Orientation 2024 - PhD in Biomedical Science or Neuroscience

Course Requirements by MTA

First Year:

All MTAs:
Fall –
BSR1021 Responsible Conduct in Research

A Statistics course – see below

Spring -
BSR1022 Rigor and Reproducibility

Cores:
AIET, CAB, DMT, DRS, GGS, MIC, IMM
BSR1012/1013 Biomedical Science (BMS); ***note: BSR1013 provides multiple options for Unit 5 and 6***

NEU
Fall - BSR1706 – Systems Neuroscience
Fall - BSR1705 – Cellular and Molecular Neuroscience
Fall – BSR2707 – Techniques and Approaches in Neuroscience
Spring – BSR1707 – Behavioral and Cognitive Neuroscience
Spring – BSR1708 – Pathophysiology of Neurological and Psychiatric Disorders
Spring - BSR6705 Clinical Topics in Neuroscience
Fall/Spring-- BSR4702 Selected Topics in Neuroscience (student WIP)
Fall/Spring-- BSR5701 Seminar in Neurobiology (Neuro seminar series)

MSTP Students:
All MTAs
BSR1017/1018 – BMS for MD/PhD

Research Credits:
BSR1006: Laboratory Rotation (Fall) – Requires rotation agreements, evaluations, **and check-in forms**
BSR1007: Laboratory Rotation (Spring) – Requires rotation agreements, evaluations, **and check-in forms**
BSR8000: Independent Research for Basic Science Research (after declaring a lab, before qual exam) – Requires one advisory committee meeting per semester from lab declaration
BSR9000: Doctoral Dissertation Research (after passing your qualifier) – Requires one advisory committee meeting per semester

Second Year: (MSTP Year G1)
All MTAs: JC, Seminar and WIP until semester after Thesis Proposal defended; CAB: Seminar and WIP throughout PhD
Advanced Electives: For PhD in BMS, you need 6 credits. For PhD in Neuro, you need 2 electives.

AIET:
Fall:BSR0907, Introduction to Nanomedicine, 3 credits
Fall:BSR6901, Introduction to Biophysics and Biophysical Instrumentation, 1.5 credits
Spring:BSR1803, Systems Biology: Biomedical Modeling, 3 credits (this is not an elective designed and offered by AIET, but it's a course that AIET strongly recommends as an elective)
Spring:BSR0908, Introduction to AI/Deep Learning in Biomedical Research and the Clinic, 1.5 credits
Plus, any other electives offered within the GSBS including those offered by the Hasso Plattner Institute, CCNY Grove School of Engineering, or Cooper Union – please consult with the MTA directors

CAB:
Fall – BSR6202 – Advanced Topics in Tumor Biology - (3 x 1 credit modules)
Spring – BSR6201 – Advanced Topics in Cancer Biology - (3 x 1 credit modules)
Plus, any other electives offered within the GSBS – please consult with the MTA directors

DMT:
BSR1803 Systems Biology: Biomedical Modeling
BSR2108 Structural and Chemical Pharmacology
Plus, any other electives offered within the GSBS – please consult with the MTA directors

DRS:
One course offered each Fall on alternate years (so year 2 or 3)
BSR2301 – Embryos, Genes and Development (3 credits)
BSR6301 – Stem Cells and Regenerative Biology (3 credits)

GGS:
Fall: BSR2402 Genetic and Genomic Approaches to Human Variation and Disease (3 credits)
Fall: BSR6402 – Practical Analysis of a Personal Genome (3 credits)
Spring: BSR1015 – Introduction to Scientific Computing (1 credit)
Spring: BSR2400 – Translational Genomics (3 credits)
Spring: BSR2109– Introduction to programming in python (1 credit)
Year Long - CLR0012 – Integrative Problem Solving (1 credit)
Spring – CLR0810 – Genetic Epidemiology (3 Credits)
Spring – CLR0007 – Spectrum of Methods in Clinical Research III: Genetics and Genomics (3 Credits)
Plus, any other electives offered within the GSBS – please consult with the MTA directors

IMM:
Fall – BSR1501 – Fundamentals of Immunology (3 Credits)
Plus 3 more credits, most commonly:
BSR3508 Data Intensive Immune Technology (1 credit)
BSR 3503, 3504, 3505, 3506 International School of Immunotherapy (4 x 0.5 credit modules)
Plus, any other electives offered within the GSBS – please consult with the MTA directors

MIC:
Fall every other year – BSR6601 – Advanced Virology (3 credits)
Fall – BSR1501 – Fundamentals of Immunology (3 Credits)

NEU:
Fall – BSR6717 – Advanced Neural Data Science
2 advanced electives (regardless of credits) – Please consult with Dr Huntley for listings.

Advisory Committee Meetings:
On joining a lab, you should (in consultation with your preceptor) form an advisory committee of at least 3 members from the GSBS training faculty. One of these should be in a different department and be a "non-expert" in the field of you project:

For Example, if you are in CAB and studying RTK signaling, you can have 3 CAB faculty, but at least one should have a cancer-relevant research effort outside of the field of signal transduction.

You may include additional members from outside of ISMMS.

You can modify the membership of the committee as your project evolves.

Your committee may include collaborators, but see below*.

ONCE DECLARING A LAB, YOU MUST MEET WITH YOUR COMMITTEE AT LEAST ONCE PER SEMESTER.

Providing a bullet-point summary of your project and progress ahead of time will make this more efficient.

When you and your preceptor think you are within 6 months of defending, this will be discussed and decided upon at a committee meeting = the "green light"

Combining an advisory committee meeting with your WIP presentation is an efficient way to avoid doubling up effort (for everybody).

Thesis Proposal Exams:
The thesis proposal should be completed before the end of Semester 4 for PhD, and Semester 6 for MSTP.

The examination committee is the GSBS training faculty on your advisory committee, plus one of your MTA directors or their designate.

*Collaborators may not examine you, and suitable faculty can substitute for them on the exam.

The format is identical to an NIH F30/31 application – 1 page of specific aims, plus 6 pages of proposed experiments inclusive of any figures. Reference list does not count in page limit.

11 point Arial font, 0.5inch Margins, regular single-spaced line density.

DO NOT LEAVE THIS TO THE LAST MINUTE.

You should register for the Exam 4 weeks prior to the oral defense date.

The written proposal is submitted 3 weeks prior to the oral defense date.

Failure to do this on time will result in Academic Probation.

Rotation Guidelines for PhD Students in Biomedical Science and Neuroscience
The goal of the rotation is to find a lab. Producing data is a bonus, but not the goal.

A “match” between student and lab is defined as an offer from the PI for the student to join the lab. This may be a hard yes, or could be pursuant to other conditions, such as the outcome of other rotation students in the PIs lab.

PREP and MSBS students now in a PhD program can use their research time in lieu of a rotation.
Ex-SURP scholars who have spent two summers at ISMMS can use that research time in lieu of a rotation once they join a PhD program.

Staff who become PhD students, and who feel it necessary to do a rotation in their lab of employment before making a decision to joining that lab, may not do so until after completing a rotation in another lab. If, on the other hand, the student and mentor are confident about the student joining their lab of employment for PhD studies, other rotations are not strictly required.

The lab time commitment during the rotations should average 20 hours per week.

The process:
1. Students are encouraged to use web resources and the current student body to explore possible labs before and during discussions with their advisors.

2. All students will work with their first-year advisors and/or MTA Directors to select labs they are interested in that have sufficient resources to take a new student.

3. Rotations do not need to be arranged sequentially. You should line-up future rotations so that you are either doing a rotation or have declared a lab. See below regarding the check-in form to record your rotation activities and plans.

4. Before commencing the rotation, you and your preceptor will complete the rotation agreement form found at: https://mountsinai.formstack.com/workflows/gs_lab_rotation_agreement . On completion, you and your preceptor will complete the rotation form found at:
https://mountsinai.formstack.com/forms/gs_lab_rotation_evaluation

5. Starting in week 3 of the rotation, the PI and student should review progress and the possibility of joining that lab on a weekly basis during the rotation. This does not have to be a detailed conversation each week, but can be a simple update: yes, no, or possibly, and could be an email. If it is a no, a firm no is more helpful. A no could be delivered more softly by simply stating that you do not have a match. The outcome of these discussions should be conveyed by the students to their first-year advisors or MTA co-directors.

6. In cases where either the student or PI expresses the lack of a match, the rotation terminates, and an evaluation is filed with the Graduate School (GS). For these, there is no minimum time after the first discussion at 3 weeks. For students saying no, they should email/visit their advisors, state why and briefly discuss, which may be simply “this is not a match for me”. Alternatively, your advisor/MTA director can also help you convey this information.

7. In cases of a common match, the minimum time of rotation is 6 weeks; the minimum is to avoid “changed minds”. Again, an assessment report is submitted to the GS. Please work on this with your PI, and make sure this goes to the GS. Once you have found your lab, you and you preceptor will submit a lab declaration form found at: https://mountsinai.formstack.com/workflows/gs_dissertation_advisor_mta_declaration . If you are still taking core classes, the expected time to spend in the lab after declaration remains at an average of 20 hours per week until classes are concluded.

8. The maximum time spent to make a decision should be around 6-8 weeks. There is flexibility for this, but best to try for 6-8 weeks. This will mean that some rotations will span the winter break, the time off (generally ~3 weeks) doesn't count towards the rotation. This means four rotations can be completed (if needed) by spring break, but likely 3 as transitioning from one lab to another is not always immediate. These times could be shortened further if the student is not taking classes while rotating.

9. While it is acceptable to join a lab after 1 successful rotation, you are encouraged to find two matches before terminating your rotations and joining a lab.

10. The MTAs may require presentations etc, and this is encouraged. Presentations will not be synchronized with the end of each rotation, but students should still be capable of describing work that they completed a few weeks earlier.

First year check-in form
In order for us to monitor your rotation progress, you will receive a first-of-the month reminder to complete the first year check-in form, which must be submitted by the 4th of each month. The form can be found here: https://gradschool.mssm.edu/first-year-check-in/ . If you do not submit these forms, your grade for BSR1006 (Fall) or BSR1007 (Spring) will be recorded as incomplete. **Once you declare a lab, you will no longer get the reminders or need to submit the form.**

For MSTP Students:
MSTP Students do summer rotations:

- During the summer before year 1 and during the year, MSTP students will be required to meet with potential mentors and MTA directors to identify potation rotation mentors).
- Going into year 2, MSTP students do 2 rotations, each ~3 weeks. They need not be identical in length.
- If they have not found their lab by that first summer, they will have 1 month in June after year 2 before officially joining the lab.

Statistics Options

Core Biostatistics Option 1
Course Number & Title: MPH0300 – Introduction to Biostatistics (3 credits)
Course Director: Dr. John Doucette
Term: Fall (12 weeks)
Placement Test: No
Prerequisites: None
Weekly Statistical Computing Lab: Yes, using SAS.
Target Audience: MPH Students, other Graduate Students who conduct public health research.

Course Description: This course provides an introduction to the principles underlying biostatistical methods and their application to problems in epidemiology, public health and clinical research. Students will learn about basic probability distributions, descriptive statistics, presentation of data, hypothesis testing principles, and the specific hypothesis tests and analytic methods for a variety of data types. These analytic methods will include t tests, chi-square tests, nonparametric tests, analysis of variance, correlation, regression, and basic survival analysis methods. Students will have the opportunity to apply these methods to sample data both via direct calculation and using SAS® statistical software. Each week, a one-hour laboratory session will reinforce material from lecture with additional examples and instruction in use of the SAS® software. Methods for determining sample size and power for a variety of commonly used study designs will also be presented, as will measures of the accuracy of diagnostic and screening tests.

Core Biostatistics Option 2
Course Number & Title: BIO6400 – Biostatistics for Biomedical Research (3 credits)
Course Director: Dr. Emilia Bagiella
Term: Fall (12 weeks)
Placement Test: Yes or evidence (unofficial transcript accepted) of having taken calculus in the past 2-3 years with a grade of B+ or higher. A certificate attesting completion of an online calculus course (e.g., Corsera) will also be accepted.
Placement Test Dates: Offered online on blackboard upon request. Please contact the course director for details: emilia.bagiella@mountsinai.org
Placement Test Content: The test covers topics in calculus and algebra and it is meant to determine whether students have a sufficiently strong math background to take the class. The average time it takes to complete the test is approximately 20-25 minutes. Please note, this is not a waiver exam.
Prerequisites: Calculus
Weekly Statistical Computing Lab: Yes, students can choose between a SAS or R Lab.
Target Audience: MS in Biostatistics, MS in Clinical Research, and PhD in Clinical Research students. All other Graduate Students with a strong mathematical background.

Course Description: This course covers the basic tools for the collection, analysis, and presentation of data in all areas of basics, clinical and translational research. Central to these skills is assessing the impact of chance and variability on the interpretation of research findings and subsequent implications on the understanding of disease mechanisms, drug discovery and development, and applications to clinical practice. Topics covered include: general principles of study design including internal and external validity; probability and sampling distributions, theory of confidence intervals and hypothesis testing; review of methods for comparison of discrete and continuous data including one-sample and two-sample tests, correlation analysis, linear regression, sample size and power. Additionally, students will learn to apply their statistical knowledge to complex real-world challenges, while gaining introductory statistical computing proficiency in R or SAS.

Core Biostatistics Option 3
Course Number & Title: BSR1715 Modern Statistics for Modern Biology (4 credits)
Course Directors: Drs Erin Rich and Angela Radulescu
Term: Spring (14 weeks)
Placement Test: No
Prerequisites: None
Weekly Statistical Computing Lab: Yes, using R
Target Audience: This course is required for students in the Neuroscience but may be taken by students in other MTAs.

Course Description: Modern Statistics for Modern Biology is a statistics and data science course required for students in Neuroscience but may be applicable to those in Genetics and Genomic Sciences and other areas, who will be working with diverse biological data in their research. The course primarily focuses on equipping students with essential data science and statistical skills that are critical for modern biomedical research data analysis. Through a combination of theoretical concepts and practical applications, the course aims to achieve several key objectives. These include introducing fundamental probability and statistical inference concepts using R simulations, teaching reproducible research techniques like R notebooks and environment/version control, exploring causal inference and experimental design principles, and demonstrating the application of linear models in biological data analysis. Moreover, the course covers important statistical methodologies, such as null hypothesis significance testing and Bayesian parameter estimation, and hones students' abilities in biological data pre-processing, visualization, and statistical modeling using R. Overall, the course addresses the increasing complexity and volume of biological data in modern biomedical research and the growing emphasis on rigor, reproducibility, and data management in biomedical studies, making it an invaluable resource for students aiming to excel in this field.