

Portland State University Faculty Senate Motion
3 May 2021

Applying Area Distribution Designation for UG Systems Science Courses

Background, rationale, and preliminary discussions

Background: At PSU, the Systems Science program had been offering only graduate degrees, Master and Ph.D., until recently. Three years ago, they added a Systems Science Minor degree for undergraduates and added eight 300- and 400-level courses. Due to lack of experience working with UG courses, the courses were not requested to be coded for the distribution areas at the initial stage. Now the Systems Science program is requesting to assign appropriate area distribution designation to the UG courses.

Rationale: Systems science is the study of general principles governing systems of widely differing types, drawing on the natural and social sciences, mathematics, computer science, and engineering. Because of the inherently interdisciplinary nature of the program, some courses are designated as social science, and others as science. Rationales for each course are provided in the attached memo from the Systems Science program.

After reviewing the curricular content and the context under which the request was made, the ARC supports the request for the area distribution designation.

Motion presented by the Academic Requirements Committee

The Faculty Senate approves the distribution designation for the SYSC undergraduate courses as follows and its retroactive application for the time since the courses were implemented:

Social Science

SYSC 340U Big Data and the Modern World (4)
SYSC 342U Systems Thinking for Social Change (4)
SYSC 418 System Sustainability and Organizational Resilience (4)

Science

SYSC 411 System Theory (4)
SYSC 414 System Dynamics (4)
SYSC 435 Modeling & Simulation with R and Python (4)
SYSC 440 Introduction to Network Science (4)
SYSC 445 Application of Data Science (4)

Attachment: Systems Science memo

College of Liberal Arts & Sciences
Systems Science Program



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Date: October 11, 2020

To: Academics Requirement Committee

Re: Request for SCI, SSC designations for recent systems science (SYSC) courses

Eight Systems Science (SYSC) courses have been added to the catalog in the last three years, and we did not code them correctly on the new course proposals in the CMS, so the area designations were not requested as should have been done. Below I have listed the two relevant areas and the courses we like to include in each designation. I have provided the catalog text and a brief rationale for the requested designation.

Social Science (SSC)

SYSC 340U

Big Data and the Modern World (4)

Overview of data science, big data, and its impact society including its promise, limitations, and ethical considerations.

This course fits best in the SSC category due to its focus on social/societal impact and ethics.

SySc 342U

Systems Thinking for Social Change (4)

Why are complex social problems like poverty, homelessness, and climate change so hard to solve? How can we identify effective leverage points for change? This interdisciplinary course addresses social challenges using the methods of systems thinking. We'll dig into real-world examples and learn how to create interactive systems "maps" using causal-loop diagramming. Causal mapping enables a rich understanding of context, interrelationships, and perspectives. Students will gain practical tools they can use in their future work.

The emphasis on social change indicates that SSC is the correct category.

SYSC 418

System Sustainability and Organizational Resilience (4)

Organizations are complex adaptive systems coupled with their environment, supply chains, strategic partners, and competitors. Survival depends on structural resilience market turbulence, and the environmental/political climate. Principles of emergent leadership and living systems are applied to various fields including strategic business management, environmental stewardship, health and public administration, technology management.

The focus on organizations, leadership, political climate, etc. indicates SSC.

Science (SCI)

SYSC 411

System Theory (4)

Surveys fundamental systems concepts and central aspects of systems theory. Gives an overview of the systems paradigm and the systems field as a whole. Topics include introductions to networks, set- and information-theoretic multivariate relations, dynamic systems, regulation and control, modeling, decision analysis, optimization, and game theory.

A theory course focused on networks, dynamics, models, optimization fits best in SCI.

SYSC 414

System Dynamics (4)

Introduces concepts and methodology to analyze dynamic behavior of systems with complex feedback loops. Emphasizes building computer models to enhance understanding, make predictions, and find ways to improve the performance of systems and processes. Models are defined via "rate" equations that are numerically integrated to simulate behavior.

Modeling and simulation of the dynamics of complex systems fits best in SCI.

SYSC 435

Modeling & Simulation with R and Python (4)

Computer modeling & simulation using general purpose tools, R and Python. Covers statistical and simulation-based approaches for simulating dynamics, Monte Carlo methods for addressing uncertainty and risk, and interacting agents to incorporate heterogeneity and network effects.

Similar to the above course, but using different software tools and approaches, so again, SCI.

SYSC 440

Introduction to Network Science (4)

Interdisciplinary introduction to network science, complex systems research, and social psychological concepts. In depth exposure to foundations of network science, including classical topics: random graphs, small world networks, etc. Discussion of social processes such as social contagion, opinion formation, etc. Introduction to advanced topics: community detection and (social) network interventions.

This course could easily fit in either SSC or SCI, but since we have to pick one, we suggest SCI. Either would be okay with us.

SYSC 445

Application of Data Science (4)

Introduction to data science as a profession and toolset, including its role in various types of projects, from exploration to discovery to prediction. Surveys current methods and technologies, emphasizing what's possible, feasible, and practical in terms of modeling and interactive visualization. Complements courses focused on specific methods and tools.

Expected preparation: It will be helpful though not required to have exposure to data

management or programming/scripting tools such as Matlab, Mathematica, R, Python, SPSS, or advanced Excel scripting or formulas.

This is straight up data science, so SCI is the preferred designation, especially given its technical focus.

Sincerely,

A handwritten signature in black ink that reads "Wayne Wakeland". The signature is written in a cursive, flowing style.

Wayne Wakeland, PhD.

Professor and Systems Science Program Chair