INSTRUCTOR'S GUIDE
PROJECT PLANNING AND MANAGEMENT SKILLS MODULE

Russ Pimmel
Electrical and Computer Engineering Department
College of Engineering
University Of Alabama

INTRODUCTION

The Instructor's Guide for the Project Planning and Management Skills Module will assist instructors as they insert a short module on project planning and management into a standard engineering course. Using this instructional module in a standard engineering course will provide the students with some instruction on several project tools and experience in using them. While examining this guide, the reader also should examine the following associated documents that are part of this package:

- PowerPoint Slides – Session 1
- PowerPoint Slides – Session 2
- PowerPoint Slides – Session 3
- Class Handouts
- Assignment Sheet
- List of Web Sites
- References

Instruction Guide Organization: This guide contains a discussion of several aspects important in teaching this module on project planning and management skills in an engineering course. The major sections are:

- Tips on using the instructional material
- Tips on homework assignments
- Tips on grading student work
- Tips on assessment

Prerequisite Knowledge or Skills: This module requires no prerequisite knowledge, but some experience with projects in previous class would provide a perspective on projects. Also, prior experiences with co-operative learning approaches, i.e., team-based in-class exercises and out-of-class homework assignments, would facilitate the use of these approaches in this module

Classroom Requirements: Teaching this module requires no special classroom facilities excerpt for a projection system for showing the module slides. This may be a computer-based projection system with electronic versions of the slides or simply an overhead projector with transparencies. Also, an arrangement that promotes small group interactions would enhance team-based classroom exercises.

Module Organization: This module contains material for three 50-minute sessions. The first uses mini-lectures and group-exercises to define a project and the role of projects and project management in modern industry. The second and third introduce several project management tools and provide in-class exercises where students apply these tools in developing project-planning documents. The module provides the opportunity to practice using these tools in developing a plan for a three projects: one during the in-class exercises, one in team homework assignments, and, if the instructor chooses, one using a project on a technical subject drawn from the course content. This progressive development follows the format for teaching skills suggested by Woods et al (*J. Eng. Ed.*, 86:74-91, 1997), where a skill is introduced in a context-free environment and then bridged and extended into the discipline material. The module also provides for instruction followed by practice with evaluation and feedback -- an approach considered essential in teaching a skill (Seat et al *J. Eng. Ed.*, 88:385-390, 1999).

TIPS ON USING INSTRUCTIONAL MATERIAL:

The instructor's guide discusses the use PowerPoint slides for the three classroom sessions. The "notes" section of the slides provides some additional points and information and some comments usually describing optional use of the slides. Selecting the "Note Page" option from the "View" menu in PowerPoint makes these notes visible.

The in-class team exercises will be more beneficial if students have had some training in teaming. If a significant number have not, then the instructor may want to provide a brief (5 to 10 minutes) introduction to teaming. As in all cooperative learning activities, students will take the in-class exercises much more seriously if individual accountability is built into the activity. Requiring a few randomly selected students to report the result of their team's deliberations to the entire class is a simple approach for providing individual accountability. Having each team prepare a hand written transparency is an easy way of accomplishing this when the result is a complicated table or chart. A second approach for building in accountability is to collect and grade a paper from each team. Using lenient, binary scale (eight points for trying and ten points for a good answer) emphasizes participation rather than working for the right answer.

Session 1

The first session contains slides on (1) learning objectives, (2) justification of the material, (3) an introduction to project planning and management with two short team exercises, and (4) managing time and resources with two short team exercises. As an instructor prepares for the first session, he or she may want to incorporate some personal experiences to illustrate various points.

Learning Objectives: An early slide defines a set of learning objectives for the session in terms of student behavior. These include discussing the importance of project management techniques in modern industry, defining a project, describing measures used to evaluate a project's success, and listing the tool used in planning and managing a project. The instructor should emphasize these and make sure that the students understand them, but he or she should not spend more than a few minutes on them.

Justification: The PowerPoint material for Session 1 includes several slides on the justification for developing project planning and management skills. The instructor may wish to delete one or more of these slides or insert a personal insight or experience that illustrates the importance of these skills to provide additional justification. Again the instructor should not spend more than a few minutes on these slides, but the students need to understand that project planning and management skills are as important to an engineer as design and analysis skills.

Introduction to Project Planning and Management: The next group of slides introduces the concept of a project, using two short team exercises. The instructor should spend about 15 minutes on this material and make sure that the students are able to list several of the "features of a project" (i. e., the components of a definition of a project). In the reporting phase of the team exercises, the instructor should call on randomly selected individuals in each team to provide a report and write each on the board or a transparency or type it into a PowerPoint slide. After all teams, or at least a substantial number of them, have reported, the instructor should comment on the quality and completeness of the responses (usually saying they were good), add any important ideas that were missed and summarize. There will be a tendency to drag out the reporting phase, but the instructor must keep the discussion moving and finish quickly.

Managing Time and Resources: The next few slides introduce the "3 S's (scope, spending, and schedule and the tools to plan and monitor these aspects of a project. Again the instructor should spend no more then 15 minutes on this material and should make sure that the students can list the 3 S's and several of the tools used to plan and monitor them. Again, the instructor should use care in conducting the student reporting.

Differences between Design and Construction: The last few slides in this session emphasize that "construction" projects are fairly well defined from the start, while "design" projects evolve as the project proceeds. This material is not central but does provide a chance for students to apply their new knowledge about projects in a little different context.

Session 2

The second session contains slides on two tools: the work breakdown structure and the linear responsibility chart with an extended team activity on each. An early slide defines the learning objective for the session -- be able to define, describe, and use the work breakdown structure and the linear responsibility chart. The instructor should emphasize it and make sure that the students understand it; however, he or she should not spend more than a few minutes on it.

Work Breakdown Structure: The instructor should spend about ten minutes discussing the work breakdown structure and then allow ten to fifteen minutes for the team exercise on this tool. He or she should pick one of the scenarios from Problem # 5 in the Assignment Sheet and should emphasize that the students are planning the project and not completing it – there is a strong tendency to want to work on the problem rather than the plan. The instructor should manage the team exercise so that each student feels he or she may be asked to report for their team and then to allow adequate reporting time. One approach has each team writing their solution on a transparency and then selecting a reporter using some simple distinguishing factor such as the team member who slept latest that morning or who was swimming most recently. Because of time constraints and because the reports will become repetitious, the instructor should request only two or three reports. After the students give their reports, the instructor may wish to present his or her solutions to illustrate a "good" response. The instructor may choose to collect and evaluate (even grade) all teams' transparencies.

Linear Responsibility Chart:: The instructor should spend about five minutes discussing the linear responsibility chart and then allow ten to fifteen minutes for the team exercise on this tool. The students should use the same scenario from Problem # 6 that they used in the earlier exercise on Problem # 5. Again it is important to ensure all students engage in the process and to allow adequate time for reporting. As mentioned earlier, the instructor may want to show a "good" solution and collect the students' work.

Session 3

The third session contains slides on two tools: the activity networks and the Gantt chart with an extended team activity on each. An early slide defines the main learning objective for the session – be able to define, describe, and use the activity network and the Gantt chart.   The instructor should emphasize it and make sure that the students understand it but he or she should not spend more than a few minutes on it. A secondary objective requires that students be able to define several other tools. If time is a problem, then the instructor may choose to skip this objective.

Activity Networks: The instructor should spend about ten minutes discussing the activity network and then allow ten to fifteen minutes for the team exercise on this tool. He or she should pick the same scenario from Problem # 7 that they used in the earlier exercises on Problem # 5 and 6. Again it is important to ensure all students engage n the process and to allow adequate time for reporting. As mentioned earlier, the instructor may want to show a "good" solution and collect the students' work.
.
Gantt Chart:: The instructor should spend about five minutes discussing the Gantt chart and then allow ten to fifteen minutes for the team exercise on this tool. The students should use the same scenario from Problem # 8 that they used in the earlier exercises on Problem # 5, 6, and 7. Again it is important to ensure all students engage n the process and to allow adequate time for reporting. As mentioned earlier, the instructor may want to show a "good" solution and collect the students' work.

Other Tools and Commercial Software Packages: The last few slides define a few other tools and list two commercial software packages. The instructor may skip these or spend a few minutes discussing them.

TIPS ON HOMEWORK ASSIGNMENTS

Problems # 1 through 4 on the Assignment Sheet provide simple exercises that can be completed either by individual students or by teams of students after the first session. These exercises encourage the students to think about project management issues, to become familiar with web-based resources on these issues, and to develop some perspective on them. The instructor should not assign all of these in any course offering but should pick a few for homework after the first session. The instructor may ask the students to do these individually or as a member of a team. If teams are already in place for some other class activity, these exercises will provide them with an opportunity to practice team skills and help them mature as a team.

Problems # 5 through 12 direct students to complete project-planning documents for a project involving a student activity. Problems # 5 to 8 require a <u>team</u> effort and Problems # 9 to 12 require an <u>individual</u> effort. These assignments provide the students with an opportunity to develop various project-planning documents for non-technical, student activity projects. Since these are free of technical details and complexities, students can focus on the planning issues with a minimum of confusion (i. e., develop the skill in a "context-free" environment).

Problem # 13 asks the students to prepare a plan for a project based on some aspect of the technical content of the course. The project may involve research on some assigned topic, the design or analysis of some component, process or system, or the completion of some experimental activity. Typically, the instructor would have assigned this project later in the term to develop and re-enforce technical concepts, even without the inclusion of the project management material. The inclusion of the planning aspect in this project serves as a "bridge" to extend the project management concepts developed in the module into the mainstream of the course. For this project planning effort, the instructor can select the tools that he o r she feels will be useful. In order to ensure that the students take this later project planning assignment seriously, the instructor needs to grade the planning effort associated with this technical project using an approach similar to that used earlier in evaluation the project-planning documents for the student activity project.

The associated document called ""List of Web Sites" provides a set of Internet address to web sites with links to project management material. Before distributing this list the instructor should check to see that all of these address are still accessible; if not, he or she may want to add some new ones. Using a standard Internet search engine with "project management" or something similar as a subject will provide many possibilities. Instead of providing specific Internet addresses, the instructor may direct the students to use a standard Internet search engine with "project management " or something similar as a subject and find their own source material.

<u>TIPS ON GRADING INDIVIDUAL STUDENTS</u>

Grading Homework Assignments: If an instructor assigns one or more of the first four problems, then he or she should grade them or else the students will not take the assignment seriously. In grading these assignments, there is no single correct answer and so grading becomes subjective. As criteria for grading, the instructor should look to see that the answer is:

- Responsive -- Does it address the question?

- Reasonable -- Does it make sense?

- Complete -- Does it include a complete response to the question?

- Referenced -- Is the web site reference correct and complete?

Remember that there is no single right answer -- basically, the instructor wants to determine if the student read the question, visited the web site(s), read the material at the site, thought about it, and constructed an appropriate response.

Grading Problems # 5 to 12 (i. e, those asking the student to complete a project management tools for a assigned student activity project) will again require the use of subjective criteria. The instructor should determine if the submitted work dealt with the assigned project in a reasonable and complete way, if it has the correct format, and if it is presented in a understandable style. To facilitate this evaluation he or she may want to use the following checklist:

- Responsive -- Does it deal with the assigned project?

- Reasonable -- Do the details make sense?

- Complete -- Does it include all aspects of the project?

- Correct -- Is the format correct and consistent with class material?

- Neat and Orderly -- Is it readable, well organized, and easily understood?

The instructor may actually give this list to the students when he or she makes the assignment. The whole idea is to get the students to recognize and generate good project planning documents and to give them feedback on how well they did this. Knowing exactly what the instructor expects will encourage the students to follow the guidelines for a good result.

Grading Quizzes: The instructor may want to give a short quiz after the each session in order to encourage the students to actually acquire the information. Quiz question could ask students for a definition of a project or a specific tool, for a list of measures used in evaluating a project, or for a list of a specified number of tools. The quiz does not have to be comprehensive, but it should sample the students' knowledge of this material, probably using only one question. Instructors may even want to indicate the type of questions ahead of time, for example, give them the questions listed earlier in this paragraph. In grading these quizzes, the instructor should use the same approach described for the homework assignments above. He or she must use a subjective evaluation that determines if an answer is responsive, reasonable and, to some extent, consistent with the guidelines described in class.

TIPS ON OUTCOMES ASSESSMENT

An instructor may wish to assess the impact of the module on the students' development by making a measurement before offering the module and then after completing it. This assessment may involve a pre-test and post-test of the students' awareness of project management issues. For example, the instructor can ask the students to define a project, list measures used to evaluate success, or list tools used to plan and manage a project. In these assessments, the instructor scores student performance subjectively, raising questions about the reliability of the assessment. Short of getting another faculty member or outside evaluator to score the presentation, there is no real safeguard for ensuring that personal biases do not corrupt the assessment.

As an alternative, the instructor may ask the students to rate their confidence to do specific tasks derived for the objectives (e. g., define a project, list tools used to plan a project, develop a Gantt chart, or even plan a project. Using a 5-valued Liker scale (1 – " Strongly Disagree", 2 – "Disagree", 3 -- "Neutral", 4 --- "Agree", and 5 – "Strongly Agree") with a set of statement simplifies the scoring of the assessment. The instructor should collect data before and after the instruction using the module instruction with some time between the use of the tool and the instruction using the module. In the post module measurement, the instructor may want to include statements to assess the students' perceived improvement in their ability.

ACKNOWLEDGEMENTS