

A Bachelor of Science Degree Program in System Dynamics at WPI

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Although system dynamics is currently taught in hundreds of schools at the K-12 level in the United States and in dozens of graduate schools throughout the world, there has historically never been a place where interested high school students could study system dynamics intensively at the undergraduate level. As a result, many students who excel in system dynamics in high school lose touch with the field when they go to college and miss out on the growing number of career opportunities in system dynamics. To address this problem, Worcester Polytechnic Institute, located in Worcester, Massachusetts and known as the third oldest private university of engineering, science, and technology in the United, has established the world's first bachelor of science degree program in system dynamics. The purpose of this article is to describe the design and implementation of the new program and its current status.

Undergraduate Education at WPI

The goals of WPI's system dynamics major are to train students to be critical thinkers, communicators, and leaders in business, society, and the world as well as to equip them with the skills necessary to become system dynamics professionals in either public and private sector organizations. These goals are achieved through WPI's unique approach to undergraduate education, which emphasizes learner-directed learning, cooperative learning, and learning by doing. Every undergraduate student at WPI completes two extended research projects or "theses" in which they work in teams to solve complex, open-ended problems in close collaboration with faculty members. These research projects are often completed under the sponsorship of businesses or government agencies at one of WPI's many Project Centers in the United States (in Washington, D.C. and San Francisco, for example) and throughout the world (in London, Venice, Bangkok, and many other cities). Consistent with WPI's educational philosophy, students in the B.S. program

in system dynamics will learn the craft of system dynamics modeling by working with faculty in an “apprenticeship-style” learning environment.

The System Dynamics Major

In addition to using system dynamics to complete one or both of their research projects, students in the B.S. program in system dynamics will take a variety of courses designed to acquaint them with the “nuts and bolts” of SD modeling and related topics. The core of the program is a five-course sequence that introduces the system dynamics and systems thinking approach, covers both basic and advanced topics in system dynamics modeling and group model building, and culminates in a seminar in which students replicate and discuss classic system dynamics models as well as review the latest developments in the field. System dynamics students are also required to complete courses in basic science, computer science, and mathematics in order to obtain an understanding of the scientific basis of system dynamics modeling as well as courses in social science, policy, and management that provide a background in the most popular fields to which system dynamics modeling has historically been applied. Finally, each student is required to complete a five-course sequence of applied courses in the area in which they choose to focus their modeling work. A dozen application areas are currently available, including economics, project management, public policy, environmental policy, computer science, and engineering systems. Students are also encouraged to develop and gain approval for new application areas according to their interests.

The System Dynamics Minor

Students can also complete a minor in system dynamics at WPI by completing a sequence of six system dynamics courses. This option allows students to maintain their interest and build their skills in system dynamics while pursuing any of WPI’s other successful major programs, including such options as computer science, electrical, chemical, civil, and industrial engineering, and biotechnology. Students may also, if they wish, obtain a double major at WPI, for example, in system dynamics and computer science.

Current Status of the Program

Implementation of WPI's B.S. program in system dynamics is well underway, with the first group of students declaring the major and taking advanced system dynamics courses in the 1998/99 academic year. In addition, in October of 1998 the program's advisory board, including such members as Jay Forrester, the founder of system dynamics, and Peter Senge, author of the Fifth Discipline, was established and met for the first time. The program is now accepting applications from students who wish to begin the program in the Fall of 1999. Teachers and students who would like more information about WPI and/or the B.S. program in system dynamics may contact WPI's Admissions Office or Social Science and Policy Studies Department (which administers the system dynamics major) at:

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