MIT Department of Physics

Academic Programs Office

New and revised Physics subject offerings and enrollment information Spring 2023

UNDERGRADUATE SUBJECTS, spring term:

8.08 Statistical Physics II

This subject is not being offered in spring 2023.

8.13 Experimental Physics I **MW 9:00-12:00, 2:00-5:00; TR 9:00-12:00**

8.14 Experimental Physics II **TR 2:00-5:00**

During the pandemic, we needed to restrict enrollment in J-Lab to practice appropriate social distancing. The course limit of 12 per section proved to be a good fit, and both 8.13 and 8.14 are now officially enrollment-limited subjects. While the Registrar's enrollment tools will initially work on a first-come, first-served basis, those wishing to take one of these classes will still be prioritized by year in the program and Physics-major status. The Academic Programs Office will keep in touch with students interested in taking Junior Lab and will confirm enrollments when we get closer to spring term.

NEW SUBJECT:

8.16 Data Science in Physics **MW 2:30-4:00 pm**

Created by Profs. Phil Harris and Jesse Thaler (Prof. Harris will be the lecturer), this new subject aims to present modern computational methods by providing realistic, contemporary examples of how these computational methods apply to physics research. Designed around research modules in which each module provides experience with a specific scientific challenge. Modules include: analyzing LIGO open data; measuring electroweak boson to quark decays; understanding the cosmic microwave background; and lattice QCD/Ising model. Experience in Python helpful but not required. Lectures are viewed outside of class; in-class time is dedicated to problem-solving and discussion. Students taking graduate version (see grad subject number under Graduate Subjects, spring term) will complete additional assignments.

http://web.mit.edu/physics/
E physics-undergrad@mit.edu **T** 617 253-4841 **F** 617 258-8319
Room 4-315
77 Massachusetts Avenue
Cambridge, MA 02139-4307

UNDERGRADUATE SUBJECTS, spring term, continued:

8.226 Forty-three Orders of Magnitude TR 1:00-2:30 pm

Prof. Jeff Gore offers this CIM-8 subject for the second time. Note that *this subject will likely not be offered in spring 2023*; ideally it will alternate each spring with 8.225 but planning for when to schedule 8.225 is still ongoing.

8.284 Modern Astrophysics

Note that this subject will not be offered in spring 2023. Its regular schedule has been changed and it will now be a fall-term subject, **next offered in fall 2023**.

8.292J Fluid Physics TR 2:30-4:00 pm

Prof. Lydia Bourouiba, a faculty member in Course 1, will once again teach this course that focuses on how fluid dynamics intersects with biophysics.

GRADUATE SUBJECTS, spring term:

NEW SUBJECT:

8.316 Data Science in Physics **MW 2:30-4:00 pm**

Created by Profs. Phil Harris and Jesse Thaler (Prof. Harris will be the lecturer), this new subject aims to present modern computational methods by providing realistic, contemporary examples of how these computational methods apply to physics research. Designed around research modules in which each module provides experience with a specific scientific challenge. Modules include: analyzing LIGO open data; measuring electroweak boson to quark decays; understanding the cosmic microwave background; and lattice QCD/Ising model. Experience in Python helpful but not required. Lectures are viewed outside of class; in-class time is dedicated to problem-solving and discussion. Students taking graduate version complete additional assignments.

8.322 Quantum Physics I

This subject is *not being offered in spring 2023*.

8.334 Statistical Mechanics II

Offered spring 2023; offered every other spring, in alternation with 8.592J

8.396 LEAPS Part I **TR 9:30-11:00, spring break - May**

8.397 LEAPS Part II **TR 9:30-11:00, February – spring break**

These graduate professional-development subjects, Leadership and Professional Strategies and Skills Training, are overseen by Prof. Anna Frebel. Enrollment can be in one subject, the other, or both.

8.398 Selected Topics in Graduate Physics **W 12:00-1:00**

All first-year graduate students must enroll in this seminar that touches on both scientific and pedagogical topics important for beginning PhD students; **enrollment in this 6-unit subject is required in both fall and spring of the first year.**

8.582J/6.645 Selected Topics in Condensed Matter Physics **TR 2:30-4:00**

Introduces physics and engineering of superconducting qubits for quantum information processing. Topics include superconductivity and Hamiltonian engineering; superconducting qubits, cavities, and microwave cavity quantum electrodynamics; theory and microwave engineering of qubit control and measurement; noise, decoherence, dynamical error mitigation; microwave photons, squeezing, and quantum-limited amplification. Lecturer. Prof. William Oliver. Pre-req: 6.728 or 8.06 or equivalent.

8.S998 Special Subject: Mentorship Pedagogy and Practice

First time physics mentors and others interested in improving their knowledge and skills in teaching one-on-one and in small groups, particularly TEAL TAs, and graduate student TAs

3-unit class (2-0-1):

- 1-hour weekly class on pedagogy topics
- 1-hour weekly Physics Mentoring Community of Practice (CoP) meeting; the Community of Practice meetings will also be attended by continuing physics mentors
- 1-hour weekly homework consisting of reading/listening/watching material to prepare for in-class discussion and writing reflections after the classes

Instructors:

Prof. Edmund Bertschinger, Dr. Byron Drury, Dr. Michelle Tomasik

Learning Objectives:

For Pedagogy class:

- Learn about cognition, metacognition, and the role of affect as applied to mentoring/teaching
- Strengthen communication skills (practice listening, questioning, and eliciting student ideas)
- Learn about the roles of motivation and mindset in learning, and how to foster them
- Learn how to foster belonging and self-efficacy through peer mentorship
- Learn how to facilitate small-group interactions to enhance peer instruction and learning
- Learn physics-specific learning strategies, such as how to teach/learn problem solving
- Learn and practice research-based techniques for effective mentorship in STEM
- For all elements of the pedagogy course
    - Practice role-playing interactions with students working on physics problems
    - Reflect on how the content applies to their own teaching/mentoring, as well as their own learning experiences

For students attending CoP meetings only:

- Increase participants' skills in their role as mentor or TA
- Increase participants' self-efficacy in their role as mentor or TA.
- Build community among the students and others.

Physics Mentoring Program

The Physics Mentoring Program, in operation since 2020 Spring, provides academic and psychosocial support to students enrolled in first- and second-year physics subjects through course-based near-peer mentorship. Mentees who join this optional program receive academic assistance for a particular course as well as general support and advising in weekly meetings with a trained mentor. Mentors are paid and are students (undergraduate and graduate) and postdocs who are proficient with the physics content of the subject and who participate in ongoing training in mentorship skills through a weekly Community of Practice Meeting. The program seeks to help mentees through academic and social support, develop the skills of the mentors, and build community in the Physics Department.