**NARRATIVE EXPOSITION OF STS COURSE OBJECTIVES AND GUIDELINES FOR SUBMISSION**

For the benefit of Santa Clara faculty who are developing, or thinking about developing *Science, Technology and Society* courses for the new core, this document defines the two course objectives for STS and describes general pedagogical approaches to meeting these objectives, along with examples of such approaches in various disciplines. Each learning objective is illustrated with examples to follow.

**Guidelines for Submission**

Proposals for STS core courses should describe how that course will satisfy the two STS

objectives for student achievement, and how such achievement will be assessed. With regard to each of the objectives, a course proposal should identify and describe:

A. Those exercises, units, or themes that the instructor believes will be particularly successful in modeling/encouraging student achievement of the objective,

B. How someone looking at the course products could tell how well this goal was achieved in the case of any given student.

Finally, in order to ensure that STS courses provide students with substantial exposure to both the scientific/technological and social dimensions of their subject matter, the STS Faculty Core Committee developed the following rule of thumb:

• A minimum of 30% of the course content should address the scientific/technological dimension.

• A minimum of 30% of the course content should address the social dimension, each taught at a level appropriate for the expected student audience.

• Ideally, these dimensions will be integrated within the course rather than treated separately, and thus the FCC does not regard precise quantitative assessments of such percentages as feasible.

• However, the minimums reflect the overarching aim of the STS component: a true intellectual union of these perspectives in the minds of our students.

**Course Objective #1** *Comprehend the relevant science and/or technology and explain how science and/or technology advance through the processes of inquiry and experiment.*

**Definition:** Expresses the need for students to acquire a greater capacity for understanding how scientific inquiry and/or technology actually progress.

**General Approaches:** Develop course content that helps students develop a greater capacity for understanding basic scientific/technological methodologies, concepts, principles, standards, and techniques.

**Examples:** A course offered in the humanities might meet the objective by presenting students with case studies taken from the history of science in which the evolution of a particular theory or scientific concept is analyzed; this might include examining the theoretical or experimental background used to select and define the specific research question; the specific patterns of scientific reasoning (deductive, inductive or abductive) used to advance the discovery; the specific techniques used for data collection and analysis, the stages by which the scientists arrived at their conclusions, and/or how the validity of those conclusions was ultimately confirmed by the research community. For example, one might teach a course in evolutionary theory that explored the conceptual difficulties in dealing with non-experimental, non-predictive science. In a history class, attention would be paid to the development of the theory in the context of changes in geology early in the twentieth century, the development and value of statistical tools, and finally the synthesis between evolutionary theory and genetics.

A course taught in the natural sciences or engineering might meet this objective by focusing

on a particular scientific discovery, development or sub-discipline and examining: the underlying

scientific principles; the ideas that were revised, replaced or removed as understanding grew; and the scientific techniques used and developed that provided the tools for the discoveries. The theoretical and quantitative components of this treatment may be analyzed on a deeper level than would be the case in a humanities STS course, in accordance with the skills and background knowledge of the expected student audience. A canonical case here would be the move from a Newtonian to an Einsteinian world view—one could discuss this through reading Thomas Kuhn on the structure of scientific revolutions and the role of anomalies in science (which could be covered in an exploration of the emergence of quantum theory and general relativity).

**Course Objective #2** *Analyze and evaluate the mutual influence between science and/or technology and society.*

**Definition**: This objective teaches students that science, technology and society are not three separate islands, but that they mutually interpenetrate: social changes precipitate scientific and technological changes and vice versa.

**General Approaches**:

Coursework should help students recognize that science, technology and society are, and have always been, fundamentally inter-related dimensions of human existence and help them integrate their understanding of these three regions of human activity.

**Example**: There are many ways to play this out in different disciplines. We will give just one example covering climate change from different disciplinary angles.

A historian teaching a climate change course might want to look at the history of the relationship between peoples and climate change over the past several thousand years (the desertification of Africa; the little Ice Age in the early 1800s when the Thames froze over) and so forth. So they would learn that climate change is an ongoing phenomenon. They should learn about the evidence for anthropogenic climate change dating from the Industrial Revolution. They should understand enough of the science to be able to follow debates around natural variation (Milankovich cycles; the role of volcanic eruptions and so forth) as opposed to change caused by our activities. They should learn about scientific changes on this issue – in the 1970s the consensus prediction was for an imminent Ice Age. And they should learn about the

politicization of climate change science over the past ten to twenty years. A cognate course in an

engineering school might look at the various technical fixes that have been proposed: giant mirrors in space, increasing the albedo of the ocean by dispersing reflective sheets, burying carbon dioxide far below the surface and so forth. However, to work in the new core, such a course might also cover an exploration of the trade-off between lifestyle changes (polluting less) and technical solutions. They might look at how ‘clean technology’ is developing now – and how some countries have embraced this as an economic boon and others continue to push for, say, the use of coal-fired plants. A science class could look at the various modalities for measuring climate change (tree rings, ice cores, the importance of isotope variations and so forth). However, it could also look at the ways in which the rules of scientific evidence have been deployed politically on both sides of the equation by believers and unbelievers.