Boise State University
Foundational Studies Program Course Application Form
Due to the Foundational Studies Program by August 19, 2011

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 108: Bicycle Engineering

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: [ ] Yes [x] 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 108 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 108: Bicycle Engineering is a course focusing on bicycle technology in society and emerging nations. Introduction to engineering design, simple materials, structures and analysis in the context of bicycles. (PREREQ: MATH 108) 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:

• Understand the ideas of engineering project formalism. Understand and use technical language to describe the design, structure, statics and analysis of bicycle frames.
• Explain bicycle frame design materials structure and analysis using correct engineering terminology and correct engineering units of measure. Explain how bicycle will work in a modern society and in emerging societies.
• Design a simple engineering system with considerations of materials, forces, safety factors and post design analysis.
• Confirm existing explanations or models (theories) for materials and designs as it relates to engineering statics and simple data analysis emphasizing engineering concepts, units and ideas.

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 108: Bicycle Engineering: 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.
**Boise State University**  
Foundational Studies Course  
Spring 2014  

Course Number and Title: **ENGR 108: Bicycle Engineering**

### 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>
</tr>
</thead>
</table>
| ULO 8.1: Process of Inquiry and Analysis in Response to Evidence or Observation | 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 | Develop engineering intuition in four diverse engineering areas; Statics, Computer Aided Design, Material Science and Electronic Data Acquisition. Students should be able develop a rudimentary analysis of simple engineering systems. Emphasis will be placed on understanding Engineering Units as they apply to the four areas. | * Assignment: In each of the four sections, following the presentation of the engineering material the students will be asked to apply the information to the construction of a bicycle.  
An assessment metric will be used that measures the understanding of rudimentary engineering concepts, the application of the concepts to engineering projects (bicycle frame constructions) and the integration of the ideas of design, statics, material science and data acquisition. | Example: Introduce web-based bicycle design software and computer-aided-design. Emphasis will be placed on general computer skills, formats, transportability of design and instantiation of design. Examine the structure of the modern bicycle introduce the idea of free body diagram and the forces acting on the bicycle. Examine the property of materials. |
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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)</td>
<td>The curriculum will use the modern bicycle as the medium for moving between theories and engineering application. The essential element of engineering, the application of science to physical systems, will be examined by examining design, materials, construction and analysis of steel bicycle frame.</td>
<td>Material suitable for homework, in class assignment, quiz or exam question: Demonstrate understanding of materials, structure and design as it relates to the actual construction and feasibility of a bicycle frame. Develop appropriate Metric for evaluating understanding and application of ideas of design, structure, materials and testing of bicycle frame construction.</td>
<td>Example: The characteristics of forces and pressures drawn on a free body diagram of a bicycle would be examined in a real bicycle. Material properties would be investigated by looking at material data and material behavior, such as yield points on graphs.</td>
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| ULO 8.3: Communication of Scientific and/or Technological Understandings | 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. | As the students investigate engineering ideas related to a steel bicycle frame, emphasis will be placed on understanding Engineering Units of measure along with engineering concepts. Emphasis will be placed on accurately describing engineering ideas using appropriate engineering parlance and using Engineering Units correctly. | Material suitable for homework, in class assignment, quiz or exam question: Ask students to explain in a paragraph consisting of several sentences, the characteristics of their bicycle frame design, materials and structure. Indicate that an illustration, or plot of behavior as a function of physical change, may be needed as part of the explanation.

Appropriate metrics will be applied to one or two assignments completed by all students in class; analyze results. | Example: In designing bicycle frame students would be required to use the appropriate Engineering Units and strength characteristics such as tension, compression and shear. Students would also need to be able to talk about different characteristics of frame materials and the constructions advantages of one over another. |
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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>Much of engineering is improving the design of existing systems. The benefits of better engineering through better design, materials and analysis will be discussed and demonstrated through the analysis of materials and techniques that yield lighter, stronger and more durable products. The ideas of classical machines and the bicycle will be investigated. The application of bicycle systems used in emerging societies will be discussed along with new ideas of using bicycle technology in new applications.</td>
<td>Assignment suitable for homework, in class assignment, quiz or exam question: The students will be asked to evaluate the efficiency of bicycles for doing work and the adaptability of the technology to other low power demand projects. Appropriate metrics will be applied to one or two assignments completed by all students in class; analyze results.</td>
<td>Example: Bicycle technology in developing countries will be examined. Bicycle technology applications such as grinding grain, pumping water and generating electricity will be examined. The efficiency of bicycle power will be discussed and the benefits to the ecosystem of using bicycles will be discussed.</td>
</tr>
</tbody>
</table>

5-16-2013

Foundational Studies Program Director Signature

Date