

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
ELECTRICAL ENGINEERING DEPARTMENT

EE 411

Capstone Design Projects

Handout #1

CAPSTONES DESIGN PROJECTS PROGRAM

The capstone design project provides the electrical engineering student with the **opportunity** to work on **a realistic, industry-related design project.**

OBJECTIVE

The objective of the capstone program is to provide the graduating engineer with a **smooth transition** to industry through the experience provided by the design project.

THE DESIGN PROJECT

The design project presents the student with an opportunity to operate as **part of a design team** in an **unstructured problem-solving** environment. This design project experience builds on the excellent analytical and theoretical backgrounds developed in the engineering study. The student design team has **complete responsibility** for conducting the project.

CAPSTONE PROPOSALS

The chairman of the Electrical Engineering Department is responsible for soliciting design projects from industry and/or from faculty members. The chairman sends a call for projects to the faculty members and to the engineers at companies employing electrical engineers. The call requests proposals on current design problems. **Design problems may vary considerably depending on the company and the interest of the faculty members.**

Some of the sources of design problems submitted include:

1. **current** problems in different areas of electrical engineering
2. **traditional problems** which have not been totally and satisfactorily solved.
3. favorite **ideas** or projects which have been discarded because of resource limitations.
4. **parts of large scale projects** on which the organization has neither the time nor staff to fully investigate, and

5. problems which have been solved before, but subsequent implementation indicates a **better solution exists.**

PROJECT SELECTION

The proposals are submitted by the EE groups and/or the company. The projects selected for consideration are expected to be **open-ended, multi-component,** broadly based projects which typically include mechanical, electromechanical, pneumatic, hydraulic, thermo-fluid, solar, or other technical considerations. Some of the **non-technical** consideration that may be included in the design project are **safety, economics, ethics, aesthetics,** and others.

Some features of typical design projects are:

1. projects containing some or all of the following **design phases:** feasibility study, preliminary design, and detailed design.
2. problems dealing with mechanical systems or multi-component assemblies.
3. broad based problems requiring analysis, synthesis, experimentation, simulation, optimization, etc.
4. new designs rather than redesigns, and
5. problems requiring investigation into new technical areas, new applications, and use of new technologies.

DESIGN TEAM SELECTION

1. Students will work in 3-4 person design teams on an authentic design problem submitted by industry or by the EE groups.
2. Design teams will be composed of students with varied, but **complimentary** analysis interests, backgrounds, experience, and skills.
3. The selection process used by the professor-in-charge of the course in determining the members of a design team will be based on the expressed student interest in a topic, a student skills inventory, and a management evaluation of what is needed to get the work done.
4. Four/five teams constitute the class for the capstone project.
5. **People excel best on work that they like.** Hence all students are asked to read the proposals received for all design projects and will then be given the opportunity to specify (3) top interests preferences.
6. The professor-in-charge of the course will attempt to assign students to their first preference. If it is not possible to assign a student to one of their first three

preferences, the professor-in-charge of the course will meet with the student to discuss the possibilities before a final assignment is made.

7. The professor-in-charge of the course must satisfy requirement for each project quickly by reviewing the design team background. In this situation the student is asked to complete a **STUDENT DATA SHEET** to help the professor assign team members. The information on the data sheet will be used by the professor to assemble a design team that will collectively have the required knowledge base, work experience, and skills for the project.
8. The professor-in-charge of the course must take decisions in staffing, time management which are required to satisfactorily complete the task. In those cases which strongly impact the design team (individuals), the professor-in-charge will consult with the design team (individuals) before finalizing a decision.

PROGRAM LOGISTICS

Effective completion of the design project is facilitated by understanding the roles of three (3) individuals; the faculty advisor(s), the professor-in-charge of the class, and the design team leader.

- **FACULTY ADVISOR**


The design team will select, in consultation with the professor-in-charge of the class a faculty advisor. The faculty member chosen by the design team should have expertise in a technical area of the design project. The primary responsibility of the faculty advisor is to provide consultation and act as a resource person to the design team on **tough technical problems** related to the faculty members area(s) of expertise.

In some cases it may be necessary to identify faculty advisors in more than one area of expertise. It may also be necessary to identify faculty advisors in other areas of science and engineering (i.e. physics, electrical engineering, computer science, etc.).

Difficult technical problems which confront the design team should be brought to the faculty advisor(s) for their advice and suggestions. The faculty advisor should **be kept aware of the progress** on the design problem.

- **PROFESSOR-IN-CHARGE**

The Professor-in-charge of the course is responsible for the **design education process**, the management of the student design teams,

communication with the companies involved in the capstone project design mentors, communication with faculty advisors. In addition,  Professor-in-charge has the responsibility to respond to **all problems** encountered by the design teams which may arise throughout the duration of the design project.

Problems encountered by the design team should be handled initially by the leader of the design team. **The team leader should use the Professor-in-charge as a resource person and advisor.** A design team need for monetary support, facilities equipment, and support personnel should be discussed with the Professor-in-charge. All needs that **hinder or slow the project** should be directed immediately to the Professor-in-charge.

- **DESIGN TEAM LEADER**

The design team leader will be selected from members of the design team. Each student will be asked whether they would/would not wish to be the leader. The Professor-in-charge will make the selection after consulting with the design team.

The team leader will be responsible for organizing the group effort, setting schedules, and maintaining schedules. Each leader will make sure that the group is performing in an **efficient and effective manner.** The team leaders may make changes in the task assignments to maintain schedule of work. In all cases the team leader must maintain close contact with the Professor-in-charge of the class, and should consult immediately with the Professor-in-charge on problems that may affect the schedule of completion of the project.

