Dec. 5, 2014

Curriculum & Program Committee

NOTICE OF MOTION

CPC1415 – 11

The Curriculum and Program Committee moves approval of a new concentration in Computational Science.

Rationale:
A computational science concentration will complement our existing programs, particularly our science and social science majors. As an interdisciplinary field, computational science offers appropriate content for a concentration. No additional courses or staff are required to offer this program. Administration of the program will include an interdisciplinary steering committee.

Proposal:
Computational science is the application of computer modeling, visualization and analysis for the purpose of complex problem solving tasks in a wide variety of disciplines. The Association for Computing Machinery, the international standards setting body for computing curricula, identifies computational science as a discipline in its own right beyond computer science that is “the application of computer science to solve problems across a range of disciplines.” The Journal of Computational Science describes computational science as “a rapidly growing multi- and interdisciplinary field that uses advanced computing and data analysis to understand and solve complex problems.” In 2009, The Chronicle of Higher Education cited computational science as one of five college majors on the rise.

Courses within the computational science concentration all focus on the application of computational models to problems from fields such as biology and bioinformatics, astronomy, economics, finance, and digital humanities. The included courses all include applied student projects. Through the completion of the concentration, students will have the opportunity not only to practice the techniques of computational science through the lens of a range of disciplinary problems, but also to craft their own projects that specifically connect to problems of interest drawn from their major or other programs of study. This can include, for example, data mining astronomical data to classify galaxies, using machine learning to predict the “retweetability” of Tweets, and applying network models to test the gravity theory of trade. Students will particularly be encouraged, through advising, to direct their projects in this way as they advance through the concentration. The intrinsic interdisciplinarity of the field and integration of applied problem solving within coursework is also reflected in the fact that the courses to be included in the program carry between them Q, NSM, and SSC designations.
Student demand for the program is reflected in consistent oversubscription of the courses listed for inclusion, with a high percentage of the demand coming from students outside the CIS major or minor who are particularly seeking out courses in computer modeling and simulation to support their research and professional goals. Currently, however, student transcripts often do not reflect a student’s computing experience in a coherent way. This program is a meaningful and relevant packaging of courses already offered regularly in the CIS department that will provide a vehicle for students to pursue the computing knowledge that supports their primary area of study in a framework recognizable beyond the W&J community. The concentration will serve those students well by allowing them to present a depth of computing knowledge that supports their major academic pursuits in other departments. As such, it will fill a gap in the transcripts of many students seeking to demonstrate the technical competence required for advanced research or data-driven professional work. Students completing the concentration will also be encouraged to apply their computational science skills to available research opportunities in their major or other program of study; members of the steering committee should be helpful in advising students about such projects.

**Catalog Language:**
Computational science is the application of computer modeling, visualization and analysis for the purpose of complex problem solving tasks in a wide variety of disciplines. The interdisciplinary computational science concentration provides students with the essential skills to construct and analyze computer models in a number of disciplines. Students may choose from a variety of courses to suit their interests and are encouraged to pursue projects or independent research applying course content to problems from their major or other programs of study. All students who complete the program should be able to model complex phenomena supporting analysis and problem-solving.

The program addresses the growing importance of modeling and simulation in professional and academic settings. Since computational models are increasingly used in the natural and social sciences as well as the humanities and arts, the program serves as a foundation for integrating computing and technology across the curriculum. The program supports interdisciplinary computing by providing a set of foundational courses in the basics of computer modeling that students can apply across the curriculum.

**Requirements:**
The concentration consists of four required courses selected from the following list: CIS112, CIS220, CIS221, CIS207, CIS241, CIS245, and CIS351. Courses may be taken in any order, though some have prerequisites. The concentration is available to students in any major except Computing and Information Studies. Students may not complete both the CIS minor and the Computational Science concentration.