

New Jersey
Institute of Technology

FUNDAMENTALS OF ENGINEERING

The Lawn Sprinkler and the Floppy Disk Drive Projects

By Kwabena A. Narh and Herli Surjanhata



Mechanical Engineering
Module

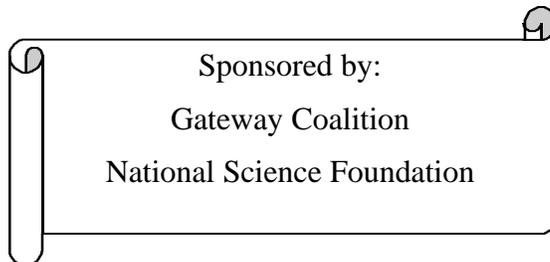
FUNDAMENTALS OF ENGINEERING

Mechanical Engineering Module

The Lawn Sprinkler and the Floppy Disk Drive Projects

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Abstract

This document describes the Mechanical Engineering Module of the project-based freshman engineering pilot course known as Fundamentals of Engineering (FE). The course, has been modeled on another Freshman course called Fundamental of Engineering Design (FED). Both courses were to run concurrently*. The differences between the two courses are described, as well as the main structure of the pilot course. The two case-study projects, which constitute the Mechanical Engineering Module of the course curriculum, are the “Lawn Sprinkler” and “3.5” Floppy Disk Drive”. In this course, the freshman engineering student is introduced to many aspects of engineering as an entire unit working together, emphasizing the concept of teamwork in engineering research projects. Students are introduced to many computer aided design tools available at NJIT which can be used not only to build models of the product to be manufactured but also for diagnostic analysis in order to solve potential manufacturing problems. The student is also introduced to the concept of communication among team members and the concept of technical report writing and oral presentation. The grading and course evaluation schemes are also discussed. A few samples of the course materials such as homework assignments and students graphics are reproduced.

* Both courses were running concurrently when this module was first prepared for publication. Currently, only the Fundamentals of Engineering is running as a Freshman Engineering course.

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FUNDAMENTALS OF ENGINEERING 101
Fall 1996

Project Title: The Lawn Sprinkler

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Week	Topics
1	Introduction of TEAM ADVISORS Course Objectives, Description of Project (M.E.) and I.M.E. takes over.
2	I.M.E (Industrial and Manufacturing Engineering) Module
3	I.M.E. Module
4	I.M.E. Module
5	M.E.: Product Description and Function - Isometric sketching of the Product and component parts. A step-by-step instruction on how to sketch isometric view of the product. Each student is expected to participate.
6	M.E.: Disassembling of Product - Taking Measurement of Component Parts using dial calipers: A brief review of the functions of a dial caliper; types of calipers; Reverse Engineering: disassemble of the product and Itemization of Product Components; Detail measurement of component parts, with tolerances etc. Assignment #2: Group Report.
7	M.E.: Introduction to gear types and arrangements; gear terminology/nomenclature; gear systems as transmission of power; gear ratio based on input/output speed; Expressions for Mathcad Calculations. Assignment #3: Individual Effort on Mathcad Calculations.
8	M.E.: Materials and Processes - Materials for Engineering; Types of Materials: Metals, Ceramics and Glasses, Polymers, Composites, Semiconductors: Materials Processing (an overview of processes used to produce materials listed above). Introduction to Plastic Materials.
9	M.E.: Plastic Parts Manufacture - A Brief Description of Plastics Processing Techniques; Visit to Plastics Processing Lab. and the Factory Floor. Materials Selection: Engineering Design Parameters used in Materials for the Lawn Sprinkler: Plastic gears as opposed to metal gears. Assignment #4: Group Report
10	M.E.: Introduction to C-MOLD - Getting acquainted with C-MOLD. Preparing Pro/ENGINEER Model for Exporting to C-MOLD: FEM Files.
11	M.E.: Introduction to Plastics Moldability Analysis - C-MOLD Simulation of Mold Cavity Filling in Injection Molding (Filling EZ).
12	I.M.E. Module
13	M.E./I.M.E.: Integration Session. Brief review of what is needed in the Final Report.
14	Final Report & Oral Presentations. Final Report to precede Presentation in order that students receive feedback from faculty on Final Report.



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Fall 1996

Project Title: The Floppy Disk Drive

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Week	Topics
1	Introduction of TEAM ADVISORS Course Objectives, Description of Project (E.C.E/M.E.)
2	E.C.E (Electrical and Computer Engineering) Module
3	M.E.: Disassembling of product and sketching the component parts.
4	M.E.: Taking Measurement of Component Parts using dial calipers.
5	M.E.: Different types of spring and functions; strain energy; Hooke's Law (stress vs. strain). Specific application of a spring in the design of a floppy disk drive: (i) Front panel (ii) Read/Write mechanisms; Shaft – as power transmitters; Screw type shaft as a mechanism for positioning read/write head in floppy drive.
6	M.E.: Materials and material selection; Plastic front panel; Plastic material recycling; Introduction to plastic parts manufacturing.
7	M.E.: Preparing Pro/ENGINEER Model for Exporting to C-MOLD: FEM Files.
8	M.E.: Preparing Pro/ ENGINEER Model for Exporting to C-MOLD: FEM Files.
9	M.E.: Introduction to C-MOLD Simulation of Mold Cavity Filling in Injection Molding (Filling EZ).
10	M.E.: Plastics moldability analysis: C-MOLD computer simulation.
11	E.C.E (Electrical and Computer Engineering) Module
12	E.C.E (Electrical and Computer Engineering) Module
13	E.C.E (Electrical and Computer Engineering) Module
14	Final Report & Oral Presentations. Final Report to precede Presentation in order that students receive feedback from faculty on Final Report.