

**Planned Approach to Design Activity:**

Include proposed outcomes and deliverables  
(continue on separate sheet as necessary)

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**LIST OF ACTIVITIES****Proposal Phase:**

1. Choose primary project advisor and collaborating advisor.  
Choose a problem.
2. Register for Senior Project I during normal registration period.
3. Complete Project Proposal form.  
(Due May 1st for the Fall Semester.)  
(Due December 1st for the Spring Semester.)
4. Revise Project Proposal form if needed before the start of the SP1 semester.

**Planning Phase: (SP1)**

5. Complete preliminary design.
6. Register for SP2 during normal registration period.
7. Submit SP1 Preliminary Design Report to the primary project advisor before the end of SP1.
8. Deliver 10-minute preliminary design presentation during Senior Project Conference Day.

**Design Execution: (SP2)**

9. Complete design phase and if required working model.
10. Deliver a 20-minute presentation (Design Review) to your specialization faculty one month before Senior Project Conference Day.
11. Submit Final Design Report to your advisor at least one week prior to Senior Project Conference Day.
12. Deliver 20-minute presentation during Senior Project Conference Day.
13. Deliver a final copy, without any grades or written comments, of your Design Report to the department secretary by the last day of Finals Week.

If a notebook is required, it will be graded according to the following statement: *Someone skilled in the art of engineering should be able to complete the project using your notebook.*

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Date Received: \_\_\_\_\_  
Proposal Accepted: \_\_\_\_\_  
Chair's Signature

**The College of New Jersey  
Department of Engineering**

**Senior Project**

**Project Proposal**

**Title of Project:** \_\_\_\_\_

**Semester:** \_\_\_\_\_

**Student Advisors**

**Name (print):** \_\_\_\_\_ **Primary (print):** \_\_\_\_\_

**Contact Phone #:** \_\_\_\_\_ **Collaborating:** \_\_\_\_\_

**E-mail:** \_\_\_\_\_

**Group Members** \_\_\_\_\_

**Grade Weighting Criteria (%)**

**SP1**

Prelim Design Report (40-70) [ ]

Preliminary Design Presentation (10-30) [ ]

Project Notebook (10-30) [ ]  
\_\_\_\_\_ [ ]

**SP2**

Final Design Report (50-70) [ ]

Final Design Presentation (10-

30) [ ]

Project Notebook (10-30) [ ]

Working Model (0-30) [ ]

\_\_\_\_\_ [ ]

**Formulation and Statement of Design Problem:**

- d. Discussion of the following considerations and constraints  
ethics, economic, reliability, safety (must be included in your discussion),  
aesthetics, social impact (include as appropriate to your project)
- e. Deviation of specifications from the problem statements and problem constraints
- f. Theoretical analysis of the design, any software evaluation, and experimental verification
- g. A detailed discussion of your results. This discussion must include an analysis of your design and a description of the analytical model used and any limitations of the model with any error analysis
- h. A presentation of the results of the overall design evaluation
- i. Conclusions
- j. Appendices

### **Design Review Presentation to Specialization Faculty**

You must deliver a 20-minute presentation to your specialization faculty one month prior to your final presentation. At this presentation, the faculty will provide feedback and record any action items that will help you improve your project. In consultation with your advisor, you must respond to all action items in the final report.

### **Final Design Presentation**

You must deliver a 20-minute presentation based on your Final Design Report during Senior Project Conference Day. You will be scheduled for a specific time and room. Normally, your project advisor will be present with a number of reviewers. The session will be open to all interested faculty, students and the general public. It may also be videotaped for department use. Your project advisor will work with you to help you prepare for this presentation. Because your presentation is based on the Final Design Report, you must submit the completed final report to your advisor **at least one week in advance** of Senior Project Conference Day. Your final design presentation will be *scored* by the formal reviewers assigned to your presentation. The scores will be developed using the **Senior Project Conference Evaluation**. Your advisor will take into consideration the ratings of all submitted evaluation forms and may discuss with you the score and pertinent comments. Your SP2 grade will be assigned by the instructor of record in consultation with you primary project advisor and collaborating advisor.

### **Other Common Project Requirements**

Some project advisors may establish additional requirements as part of the materials you must submit in completing Senior Project. These are usually specified on the Project Proposal form completed before registering for SP1. In some cases, your advisor may choose to add requirements after the start of SP1.

#### **Delivery of Tested Model**

To complete the requirement for delivery of a tested model at the time of Senior Project Conference Day, as a minimum, the following should be delivered in addition to the Final Design Report:

- a. A working model or prototype of the system, component or process as described in the Statement of Problem; hardware and/or software
- b. Documentation supporting the existence of a formal test program (the test program must be specified and developed for the project)
- c. Evidence that the test program has been conducted (include data and a discussion of results)

#### **Contents: Project Progress Documentation Notebook:**

Project advisors may require that you maintain a notebook in which you retain pertinent notes on your project. Your advisor will identify the specific items you should include in your notebook. This will be stated on the Statement of Problem.

- g. Discussion of Feasibility Considerations
- h. Identification and discussion of alternative solutions, if any, and reasons for not choosing them
- i. Supporting documentation including plans, graphs, tables, etc.
- j. Detailed prototype construction plan or schematic diagram
- k. A plan for testing the model or prototype developed
- l. A plan for evaluating the performance of the model or prototype

### **Preliminary Design Presentation**

You will deliver a 10-minute presentation on your project based on your Preliminary Design Report on Senior Project Conference Day. Your project advisor will work with you during the term to help you prepare for this presentation. You must submit the completed report to your advisor at least one week in advance of Senior Project Conference Day. Your presentation will be scheduled for a specific time and room. Normally, your project advisor will be present with a number of formal reviewers. This session is open to all interested faculty and students, as well as the general public. It may also be videotaped for department use. The formal reviewers will be asked to submit comments on what they see and hear at your presentation. They will also be asked to *score* your presentation using the form: **Senior Project Presentation Evaluation**. A copy of this form is attached to this manual. These forms and the reviewers' comments will be collected by your project advisor and will be discussed with you after the presentation. Your advisor may require you to make changes in your project on the basis of these comments. Your SP1 grade will be assigned by the instructor of record in consultation with your primary project advisor and collaborating advisor.

### **Senior Project II**

After delivery of the Preliminary Design Report and acceptance of the report by your advisor, you may begin the development and/or construction of your final design. Your advisor will assist you in obtaining the resources necessary to complete the design execution phase. If you will deliver a tested model or prototype in completing SP2, you should have completed most of the planning for the project during SP1. You should already have such project components as drawings, a parts list, notes on where parts can be obtained, a detailed programming flowchart if a computer program is to be delivered, etc. If you are designing a system or a process for which a prototype is not practical, you should have enough information to proceed with a detailed design.

You must deliver a 20-minute presentation of your project to your specialization faculty one month prior to the end of the semester. At the end of SP2, you will deliver to the advisor and to the department a Final Design Report and, if specified, a working, tested model or prototype. You must also deliver a 20-minute presentation of your project on Senior Project Conference Day at the end of the SP2 term.

### **Final Design Report**

Your project Final Design Report will probably be the only student work you produce at college that will be kept indefinitely. A copy without any grades or written comments will be retained in the engineering department library and will be available for inspection by anyone who is interested in your work. Students, especially, will refer to your final report to help them with their own projects. The engineering department, therefore, sets and maintains strict standards for the final copy of all senior Design Reports. Because these reports do not display written comments, you must revise or rewrite your work to incorporate changes required by your advisor.

#### **Contents: Final Design Report**

- a. Letter of transmittal
- b. An abstract (200 words)
- c. Review of the literature

or by December 1st for SP1 in the spring semester. The project advisor, collaborating advisor, department chair and instructor of record will then meet to discuss the project. If there are any major concerns, the project will be reviewed by the Senior Project Review Counsel. Any changes required in the **Project Proposal** must be completed before the start of the semester in which you are registering for SP1. If the required changes are not completed, you will be dropped from the course. NOTE also that you should not drop SP1 (or SP2) by yourself, you should discuss your needs with your advisor. The usual deadlines for dropping courses also apply to SP1 and SP2.

When the **Project Proposal** form is submitted to the engineering department, it is placed in your student file. You and your advisor should keep copies of this document because it will become a part of your project reports.

### Contents: Project Proposal

1. Formulation and statement of design problem
2. General description of planned approach to the design activity  
Proposed outcomes and deliverables  
Specify that a tested working model will or will not be required  
Specify that a project notebook will or will not be required for SP1 and/or SP2
3. Weighting criteria for final grade

The **Project Proposal** form is attached to this manual.

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## Planning Phase

### Preliminary Design Report

You and your project advisor agree on a schedule for advisement meetings. The advisor may identify activities and milestones appropriate to the planning or execution of the design project and may set delivery dates through the term. Your advisor may choose to organize all his or her advises into a *class* and meet at regular intervals.

The SP1 term is usually devoted to completing the problem analysis and the preliminary design of the system, component or process, and to completing a literature search and other research activities necessary to develop a plan for completing the project. The SP2 term is devoted to completing the design project.

At least one week before Senior Project Conference Day at the end of the SP1 term, the student must submit to the advisor the Preliminary Design Report. On that day, each student enrolled in SP1 must deliver a 10 minute presentation of the project based on the contents of the Preliminary Design Report. Copies of the report **must** be available to all faculty at the time of the presentation.

### Contents: Preliminary Design Report

- a. Formulation and statement of design problem  
Identify needs to be satisfied  
Establish standards by which to judge suitability of the concept
- b. Evidence of a literature search in which you review the literature that is relevant to your topic
- c. Identification of constraints and standards established  
These include (as appropriate to the project):  
Economic Factors, Aesthetics, Reliability, Safety, Ethics, Social Impact
- d. Detailed Description of System, Component or Process
- e. Project Specifications (Preliminary)
- f. Discussion of constraints with accompanying analysis showing how the constraints and relate to the project specifications affect the design, and that the design accommodates the specified constraints

Report	<b>b) Planning Phase:</b> <i>Through SP1</i>	Preliminary Design
		Preliminary Design Presentation
Presentation	<b>c) Design Execution:</b> <i>Through SP2</i>	Design Review
		Final Design Report
		Final Design Presentation

## Grading Standards

The following elements will be considered in determining the grades for your Senior Project effort:

**a) Background** - Systematic identification of the problem, including completeness of documentation in the form of cited references and other appropriate data.

**b) Methodology** - Comprehensiveness of methods used to examine the problem, including appropriateness of engineering analysis and potential effectiveness of the proposed design/solution.

**c) Constraints** - Consideration of constraints, especially safety, reliability, economic factors, aesthetics, ethics and social impact as appropriate to the project.

**d) Feasibility** - Originality, innovation, practicality and completeness of the proposed design/solution, and consideration of alternative designs.

**e) Continuation** - Quality of conclusions.

The Department Chair or a faculty member assigned by the Chair will be the Instructor of Record. The Instructor of Record will assign the final grade for SP1 and SP2. The final grade will be determined by the Instructor of Record in consultation with the senior project advisor and the collaborating advisor.

## Project Proposal

When you are prepared to begin Senior Project, your first step is to identify a **Primary Project**

**Advisor.** With the help of your primary project advisor you must obtain at least one other qualified person to serve as **Collaborating Advisor** for your project. You may choose a faculty member from outside the department as your primary advisor. If you do so, your collaborating advisor must be from within the department.

You may already have an idea for the project you want to do. If so, your task is to find a project advisor who is willing to advise and work with you on this topic. A student can often obtain a project topic from a faculty member who is prepared to suggest a specific project and also act as their advisor. You should begin this process early in the term **before** the one in which you intend to enroll in SP1. This search may be quite simple or it may be very time consuming. If you need assistance, see the class instructor for Senior Project. He or she will assist you in identifying an advisor.

When you have obtained a project advisor, you must work with this advisor to find a collaborating advisor and complete the **Project Proposal** on a special form supplied by the Engineering Department. In order to properly complete the **Project Proposal** form, you must thoroughly think through what the scope of your project is and how you plan to approach the problem. Your selection of a specific collaborating advisor is also noted on the **Project Proposal** form.

When the **Project Proposal** form is completed, your Project Advisor submits the original copy to the department chair. The **Project Proposal** form must be submitted to the department chair by May 1st for SP1 in the fall semester

**Senior Project Manual**  
**The College of New Jersey**  
**Department of Engineering**

Revised by the Department of Engineering  
(May 2, 1997)

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*The Senior Project is a meaningful, major engineering design experience that builds upon the fundamental concepts of mathematics, basic sciences, the humanities and the social sciences, engineering topics and communication skills.*

The Senior Design Project is a capstone experience in which the student selects a problem, in consultation with his or her advisor, and then performs a thorough analysis of this problem to guide the formal process of design and arrive at a final solution. Engineering design may be defined as the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics and engineering sciences are applied to convert resources optimally to meet a stated objective. Among the fundamental elements of the design process are the establishment of objectives and criteria, analysis, synthesis, construction, testing, and evaluation. The emphasis in this course is on **design** and the intent is that this course draws on the knowledge and skills acquired in earlier courses in the sciences and humanities and in the professional specialty courses.

The choice of the problem to be analyzed is virtually unlimited. The major requirement is that the solution of this problem must require significant design effort. In addition, consideration must be given to such realistic constraints on the problem as economic factors, safety, reliability, aesthetics and social impact.

### **Senior Design Project**

The senior design project is a major engineering design experience. A student works under the individual guidance of an engineering department faculty member and draws on the support of the entire engineering faculty in developing a technically significant system, component or process. The design project you choose must be appropriate to the practice of engineering in your engineering specialization.

Senior Project fits into the curriculum as a **two course, two semester activity**. In this manual we refer to the two semesters of senior project as SP1 and SP2. Normally, you will enroll in SP1 and SP2 in two successive semesters.

Senior Project is completed in three phases:

Phase

a) **Proposal Phase:** *Prior to SP1*

Activity

Project Proposal