

School of Applied Engineering & Technology Fenster Hall Suite 200 Phone: 973.596.3228 Fax: 973.624.4184 Email: EngineeringTechnology@njit.edu

NEWARK COLLEGE OF ENGINEERING

SYLLABUS AND COURSE INFORMATION

Instructor Information:

Name:	Chang Yaramothu, PhD		
Email:	Chang.yaramothu@njit.edu	Phone:	973-642-4844
Office:	Fenster 220 (Virtual Appointments Preferred)		
Office Hours:	Wednesdays 9:00AM – 10:00AM		

Course Information:

Course Name:	Applied Biomedical Data Acquisition			
Course Number:	BMET 320-002			
Course Structure:	2-2-3 (lecture hr/wk – lab hr/wk – course credits)			
Meeting Times:	Day	Meeting Time	Building	Room
	Monday	10:00AM - 11:55AM	GITC	Makerspace Training Room
	Wednesday	10:00AM - 11:55AM	GITC	Makerspace Training Room
Course Description:	This course introduces students to various imaging systems and modalities including MRI, Ultrasound, and X-Ray systems. They will also be introduced to sensors used for physiologic measures including EKG, motion trackers, and optical/infrared sensors. Students will learn not only how to collect the data but how to analyze through various techniques including signal processing and Computer Aided Design. Relevant biologic information will be covered in the context of the system discussed. This course contains a lecture and applied laboratory to reinforce concents			
Prerequisites:	[MET 103 or FED 101], [BME 210 or CS 100 or CS 106 or CS 113 or CS 114 or CS 115 or CS 116 or SDET 101], BME 111, [Phys 102 or Phys 111], and [Math 138 or Math 111].			
Corequisites:	None			
Required Materials:	Electronic course materials are provided by the instructor.			
Course Outcomes:	 By the end of the course students are able to: 1. Understand the basics of medical imaging techniques including. MRI, Ultrasound, X-Ray systems, EEG, EKG, EMG, and EOG. 2. Apply the fundamental data structures of each medical imaging technique. 			



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	 Apply the fundamentals of human data collection through collecting EKG and motion tracked data. Understand the fundamentals imaging instruments compatibility with the human body and associated risks. Develop skills to work in a team-based environment. Apply knowledge of math, engineering, and science to interpret data. Prepare engineering documents and reports 		
Class Topics:	Medical Imaging	Human-Device Interaction	
	Imaging Data Structure	EEG, EKG, EMG, EOG	
	Medical Sensors	Graphical Representation	
	MRI, Ultrasound, A-rays Human Data Collection	Signal Processing	
Student Outcomes:	s: The Course Learning Outcomes support achievement of the following Student Outcomes from the ETAC of ABET Criterion 3 requirements		
	Student Outcome (1) : An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies. Related C.O. -1 , 2, 3, 4, 6		
	Student Outcome (2) : An ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives. Related C.O. -2 , 5, 6		
	Student Outcome (3) : An ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature. Related C.O. -5 , 7		
	Student Outcome (5) : An ability to function effectively as a member a well as a leader on technical teams. Related C.O. -5		
Academic Integrity:	7: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree to which you are working towards. As a member of the NJIT community, it is your responsibility to protec your educational investment by knowing and following the academic code of integrity policy that is found at: <u>http://www5.njit.edu/policies/sites/policies/files/academic-integrity- code.pdf</u>		

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any



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	student found in violation of the code by cheating, plagiarizing, or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.
	AI/Generative AI/LLM (AI) usage is permitted in this course only for specific assignments. The assignments which permit the usage of AI will be specifically stated, a lack of explicit permission is an explicit implication that AI usage is not permitted. Various tools and resources will be utilized to validate academic integrity.
	If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at <u>dos@njit.edu</u>
Modification to Course:	The Course Outline may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the Course Outline.
Prepared By:	Chang Yaramothu
Course Coordinator:	Chang Yaramothu
Updated:	21 January 2025

GRADING POLICY

Your final grade will be determined according to the following scale:

Final Grade	Range
А	100% - 90%
B+	90% - 85%
В	85% - 80%
C+	80% - 75%
С	75% - 70%
D	69% - 60%
F	59% - 0%

Assignments will be weighted towards your final grade by these percentages:

Attendance and Participation:5%Assignments, Quizzes, and Labs:30%Midterm Assessment:30%Final Assessment:35%



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EXAM AND QUIZ POLICY

No makeup examinations will be administered. If a valid, documented excuse for the missed Exam or Quiz is provided, the weight of the remaining Exam(s) or Quiz(s) will increase to compensate for the missed grade. Approval is at the discretion of the instructor.

WITHDRAW POLICY

Carefully monitor dates if you plan to exercise your option to withdraw from the course. Withdraw dates are listed in the academic calendar located at: <u>http://www.njit.edu/registrar/calendars/</u>

ATTENDANCE POLICY

Attendance is necessary for success in this class and is required. Regular attendance may not be taken; however, if you are absent on a day in which you are randomly called for oral review or roll call, you will get a zero for that activity – unless you have an excused absence or an extenuating circumstance. If you are absent on a quiz or exam day, you will get a zero for that activity.

Excused absence is one where you have the given the instructor at least 48 hours of notice (e-mail is acceptable) of your absence. You may have one – and only one – excused absence during the semester, though it can be for any reason.

Extenuating Circumstances are those that are truly beyond your control, such as sudden illness, or death of family member. Written documentation must be provided to the Dean of Students Office for an extenuating circumstance to be valid (such as a letter from a physician, or an obituary/funeral house notice). Undocumented cases will not be honored.

Tardiness You will be considered present if you are in class during the first 5 minutes of the class, and remain in class during the entire (remaining) duration of the class. If a quiz or oral review missed due to tardiness it will be counted towards your excused absence. Any additional absences or tardiness will result in a zero grade for the missed activity and attendance.

<u>Religious Observances</u> Per NJIT policy, students expecting to miss classes or exams due to religious observances must submit a written list of dates to their instructors, ideally by the end of the second week of class, but no later than two weeks before the anticipated absence. Accommodations will be made accordingly.

If you miss a class, you are responsible for any missed material.



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Exams are closed book and closed notes unless specified and will be graded on correctness, support work provided, grammar, and professionalism. Partial credit will be given. Missed examinations may not be retaken with the exception of extenuating circumstances. For assessments given remotely via software, students are expected to work alone and individually; software measures may be taken to ensure academic integrity.

PROJECTS

Projects may be assigned in lieu of exams or traditional assessments. Grading of projects is subject to the requirements of the projects, professionalism, and completeness. Projects are individual assignments but discussion among your peers is encouraged.

HOMEWORK

Homework will be graded on correctness and professionalism. Partial credit will be given. Homework is an individual assignment but discussion among your peers is encouraged. Homework submitted via paper is due at the start of class on the day the homework is due. Late submissions are not accepted unless there are extenuating circumstances, which will be handled on a case-by-case basis. Homework must be neat, organized, and legible. All answers must be clearly indicated. Multi-page homework's are to be stapled prior to class.

LAB REPORTS

Lab reports will be graded on correctness, content, presentation, grammar, and professionalism. Partial credit will be given. Hand submitted lab reports are due at the start of class on the due date. Lab reports are to be stapled prior to class.

LATE ASSIGNMENT POLICY

Late assignments will be penalized according to the scale:

- Homework is not accepted late 0% credit
- All other assignments:
 - Less than 24 hours late –75% maximum credit
 - 24 to 48 hours late 50% maximum credit
 - More than 48 hours late -0% maximum credit

TEAMWORK POLICY

Lab work in this class may be performed as a collaborative effort within a group. All team members must contribute equally to all team exercises. The instructor will employ various mechanisms to determine the individual contributions to group lab(s). Therefore, not everyone in



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a given group will necessarily receive the same grade. If a group member has not contributed to a lab, their name should not appear on the lab report and the instructor should be notified of the lack of contribution to that assignment.

ACCOMMODATION FOR DISABILITY

If you have a documented physical and/or learning disability, please feel free to inform me or the NJIT Office of Accessibility Resources and Services (<u>https://www.njit.edu/accessibility/</u>) regarding what kind of accommodation you need to help you succeed in this class. While you are not required to disclose your disability to me, you must provide appropriate documentation to receive official university assistance. All such requests will be held confidential to the fullest extent possible.

PROFESSIONALISM EXPECTATIONS AND RULES

- No eating in class. Absolutely no sandwiches, pizza, hoagies, etc... Please time yourself accordingly. In lecture classrooms only, bottled water and quiet drinks are allowed, away from any equipment.
- <u>Cell phones must be kept silenced during class. No exceptions</u>. If your cell phone rings during class you may be asked to leave the class. Your professionalism grade will be reduced by 50%. Excuse yourself from the classroom for all outgoing cell phone usage: text, voice, email, X (formerly known as twitter), etc... If you are dealing with an urgent situation please quietly step outside of class and handle the situation. The expectation is that cellphones do not cause any distractions to you or your fellow classmates. Cellphone must be kept out of sight during assessments.
- Absolutely no recording or photographing of assessment material (quizzes, exams, projects, etc. ...).
- No web surfing, instant messaging, and / or other unrelated use of computers.
- Sleeping is not allowed in class, it is expected that you are awake and alert during class.
- In-class discussions are welcome, and in fact encouraged, within the limits of mutual respect and courtesy.
- You are responsible for checking the class page daily for announcements and assignments.
- You are **encouraged to work with other students** for all exercises, except exams and quizzes. Working together does not mean copying or plagiarizing (see Academic Integrity above).
- Suitable attire is required for class and lab. Wear attire, which is appropriate for a casual business meeting. Your overall compliance will be reflected in your professionalism grade. (Pajamas and sweatpants are business inappropriate.)
- Business suitable hygiene and grooming is required for class and lab. This includes daily showering, clean hair, face, hands, and nails, application deodorant, good oral hygiene, and clean clothing.



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• For remote lectures conducted via an online meeting software or platform, it is expected that your webcam is enabled and active.

WEEK BY WEEK SCHEDULE

Week	Date	Lecture	Date	Lab
1	1/22	Fundamentals of Biological Signals and Vitals	1/27	1A: Crimping and Electrical Wiring
2	1/29	ECG Signal and its Composition	2/3	1B: EKG Data Collection
3	2/5	Grounding, Electrical/Physiological Noise, AC/DC Isolation	2/10	1C: Electrical Enclosures and Biomedical Equipment
4	2/12	Fundamentals of Magnetic Imaging	2/17	2: 3D/4D Data structures
5	2/19	Fundamentals of Computer Vision	2/24	3A: Hand mapping
6	2/26	Tracking in Rehabilitation	3/3	3B: Full body Mapping
7	3/5	Sway and Gait	3/10	4: Force Plate Data Collection
8	3/12	Midterm Part I	3/17	SPRING BREAK
9	3/19	SPRING BREAK	3/24	Midterm Part II
10	3/26	X-Rays, CTs, and Ultrasounds	3/31	5A: Phantom Creation Part I
11	4/2	Equipment Calibration	4/7	5B: Phantom Creation Part II
12	4/9	5C: Ultrasound Measurements	4/14	5D: Ultrasound Calibration
13	4/16	Final Project Accountment	4/21	Final Project Q&A
14	4/23	Final Project Q&A	4/28	Final Project Q&A
15	4/30	Final Project Q&A	5/5	Final Project Q&A