**New York City College of Technology**

**Interdisciplinary Committee**

**Course Review Form**

**DATE:** Nov 15,2017

**REVIEWER:** Laina Karthikeyan

**COURSE TITLE & NUMBER:** PHYS 3600 Machine Learning for Physics and Astronomy

**PROPOSED BY:** V. Acquaviva (Physics), A. Satyanarayana (CST)

**CREDIT HOURS:** 4 (3 credits)

**PREREQUISITES:** CST 1201 or equivalent introductory programming course, and MAT 1272 or equivalent statistics course

**COURSE IS:** X Existing New In development

**PROPOSED COURSE DESIGNATION**: X College Option elective Capstone other:

**DEPARTMENT HOUSED IN:** Physics

**PROPOSED STRUCTURE (e.g., co-taught, guest lecture, LC, other):**  Co-taught

**CREDIT DISTRIBUTION** (if co-taught): 3 credits physics, 1 credit CST

**CATALOG DESCRIPTION:** The course focuses on problem solving in Physics and Astronomy through statistical inference, machine learning algorithms and data mining techniques.

Students will be presented with data sets and research problems in different areas of physics and will solve them using tools such as Bayesian statistics, Monte Carlo sampling, regression and classification algorithms, dimensionality reduction, and data cleaning. The programming assignments will be carried out in current, flexible languages, such as Python.

**DESCRIBE & EVALUATE HOW COURSE MEETS INTERDISCIPLINARY CRITERIA?**

This interdisciplinary course examines the potential of a Physics student to think as a Computer Scientist... Students will be introduced to standard statistical tools and Machine Learning, as research methods. Co-teaching by faculty members with different expertise like Physics and Computer Science give a practical dimension to this course*. “*For their weekly or biweekly homework, students will be required to briefly summarize the problem that they are trying to solve numerically and synthesize insights and challenges from the Physics and Computer Science perspectives”.

**DESCRIBE & EVALUATE THE INTERDISCIPLINARY STRUCTURE?**

In this course there is integration of the interdisciplinary nature of science (Physics, Computer Systems and Mathematics) into the curriculum. Besides the course is co-taught by faculty from different departments, which by itself reinforces the idea of interdisciplinarity.

**DOES COURSE MEET REQUIREMENTS FOR GENERAL EDUCATION? Yes, it meets requirements for General Education.**

This course will allow students to acquire more knowledge in the disciplines of Physics, Computer Science and Mathematics. Communication and collaboration through a variety of written, visual and oral methods is integrated into the curriculum. Exposure to inquiry-based, open-ended research and interpretation in course labs. There is integration of quantitative reasoning in the curriculum. Students are also introduced to the process of peer review that is a core component of liberal arts and sciences in all disciplines.

STRENGTHS: Machine Learning is a key technology in Big Data and in many scientific applications. Modern statistical learning models can be used in practice on Big Datasets to extract relevant information. In this course there is a combination of active learning pedagogies integrated with the use of appropriate technologies in the classroom. Students will have the opportunity to have an understanding of Machine Learning and its vast capabilities, as well as the tools to apply it to their Physics research. This course will help them acquire skills in what’s plausibly one of the most important technologies of the coming decade.

**WEAKNESSES:** None