabus form should be submitted to OAA ([gsbs\\_academic\\_affairs@uth.tmc.edu](mailto: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 Coordinators, Cheryl Spitzengerger or Natalie Sirisaengtaksin. 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.

<p><b>Term and Year:</b> Fall 2023 course</p> <p><b>Course Number and Course Title:</b> GS02 1202: Electronics for Medical Physics</p> <p><b>Credit Hours:</b> 2</p> <p><b>Meeting Location:</b> MD Anderson Cancer Center <span style="float: right;">+</span></p> <p><b>Building/Room#:</b> FCT14.5059</p> <p><b>WebEx/Zoom Link:</b> by invitation</p>	<p><b>Program Required Course:</b> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p><b>Approval Code:</b> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>(If yes, the Course Director or the Course Designee will provide the approval code.)</p> <p><b>Audit Permitted:</b> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p><b>Classes Begin:</b> August 29, 2023</p> <p><b>Classes End:</b> December 5, 2023</p> <p><b>Final Exam Week:</b> December 11-15, 2023</p>
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**Class Meeting Schedule**

Day	Time
Tuesdays	9:00AM - 10:00AM
Thursdays	8:45AM - 9:45AM

<p><b>Course Director</b> Name and Degree: Xinming Liu, Ph.D. Title: Professor Department: Imaging Physics Institution: <input type="checkbox"/> UTH <input checked="" type="checkbox"/> MDACC Email Address: xliu@mdanderson.org Contact Number: (713)745-2834 <span style="float: right;">+</span></p> <p><b>Course Co-Director/s:</b> (if any) Name and Degree: Title: Department: Institution: <input type="checkbox"/> UTH <input type="checkbox"/> MDACC Email Address: Contact Number:</p> <p><b>Office Hours:</b> Office hours are available by request.  Please email me to arrange a time to meet.</p>	<p><b>Instructor/s</b> (Use additional page as needed)</p> <ol style="list-style-type: none"> <li>1. Name and Degree: Jim Bankson, Ph.D. Institution: MDACC Email Address : jbankson@mdanderson.org</li> <li>2. Name and Degree: Richard Bouchard, Ph.D. Institution: MDACC Email Address : RRBouchard@mdanderson.org</li> <li>3. Name and Degree: Xinming Liu, Ph.D. Institution: MDACC Email Address: xliu@mdanderson.org</li> <li>4. Name and Degree: Ramesh Tailor, Ph.D. Institution: MDACC Email Address: rtailor@mdanderson.org</li> </ol>
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**Cont. Instructor/s**

5. Name and Degree:

Institution:

Email Address:

**Course description:**

GS02-1202 Electronics for Medical Physicists covers the topics in electric elements, DC & AC circuits, basis of semiconductor components and working principle, integrated circuits, basic analog electronics and digital logic and their applications for non-EE majors.

**Textbook/Supplemental Reading Materials (if any)**

- Textbook: Electrical Engineering Principles & Applications, Allan Hambley, Prentice-Hall
- Supplemental Reading Materials: The Art of Electronics, Paul Horowitz and Winfield Hill, Cambridge
- Supplemental Reading Materials: Basic Electronics for Scientists, James Brophy, McGraw-Hill
- Supplemental Reading Material: The Essential Physics of Medical Imaging (Bushberg) Chapter 12: Ultrasound

**Course Objective/s:**

Upon successful completion of this course, students will

learn DC/AC components, DC/AC circuits, analysis and applications; types of semiconductor components and working principles; analog and digital circuits and applications. Students will also learn how to build basic electronic circuits and the operation of testing equipment.

***Specific Learning Objectives:***

1. Understand DC component, voltage, current, and power; Kirchoff's law; node analysis; mesh analysis.
2. Understand AC components, complex impedance, and frequency response; AC voltage, current, and power analysis.
3. Understand types of semiconductor components and working principles – diode, transistor, integrated circuit; op-amps circuits and applications.
4. Understand Boolean logic, logical operators, coding schemes; digital combinational circuits; digital sequential circuits.
5. Applications in medical physics; computer-based instrumentation systems.

<b>Grading System:</b> <input checked="" type="checkbox"/> Letter Grade (A-F) <input type="checkbox"/> Pass/Fail	
<b>Student Assessment and Grading Criteria :</b> (May include the following:)	
Homework ( 15 %)	Description
Quiz ( 10 %)	Description
Presentation ( %)	Description
Midterm Exams ( 30 %)	Description Consists of two midterm exams, 15% each
Final Exam ( 25 %)	Description
Workshop or Breakout-Session ( 20 %)	Description Consists of 3 hands-on labs
Participation and/or Attendance ( %)	Description

### CLASS SCHEDULE

Day/Date	Duration [Hour(s) taught by lecturer]	Lecture Topic	Lecturer/s
8/29	1	DC voltage, current, and power; resistors; Kirchoff's law	Dr. Liu
8/31, 9/5. 9/7	3	DC Circuit and Analysis	Dr. Liu
9/12, 14	2	Reactive Elements	Dr. Liu
9/19, 21, 26	3	AC Circuits and Analysis & Applications	Dr. Liu
9/28	2	Lab 1:Lab Equipment & Safety; Resonance (2-3 groups	Dr. Bankson
10/3	1	Transformers	Dr. Liu
10/5	2	Exam 1: DC/AC Circuits and Analysis	Dr. Liu

10/10, 12	2	Introduction to Diodes and Diode Circuits	Dr. Liu
10/17, 19	2	Amplifiers & Op-Amps and applications	Dr. Liu
10/24	2	Lab 2: Rectification, Operational Amplifiers (2-3 groups)	Dr. Liu
10/26, 31	2	Transistors	Dr. Liu
11/2, 7	2	Introduction to Digital Electronics	Dr. Liu
11/9	2	Exam 2: Diodes & Rectification, Amplifiers, and Transistors	Dr. Liu
11/14, 16, 21	3	Analog & Digital Signals; transducers; noise; RF basics	Dr. Liu
11/28	2	Lab 3: RF Properties of Nuclear Imaging Systems	Dr. Taylor
11/30	1	Applications: Electronics of Ultrasound	Dr. Bouchard

12/5	1	Applications: Electronics of MRI	Dr. Bankson
12/7		No class	
12/12	1	Course Review	Dr. Liu
12/14	2	FINAL EXAM: 9:00 – 11:00AM	Dr. Liu

**GRADES DUE DATE: December 19, 2023**