New Jersey Institute of Technology
University Heights
Newark, NJ 07102-1982

**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:** Tuesdays 10:35 AM – 12:00 PM

## Course Information:

**Course Name:** Biomedical Mechatronics

**Course Number:** BMET 415-001

**Course Structure:** 2-2-3 (lecture hr/wk – lab hr/wk – course credits)

**Meeting Times:**

| Day | Meeting Time | Building | Room |
|---|---|---|---|
| Tuesday Thursday | 8:30 AM – 10:35 AM | GITC | Makerspace Training Room |

**Course Description:** This course provides students a background in the design and control of mechatronic systems for biomedical applications. Students will gain knowledge in healthcare equipment, electromechanical medical devices, and industrial biomedical manufacturing equipment. Hardware used to sense and perform operations as well as the software used in control and analysis will be emphasized. Safety requirements will be reviewed along with appropriate regulations and standards including FDA, UL/CE, and operating in an ISO quality environment (13485 & 9001). Relevant biologic information will be covered in the context of the system discussed. This course contains a lecture and applied laboratory to reinforce concepts.

**Prerequisites:** MATH 279 or MATH 305 or MATH 333 or MNET 315

**Corequisites:** None

**Required Materials:** Electronic course materials provided by the instructor.
LogixPro Software

**Course Outcomes:** By the end of the course students are able to:

1. Understand the fundamentals of mechatronic system and process design for biomedical applications.
2. Apply knowledge of Mechatronic system towards biomedical application.
3. Understand the software requirements for biomedical application.

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4. Understand the biomedical industry regulatory landscape and role of Federal and International Agencies (i.e. FDA).
5. Apply device safety/regulatory requirements, hazard analysis, and ISO quality environment including 13485 and 9001.
6. Work in teams to apply knowledge of engineering, design, and science.
7. Prepare engineering documents and reports

**Class Topics:**

| | |
|---|---|
| Design and Control | Privacy and Security |
| Biomedical Manufacturing | Regulation and Compliance |
| Biomedical Products | FDA, CE, UL |
| Biomedical Software | ISO 13485, ISO 9001 |
| Hazard Analysis | Ethics |

**Student Outcomes:**

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, 5

**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

**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.** – 6, 7

**Student Outcome (5)**: An ability to function effectively as a member as well as a leader on technical teams.
**Related C.O.** – 6

**Academic Integrity:**

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 that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using

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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 in 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 dos@njit.edu

**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:** 18 August 2025

## GRADING POLICY

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

| Final Grade | Range |
|---|---|
| A | 100% - 90% |
| B+ | 90% - 85% |
| B | 85% - 80% |
| C+ | 80% - 75% |
| C | 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:
http://www.njit.edu/registrar/calendars/

## ATTENDANCE POLICY

Attendance is necessary for success in this class, and is required. Regular attendance may not be taken, however if you are absent a day in which you are randomly called for oral review or for 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 the day of a quiz or exam 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 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.

**Religious Observances** 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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## EXAM AND QUIZ POLICY

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 (https://www.njit.edu/accessibility/) 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.
- **Cell phones must be kept silenced during class. No exceptions**. 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 | 9/2 | Intro to Mechatronics | 9/4 | Lab 1a: Intro to PLC Software |
| 2 | 9/8 | Mechatronic System Design | 9/11 | Lab 1b: PLC Fundamental Design |
| 3 | 9/15 | Mechatronic System Design 2 | 9/18 | Lab 1c: PLC Event Sequencing |
| 4 | 9/22 | Verification & Validation | 9/25 | Lab 2a: QMS Verification Documentation |
| 5 | 9/29 | International Regulatory Bodies and Standards | 10/2 | **NO CLASS – Wellness Day** |
| 6 | 10/7 | Lab 2b: Electrical Measurements & Verification Records | 10/9 | **NO CLASS** |
| 7 | 10/14 | American Regulatory Bodies and Standards | 10/16 | Calibration and NIST Standards |
| 8 | 10/21 | Lab 3: Calibration & Measurements | 10/23 | Experiential Learning – Visit MTF Biologics |
| 9 | 10/28 | Midterm Examination Part II | 10/30 | Midterm Practical Examination |
| 10 | 11/4 | Documentation | 11/6 | Lab 4a: Ingress Protection Testing |
| 11 | 11/11 | Foundations of Mechatronic Systems and Devices Material Composition | 11/13 | Experiential Learning – Visit Stryker (**TBD**) |
| 12 | 11/18 | Lab 4b: Finishing Processes | 11/20 | Ethics & Final Project Announcement |
| 13 | 11/25 | Final Project | 11/27 | **No CLASS – Thanksgiving** |
| 14 | 12/2 | Final Project | 12/4 | Final Project |
| 15 | 12/9 | Final Project | 12/11 | Final Project |
| 16 | **Final Exam – TBD** | | | |