After the Foundational Studies Program has approved a course, departments will continue through the regular department and college procedures. The approved course should be submitted to the University Curriculum Committee by October 1, 2011.

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Instructions:

1. Complete one form per course.
2. Attach this Foundational Studies Course Application Form to the back of the University Curriculum Committee “Request for Curriculum Action” form. Both forms should be submitted to the Foundational Studies Program Office by August 19, 2011.

Part I. Course Information

Course Number and Title: ENGR 104: Introduction to Scientific Reasoning

Type of Foundational Studies Course – (Choose One):
[ ] DLS (Disciplinary Lens – Social Science)
[ ] DLL (Disciplinary Lens – Literature and Humanities)
[ ] DLV (Disciplinary Lens – Visual and Performing Arts)
[ ] DLM (Disciplinary Lens – Mathematics)
[x] DLN (Disciplinary Lens – Natural, Physical, and Applied Sciences)

   - Includes Lab: [x] Yes [ ] No

[ ] CID (Communication in the Discipline)
[ ] FF (Finishing Foundations)

Delivery Format(s) – (Check all that apply):
[x] Face to Face
[ ] Fully Online
[ ] Hybrid
[ ] Concurrent Enrollment
[ ] Other (briefly describe):
Part II. Syllabus Statement

Boise State's Foundational Studies Program provides undergraduates with a broad-based education that spans the entire university experience. ENGR 104 satisfies 3 credits of the Foundational Studies Program's Disciplinary Lens – Natural, Physical and Applied Science requirements. It supports the following University Learning Outcomes, along with a variety of other course-specific goals.

ULO 8. Apply knowledge and methods characteristic of scientific inquiry to think critically about and solve theoretical and practical problems about physical structures and processes.

ENGR 104: Introduction to Scientific Reasoning engages students in a series of scientific problems involving phenomena that cannot be explained by their current reasoning. Using small and large group discussions, new lines of reasoning are developed and applied to multiple situations. This course helps to achieve the goals of the Foundational Studies Program by focusing on the following course learning outcomes.

After successful completion of this course, you will be able to:

- Consider scientific phenomena that cannot be explained by their current reasoning; recognize the inadequacies of the current reasoning and develop another line of reasoning or hypothesis to explain the behavior.
- Collect and/or interpret data to form conclusions about the science problems being addressed. The student will recognize whether the evidence supports or refutes the hypothesis.
- Understand and use technical language to describe the experimental design and measurement error within the context of a lab report. Use appropriate dimensions in written analyses so as to develop deeper understanding of physical concepts.
- Reason using probability, control of variables, random fluctuation, and interpretation of data.

Part III. Design for Accessibility

In the space below, briefly describe plans for providing access to course materials and activities (or equivalent alternatives) to all students in adherence with the Americans with Disabilities Act. Although these plans may vary from instructor to instructor, the descriptions provided below should be representative of intended departmental and instructor practices. (See example statements appended to this form.)

ENGR 104: Introduction to Scientific Reasoning: Materials utilized or distributed in class will also be posted on Blackboard, with sufficient resolution to allow magnification with fidelity. PowerPoints used in class lectures, insofar as they contain graphs or other visual representations of content, will be verbally described to students on an as-needed basis. We will add textual descriptions accessible by screen readers to images used on the course web site. Extra time on tests, oral examinations, or other accommodations will be provided to students as needed per the policies of the Disability Resource center.
Part IV. Evidence of Quality Course Design

Please use the table below (column headings for this table should not be changed) to provide evidence that the course has been carefully designed and is clearly aligned with Foundational Studies Program desired ULOs. All sections of the course should share similar student learning outcomes. Teaching and Learning Activities and Assessment Methods may vary from instructor to instructor. Please use the table to report representative strategies that may be used. Assessment activities used for reporting to the Foundational Studies Program should be consistent across different sections of the course.

Please see below.
## Course Design Table

<table>
<thead>
<tr>
<th>Foundation ULO 8 Criteria</th>
<th>Foundation ULO 8 Notions of Exemplary Work</th>
<th>Course Learning Outcomes: By the end of this course, each student should be able to…</th>
<th>Assessment Method: Evidence of Student Learning</th>
<th>Planned Teaching &amp; Learning Activities / Pedagogy</th>
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</thead>
<tbody>
<tr>
<td>ULO 8.1: Process of Inquiry and Analysis in Response to Evidence or Observation</td>
<td>Skillfully and thoroughly formulates research question or testable hypothesis. * Constructs a model to test evidence and observations * Skillfully uses model to either confirm existing explanations or formulate new hypotheses</td>
<td>Consider scientific phenomena that cannot be explained by their current reasoning; recognize the inadequacies of the current reasoning and develop another line of reasoning, or hypothesis, to explain the behavior.</td>
<td>Assignment: Observe the following situation (e.g. observation experiment involving insects). In small group discussion, discuss the observations. What explanation (model, theory) can explain the observations? Discuss the assumptions and limitations of your explanation. Develop a rubric to assess such an assignment, using (for example) four-point scale. Apply to one or two assignments completed by all students in class; analyze results. Test questions where the student is specifically asked to recognize whether the data supports or refutes a hypothesis, and develop new hypothesis if required.</td>
<td>During the lab/workbook portion of the class students will repeatedly work through examples of developing and testing hypothesis. These activities are done within small groups and discussed class wide. Homework problems are assigned which explicitly require the student to analyze data and generate supportable hypothesis.</td>
</tr>
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<td>ULO 8.2: Understanding of Knowledge and Inquiry</td>
<td>Clearly understands the difference between evidence (data) and explanation (theory) Is able to connect evidence &amp; explanation to build an argument * Understands the role of these kinds of arguments in building knowledge in the discipline</td>
<td>Collect and/or interpret data to form conclusions about the science problems being addressed.</td>
<td>Assignment suitable for homework, in class assignment, quiz or exam question: Given the following set of DATA, what can you conclude about the science problem being addressed? Discuss the limitations associated with your conclusions, and suggest plan of action. Develop appropriate rubric; apply to one or two assignments completed by all students in class; analyze results. Example: Given a series of observations taken from a scientific experiment in class that has one variable (e.g. concentration), what effect does this have on the measurement that is taken?</td>
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<td>ULO 8.3: Communication of Scientific and/or Technological Understandings</td>
<td>Produces clear, accurate, well-organized written and oral communications about scientific and technological understandings * Use of scientific language, representational tools, and notation covered in the course is skillful.</td>
<td>Understand and use technical language to describe the experimental design and measurement errors. Use appropriate dimensions in written analyses so as to develop deeper understanding of physical concepts.</td>
<td>Assignment suitable for homework, in class assignment, quiz or exam question: Ask students to explain in a paragraph consisting of several sentences, the scientific observations made during class. What is the error associated with the observations? What units appropriately describe the observations? Students write several lab reports where they demonstrate their skills of using technical language and coherently organizing their results. Develop appropriate rubric; apply to one or two assignments completed by all students in class; analyze results. The students first spend time grading and reviewing examples of student work. Then they are asked within the context of homework to write their own reports. Example: Given a series of observations taken from a scientific experiment in class that has one variable (e.g. concentration), what effect does this have on the measurement that is taken? Include an estimate of error in your work and units. Be specific in your response and use technical language.</td>
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<td>ULO 8.4: Understanding of interactions of science and technology with humans and environment</td>
<td>Skillfully assesses the potential connection of scientific and/or technological developments to humans and the environment</td>
<td>Students should recognize the potential impact of scientific research, both good and bad, specifically within the context of medical research.</td>
<td>Students read the text “Bad Science” by Goldacre. The experimental techniques developed in the text are discussed as well as the societal implications.</td>
<td>Small group and classroom discussions of the readings, as well as homework assigned short essays on the text topics.</td>
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<td>Able to articulate possible implications of these relationships</td>
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5-16-2013

Foundational Studies Program Director Signature

Date