Syllabus
IDND 30531: Teaching Engineering (1 credit)
Summer (E Term) 2006

Location:
Room 219, Atwater Kent Laboratories, WPI

Instructor:
Dan Wolaver
Adjunct Professor, WPI
(603) 566-0685
dan@wolaver.org

INTRODUCTION TO COURSE

Teaching engineering requires the general skills of teaching—providing structure, guiding, motivating, mentoring, evaluating. But it also requires special skills involving problem solving, strong use of visual organization and heuristics, and familiarity with math and physical principles. This course deals with those special skills, while the general skills are covered in the *Seminar in College Teaching* (IDND 30501). Since these areas have only a little overlap, IDND 30501 is not a prerequisite. However, those who have taken IDND 30501 will perform better in this course and get more out of it. If you have not had IDND 30501, you must get permission from the instructor to take IDND 30531.

This course approaches problem solving through discovery—leading the student to discover new ideas rather than just presenting them in a lecture format. This involves prodding the students with the "right" questions, which means not too much help and not too little. To do this, the teacher has to be aware of his or her own thought process and the background knowledge required for discovery.

Students in this course will actively participate through leading discovery sessions, participating in the sessions, and performing evaluations. They will also produce a portfolio with plans for discovery sessions and for a sequence of problem sets that lead to discovery.

COURSE OBJECTIVES

After successfully completing this course, the student will be able to:

1. Understand his or her engineering discipline from his or her own new perspective.
2. More easily discover solutions to problems and insights to concepts.
3. Understand his or her discovery process—the required background, the steps.
4. Teach by leading students to their own discoveries through questions and ordered exercises.
5. Evaluate students' performance—what they yet lack to reach the discovery.

COURSE MEETINGS

The course will consist of seven weekly classroom meetings on Thursdays from 4:00-5:50 p.m., May 25, June 1, 8, 15, 22, 29, July 6. The due date for course portfolio is Thursday, July 13.

REQUIRED TEXTS

Polya, G. (1945). *How to Solve It,* Princeton, NJ: Princeton University Press.

Wankat, P. & Oreovicz, F. (1993). *Teaching Engineering,* New York: McGraw-Hill. Out of print; available free on line at: https://engineering.purdue.edu/ChE/News_and_Events/Publications/teaching_engineering.

BOOKS ON RESERVE

Bruner, J. (1960). *The Process of Education,* Cambridge, MA: Harvard University Press

OTHER COURSE MATERIALS

Additional course materials will be provided on the Website http://www.wolaver.org/30531.

GRADING PROCEDURES

Your performance in this course will be graded in three areas: written material, presentations, and classroom participation. The written material is produced throughout the course, but the grade will be based on the compellation in a final portfolio. The presentations include brief lectures and leading discussions. Participation includes contributing to discussions and evaluations. Grades for these activities will be numeric: 0–100. The activities are weighted as follows: 50% for written material, 30% for presentations, and 20% for participation. The numerical course grade will be converted to a letter grade: 90–100 = A; 80–89 = B; 70–79 = C; 60–69 = D; 0–59 = F. We reserve the right to lower these grade cutoffs, but we will not raise them.

ACADEMIC HONESTY POLICY

There are no tests in this course. All written assignments are performed outside of class. You are encouraged to collaborate with colleagues in exchanging ideas about assignments, but the writing itself must be done independently. When making use of external sources such as books, published papers, Web resources, etc., you are expected to cite sources of ideas and information that are not your own, and to enclose in quotation marks and properly attribute any material that you take verbatim from other sources.

COURSE SCHEDULE

All classes 4:00–5:50 p.m. are held in AK219**.** Reading assignments are to be done *before* class. Homework assignments are due the next week.

1. **Introduction.** Date: 5/25
   Topics: What skills are needed to solve engineering problems? What are the skills necessary to teach discovery?
   In-class practice: Discussion of teaching and learning styles. The instructor will lead the class to some discoveries.
   Reading assignment: W&O - Ch.1, http://www.wolaver.org/teaching/FIE.pdf
   Homework assignment: Prepare to conduct an 8-minute discovery session involving a math puzzle.

2. **Discovery in Math Puzzles.** Date: 6/1
   Topics: Leading to discovery through questions.
   In-class practice: Conduct your prepared discovery session.
   Reading assignment: W&O – Sections 7.1, 15.1 and 15.2. Polya - Part I.
   Homework assignment: Prepare to conduct an 8-minute discovery session involving an engineering concept or problem.

3. **Playing Around.** Date: 6/29
   Topics: Making your engineering discipline your own; having a new approach to offer students.
   In-class practice: Conduct your prepared discovery session.
   Reading assignment: W&O – Sections 4.2, http://www.wolaver.org/teaching/traffic.pdf
   Homework assignment: Choose a topic in your engineering discipline and discover something about it by trying new things.

4. **Discovery in Engineering Problems.** Date: 6/8
   Topics: Tools for discovery, problem solving, and creativity.
   In-class practice: Conduct 8-minute session to lead the class to your discovery.
   Reading assignment: W&O - Ch. 5. Polya - Parts II, III.
   Homework assignment: Prepare a 12-minute one-on-one session involving an engineering concept or problem.

5. **Diagnosis.** Date: 6/15
   Topics: Listening skills, understanding what the student lacks.
   In-class practice: Conduct 12-minute one-on-one session. Evaluate each other's sessions.
   Reading: W&O – Ch. 10
   Homework assignment: Design set of exercises to provide a sequential learning experience.

6. **Providing Structured Experience.** Date: 6/22
   Topics: Designing homework, projects, laboratory.
   In-class practice: Perform and evaluate each other's exercises.
   Reading assignment: W&O – Sections 7.4, 11.3.
   Homework assignment: Revise your write-ups of discovery sessions and structured exercises.

7. **Review.** Date: 7/6
   Topics: Review portfolio revision. Evaluation of the course.
   In-class practice: Twenty-minute one-on-one review with instructor. Time outside the regular two-hour class will be made available.
   Reading assignment: none
   Homework assignment: Final portfolio (due 6/13).