

Executive Summary: MSCMP 3780 “A Systems Approach to Inflammation”

1. Goals and Rationale

This is a two-credit elective course. This course is dedicated to the promotion and development of complex systems modeling in acute critical illness, such as sepsis and trauma, with the long-term goal of improving patient care. Inflammation is a complex process that drives the pathology of severe trauma and sepsis, both major reasons for intensive care unit admission, morbidity, and death. In recent years, modeling complex biological systems has become increasingly useful. However, mathematical modelers are typically neither involved in biology research nor provide patient care. Similarly, bench scientists and clinicians have little modeling experience, and are clearly struggling with the complexity of pathophysiological processes. One way to address this issue is through cross-disciplinary education, and this is the goal of the proposed course.

2. Course Description

Our course is focused on particular topics of great complexity in critical illness, where modeling has the potential to translate in improved patient care. We have adopted a unique structure for this course, in which information is presented by both basic (biological and mathematical sciences) and clinical faculty, in conjunction with graduate students, postdoctoral fellows, members of industry, and speakers from outside institutions whose work is relevant to this course. This information is communicated within the framework of defined themes. Two hours per week (in a single session) are allotted for each lecture, including ample time for questions and discussions. Presentations will be generally carried out using either electronic slides or whiteboards. Grading is based on participation in discussions and on a semester-long, interdisciplinary group project. Each group includes students with a predominantly biology background along with students who are more facile with mathematics and/or simulation. This project therefore requires the students to work with others from outside of their main discipline, to learn about and from interdisciplinary exchange, and gain practical experience in team-based modeling of biological processes.