

ME 518
Concurrent Design of Product
Winter 2008

Instructor: Professor Ping Ge
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Office Hours: MW 2:30 - 4:00 PM

Class Hours

Lecture: MWF 1:00 - 1:50 PM

Course Learning Objective

The class aims at stimulating research interest and nurturing research development capability in the area of collaborative product design through an integrative effort of people, information, and processes. Focus is on the design theory and methodology; accompanying real world examples are provided to demonstrate their use; literature-based, innovative research development is conducted on selected collaborative design topics.

Course Learning Outcomes

By the completion of this course, students are expected to:

1. Identify major collaborative design challenges in modern product development with awareness of their environmental, economical, and societal impact
2. Articulate collaborative design theories and methodologies
3. Develop innovative, conceptual ideas and/or strategies on improving current collaborative design research and/or practice
4. Conduct design research using library resources as an aiding tool
5. Represent design research findings in both presentation and writing forms
6. Perform as a part of a collaborative design research project team

Text

Product Design, Kevin **Otto** and Kristin **Wood**, 2001, Prentice Hall PTR

Useful Reference (recommended)

Concurrent Engineering Fundamentals, Volume I, Biren **Prasad**, 1996, Prentice Hall PTR

The Principles of Design, Nam P. **Suh**, 2001, Oxford University Press

Mechanical Design Process, David **Ullman**, 1997, McGraw-Hill

Class Organization

Students will be grouped into collaborative engineering research project teams. The lectures structured around the team projects focusing on collaborative design research topics selected by the students and the instructor. Each team is required to:

- 1) define a collaborative design research topic through identifying a research/practical problem area where improvement is needed;
- 2) summarize the pros and cons of existing work in dealing with the topic in 1) based on a literature investigation;

- 3) generate innovative, conceptual ideas and/or strategies on better dealing with the topic in 1) in comparison to what has been done in the existing work in 2);
- 4) discuss the potential use of the 1)-3) findings in real world product development;
- 5) present 1) - 4) to other teams and evaluate others' presentations;
- 6) develop a self-contained collaborative design research project report to cover the discovery learning results from 1) through 4).

Grading and Requirements

Grading will be based on:

- 10% Homework
- 50% 2 Presentations (each worth 25%)
- + 40% Final Term Paper

Total 100%

Each student will be graded based on his or her teamwork results (homework, presentations and final term paper). The grades for members in a team may be differentiated as a result of team evaluation on individual's contribution to the teamwork (See *Teamwork Contribution Evaluation Form*).

In the following, each graded item is described.

HOMEWORK: HW1 due by 5pm on Wed. of week 1; HW2 due by 5pm on Friday of week 2, submitted as an attachment to christine.ping-ge@orst.edu (please do not send a monster file). Homework are those with **bold font** in the class schedule "Homework" column (See the *Class Schedule*).

All homework should be computer-generated and made using Microsoft Word. The style for the text is Arial 11 point regular, double line spacing. Page number is required on each page of the homework. Your team number and all members' names must be on the first page of the homework.

2 PRESENTATIONS: Presentation serves as major milestones to report, review, and evaluate the development progress of the research project. There are totally 2 presentations required for each team. All team members must attend all the presentations, where they will i) present their own research development results and ii) evaluate other teams' work. All the presentations should be made using Microsoft PowerPoint. The presentations should be focused on the required contents as specified in the following. The preference of the presentation style is up to the team.

Team Presentation 1 (see the grading template in Appendix)

During the lectures in the 4th week (see "Week 4" in *Class Schedule*), every team is required to give a 20-minute presentation for the topic and problem statement of the research project. All team members must take part in the presentation. The required contents of the presentation are:

- 1) Topic for your research project
 - a. What are a research and/or practical collaborative design problem of interest?
 - b. Background, motivation, and key issue(s)/aspects
 - c. Significance and impact

- 2) Project objective(s)
 - a. What is your focus issue(s) or aspect(s) of the problem area to investigate upon in this project?
 - b. What is your expectation out of the investigation at the end?
- 3) Project plan
 - a. What are the major tasks in order to achieve the project objective(s)?
 - b. What is a week-by-week plan? How has the plan been implemented so far?
 - c. What is a team management plan?

All the proposals are subject to the instructor's approval and may need adjustment or revision.

Team Presentation 2 (see the grading template in Appendix)

During the lectures in the 7th week (see “Week 7” in *Class Schedule*), every team is required to give a 20-minute presentation for their research idea/strategy(s) development so far based on literature investigation. All team members must take part in the presentation. The required contents of the presentation are:

- 1) Finalized Term Paper Topic
 - a. Explain any revisions compared to those in the *Team Presentation 1*
- 2) Research Problem, Objective, and Significance
 - a. Background, motivation, problem statement
 - b. Clarified objective(s) and Expectation
 - c. Significance and impact on collaborative design research and/or practice
- 3) Literature Review (at least 15 very relevant references, categorization is very important here for good organization)
 - a. Why select each literature? How does it contribute to the problem at the hand?
 - b. Pros and Cons of the existing work in dealing with the targeted issue(s)/aspect(s)
- 4) Evaluation of the project progress against the Project Plan
- 5) Research Development Results (in the progress)
 - a. What is your **initial** idea(s) and/or strategy(s) on better dealing with the targeted issue(s)/aspect(s) in comparison to what has been done in the existing work?
 - b. What is a **possible** use of your idea(s) and/or strategy(s) in real world collaborative product development?

FINAL TERM PAPER: Due at 5:00 PM, Friday, in Week 10, submitted as an attachment to christine.ping-ge@orst.edu (please do not send a monster file). Term paper is a self-contained report by team that summarizes the overall research development on the selected topic. The required contents are:

- 1) Finalized contents of the 1) - 4) in *Team Presentation 2*
- 2) Finalized Research Development Results
 - a. What is your **finalized** idea(s) and/or strategy(s) on better dealing with the targeted issue(s)/aspect(s) in comparison to what has been done in the existing work?
 - b. What is a **possible** use of your idea(s) and/or strategy(s) in real world collaborative product development?

Format Requirements of the Term Paper

A title page is required, including Title, Team #, Members' Names and Emails, and Abstract (No more than 100 words). Term paper should be computer-generated and made using Microsoft Word. The text body (without title page and references list, but including all the graphics and tables) should have at least 15 pages, but no longer than 25 pages. The style for the text is Arial 11 point regular, double line spacing. Page number is required on each page.

The final term paper (40) will be graded on:

- significance of the selected topic to collaborative product design research and/or practice (4)
- clarity of project objective (4)
- relevance of the investigated literatures to the topic (6)
- clarity in reviewing the investigated literatures in regard to the topic (6)
- uniqueness, variety, and quantity of generated ideas and/or strategies (10)
- potential usefulness of the generated ideas and/or strategies (2)
- organization of the manuscript (4)
- professionalism in writing, tables, graphs, and illustrations (4)

TEAM EVALUATION: Team evaluation is used to examine a team member's contribution to the teamwork. The grades for members in a team may be differentiated as a result of team evaluation on individual's contribution to the teamwork.

Teamwork Contribution Evaluation Form

Team number _____ Date _____

Name	Defining a Topic (%)	Conducting Literature Research (%)	Preparing Presentations (%)	Writing Final Term Paper (%)	Total Contribution to Teamwork (%)

Note: In each column, the percentage sum for all members should be 100%. The total contribution for each member is the percentage sum along each row divided by 4.

Class Schedule

Date	Lecture Content	Reading Material	Homework (only turn in the ones in bold font)
Week 1	Introduction Review of Product Development Process Potential topics for term papers	- Syllabus - Ullman, p.18-36, p. 60-76	A Survey on background, design experience, and expectation
Week 2	Multi-function Product Development Team - composition and structure - evaluation - team building exercise	- Otto & Wood, p. 54-74 - Wilde's paper	A writing pre-proposal for term paper topic(s) (can be more than one with priority order)
Week 3 (no class on Monday, MLK day)	Concurrent Engineering Basics (CE) - sequential vs. concurrent product development - different views and definitions - measuring and improving your Concurrent Capability Literature research using OSU library resources (01/24, by Laurel Kristick, Autzen room, main floor, Valley Library)	- Otto & Wood, p.3-48 - Prasad, p. 164-214	// Revise Topics//
Week 4	Group Presentations on project proposal	- Team Presentations 1 (ppt1)	//Finalize a topic//
Week 5	Concurrent Design Problem Appraisal - Kano's model - House of Quality for multi-participants Planning for Concurrent Product Development Project - planning process, planning and scheduling tools	- Otto & Wood, p.74-79 - Clausing's paper from HBR	//Conduct Literature Research//
Week 6	Axiomatic Design Approach - theory and methodology - applications in electrical circuit system, software system, mechanical system	- Suh, p.25-67	//Conduct Literature Research//
Week 7	Group Presentations on project development	- Team Presentations 2 (ppt2)	//Conduct Literature Research//
Week 8	Information Modeling in a Concurrent Product Development environment - product, process, enterprise, and cognitive modeling - selection of proper models to support decision making	- Prasad, p. 319-347 - Prasad, p.348-365	//Conduct Literature Research//
Week 9	Sustainable Product Development - Design for X (DFX) - Design for Manufacturing and Assembly - Design for Environment	- Otto & Wood, p.663-708 - Otto & Wood, p.719-753	//Develop Term paper //
Week 10	Special Topics by invited speaker(s) - TBD	- Handouts	<u>Final term paper due at 5:00 PM, Friday</u>

Appendix: Grading Templates for the Presentations

Grading Sheet: Team Presentation 1 – Project Proposal

Date _____

Team Number _____

Grader (optional) _____

CATEGORY	GRADE	COMMENTS FOR IMPROVEMENTS
1. Technical Quality (50)		
Clarity of the research problem and focus issue/aspect (10)		
Sufficiency of background and motivation(10)		
Clarity of project objective (10)		
Significance to the collaborative design research and/or practice (10)		
Feasibility of the project plan (10)		
2. Presentation Quality (40)		
Organization of contents (10)		
Clarity and fluency of Speech (10)		
Team coordination and Timing (10)		
Appearance of slides (10)		
Total Grade (max 90)		

Grading Sheet: Team Presentation 2 – Project Development

Date _____

Team Number _____

Grader (optional) _____

CATEGORY	GRADE	COMMENTS FOR IMPROVEMENTS
1. Technical Quality (50)		
Clarity of research problem and objective (5)		
Relevance of the literatures (5)		
Quantity and Variety of the literatures (10)		
Sufficiency and clarity of explaining the literatures (10)		
uniqueness of the generated idea(s)/strategy(s) (10)		
Quantity and Variety of the generated idea(s)/strategy(s) (5)		
Project progress against the plan (5)		
2. Presentation Quality (40)		
Organization of contents (10)		
Clarity and fluency of Speech (10)		
Team coordination and Timing (10)		
Appearance of slides (10)		
Total Grade (max 90)		