Computers in Radiation Therapy

The University of Toledo
Graduate Medical Physics
MPHY 6/8260, 55876/55877, Section 1

Name:	Nicholas Sperling, Ph.D.	**Offered**:	Fall 2021
Email:	Nicholas.Sperling@utoledo.edu	**Class Location**:	UT HSC DCC 2050G
Office Location:	HSC DCC 2050D	**Class Day/Time**:	T 9:00am - noon
Office Hours:	MR 10am - noon	**Credit Hours**:	2.0
Instructor Phone:	419 383 3599		

SPECIAL COURSE EXPECTATIONS DURING COVID-19

ATTENDANCE

The University of Toledo has a missed class policy. It is important that students and instructors discuss attendance requirements for the course. Students must perform a daily health assessment, based on based on **CDC guidelines,** before coming to campus each day, which included taking their temperature. Students who are symptomatic/sick should not come to class and should contact the Main Campus Health Center at 419-530-3451. *Absences due to COVID-19 quarantine or isolation requirements **are** considered excused absences*. Students should notify their instructors and these absences may not require written notice.

FACE COVERINGS

All students must wear face coverings while on campus, except while eating, alone in an enclosed space, or outdoors practicing social distancing. NO students will be permitted in class without a face covering. If you have a medical reason that prevents you from wearing a face covering due to a health condition deemed high-risk for COVID-19 by the Centers for Disease Control and Prevention (CDC), you should submit a request for an accommodation through the Student Disability Services Office (SDS) by completing the online application. Students will need to provide documentation that verifies their health condition or disability and supports the need for accommodations. If a student is already affiliated with SDS and would like to request additional accommodations due to the impact of COVID-19, should contact their accessibility specialist to discuss their specific needs.

SOCIAL DISTANCING

Students should practice social distancing inside and outside the classroom please follow signage and pay attention to the seating arrangements. Do not remove stickers or tape from seats and/or tables, this is there to provide guidance on the appropriate classroom capacity based on the recommended 6 feet of social distancing between individuals. Please be conscious of your personal space and respectful of others. Also be cognizant of how you enter and exit the room; always try to maintain at least 6 feet of distance between yourself and others.

DESKS AND WORK SPACES

Students will need to sanitize their desks and/or work space before class with the University provided sanitizing spray and paper towels their desks.

SPECIAL NOTES

It's important to note that based on the unpredictability of the COVID-19 virus things can change at any time so please be patience and understanding as we move through the semester. I also ask that you keep me informed of concerns you may have about class, completing course work/assignments timely and/or health concerns related to COVID.

CATALOG/COURSE DESCRIPTION

Computer fundamentals and problem solving through programming. Typical problems include PDD, TAR, TMR, MU calculations, scatter summation, TMR for arc and dose distributions.

COURSE STATEMENT

Computers in Radiation Therapy is a clinical course designed for MSBS/Ph.D. students in clinical radiation oncology physics track. It is designed to introduce students to the internal functions of computers and the system architectures and how they are used in the clinical environment. The course education will consist primarily of 3 hour lectures once a week, with supplemental material provided for further study. The goal of the course is to provide the student with a broad overview of how computers work, and how they are used in the modern clinical environment.

STUDENT LEARNING OUTCOMES

1. Analyze how computers work
2. Describe how computers can be used to solve clinical issues
3. Differentiate between the hardware and software of computers
4. Identify a task that can be done by a computer
5. Explain how computers are used to solve existing problems
6. Relate areas of computer systems to standard terminology

PREREQUISITES AND COREQUISITES

None

REQUIRED INSTRUCTIONAL MATERIALS (TEXTS AND ANCILLARY MATERIALS)

None

TECHNOLOGY EXPECTATIONS

Access to a computer system is expected. The final primary course material will not require access to a computer to complete, though supplementary materials will be electronic. The final project involves the design of a technological solution, but implementation is encouraged but not required.

UNIVERSITY POLICIES

Policy Statement on Non-Discrimination on the Basis of Disability (ADA)*

The University is an equal opportunity educational institution. Please read The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance.

Students can find this policy along with other university policies listed by audience on the University Policy webpage (http://www.utoledo.edu/policies/audience.html/#students).

Academic Accommodations

The University of Toledo embraces the inclusion of students with disabilities. We are committed to ensuring equal opportunity and seamless access for full participation in all courses. For students who have an accommodations memo from Student Disability Services, I invite you to correspond with me as soon as possible so that we can communicate confidentially about implementing accommodations in this course. For students who have not established affiliation with Student Disability Services and are experiencing disability access barriers or are

interested in a referral to healthcare resources for a potential disability or would like information regarding eligibility for academic accommodations, please contact the Student Disability Services Office (http://www.utoledo.edu/offices/student-disability-services/) by calling 419.530.4981 or sending an email to StudentDisability@utoledo.edu.

ACADEMIC POLICIES

As a student in my course and enrolled at The University of Toledo you should be familiar with the policies that govern the institution's academic processes, for example, Academic Dishonesty, Enrollment Status, and Grades and Grading. Please read Graduate Academic Policies.

OVERVEW OF COURSE GRADE ASSIGNMENT

Grades will be based on homework assignments, examination scores, and final project scores.

Midterm Grading

Midterm grading will be entered the 8th week of and are used to assist students with determining where they stand academically in the course. Attendance is also recorded during Midterm grading to meet state and federal laws regarding financial aid disbursement. Please note, if you are not attending class it could impact your financial aid (scholarships, grants, loans or Federal Work Study).

If you decide you are not going to attend this class (or any other class you have registered for), you must formally withdraw (drop) from the course. You can do this by logging onto the myUT portal, clicking on the "Student" tab, and then under My Toolkit clicking on Register/Drop/Withdraw.

For more information about add/drop dates please visit the Registrar's Office online at: http://www.utoledo.edu/offices/registrar/registration_dates.html.

Final Grading

Final grades will be calculated as follows:

(Assessment Measures) Assignments/Exercises/Exams	Percentage of Final Grade	SLO Alignment
Mid Term Exam	25%	SLOs 1 – 5
Final Exam	25%	SLOs 6 – 9
Project	50%	Any SLO
Total	**100%**	**All SLOs**

Assignments/Assessment Descriptions

Project (50% of final grade): Each student is expected to identify a task which could be solved through the use of a computer. The student is expected to create a document describing the task and describing the design of a method of completing the task using a computer. It is expected that the student will attempt to implement the described method. The report will be graded on how well the student considers the problem to be solved, and how a computer might be used to complete the task. Extra credit consideration will be given for a functioning solution, but it is not required that the implementation be complete or functional.

Examinations (25% of final grade, each): There will be two exams, one at the mid-term point, and one at the conclusion of the course. **The midterm exam** will cover the first five lectures. **The final exam** will cover the final 4 lectures, though material in those lectures will build heavily on the concepts from the first half of the course. Each exam will take the entire allotted time and may include multiple-choice questions, matching, short answer, and three essay questions.

COURSE GUIDELINES

As the final project in this course is intentionally very open ended, I strongly encourage students to reach out to me and discuss their project choice and how they intend to complete it. I am happy to assist in any way needed in completing the project, including providing advice and suggestions for how to solve the task, or suggestions for what task might be in need of a solution.

ACADEMIC SUPPORT SERVICES

Please follow this link to view a comprehensive list of Student Academic and Support Services (http://www.utoledo.edu/studentaffairs/departments.html) available to you as a student.

SAFETY AND HEALTH SERVICES FOR UT STUDENTS

Please use the following link to view a comprehensive list Campus Health and Safety Services available to you as a student.

COURSE SCHEDULE

SCHEDULE	TOPIC	LEARNING OUTCOME
Week 1	Machine Representation of Data & OSI	Overview of data representation, digitization, and organization of IT concepts.
Week 2	Digital and Transistor Logic Overview	Review of digital/transistor logic, as well as how computational systems may be created from simple components.
Week 3	Computer Systems (Architecture, components, and design)	Lecture will cover the core components of a computer, discussing details of component communication and particular implementations of note.
Week 4	Hardware Layer Interfaces	Overview of connections between core computer system components
Week 5	Data storage systems and technology	Discuss how data is stored on the system, including hardware features. Discussion of data integrity and retention.
Week 6	Operating Systems Overview and Programming Concepts	Explain function of the operating system, how it works, and how programs interact with it. Explain general concepts of programming, beginning with ASM
Week 7	Programming Languages	Give broad overview of general categories of programming languages, and look into specific examples of some languages.
Week 8	Mid-term Examination	
Week 9	Computer networking and Intersystem communication	Discuss how computers are networked together and how they communicate over those networks. Discussion will include details of OSI Layers, TCP/IP, HL7, DICOM and DICOM-RT, IHE-RO
Week 10	Algorithms and Discretization	Discuss particular algorithms used in radiation oncology, giving an overview of their implementations, and how those implementations affect their accuracy. This will include dose calculation algorithms, optimization algorithms, and general numerical computation.
Week 11	Information Systems and Databases	Begin discussion of system design for information systems. Overview of relational databases, including discussion of Structured query language. Discussion of what BIG DATA is, and how it can be used. Discussion of Radiation Oncology Informatics systems, including PACS
Week 12	Data Handling – Visualization, manipulation, etc.	Overview of various packages and tools which can be used to handle datasets. This includes statistical packages for handling very large datasets, visualization tools, and data 'pipelines.'
Week 13	Common Tools – Power use	Overview of the typical tools needed in a computer environment. Includes laboratory instruction time.
Week 14	Final Project Workshop	
Week 15	Project Presentations	
Final Exam	**Final Examination**	Exam over last four lectures