Syracuse University

Course Tag Reflection Exemplar
Scientific Inquiry & Research Skills

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ECN 505: Mathematical Economics

Identify the course learning objectives in the syllabus that are clearly aligned to Scientific Inquiry & Research Skills and respective assignment(s).

One of the course learning objectives is to provide an overview of the use of various mathematical techniques in the course of economic analysis, with an emphasis on the ultimate development of the theory of constrained optimization—a cornerstone of modern mathematical economics. This course learning objective is aligned to Scientific Inquiry & Research Skills. Another course learning objective is to endow students with the ability to apply constrained-optimization techniques to a variety of problems in both microeconomics and macroeconomics. This course learning objective is aligned to Critical & Creative Thinking.

Explain the connection between specific assignment(s) and Scientific Inquiry & Research Skills. At least 30% of the course grade must engage students in the selected competency for the course to be tagged.

In order to be able to successfully complete each of the six problem sets (5% of the course grade each) as well as the two in-class exams (35% of the course grade each), it is crucial that students (i) be thoroughly familiar with the mathematical concepts discussed during previous class meetings (Scientific Inquiry & Research Skills); and (ii) be able to use, synthesize, and reflect on those concepts in concrete theoretical, numerical, and applied problems related to the analysis of economic phenomena in an informed, well-reasoned, and convincing manner (Critical & Creative Thinking). Given the immanent technical nature of this course, the Scientific Inquiry & Research Skills and Critical & Creative Thinking competencies are interwoven with each other in all for-credit assignments. As a result, 100% of the course grade relates to both competencies.

Describe in detail the instructional strategies faculty use to intentionally teach Scientific Inquiry & Research Skills in the course.

To intentionally teach the Scientific Inquiry & Research Skills competency, I use meticulously designed lecture slides that I present to and discuss with students during in-class lectures. As is usual in mathematically oriented technical courses, (i) important concepts are introduced through formal definitions; (ii) propositions state the veracity of key facts revealing certain important properties that those concepts satisfy; and (iii) the veracity of the propositions is demonstrated through proofs or proof sketches, visual and geometric intuition, and illuminating examples.

To intentionally teach the Critical & Creative Thinking competency, I invite students to investigate a plethora of examples and applications throughout the course, the aim of which is twofold. First, these applications illustrate the persuasive power of mathematical arguments in the analysis of economic phenomena. Second, regular and repeated exposure to practice endows students with the ability to simplify complex phenomena and to derive important insights into the world around us through the use of mathematical arguments in a way that is both rigorous and creative at the same time. Finally, the best way to learn mathematics is to do it. In this spirit, the requirement that students work on problem sets on their own is intended to enhance their Critical & Creative Thinking competency in and by itself.

Describe the feedback tool(s) faculty use to support students' competency development on Scientific Inquiry & Research Skills.

In order to receive full credit on both problem sets and exams, not only are students required to identify the right mathematical technique and to use it in a correct manner (Scientific Inquiry & Research Skills), but they must also justify all their answers with the proviso that merely stating the final result—even if it is correct—without any explanation is not sufficient for full credit (Critical & Creative Thinking). Moreover, the synthesis of the economic intuition behind complex mathematical arguments is actively encouraged, evaluated, and rewarded—another facet of the structure of feedback in this course that is closely related to Critical & Creative Thinking. The grader provides students with written feedback, commenting on whether deductions are due to (i) the use of the wrong mathematical technique; (ii) the use of the right mathematical technique involving conceptual or computational errors; or (iii) a lack of an intelligent and convincing explanation as to how the correct use of the right mathematical technique leads to the desired results. Apart from written feedback on assignments, students are encouraged to meet privately with the instructor and/or the teaching assistant during office hours or after class meetings for additional feedback and to discuss more details about the course material or any of the assignments. Additionally, I regularly pause during in-class lectures and explicitly invite students to ask any questions they might have as well as encourage them to ask questions of their own volition at any time—be they about the foundational concepts themselves (Scientific Inquiry & Research Skills) or about the logical arguments involved in the application of those concepts (Critical & Creative Thinking).