Engineering and Technology Management Department
ETM 547/647 - NEW PRODUCT DEVELOPMENT
Winter 2017

Time: Wednesday, 18:00-21:40;
Location: Oregon Institute of Technology: 27500 SW Parkway Ave, Wilsonville, OR 97070
Room 106

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The course covers the new product development process from project idea to project management with special emphasis on development and design issues, such as product requirements and specification, product architecture decisions, prototyping, and Design-for-X methods. It is particularly useful for (present and future) development engineers and their managers, as well as for students with a non-technical background (e.g. in marketing and product management), who wish to better understand the more technical aspects of development.

Students will apply the methods discussed in class in a simple new product development project of their choice. Case study discussion and guest lectures will furthermore ensure practical relevance. The course does not require specific technical or design skills. It provides a good addition to strategy and marketing oriented new product development classes, such as 543/643 FEM or MKTG 548.

GRADING AND DELIVERABLES

Assignment/Activity	Points	Grading
Product Project (Team)		Grades will be assigned in increments of A, A-, B+, and so on. Typically the following grading scheme is applied: [94% - 100%] = A [90% - 94%[= A- [87% - 90%[= B+ [84% - 87%[= B [80% - 84%[= B- [77% - 80%[= C+ [74% - 77%[= C [70% - 74%[= C-
Brainstorm Team Presentation "1st Product Ideas" (Week 2)	-	
Team Presentation I "Customer Needs & Concept Ideas" (Week 4)	10	
Team Presentation II "Product Concept" (Week 6)	20	
Final Team Presentation (Week 10)	40	
Team Learning Document "Development Log"	30	
Individual Contributions		
Article Reviews (2 @ 15 pts each)	30	
Case Study Reviews (2 @ 20 pts each)	40	
Your class contribution (attendance, discussion, teamwork, etc.)	30	
Total	**200**	

TEAM CONTRIBUTION

PRODUCT PROJECT:

Students will team up and complete most of the initial phases of a simple new product development project of their choice, using the tools and techniques discussed in class. Students document their team's development process (usage of tools and methods, problems, key learning, etc.) in a "Development Log".

Examples for team projects and information about the development log will be provided in the first week of class. Students will be guided to pick an interesting, yet feasible project. *Project teams are encouraged to develop prototypes*.

The following deliverables are part of the team project

- **"Brainstrom" Team Presentation**: potential product ideas the team plans to investigate further (brief description, no slides need).
- **Team Presentation I (Idea Phase):** Initial idea(s): opportunity and resulting project goal, critical assumptions, potential risks, remaining open questions. The objective of this presentation is to cover the main aspects of textbook chapters 3-5 *(4-6 slides – 15 minutes max).*
- **Team Presentation II (Concept Review):** Advance one initial idea and turn it into a product concept: verify customer need, explain benefit and product form and/or technology. The objective of this presentation is to cover the main aspects of textbook chapters 3-8 *(8-10 slides – 20 minutes max).*
- **Final Presentation:**
  - Presentation of the final product in a form that is suitable for submission to one of the following (your choice of format – you do not have to submit for real):
    - MCECS Innovation Program http://www.pdx.edu/cecs/innovation-program
    - Co-development community Quirky http://www.quirky.com/
    - Crowdfunding community Kickstarter http://www.kickstarter.com/
  - Presentation of your product development project to provide an overview over key aspects of your project. The presentation summarizes Team Presentations I & II and covers the main topics of textbook chapters 9-13 and 17; in addition, provide two slides that summarize what you have learned when trying to apply the tools and methods described in the book to your project *(10-15 slides – 30 minutes)*
- **Development Log:** Description of the team's development process, usage of tools and methods, problems, and assessment of the process and the outcome – please focus on how you have tried to apply the class teachings to your project (or not) and how this has impacted the process and outcome. Insights into your team process or detailed schedules are not required (15 pages + Appendix)

INDIVIDUAL CONTRIBUTION

All students need to prepare all cases and readings. In addition, **every student** hands in **two Reading Briefs** (10 points each) and **two Case Study Essays** (20 points each). You can only hand in one Reading Brief and one Case Study Essay per week!

CASE STUDY ESSAYS (3 pages max., single-spaced)

Case Studies are description of NPD projects and problems in companies like BMW, Braun, Dell, and Wipro. Some cases describe a specific problem that needs to be solved; others

present decision alternatives or describe a course of action. As a student, you are expected to suggest an action plan to solve the problem, make informed decision and choose a decision alternative, or evaluate the strategies and activities described in the case and discuss their pros and cons.

Like every real world situation, case studies are not very structured, multi-facetted, and there is generally no simple "right or wrong" answer. It is therefore important that you keep an open mind, look at alternative interpretations of the data, and apply the theories, concepts, and tools that were discussed in class.

There is no standard format for a case study essay, but they typically consist of the following generic chapters. (Choose chapter headings that are specific for your case)

Case Study on a problem that needs to be solved	Case study on a decision conflict	Case study to evaluate a situation
Problem description *(What's wrong? Why is it a problem?)*	Decision Options	Description of the Situation
Diagnosis *(What are the root causes of the problem)*	Decision criteria	Evaluation criteria
Proof of causes *(Validate your diagnosis)*	Assessment of options (based on criteria); *this leads to proof of one remaining option*	Evaluation of situation (based on criteria); *structured discussion of the strength, weaknesses, risks and opportunities* Qualifications (*explain critical factors that were not part of the evaluation)*
Suggested Action Plan, *including risks*	Recommended decision & Suggested Action Plan; *including risks*	Evaluation Action Plan *(how to deal with strengths and weaknesses)*

If you are not yet familiar with case studies, have a look at the following references
- http://www.mhhe.com/business/management/thompson/11e/case/prepare2.htm (link to a textbook publisher website)
- Ellet, William: The Case Study Handbook: How to read, discuss, and write persuasively about cases, Boston, 2007: Harvard Business School Press (new book with many examples)

General grading criteria for case studies are: problem recognition, depth of analysis, successful application of class teachings, quality of recommendation, and overall quality of discussions.

Case study essays are due on the evening of the class discussion. They are not to exceed 3 pages.

Important! **Students can choose to present one of the assigned case study discussion to the class, instead of writing a case study essay.** Presentations are schedule to last 15 minutes. In addition to the general grading criteria above, the quality of the presentation slides and the presentation will be graded. Sign up for case study presentations takes place on a first-come basis in the first week of class.

READING BRIEFS (2 pages max.; single-spaced)

Reading briefs summarize and discuss class readings and put them "into the bigger picture" by providing context (What other research is done in the field? How can the reading be applied to new product development?)

A 2-page (max), single spaced, reading brief is required for three of the articles on the reading list (your choice). Reading briefs are due in the week they are assigned as required readings (see schedule). No more than one review per person may be submitted in any given week.

The format for a reading brief is as follows:

- Title: Full article citation, article number, your name, course number, date.
- Article Overview: Consider the thesis, goals, findings and conclusions of the work (30% of space)
- Key Learning Points: What are the key learning points of the article? Identify, define, and critically assess (30% of space).
- Follow-On Research: What other work has been done in this area since the publication of the article? Compare and contrast critically. Include follow-on article(s) citation(s) under "References" at end of the review. Research the topic on PSU Library online (20% of space).
- Implications: What insights from the article apply to the new product development process? (20% of space).

If you are not yet familiar with library search, referencing, and academic writing, have a look at the following references:
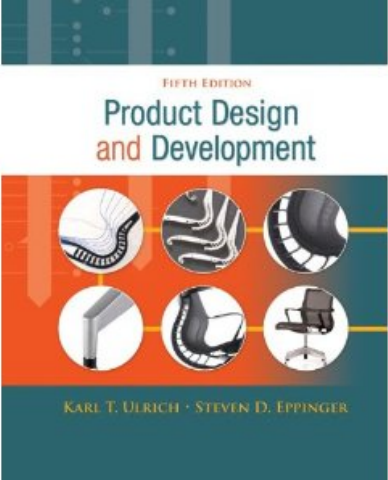
- http://www.lib.pdx.edu/instruction/survivalguide/index.htm (online tutorial; Portland State Library)
- Craswell, Gail; Writing for Academic Success: A Postgraduate Guide, London et al. 2005, SAGE Publications (the book is not cheap, but useful for all graduate classes)

CLASS PARTICPATION

Quality and continuity matter – students are asked to be prepared, to turn in assignments on time, to listen to what people say and respond to it, to ask questions, and to actively engage in discussions. They are furthermore expected to be good team players in their student teams. Regular attendance is expected - if you already know that you will have to miss more than two classes, please do not register for the course.

CLASS MATERIAL

Books:

	Ulrich & Eppinger, Product Design and Development, 5th Edition Mc Graw Hill, 2012 (There is a newer 6th edition. However, approx.. 85% of the book are identical with the earlier edition – if you are budget conscious, this 5th older edition will do)
	Ron Khormaei, Software Technology Management, 1st Edition, 2016 (The content of this reading provides emphasis on the SW aspects. We will add sections from this book to the class to complement the more HW focus of the class' main text book. Directions of how to get this material will be shared during the first lecture.)

Cases:

The cases are available for download from the Harvard Business School Website
https://cb.hbsp.harvard.edu/cbmp/access/32414712
The price per case is approx. $4.00. (You will have to register with a student account and pay per download).

#1	9-990-001	Braun AG: The KF 40 Coffee Machine
#2	9-699-044	BMW AG: The Digital Auto Project (A)
#3	9-607-032	Lean at Wipro Technologies
#4	9-610-098	Delta Electronics Hybrid Power Train
#5	9-698-004	Medtronics Corporation's Cardiac Pacemaker Business

Readings

1.   Repenning, N.P., *Understanding Fire Fighting in New Product Development.* Journal of Product Innovation Management, 2001. **18**(5): p. 285-300.
2.   Kappel, T.A., *Perspectives on roadmaps: how organizations talk about the future.* Journal of Product Innovation Management, 2001. **18**(1): p. 39-50.
3.   Gassmann, O., P. Sandmeier, and C.H. Wecht, *Extreme customer innovation in the front-end: learning from a new software paradigm.* International Journal of Technology Management, 2006. **33**(1): p. 3-3.
4.   Hauser, J.R. and D. Clausing, *The House of Quality.* Harvard Business Review, 1988. **66**(3): p. 63-73.
5.   von Hippel, E., *PERSPECTIVE: User toolkits for innovation.* Journal of Product Innovation Management, 2001. **18**(4): p. 247-257.
6.   Veryzer, R.W. and B. Borja de Mozota, *The Impact of User-Oriented Design on New Product Development: An Examination of Fundamental Relationships.* Journal of Product Innovation Management, 2005. **22**(2): p. 128-143.
7.   Dahan, E. and V. Srinivasan, *The Predictive Power of Internet-Based Product Concept Testing Using Visual Depiction and Animation.* Journal of Product Innovation Management, 2000. **17**(2): p. 99-109.
8.   Baldwin, C.Y. and K.B. Clark, *Managing in the Age of Modularity.* Harvard Business Review, 1997. **75**(5): p. 84-93.
9.   Mikkola, J., H., *Management of Product Architecture Modularity for Mass Customization: Modeling and Theoretical Considerations* IEEE Transactions on Engineering Management, 2007. **54**(1): p. 57-68.
10.   Hauptman, O. and K.K. Hirji, *Managing integration and coordination in cross-functional teams: An international study of.* R&D Management, 1999. **29**(2): p. 179.
11.   Sobek Ii, D.K., A.C. Ward, and J.K. Liker, *Toyota's principles of set-based concurrent engineering.* MIT Sloan Management Review, 1999. **40**(2): p. 67-83.
12.   Thomke, S. and T. Fujimoto, *The Effect of "Front-Loading" Problem-Solving on Product Development Performance.* Journal of Product Innovation Management, 2000. **17**(2): p. 128-142.
13.   Sobek Ii, D.K., J.K. Liker, and A.C. Ward, *Another Look at How Toyota Integrates Product Development.* Harvard Business Review, 1998. **76**(4): p. 36-49.
14.   Reitzig, M., J. Henkel, and C. Heath, *On sharks, trolls, and their patent prey—Unrealistic damage awards and firms' strategies of "being infringed".* Research Policy, 2007. **36**: p. 134-154.
15.   Bernasco, W. and P.C. de Weerd-Nederhof, *Balanced matrix structure and new product development process at Texas Instruments Materials and.* R&D Management, 1999. **29**(2): p. 121.

All readings will be made available through Desire2Learn.

WINTER 2015 CLASS SCHEDULE

Week/Day	Subjects to be Covered	Assignment Due
Week 1 01/05/2015	• Lecture on Product Development Process and Introduction to Team Projects	**Read** ▪ Syllabus ▪ UE 1, 2
Week 2 01/12/2015	▪ Recap: Product Development Process ▪ Lecture: Opportunity Identification and Product Planning ▪ Team Formation	**Read** ▪ UE 3,4 (+ UE1 & 2 if you haven't done so already) ▪ Reading [1] ▪ Reading [2] ▪ Reading [3] **Hand in / Present** ▪ One of a total of 2 reading briefs, selected from *last* week's readings (optional) – *this is an exception* ▪ Brainstorm ideas for team projects (no slides) ▪ List of Teams (names, contact info)
Week 3 01/19/2015	Martin Luther King Day – PSU is closed	
Week 4 01/26/2015	▪ "Brainstorm" Team Presentations (all teams) ▪ Lecture: Customer Needs; Product Specifications, QFD ▪ NPD Class Exercise – The Vegetable Peeler	**Read** ▪ UE 5,6 ▪ Reading [4] ▪ Reading [5] **Hand in / Present** ▪ One of a total of 2 reading briefs, selected from *this* week's readings (optional)
Week 5 02/02/2015	▪ Team Presentation I (all teams) ▪ Lecture: Concept Generation, Concept Selection, Concept Testing	**Read** ▪ UE 7, 8, 9 ▪ Reading [7] **Hand in / Present** ▪ Team Presentation I ▪ One of a total of 2 reading briefs, selected from *this* week's readings (optional)
Week 6 02/09/2015	▪ Lecture: Architecture & Platforms; Industrial Design ▪ 1st Case Discussion "Braun"	**Read** ▪ UE 10, 11 ▪ Reading [8] ▪ Reading [9] **Prepare** ▪ 1st Case **Hand in / Present (if applicable)** ▪ One of a total of 2 reading briefs, selected from *this* week's readings (optional) ▪ Essay/Presentation 1st Case (optional)

Week 7 02/16/2015	▪ Team Presentation II (all teams) ▪ 2nd Case Discussion "BMW"	**Read** ▪ Reading [6] ▪ Reading [12] ▪ **Prepare** ▪ 2nd Case **Hand in / Present (if applicable)** ▪ Team Presentation II ▪ Reading Brief for one of last week's readings (optional) ▪ Essay/Presentation 2nd Case (optional)
Week 8 02/23/2015	▪ Lecture: Design for X & Concurrent Engineering; Design for the Environment ▪ 3rd Case Discussion "Wipro"	**Read** ▪ UE 12, 13 ▪ Reading [13] **Prepare** ▪ 3rd Case Study **Hand in / Present** ▪ Reading Brief for one of last **or this** week's readings (optional) ▪ Essay/Presentation 3rd Case (optional)
Week 9 03/02/2015	▪ Lecture: Intellectual Property, Product Development Economics & Managing Projects ▪ 4th Case Discussion "Delta Electronics"	**Read** ▪ UE 14, 15 ▪ ▪ Reading [14] **Prepare** ▪ 4th Case Study **Hand in / Present** ▪ Reading Brief for one of last week's readings (optional) ▪ Essay/Presentation 4th Case (optional)
Week 10 03/09/2015	**FINAL TEAM PRESENTATIONS**	**Read** ▪ Reading [15] **Hand in / Present** ▪ Final Team Presentation ▪ Your new products finished ▪ Reading Brief for one of last week's readings (optional)* ▪ 5th Case Discussion "Medronics" (optional, no case discussion on this)
Week 11 03/16/2015	**No Class: Finals Week** **(Hand in Final Report on D2L!!)**	