HANDS ON AN AQUARIUM

Rowan Hall
Monday 9:30 10:20 AM Wilson 206
Rowan 117 and Rowan 302 Wednesday 8:30 – 10:45 AM

An aquarium is an exquisite combination of interacting systems which can be analyzed using multidisciplinary engineering principles. Children typically have personal aquariums for their pet fishes and visit some large aquarium as part of a school field trip or as part of their family outing. Movies such as Disney-Pixar's "*Finding Nemo*", *Epcot's Living Seas* also make tremendous impact on a young audience. While these activities apparently raise the knowledge base in terms of nature and the environment, children seldom make a connection to the engineering principles playing out in the maintenance of a natural, commercial or personal aquarium. Therefore the idea of reverse engineering an aquarium is innovative and exciting. The idea will also have a broad appeal to a wide audience ranging from young children to engineering students. Educators are always being challenged to develop teaching tools that engage students' imaginations and provide a platform for integrating state-of-the-art modern technology into the undergraduate curricula. Therefore it is expected that the activities proposed would generate enthusiasm and enhance student understanding and learning. MIT's *iquarium* project and Georgia Tech's *NSF Funded Aquarium Project* are two excellent examples of aquariums being used to enhance the quality of science and engineering education at all levels including K-12 education. Students will be engaged in the scientific discovery process using exciting hands-on activities which will be introduce chemical, mechanical, electrical engineering, civil and environmental principles. The aquarium theme will also add to the need for an understanding of biological systems, ecosystems, pollution and sustainable development. Finally, the aquarium theme will be extended to investigate ethical, social and environmental issues through classroom and homework activities. These topics bring tremendous strength to the theme as engineers of the future must have a fundamental understanding of their role in the design and analysis of complex interacting systems, as well as the relevance of ethical and social issues.

References:

1. http://iquarium.mit.edu/ , November 25, 2004

2. NSF DUE 9354530 "Use of an Aquatic Ecosystem in Undergraduate Chemistry Curricula", 1993.

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OFFICE HOURS: Monday 11AM-12PM and Wednesday 11AM-12PM Room 139.

Grade Distribution	%
Reverse engineering project (experiments and lab reports)	35
Oral presentations – midterm oral and final presentations	15
Final Exam (Individual)	20
Professional Conduct	5
Portfolio	**Required**
Quizzes & Homework (Individual)	25

WEEK #	MONDAY	WEDNESDAY	PATHFINDER	DELIVERABLE
WEEK 1	No class	01/20 *First Day of Classes* Welcome & getting to know you		
WEEK 2	01/25 Introduction to Reverse Engineering	01/27 Lab: RE of Flashlights	Product Development Intellectual Property	
WEEK 3	02/1 Introduction to Water Quality	2/3 Measuring common water quality parameters		Flashlight Report
WEEK 4	02/8 EXCEL	02/10 Report Workshop		
WEEK 5	02/15 Gas Transfer	2/17 Gas Transfer Rate Measurement	Statistics	Flashlight Report Final
WEEK 6	02/22Heat Transfer	02/24 Heat Transfer Experiment	Statistics	
WEEK 7	02/29 Statistics	3/2 Statistical Data Analyses	Statistics	Water Quality Report
WEEK 8	03/7 UROV	03/9 UROV		Gas Transfer Memo
WEEK 10	**3/14 SPRING BREAK – *No Classes***	**3/16 SPRING BREAK – *No Classes***		
WEEK 11	**03/21 Midterm Review**	**03/23 Midterm Exam**		
WEEK 12	03/28 Water Treatment Methods	03/30 Water Treatment	Engineering Economics	Heat Transfer Memo
WEEK 13	4/4 Engineering Economics	4/6 Water Treatment	Engineering Economic Evaluation	
WEEK 14	04/11 Materials	04/13 Material Testing	Engineering Ethics	Water Treatment Report
WEEK 15	04/18 Ethics Video	04/20 Contemporary Ethics Case Studies	Engineering Economic Evaluation	Materials Testing Memo
WEEK 16	04/25 Engineering Economics	04/27 **Oral Presentations**		Oral Presentation
WEEK 17	5/2 **Final Exam Review**			