Scientific Computing at SNHU, and Me!

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About

This document is a very short informational sheet, designed to help faculty determine whether the SCI2XX (Introduction to Scientific Computing) course could be a good fit for students majoring in their degree programs. In particular, the document highlights the goal of creating a three-course *certificate* or *badge* in scientific computing here at SNHU.

Three-Course Certificate/Badge

Our ultimate goal is to develop a three-course certificate or badge in Scientific Computing, to be offered at SNHU. The three course sequence would consist of the foundational SCI2XX (Introduction to Scientific Computing) course, a discipline-specific computational course such as BIO422 (Bioinformatics) or MAT370 (Numerical Analysis), and finally a culminating experience in the vein of MAT440 (BIG Problems) where students develop a solution to a pertinent computational problem for a business, industry, or government partner. We envision the culminating course to be truly experiential and to give students a semi-controlled exposure to consulting work.

To complete the three-course certificate/badge, students complete

i) the foundational SCI2XX (Introduction to Scientific Computing) course
ii) one second-tier partner course
iii) the culminating experience

SCI2XX: Introduction to Scientific Computing

The Introduction to Scientific Computing course is expected to satisfy the ESTM Commons requirement. Major objectives covered in this foundational course include (i) experience with collaboration and version control with GitHub, (ii) experience applying numerical methods to solve problems with python, and (iii) experience conducting transparent and reproducible analyses via a notebook environment. You can see more detail about the Introduction to Scientific Computing course here.

Second-Tier Scientific Computing Partner Courses

We are actively soliciting potential partner course for our Scientific Computing certificate or badge. Currently, we know of the following two courses which are good candidates.

- MAT370 (Numerical Analysis)
- BIO422 (Bioinformatics)

Third Tier Consulting Experience

While we are currently unsure what this third-tier experience will look like, we have considered the development of a consulting lab perhaps named *Inkwell Analytics and Scientific Computing Lab*. We have also considered a simpler course-based approach via either the MAT440 (BIG Problems) or similar course.

An Example Experience

As an example student experience, we envision the following scenario being common. We us an example student pursuing a degree in Biology for convenience.

- In Caroline's sophomore year, they realize that they are interested in a career and research in the field of biology.
- Caroline enrolls in SC2XX (Introduction to Scientific Computing), where they learn about using GitHub to collaborate on a joint research project, using python to approximate numerical solutions to real-world problems, and communicating and sharing a completely transparent analysis via a rendered notebook hosted at their GitHub pages portfolio.

- Caroline enrolls in BIO422 (Bioinformatics) during their junior year, where they learn about applying computational methods for working with genetic data.
- During Caroline's senior year, they are involved in a group project with our partner ARMI where Caroline and their team are monitoring synthetic tissue growth in a lab environment and both constructing and anaysing models for the growth of of the tissue under slightly different conditions. Caroline and their group meet with a scientist from ARMI bi-weekly to present on the status of their project.
- Caroline earns the Scientific Computing certificate/badge along with their degree and has offers to pursue a graduate degree while working in a research lab or to move directly into the workforce with a job as junior scientist.

We are excited by the trajectory students will take through this certificate/badge experience. They'll gain foundational exposure to fundamental topics and tools in the SCI2XX course. They'll have an opportunity to learn about and apply computational methods in their home discipline. They'll have an opportunity to apply what they've learned to a real-world problem with implications for a partnering entity.