ESG 21W.732 PROJECT II OVERVIEW  
FALL 2010  
CONCEIVE, DESIGN, PROTOTYPE, & EVALUATE a SOLAR HOT WATER HEATING DEVICE

Problem Statement:

As a pilot for an esg solar water heating system, conceive, design, prototype, and evaluate a device to heat hot water with solar radiation. The device requirements:

• heat 100 ml of water as quickly as possible
• be safe to build, operate, and store (please, no broken glass)
• cost < $125 in materials; this cost is for three units and excludes materials available at the hobby shop and incidentals (e.g. hanger wire, cardboard) that can be rummaged for free
• when deployed, the device must fit in a 0.5 meter cube
• duct tape may not be used in the construction of the final prototypes

Two further design constraints:

• accuracy—the degree to which the device heats water should match the design prediction
• precision—the performance results from three different units should match closely; the degree of this match should be predicted in the proposal and analyzed in the report.

Design process suggestions:

The intended challenge of this project is to match the analysis to the prototype performance. Include accurate prediction of performance as one of your selection criteria. During the FRDPARRC design phase, dwell on developing a useful model to predict device performance. You are highly encouraged to use the hobby shop facilities to construct your devices.

Team deliverables:

Project II is done as a team and the communication deliverables include individual and collaborative efforts. Document your contributions in your notebook. Address team issues promptly.
### Table 2: Project II Workflow, Roughly in Order of Occurrence

<table>
<thead>
<tr>
<th>Activity</th>
<th>Deliverables</th>
<th>Due Dates</th>
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<tbody>
<tr>
<td><strong>Team Formation</strong></td>
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<tr>
<td>Team Roster</td>
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<td>Sept. 20 (in class/lab)</td>
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<tr>
<td><strong>Team Meeting 1</strong></td>
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<tr>
<td>Roles</td>
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<td>Sept. 21 (during class/lab time)</td>
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<tr>
<td>Who am I Presentations</td>
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<td>(Document in notebooks)</td>
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<tr>
<td>Schedule of when work will</td>
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<td>occur (Email/hardcopy to Dave)</td>
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<td>Team Contract (Email to Dave</td>
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<tr>
<td>&amp; Elizabeth)</td>
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<tr>
<td><strong>Brainstorming (Individual)</strong></td>
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<tr>
<td>Sketches and scrawlings in</td>
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<td>Sept. 23 (for class)</td>
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<td>your notebook that identify:</td>
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<tr>
<td>• 3 Concepts for solar water</td>
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<td>heating</td>
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<td>• 3 design spaces for each</td>
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<td>concept (9 total spaces)</td>
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<tr>
<td><strong>FRDPARRC &amp; Selection</strong></td>
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<td>Rough FRDPARRC Table for each</td>
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<td>Sept. 23 (for class)</td>
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<td>Design Space (in notebook)</td>
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<td>Sept. 23 (for class)</td>
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<tr>
<td>Selection Criteria Table</td>
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<td>Sept. 23 (for class)</td>
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<td>(in notebook)</td>
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<td>At least one back of the</td>
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<td>Sept. 23 (done in class)</td>
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<td>envelope calculation (in</td>
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<td>notebook)</td>
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<td>Informal presentation of</td>
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<td>Sept. 23 (for class)</td>
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<td>spaces and designs (in</td>
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<td>Sept. 23 (for class)</td>
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<td>notebook)</td>
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<td>Sept. 23 (for class)</td>
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<tr>
<td><strong>Selection (Team)</strong></td>
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<td>Sept. 23 (done in class)</td>
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<tr>
<td>PREP of Individual Concepts &amp;</td>
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<tr>
<td>Spaces (Evidence in notebook)</td>
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<tr>
<td>Possible Further Brainstorming</td>
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<tr>
<td>(Evidence in notebook)</td>
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<tr>
<td>Selection of Concept (Evidence</td>
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<td>Sept. 23 (done in class)</td>
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<td>in notebook, Formally Part of</td>
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<td>Proposal)</td>
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<tr>
<td><strong>Reflection</strong></td>
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<td>Sept. 26 (midnight)</td>
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<tr>
<td>E-mail Memo to Elizabeth about</td>
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<tr>
<td>How Well the Team is Working</td>
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<tr>
<td><strong>Reading</strong></td>
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<td>Sept. 28 (for class)</td>
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<td><strong>Propose Design</strong></td>
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<tr>
<td>Poster (Team)</td>
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<td>Sept. 30 (for class)</td>
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<tr>
<td>Poster Pitch/Preliminary</td>
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<td>Sept. 30 (for class)</td>
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<tr>
<td>Design Review (Individual)</td>
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<td>Oct. 5 (for class)</td>
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<tr>
<td>Extensive FRDPARRC of Design</td>
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<td>Oct. 5 (for class)</td>
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<tr>
<td>(Team)</td>
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<td>Oct. 5 (for class)</td>
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<tr>
<td>Formal Written Proposal</td>
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<td>Oct. 5 (for class)</td>
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<tr>
<td>Proposal/Design Review</td>
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<td>Oct. 5 (for class)</td>
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<tr>
<td>(Semi-Formal Presentation,</td>
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<td>Oct. 5 (for class)</td>
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<td>Team)</td>
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<td><strong>Reading</strong></td>
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<td>Oct. 5 (for class)</td>
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<td><strong>Predict Performance</strong></td>
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<td>Oct. 14 (Delivered In Class)</td>
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<td>Prediction Presentation</td>
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<td>Oct. 14 (For Class)</td>
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<td>(Team)</td>
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<td>Prediction Report (Team)</td>
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<td><strong>Reading</strong></td>
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<td>Oct. 14 (For Class)</td>
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<tr>
<td><strong>Prototype</strong></td>
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<td>Oct. 19 (For Class)</td>
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<tr>
<td>Product Prototype</td>
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<td>Oct. 19 (In Class)</td>
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<tr>
<td>Demo Prototype</td>
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<td>Oct. 19 (For Class)</td>
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<tr>
<td>Documentation of the</td>
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<td>Construction (Photos and</td>
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<tr>
<td>Notebook)</td>
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<tr>
<td><strong>Test</strong></td>
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<td>Oct. 21 (During Class/Lab Time)</td>
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<tr>
<td>Test Results in Notebooks</td>
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<td>Photo Documentation of Results</td>
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<tr>
<td><strong>Memo</strong></td>
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<td>Oct. 24 (Midnight)</td>
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<tr>
<td>E-mail Memo to Elizabeth about</td>
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<td>Team III Roster Recommendations</td>
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<td><strong>Report</strong></td>
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<td>Oct. 26 (For Class)</td>
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<tr>
<td>Oral Presentation (Team)</td>
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<td>Written Report (Team)</td>
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<td>Graphics Package (Team)</td>
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<tr>
<td><strong>Reflection</strong></td>
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<td>Oct. 28 (Before Class)</td>
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<td>Reflection Memo to Neal</td>
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<td>Oct. 28 (In Class)</td>
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<tr>
<td>Debrief</td>
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<td>Oct. 28 ± 2</td>
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<tr>
<td>Performance Review w/ Dave</td>
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<tr>
<td><strong>Reading</strong></td>
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<td>Oct. 28 (For Class)</td>
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</tbody>
</table>

A movie project starts Oct. 7, and its assignments will overlap with project II, especially movie essay drafts due for class on Oct. 14 and Oct. 28.