Space Colonies

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Type: Exploratory Design problem
Student time: Ten weeks
Location: At school

Summary

This project is intended for students to do the feasibility study of space colonies as resources on the Planet Earth get limited. Topic of space travel and space colonization is becoming a distinct possibility. Students will work in a group of 3-4 to study the literature on space travel. Taking clues from TV and internet, they will design a conceptual model of a colony in space. They will examine the anticipated limitations on Earth and design a model space city, taking into account economic and socio-technological factors. For presentation of their ideas, they will design a Web page and communicate its use to the class in the form of a brief oral presentation.

ABET Descriptors

Engr Sci Content:	First Year/Sophomore Engineering
Type:	System
Elements:	Design, engineering economy, feasibility
Features:	Design process, envisioneering, open-ended, written and oral communication
Constraints:	Cost and convenience
Effort:	Team

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Memorandum

To: Engineering Students in SSE201: Professionlism and Ethics
From: Exploratory Technologies Committee
Subject: Space Colonies

As you see on the television, space travel is capturing the imagination of many young and old alike. As of today, space travel and colonization seem beyond the dreams of ordinary people. Think of the days of Columbus when even finding a sea route to India seemed an impossibility. NASA projects are now showing us a variety of prescriptions that may become reality for humankind. The projected space colonies may have special features for handicap people, religious groups, social and political outcasts, and many more that capture your imagination. You are asked to consider a design of this space colony. Each settlement must be an independent biosphere, much like the Biosphere II project in Oracle, Arizona. Building cities in space will require materials, energy, transportation, communications, life support, and radiation protection. With so much complexity of the space colonization and various possible options, we ask you to generate various alternatives and suggest a possibility which may become a reality in year 2005.

In this project, you will surf the Net, take clues from TV shows, and read some space journals. We are asking for your designs, cost analysis, and feasibility report. Please submit your designs and supporting documents within ten weeks.   While considering your choices, you have to fully state the reasons for a particular recommended choice and its implementation procedures. Also, consider the ergonomic factors while designing a web page for your presentation.

Evaluation Criteria:
- A conceptual sketch of the space colony. Engineering drawings preferred
- Function of various components.
- Budgetary constraints etc.
- Report in the form of a Web page with links attached to other pages of relevant interest. A brief oral description on how to effectively use your designed Web page.

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Engineering Notes:

- **Ergonomics:** The scientific, interdisciplinary study of humans and their relationship to planets and galaxies (astrological fantasies, etc.).
- **Survival factors:** Light and color, protective devices, energy and radiation, space wars, etc.
- **Environment:** power, heating, ventilation, humidity, air-conditioning, electrical wiring and conduit requirements.
- **Technology:** Spaceships, computers/workstations, bio-technology, food, medicine, Internet resources, matrerials, construction. Take clues from, for example, http://www.nas.nasa.gov/RNR/Visualization/AlGlobus/SpaceColonies/Basics/wwwwh .html#what).

Design Competency Outcomes

- **Group Dynamics:** Understand their own and other members' style of thinking and how they affect teamwork; roles and responsibilities of each member of the team; effective listening, speaking, and visual information processing to be an effective communicator in a group; creating supportive workplace environment.
- **Data, Information, and Knowledge Engineering:** Gather data from various sources-internet, journals, surveys, newspapers, government databases, visits to other places, etc. Organize data in a way to give useful information to the group and public at large and put sufficient knowledge into it to make intelligent choices.
- **Needs Analysis:** Understand open-ended nature of problems, dream ideas, develop specific goal statements, and recognize need for space colony as opposed to present comforts of earth community.
- **Generating Alternatives:** Create conducive environment for idea generation, brainstorming, understanding constraints of each idea, and synthesis of the ideas to make whole larger than the sum of its components.
- **Evaluation and Decision Making:** Follow an iterative approach for evaluating design and process of continuous improvement. Develop a follow-up plan.
- **Implementation:** Time and resource management to complete the project and make changes in the design as the project progresses to various phases. Sources of funding, resource sharing by several institutions to derive the maximum benefit, ergonomics and other human factors for using resources.
- **Communication:** Production of records, technical papers, memos, ideas in an acceptable and comprehensible style; presentation techniques to peers and public at large; nonverbal interpersonal communications; personal appearances.