

Guajataka Camp

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Type: Design Problem
Length: 4 weeks planning; 3 day workshop
Location: Classroom/Home/Outdoor Campsite

Summary

Students are asked to solve problems that usually would occur at an outdoor camp. Students use their intuition, intelligence and skills developed during class from previously assigned problems and on-site problems while having fun in a real world experience. They have the opportunity to exercise principles of communication, programming, safety, structural analysis, and recycling in an effective team environment. The task is suitable to work in teams of 5 to 7 persons.

ABET Descriptors

Engrg. Sci. Content: First Year Engineering
Type: Environmental system conceptualization
Elements: Creativity, construction, testing, evaluation
Features: Real-world experience, construction methodology,
comparative analysis, open-ended
Constraints: Recyclable materials, space, aesthetics, time, human factors
Effort: Team

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This project for first year students is suitable to work in teams of 5 to 7 persons. The objective is to solve situations that require planning and/or troubleshooting in the actual situation presented. You will use your intuition, intelligence, and the skills developed during the class for class problems and on-site problems. You will be expected to exercise principles of communication, programming, safety, structural analysis, and recycling/conservation in an effective team environment while working through problem solving alternatives on the assigned design exercises.

A. Problems assigned 6 weeks in advance:

A written report will be submitted one week after the overnight activity. The report will include:

1. Problem Identification/Title/Course and Members ID
2. Preliminary Ideas (sketches and brief description)
3. Analysis (cost, labor, accessibility, aesthetics, efficiency)
4. Implementation (concept, CAD drawings, detailed description)

1. Problem Statement: Design and construct a shelter to accommodate 6 persons for an overnight in a campsite.

Limitations and Requirements:

- a. Use recyclable materials. The components will be submitted in advance to the professor for approval.
- b. The shelter shall not exceed 25 sq. ft. per person.
- c. Safety and impermeability will be required.
- d. Must be assembled in less than three hours.

2. Problem Statement: Design and provide a transporter for goods from the parking area to the campsite.

Limitations and Requirements:

- a. Fast and easy assembly (5 minutes).
- b. To be carried or pushed by 2 persons.
- c. Should fit in a car trunk.

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3. Problem Statement: Provide means of illumination and an alarm system for your shelter and tent area.

Limitations and Requirements:

- a. No electrical outlet will be a source.
- b. Bulbs and battery utilization is allowed to create a circuit.
- c. The use of natural resources or recyclable substances is preferred.

B. Problems assigned 4 weeks in advance:

Submit a written* report for the solution of each problem statement. This report will include:

1. Project title/group name/members/course ID.
2. Problem statement and limitations.
3. Analysis of the problem.
4. Solution abstract with description and sketches.

* Software program is required.

1. Problem Statement: Assume that you are marooned on a similar site, with no tools or supplies. Identify the major problems that you will encounter. List what you would have to consider before attempting a solution for each problem. For example; illumination sources, shelter, potable water supply, need for food, available sources, methods of gathering, and storing a food supply and method of cooking. Consider resources available in a typical tropical surrounding.

2. Problem Statement: Develop a portable engineering kit to give the capability of making calculations, notes, sketches and drawings. The kit might include a carrying case, calculator, drawing instruments, paper, reference material, first aid supplies, and measurement equipment. This kit will be taken to the overnight activity for validation. A written report will be delivered in advance for approval.

3. Problem Statement: What characteristics will you look for in an ideal engineering team to work in the solution of a problem?

4. Problem Statement: What are the advantages and disadvantages of being a team member?

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5. Problem Statement: Design a backpack built with recyclable materials for use on a week long camping trip. Determine the minimum number of articles a camper should carry and use their weights and volumes in establishing design criteria. Make sketches of the pack and the method of attaching it to the body to provide mobility, comfort, and capacity.

6. Problem Statement: Determine the buoyancy force and the mass density of different materials in the campsite area.

Limitations and Requirements:

- a. You will use a weight balance provided to the group.
- b. You can prepare a measuring reference for that purpose.
- c. Air movement or pressure is an on-site consideration.

7. Problem Statement: Name waste products (minimum of 5) and suggest productive ways to recycle.

- a. One different alternative per team member.
- b. Written report (computer generated).

C. Problems Specially Assigned per Group:

1. Problem Statement: Analyze and innovate for camping purposes an existing solar still that can produce 1 gallon of pure water per day.

Limitations and Requirements:

- a. Shall be assembled in a maximum of 2 hours.
- b. Materials should be recyclable as much as possible.
- c. Use solar energy.

2. Problem Statement: Analyze and innovate an existing weight balance to determine mass density of materials.

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3. Problem Statement: Design and construct a simple raft for competition to use in the swimming pool area.

Limitations and Requirements:

- a. Submit a free-hand scale drawing of the solution.
- b. Prepare a prototype to be used during the activity, built of recyclable materials.
- c. The boat will not exceed 12 inches long.
- d. The boat will be impulsed only by the release of the air of a balloon not to exceed 12" in diameter, that will be attached to the boat.
- e. The raft will navigate a minimum distance of 34 ft.

4. Problem Statement: Design and build a campfire stake (camp officials assistance).

Limitations and Requirements:

- a. Not to exceed 15 ft. high.
- b. Safety measures will be demonstrated.
- c. Stable and functional.
- d. Use recyclable materials.

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Engineers Notes:

Students will have 6 weeks of lectures and workshops in the classroom to receive basic resources that will help in the solution of problems. During the sixth week they will attend an outdoor activity where they present solutions for the previously assigned problems and participate in situations that require design and problem solving techniques, including troubleshooting. At all times they are required to demonstrate awareness of safety and environmental issues and to create ways of dealing with these issues. Each design team has the assistance of senior engineering students. The method of evaluation of the results are by a jury formed by their tutors and the professors attending the camp.

Objectives/Comments:

The students must live their solutions in this real-world experience. Motivation is the key element in dealing with the perceived barrier that the learning process cannot be fun. Be prepared to demonstrate through primitive/basic exercises how to determine buoyancy force, mass density comparative calculations, basic lighting principles, the calculation of volume, and stability of a structure. This should be a fun and productive exercise for the students. Stress the awareness of safety and environmental issues during the activity. Emphasize to the students the importance of team work dynamics, leadership, effective communication, and accomplishment of objectives.

Discussion/Follow Up:

Encourage the participants to analyze the whole experience and perform a self evaluation of their project. Students may compare in a lab environment the results of their field calculations.