General Education Foundations of Scientific Inquiry (FSI) Course Information Sheet

Please submit this sheet for each proposed course along with 1) a syllabus describing the key components of the course that will be taught regardless of the instructor and 2) assignment guidelines.

Department, Course Number, and Title _____

Indicate when the department anticipates offering this course in 2019-20 and give anticipated enrollment:

Fall: Enrollment ____ Winter: Enrollment ____ Spring: Enrollment ____ Summer: Enrollment _____

As stated in the guidelines regarding courses in the Foundations of Scientific Inquiry (FSI), the aim of these course offerings is:

To ensure that students gain a fundamental understanding of how scientists formulate and answer questions about the operation of both the physical and biological world. These courses also deal with some of the most important issues, developments, and methodologies in contemporary science and technology, addressing such topics as the origin of the universe, environmental degradation, and the decoding of the human genome. Through lectures, experiential learning opportunities such as laboratories, writing, and intensive discussions students consider the important roles played by the laws of physics and chemistry in society, biology, earth and environmental sciences, and astrophysics and cosmology.

General Education FSI Student Goals: Courses fulfilling the GE FSI will provide a minimum of four units and should align with some (not necessarily all) of the following seven general goals:

1. Students will actively engage in the scientific process of inquiry, analysis, problem-solving, and quantitative reasoning.
2. Students will acquire an informed appreciation of scientists, scientific research, and technology.
3. Students will experience the interdisciplinary nature of science.
4. Students will develop information literacy.
5. Students will make evidence-based decisions in a wide array of science and non-science contexts.
6. Students will develop scientific literacy by addressing current, critical issues and topics in science that are personally meaningful in daily life and/or connected to the needs of society.
7. Students will recognize fundamental scientific principles and the connections between different domains of science.

General Education FSI Student Learning Outcomes: Each course should have student learning outcomes listed in the syllabus. These outcomes may be tied to a specific discipline but should be associated with the seven broad categories listed above (please see **Appendix I** for a sample list of possible learning outcomes supporting each goal).

General Guidelines for GE FSI Courses: GE Courses may be upper or lower division, but they should have no prerequisites. Any student should be able to take them and understand the material with the background expected from all UCLA students. While the course may include material related to the history of science and the social and cultural implications of scientific research, **at least half** of the course should be devoted to students actively engaging in the scientific process of inquiry, analysis, problem-solving, and quantitative reasoning (Goal #1).

Please indicate the area/s which you believe this course should satisfy.

Life Science: ☐ Physical Science: ☐ Life Science Lab*: ☐ Physical Science Lab*: ☐

**Please see the additional student learning outcomes and expectations for courses approved as GE FSI Labs.*

The GE FSI Assessment Project Resource Team would be delighted to meet with you to assist in filling out this form. Please contact us at RRamachandran@teaching.ucla.edu if you wish to arrange a meeting.

We are interested in understanding the alignment of your course learning outcomes with the GE FSI learning goals. First, identify measurable learning outcomes from your course and enter them in the first column of Table 1. You may add more rows as needed. If you need to state new learning outcomes, see Appendix I for a sample list of possible learning outcomes supporting each goal. Should you wish to choose any of these outcomes, you may simply indicate its number, e.g., 6a. Next, indicate how your learning outcomes relate to the GE FSI learning goals 1 through 7 (see previous page), by placing X's in the appropriate boxes. Note that all GE FSI courses must address Goal #1.

Table 1: Alignment of Course Learning Outcomes with GE FSI Learning Goals

	Your Course Learning Outcomes	**Select GE FSI Goal #**						
		1	**2**	**3**	**4**	**5**	**6**	**7**
1								
2								
3								
4								
5								
6								

Considering each of the GE FSI goals that you marked with X's in the table above, please provide information about related course activities and assignments.

Table 2: Course Activities and Assignments that Support the Learning Goals

Course Learning Outcome No. from Table 1	**Course Activities** How will progress towards meeting this outcome be facilitated? In other words, what types of course activities will be provided to assist students in achieving the learning goal?	**Course Assignments** How will students in the course demonstrate their ability to meet this goal? Please describe and provide a sample assignment, such as a term paper, exam, essay prompt, etc.
1		
2		
3		
4		
5		
6		

Please provide information on estimated weekly hours for the class.

A) STUDENT CONTACT PER WEEK (if not applicable write N/A)

Activity	Number of hours per week
Lecture	
Discussion Section	
Labs	
Experiential (Community-engagement, internships, other	
Field Trips	
A) TOTAL student contact per week	

B) OUT-OF-CLASS HOURS PER WEEK (if not applicable write N/A)

Activity	Number of hours per week
General Review and Preparation	
Reading	
Group Projects	
Preparation for Quizzes & Exams	
Information Literacy Exercises	
Written Assignments	
Research Activity	
B) TOTAL Out-of-class time per week	

GRAND TOTAL (A) + (B) must equal at least 15 hours/week: _____ (hours)

Additional Student Learning Outcomes for experiential learning courses approved as "GE FSI Labs"

GE FSI Lab Definition and Expectations: A hands-on laboratory, computer simulation, demonstration, or field experience that involves active participation in experimental observation, data generation and collection using the techniques, methodologies, and approaches of modern-day scientists. Any lab should be conducted under sufficient supervision by the instructor or a Teaching Assistant (TA). Furthermore, the instructor and TAs should meet regularly outside of class time (minimum weekly or biweekly) to practice performing the lab procedures and/or to review the experimental results.

Please <u>select one or more</u> of the following learning outcomes for your course (select all that apply):

☐ 1. Students will design, implement, and evaluate an experimental strategy for answering scientific questions, testing a hypothesis, or solving a problem.

☐ 2. When possible, students will replicate experiments to allow testing for and interpretation of statistical significance.

☐ 3. Students will apply commonly used mathematical concepts and statistical methods (e.g., basic addition, subtraction, multiplication, division, averages, standard deviation, t-test for significance) in their analysis of different types of scientific data they collect.

☐ 4. Students will be able to visually depict a quantitative dataset as a chart, graph, table, or mathematical equation.

☐ 5. Students will be able to concisely summarize trends and patterns deduced from quantitative and qualitative data to make informed conclusions about their experimental results.

☐ 6. When interpreting their results, students will distinguish between the most important and extraneous findings (i.e. identify those that are critical to addressing a question, solving a problem, or supporting/refuting a hypothesis).

☐ 7. When interpreting their results, students will infer relationships between controls and experimental variables as well as assess causality and correlation among variables.

☐ 8. Students will be able to troubleshoot experimental procedures or methods of analysis to develop a sound scientific rationale for deducing what went wrong and why.

Please present concise explanation of how your course satisfies these criteria.

How will students in this course actively experiment and engage in the hands-on process of gathering, analyzing, and interpreting data? How will progress towards meeting the student learning outcomes for "labs" be measured/assessed? In other words, what types of assignments will be given to determine whether students are achieving the learning outcomes?	

Appendix I. Student Learning Goals with Nested Learning Outcomes for All General Education (GE) Foundations in Scientific Inquiry Courses

Course Goals (1-7) and Student Learning Outcomes (a, b, c, etc.) for all "GE FSI" courses:

1. Students will actively engage in the scientific process of inquiry, analysis, problem-solving, and quantitative reasoning.
    a. Students will explain how scientists answer scientific questions, test a hypothesis, or solve a problem.
    b. Students will make reasonable predictions of experimental outcomes based on observation, measurements, and/or prior knowledge surmised from the scientific literature or other reliable, validated, accurate information sources.
    c. Students will break down, reason through, and solve complex quantitative problem sets.
    d. Students will be confident working with numerical data.
    e. Students will estimate and complete calculations to solve a quantitative problem.
    f. Students will recognize different objects and apply units of measurement at relevant scales (quantity, size, time) and orders of magnitude.
2. Students will acquire an informed appreciation of scientists, scientific research, and technology.
    a. Students will value their academic experiences in a science course that is outside their primary field of study.
    b. Students will recognize the benefits of science to society or their everyday life.
    c. Students will express interest in contributing to the sciences (e.g., engaging in research or scientific discourse with others).
    d. Non-science students will see scientists as role models, helping them to identify as scientists themselves.
3. Students will experience the interdisciplinary nature of science.
    a. Students will investigate topics from a variety of scientific fields.
    b. Students will explore the perspectives of multiple diverse scientists.
    c. Students will make logical connections between key concepts from multiple scientific disciplines.
4. Students will develop information literacy.
    a. Students will be mindful of information they encounter, recognizing contexts or situations when it is necessary to seek out other sources or data.
    b. Students will identify, locate, and critically evaluate information sources and datasets to ensure they are reliable, validated, accurate, and scholarly (i.e. associated with citations in peer-reviewed, public research studies).
    c. Students will explain the peer-review process in science and its role in critical evaluation and validation of published, scientific findings.
5. Students will make evidence-based decisions in a wide array of science and non-science contexts.
    a. Students will distinguish between opinion and fact (i.e. recognize data-supported conclusions).
    b. Students will use reliable, validated, accurate, and scholarly information sources and datasets before accepting or formulating a conclusion.
    c. Students will draw conclusions or make judgements about experimental results informed by critical thinking, that is, a comprehensive exploration of ideas and systematic engagement with the scientific process.
6. Students will develop scientific literacy by addressing current, critical issues and topics in science that are personally meaningful in daily life and/or connected to the needs of society (e.g., climate change, vaccination, GMOs, evolution).
    a. Students will clearly state the significance or relevance of a research question or problem (i.e. state why scientists are motivated to study the issue or topic).
    b. Students will discuss societal impacts by citing examples of the ways in which scientists and scientific research contribute to society.
    c. Students will describe the interactions between humans and their physical world and the positive and negative effects of this interaction.
    d. Students will explain why issues perceived as "controversial" in the public domain are not considered "controversial" in among scientists.
7. Students will recognize fundamental scientific principles and the connections between different domains of science.
    a. Students will describe the nature, organization, and evolution of living systems.
    b. Students will explain the origin and physical processes of the planet earth and the surrounding universe.
    c. Students will differentiate between a scientific theory, hypothesis, fact, or law.