

Spring 2023

**Fundamentals of Computed Tomography and Ultrasound Imaging**

ENU 6652; 3 Credits

**CLASS MEETING INFO**

Tuesdays and Thursdays 9:30 AM to 10:45 AM

Communicore C2-33

**INSTRUCTORS**

Manuel Arreola, Ph.D. (email: [arreom@radiology.ufl.edu](mailto:arreom@radiology.ufl.edu) )

Izabella Barreto, Ph.D. (email: [Izabella.Barreto@radiology.ufl.edu](mailto:Izabella.Barreto@radiology.ufl.edu))

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TA: Graham Stoddard, MS (email: [graham.stoddard@ufl.edu](mailto:graham.stoddard@ufl.edu))

Office Hours: By appointment

**PRE-REQUISITES**

ENU 6657

**OBJECTIVES**

To provide a understanding of the fundamental concepts of CT and Ultrasound Imaging together with a brief history and new technologies overview. Both scan acquisition and reconstruction parameters are covered in detail.

**REQUIRED TEXTBOOK**

The Essential Physics of Medical Imaging, 4th Edition, by Bushberg, Seibert, Leidholdt Jr. and Boone. Wolters Kluwer (2021)

**EVALUATION OF GRADES**

Assignment	Percentage of Final Grade
Homework	10%
Exam 1	30%
Exam 2	30%
Exam 3	30%
	<b>Total: 100%</b>

**GRADING POLICY**

Percent	Grade
93-100	A
90-92	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-
67-69	D+
63-66	D
60-62	D-
59 & below	E

More information on UF grading policy may be found at: <http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

## COURSE SCHEDULE

	Date	Topic	Chapter	By
1	Tu 1/10/23	Laminar Tomography & Basics of X-Ray Cross-Sectional Imaging	10	MA
2	Th 1/12/23	CT Algebraic & Simple Back-Projection Reconstruction Algorithms	10	MA
3	Tu 1/17/23	Filtered Back-projection, Fourier Transforms and Kernels	10	MA
4	Th 1/19/23	Iterative Reconstruction Algorithms	10	MA
5	Tu 1/24/23	<i>Sequential and Helical Scanners</i>	10	MA
6	Th 1/26/23	<i>Narrow and Broad-beam Multi-slice Scanners</i>	10	MA
	Tu 1/31/23	<b>Exam 1 (Lectures 1-6)</b>		
7	Th 2/2/23	Clinical CT Lecture – <i>watch recording (from home)</i>	10	IB
8	Tu 2/7/23	Image Quality in CT	10	IB/Graham
9	Th 2/9/23	CT Dose Indicators – <i>watch recording (from home)</i>	11	IB
10	Tu 2/14/23	Demo lab: Image Quality & Dose	10/11	IB
11	Th 2/16/23	Management of CT in the Clinical Setting	10	IB
12	Tu 2/21/23	Protocol Optimization & Pediatric CT	10	IB
13	Th 2/23/23	Cone Beam CT and Cardiac CT	10	IB
14	Tu 2/28/23	CTA, Perfusion, Dual Energy CT	10	IB/Aroon
15	Th 3/2/23	CT Artifacts	10	IB
16	Tu 3/7/23	Joint Commission and ACR Compliance in CT	10	IB/Mercy
	Th 3/9/23	<b>Exam 2 (Lectures 7-15)</b>		
	Tu 3/14/23	<i>No Class – Spring Break</i>		
	Th 3/16/23	<i>No Class – Spring Break</i>		
17	Tu 3/21/23	Fetal dose calculations in Radiology 1		IB
18	Th 3/23/23	Fetal dose calculations in Radiology 2		IB
19	Tu 3/28/23	Ultrasound: Basic Acoustics and Transducers	14	LR
20	Th 3/30/23	Pulsed Ultrasound and Image Formation	14	LR
21	Tu 4/4/23	Imaging modes: multi-frequency, harmonics, Doppler	14	LR
22	Th 4/6/23	Ultrasound Image Quality and QC	14	LR
23	Tu 4/11/23	Demo Lab: Ultrasound QC (in class)	14	LR/MA
24	Th 4/13/23	Ultrasound Artifacts	14	LR
25	Tu 4/18/23	Newer Ultrasound techniques	14	LR
	Th 4/20/23	Makeup day if necessary		
	Th 4/25/23	<b>Exam 3 (Lectures 17-25)</b>		

## **ATTENDANCE POLICY; CLASS EXPECTATIONS; MAKE-UP POLICY**

Students are expected to attend each class period. Periods which may be missed should be brought to the attention of the Instructor as far in advance of the class period as possible. In the event of an unexcused absence, it is the student's responsibility to obtain and review the material that was covered during that class period. Excused absences must be consistent with university policies in the Graduate Catalog and require appropriate documentation:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>

Class distractions such as cell phones and pagers are unacceptable. Students will ensure that any such devices that are brought into the classroom will be turned off, or operated in a silent mode, during the class period.

Make-up assignments will only be considered for exceptional circumstances and will be implemented by the instructor on a case-by-case basis.

## **STUDENTS REQUIRING ACCOMMODATIONS**

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565; <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

## **EVALUATIONS**

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

## **UNIVERSITY HONESTY POLICY**

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

## **SOFTWARE USE**

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

## **STUDENT PRIVACY**

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

## CAMPUS RESOURCES

### Health and Wellness

#### **U Matter, We Care**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

#### **Counseling and Wellness Center**

352-392-1575; <http://www.counseling.ufl.edu/cwc>

#### **Sexual Assault Recovery Services (SARS)**

352-392-1161; Student Health Care Center

#### **University Police Department**

352-392-1111 (or 911 for emergencies); <http://www.police.ufl.edu/>

### Academic Resources

#### **E-learning Technical Support**

352-392-4357 (select option 2); [learning-support@ufl.edu](mailto:learning-support@ufl.edu); <https://lss.at.ufl.edu/help.shtml>

#### **Career Resource Center**

Career assistance and counseling.

352-392-1601; Reitz Union; <https://www.crc.ufl.edu/>

#### **Library Support**

Various ways to receive assistance with respect to using the libraries or finding resources.

<http://cms.uflib.ufl.edu/ask>

#### **Teaching Center**

General study skills and tutoring.

352-392-2010 or 352-392-6420; Broward Hall; <https://teachingcenter.ufl.edu/>

#### **Writing Studio**

Help brainstorming, formatting, and writing papers.

352-846-1138; 302 Tigert Hall; <https://writing.ufl.edu/writing-studio/>

#### **Student Complaints Campus**

[https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf)

#### **On-Line Students Complaints**

<http://www.distance.ufl.edu/student-complaint-process>