

# RIGOR, REPRODUCIBILITY AND RESPONSIBILITY IN SCIENTIFIC PRACTICE, CERTIFICATE

## Rigor, Reproducibility and Responsibility in Scientific Practice Certificate Program OVERVIEW

The Rigor, Reproducibility and Responsibility certificate program emphasizes research practice and applicable, introductory graduate-level training in epistemology, logic, and ethics, as well as quantitative and communication skills. The program specifically addresses the “3R” core norms of good scientific practice, applied across the health and science disciplines, which include fundamental and trans-disciplinary application skills in:

- Rigor, critical thinking and objectivity in scientific conduct
- Reproducibility through appropriate, quantitative research methodology
- Responsibility of scientists toward the research community and society

Participants will value the program’s specific focus on the philosophical underpinnings that form the fundamental framework of how science works, thereby keeping a broad perspective in mind that allows them to understand the principles underlying good scientific practice research from the bench science to the public health disciplines

## EDUCATIONAL OBJECTIVES

Upon completion of the certificate program, students will be able to:

1. Analyze research strategies, techniques, and data in light of the norms of good scientific practice.
2. Formulate constructive critique of the research presented in the interdisciplinary primary literature.
3. Explain the basics of hypothesis testing, data analysis and visualization in science.
4. Apply fundamental logic and ethics considerations to observational and experimental approaches to study current problems in science and society.
5. Differentiate how causality is established among the scientific disciplines.
6. Appraise how limitations of causal inference can be mitigated in research and practice.
7. Describe the sources of error in scientific practice as well as approaches for error reduction.
8. Evaluate the impact of errors in discovery and innovation.
9. Apply evidence-based strategies to craft clear and concise, written communications.
10. Employ rhetoric and storytelling to strengthen the communication’s impact.
11. Recognize the critical role of scientists in society.

## SPONSORING DEPARTMENT

Molecular Microbiology and Immunology (<https://publichealth.jhu.edu/departments/molecular-microbiology-and-immunology/>)

## ADMISSIONS

Contact information and complete certificate program admissions information are available on the certificate program page (<https://publichealth.jhu.edu/academics/rigor-reproducibility-and-responsibility-in-scientific-practice-certificate-program/>) on the Bloomberg School of Public Health website.

## REQUIREMENTS FOR SUCCESSFUL COMPLETION

The certificate program requires a minimum of 18 term credits. All required and elective courses must be taken for a letter grade if a letter grade is an option. Students must earn a minimum letter grade of C in each certificate course and maintain a GPA of 2.75 or higher for the certificate courses. All courses must be completed within a three-year period.

The student should review the section of the website that addresses completion (<https://publichealth.jhu.edu/academics/certificate-programs/requirements-for-successful-completion-of-a-certificate-program/>) before completing certificate program requirements. The student’s transcripts will not indicate that the certificate was earned until the Notification of Completion form has been submitted, verified by the certificate program, and processed by the Registrar.

## COURSE OF STUDY

Students should check the Bloomberg School of Public Health course directory (<https://publichealth.jhu.edu/courses/>) to confirm when the courses are offered. The term and time may change from what is listed in the table below and some courses are only offered every other year. Students should also check for prerequisites and whether instructor consent is required.

Code	Title	Credits
PH.550.860	Academic & Research Ethics at JHSPH (All students are required to complete this online noncredit course in their first term of study)	
<b>Required Courses- Students are required to complete 4 core courses (12 credits required)</b>		
PH.260.700	How Do We Know? - Theory, History, and Practice of Science (typically offered online in 1st term, and hybrid in 3rd term)	3
PH.260.701	Anatomy of Scientific Error, Anatomy of Scientific Error - Meta-Science in Research Practice (typically offered online in 2nd and hybrid in 4th term)	3
PH.260.705	Fundamentals of Quantitative Reasoning in the Biomedical and Health Sciences (typically offered online in 3rd term)	3
PH.260.844	Causation (typically offered hybrid in both 2nd and 4th term)	3

**Elective Courses (students must complete 6 or more credits from among the following courses, for a minimum of 18 certificate coursework credits)**

PH.260.704	Critical Dissection of the Scientific Literature: Taking the Scalpel to Journal Articles (typically offered online in 1st term and onsite in 3rd term)	3
PH.260.709	Evidence-Based Mentoring	3
PH.260.710	Communication Practice for Health Science Professionals (typically offered online in 2nd and 4th terms)	3
PH.260.715	Unleash Your Writing Superpower: Crafting Clear, Concise and Persuasive Prose (typically offered online in 2nd term)	3

**All students are required to complete a capstone paper. The subject of the capstone must be approved in advance by the Certificate program director. Students may request permission to submit as their capstone a paper completed for one of the certificate courses, or, if desired, students may opt to complete PH.260.840 and to complete the capstone paper during this course**

PH.260.840	SS/R: Mol Microbiology & Imm (typically offered online in 1st, 2nd, 3rd, 4th and Summer terms)	1 - 22
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