



## The Core Science Requirement and Mendel Science Experience Courses

**Core requirement: 2 semesters of science with laboratory; requirement to be met by the end of the sophomore year**

MSE Proposal Submission Schedule:

- The *last Friday in September* (for following year fall semester)
- The *last Friday in February* (for following year spring semester)

### Rationale

Science literacy is an integral part of the intellectual credentials of an educated, informed, and responsible college graduate. Scientific literacy has three dimensions for a Villanova graduate. First, students must possess an understanding of the fundamental principles of the basic sciences. Second, scientifically literate people view the physical world in a disciplined and objective manner through careful observation of causal relationships interpreted within a framework of biological, chemical, and physical laws and principles. Third, scientifically literate people have a foundation to recognize scientific challenges and possess the ability to leverage their understanding of science and technology when confronting and solving complex problems.

The study of science plays an indispensable role in a liberal, humanistic education by cultivating modes of thought that serve as one component of a foundation for intellectual development. The core science requirement is designed to teach our students to think rigorously and to analyze and interpret data, leading to logical conclusions and predictions. Their science education helps our students become effective problem solvers. In the College of Liberal Arts and Sciences, the natural and physical sciences play a crucial role in the dialogue with the humanities and social sciences in answering questions about pressing contemporary problems that stand at the intersection of science, ethics, culture, and religious beliefs.

### What are the Characteristics of a Mendel Science Experience Course?

Mendel Science Experience (MSE) courses have a general structure of 3 hours per week of lecture and one or two sections of 3 hours per week of laboratory or field experimentation, which may include sessions reserved for field trips, independent or group projects, discussion, etc. Lectures will typically consist of **30-40** students and associated labs of **15-20** students per section

are envisioned; section limits in many cases will be determined by pedagogical requirements of the particular discipline and the availability of discipline specific laboratory space. MSE courses are expected to include about 12 lab periods per semester.

MSE courses are thematic (i.e., not traditional survey courses) and are associated with a complementary thematic lab that is linked directly to the lecture section. Some consideration may be given to sequential courses (i.e., within a single discipline) on a case-by-case basis if a compelling argument is made for a specific thematic course set. In such cases, the second course may list the first course as a prerequisite, but students who complete the first course are not obligated to take the second in the sequence.

MSE lecture and laboratory sections can be linked in one of two ways:

1) A single numbered, 4-credit course with one or two lab sections: e.g., MSE 2900, *The Science of Materials*.

2) A 3-credit lecture course affiliated with a 1-credit lab section: e.g., MSE 2900, *The Science of Materials*, and MSE 2901, *The Science of Materials Lab*. In this case, MSE 2901 will have a co-requisite (i.e., MSE 2900).

Although MSE courses are topically diverse, they share a common approach, incorporating in a meaningful way each of four critical components: problem-solving, laboratory/field experience, use of technology and application of quantitative tools, and interdisciplinary understanding. Since these four components embody the spirit of an MSE course, how they each will be enacted in the course should be articulated fully and explicitly explained in the body of the course proposal:

- *Problem Solving*: Solving problems promotes the internalization of concepts and enhances the development of sophisticated modes of thought. Our students will solve complex problems through the application of the scientific method. The problem solving aspect, while expected in the laboratory/field experience, may be incorporated in other parts of the course as well.

- *Laboratory/Field Experience*: An indispensable component of the study of the basic sciences is the hands-on experience that students gain through the application of the scientific method in laboratory or field settings. Here, the practice of science is paramount.

- *Use of Technology and Application of Quantitative Tools*: Technology also facilitates learning and extends the boundaries of potential intellectual growth. Students will gain experience in the analysis and interpretation of data, including application of mathematical structures (formulas and equations, statistical analysis, models).

- *Interdisciplinary Understanding*: All MSE courses will take an active role in fostering independent thinking and discussion at the intersections of science, the humanities, and the social sciences. Toward this end, all MSE courses will provide opportunities for students and faculty to engage the science at hand in a meaningful way with a humanities or social sciences perspective

of relevance in the context of issues informed by each. Courses might, for instance, incorporate a public lecture, class presentation, or invited speaker from a relevant outside discipline, and then build on this component through pre-lecture readings, post-lecture discussions, student-centered research, or other pedagogical approaches. The annual Mendel Medal public lecture, or an MSE-sponsored public lecture, could serve a similar purpose if the science lecture is embedded in a class discussion or assignment that seriously engages the humanities or social sciences perspective, either through further research and/or readings, or the invited participation of colleagues from the relevant discipline.

### **The Science Requirement for Science Majors**

Students majoring in the Natural Sciences meet the core science requirement through the regular program of study in their major. Any other student who completes the two-semester introductory sequence designed for these six science majors will have fulfilled the Core Science requirement.

### **Process**

Department Chairs and their faculty will determine the number of MSE courses that a department wishes to support. Proposals for MSE courses will be collated by Department Chairs and submitted to the Chair of the Core Mathematics and Science Subcommittee (i.e., MSE Subcommittee). The MSE Subcommittee will be comprised of five elected (or appointed by the Dean) members from the science and math departments (i.e., from AST, BIO, CHM, ENV, PHY, MAT and CSC), one faculty from the humanities or social sciences, and the Associate Dean for Baccalaureate Studies (*ex officio*). Committee members will serve for a term of three years.

MSE course proposals will be submitted by the ***last Friday in September*** (for following year fall semester) and by the ***last Friday in February*** (for following year spring semester). The Committee will review proposals assessing consistency with the MSE rationale, structure, and approach. This review may include an iterative component in which additional detail or changes may be requested from faculty. To facilitate the review process, proposers will normally be invited to the committee meeting during which their proposal is reviewed. The Committee will be charged with ensuring that the suite of MSE courses offered each semester is topically diverse and represents a balance between science departments commensurate with staffing limitations and demands. The Committee will make decisions by the last Friday of November (for proposals submitted in September) or by the last Friday in April (for proposals submitted in February). Courses will be approved for three years; after three years, course proposals must be resubmitted.

## THE MENDEL SCIENCE EXPERIENCE COURSE PROPOSAL

*At the time that a proposal is submitted to the MSE Subcommittee, it will be expected that these items will have been thought out and explained in full detail.*

1. Course Title:
2. Instructor(s):
3. Preferred class meeting schedule for lecture (3 meetings per week for 50 minutes vs. 2 meetings per week for 75 minutes):
4. Preferred lab meeting schedule: (this section will also define the lab schedule, i.e., a single 4-credit offering or a 3-credit lecture with a linked 1-credit lab section, or sections)
5. Course Description for NOVASIS (100 word maximum):
6. Course Description for College website of Core Curriculum courses (250 word maximum):
7. Although MSE courses are intended to be topically diverse, they share a common approach, incorporating each of four critical components listed below. Since these four elements embody the spirit of an MSE course, the Subcommittee considers this section of the course proposal of utmost importance. Keeping this in mind, please articulate fully how you will incorporate each of the following:
  - a. *Problem Solving*: The proposal will describe, in detail, the process of problem solving during the course.
  - b. *Laboratory/Field Experience*: The proposal will delineate the sequence and nature of laboratory exercises and field experiences.
  - c. *Use of Technology and Quantitative Tools*: Please be as clear as possible on the nature of the integration of technology and qualitative tools. Please describe how equipment, instruments, and methodologies are linked to individual labs and field experiences.
  - d. *Interdisciplinary Understanding* (Please refer to the rationale for our definition of Interdisciplinary): The proposal should clearly define how interdisciplinarity is integrated into the course (e.g., a lecture with pre-lecture readings, post-lecture discussions, student-centered research, or other pedagogical approaches). This element may be satisfied in a number of ways. If the proposal indicates that interdisciplinarity is woven into the fabric of the course, then the author must explicitly explain how this is accomplished.

e. Please submit one complete laboratory assignment (as an appendix to the proposal), which explains, with a clear and formulaic example, the process of hypothesis testing in the lab.

8. Provide an overview of how student performance will be assessed (exams, lab reports, written and/or oral assignments).

9. Attach a **complete** proposed syllabus, which must include a clear overview of the progression of the topics to be explored, dates of evaluations, and a list of topics for each laboratory session. Please use the standard College syllabus format, which is attached.

By nature, proposal evaluation is an iterative process, and the MSE Subcommittee may request additional information or revisions as part of the evaluation process.

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**PROPOSAL SUBMISSION:**

Please submit the proposal, in Word or PDF format, to Francis Galgano, Department of Geography and the Environment ([francis.galgano@villanova.edu](mailto:francis.galgano@villanova.edu)), Chair, MSE Subcommittee

Examples of successful proposals are available on the College Web Site

## APPENDIX 1

### College of Liberal Arts and Sciences Undergraduate Syllabus Checklist

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- Course number and title
- Meeting time, day(s), and class location
- Faculty availability to students (office hours, other availability [e.g. students may or may not contact on weekends, etc.])
- Contact information
  - Office location
  - Office or preferred phone #
  - E-mail address
- Course description: A more detailed description than the catalog summary.
- Course objectives: A bulleted list of what knowledge, skills, and values will students gain as a result of taking this course.
- Accreditation/Certification requirements (if applicable)
- Required texts, required readings (if applicable) and recommended texts (if applicable)
- Course requirements for evaluation of students' learning with percentage or points earned per assignment
- Grading scale
- Course outline/calendar of topics and activities/due dates/dates of midterm and final grading periods/Villanova observed Holiday and break schedule
- Course policies including the following statements on disabilities, learning support, and academic integrity:

- **Office of Disabilities and Learning Support Services:**

Students with disabilities who require reasonable academic accommodations should schedule an appointment to discuss specifics with me. It is the policy of Villanova to make reasonable academic accommodations for qualified individuals with disabilities. You must present verification and register with the Learning Support Office by contacting 610-519-5176 or at [learning.support.services@villanova.edu](mailto:learning.support.services@villanova.edu) or for physical

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access or temporary disabling conditions, please contact the Office of Disability Services at 610-519-4095 or email [Stephen.mcwilliams@villanova.edu](mailto:Stephen.mcwilliams@villanova.edu). Registration is needed in order to receive accommodations.

- **Academic Integrity**

All students are expected to uphold Villanova's Academic Integrity Policy and Code. Any incident of academic dishonesty will be reported to the Dean of the College of Liberal Arts and Sciences for disciplinary action. For the College's statement on Academic Integrity, you should consult the *Enchiridion*. You may view the university's Academic Integrity Policy and Code, as well as other useful information related to writing papers, at the Academic Integrity Gateway web site: <http://library.villanova.edu/Help/AcademicIntegrity>.

- Attendance and class participation policies (if applicable)
- Late assignment submissions (if applicable)
- Extra credit opportunities (if applicable)