

SYLLABUS FALL 2010  
NEW SPECIAL TOPICS COURSE

## Value-based Engineering of New Products

ME 4803 V CRN 91427 Senior Standing  
ME 8813 V CRN 91433 Graduate Students

Class Meetings T-Th 4:30-6:00 MRDC 3403

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**Text:** *Value Driven Product Planning and Systems Engineering*  
H.E. Cook and L.A. Wissmann  
2007 Springer-Verlag London Limited  
ISBN: 13:9781846289644

Available from Engineer's Bookstore and Amazon (new, used, Kindle)

**Prerequisites:** Senior standing ME 4803 V, Graduate Standing ME 8813 V

**Course Description:** A structured methodology for developing the business case and technical plan for innovative, new products. Topics covered include customer value, societal value, cost, pace-of-innovation, pricing, demand, cash flow, prospect theory, product planning, brand value, and the use of surveys and other tools for assessing value.

**Goal:** To acquire a sufficient understanding of the nature of highly competitive markets to generate meaningful forecasts of the bottom-line metrics and their uncertainty for planning and manufacturing successful new products.

**Special project:** *Graduate students only!* Graduate students form teams to develop the business case for a new product or major product improvement using tools developed in the course.

**Grading:**

<b>Graduate students</b>	Homework 25 pct Special project 25 pct Final Exam 50 pct
<b>Undergraduate students</b>	Homework 50 pct Final Exam 50 pct

## COURSE TOPICS AND SEQUENCE

### **Week 1: Introduction** (Slide Set 1.0)

**Suggested reading: Chapter 1, Appendix A.1, Section 1 of Chapt. 3, Case Study 1.**

**HW #1 Handed out:**

The engineer today; The dilemma of hyper competitive markets; Structured Methodologies used by engineers; Examples of how three major automotive decisions were made, Example of minivan innovations; Innovative power metric of an idea; Fundamental and bottom-line metrics; Verification of definition of customer value; Product markets versus stock market; Value of product attributes, Modifying QFD to include financial metrics.

### **Week 2: Introduction cont.** (Slide Set 1.0):

Attributes that are directly critical to value; Generic list of critical attributes; Prospect Theory, Demonstration of endowment effect by buyers and sellers of lottery tickets; Pace of innovation metric; Monopoly pricing and profit; Demand for oligopoly; Cournot Pricing theory.

### **Week 3: Methods for Assessing Value** (Slide Set 2):

**Suggested reading: Chapter 2, Appendix B.1 thru B.4 of , Case Studies 7 & 8.**

**HW#1 Due; HW#2 Handed out:**

Assessing value in \$; Revealed versus stated choice surveys; Analysis of stated choice surveys; Use of computers to deliver survey (example used is the value of reducing noise level); Empirical format for value curves; Example of tradeoff analysis (example used is the classic tradeoff between acceleration performance and fuel economy).

### **Week 4 Methods for Assessing Value cont.** (Slide Set 2):

**Grad Student Teams submit proposals for special project**

Estimating total value of baseline product; Using total value and empirical model for making rapid estimate of entire value curve for a given attribute; Total value computation using linear and logit models; Total value of competing minivans over time; Computing value of shaft and bearing to determine target specification of shaft size; Multiattribute value model; Identifying the critical level for any attribute that forces total value to go to zero (independent of the values of the other attributes).

### **Week 5 Creating a Value-based Product Plan** (Slide Set 3)

**Suggested Reading: Chapter 4:**

**HW#2 Due; HW#3 Handed out:**

Definition of a System; Support networks for system; Division of system into subsystems and components; Steps in creating a value-based product plan; Arriving at As-Is condition; Getting innovative ideas from generic attributes list.

**Week 6 Creating a Value-based Product Plan cont.** (Slide Set 3):

Arriving at To-Be analysis using automotive example, Discrete versus continuous attributes, Forecasting bottom-line, Impact of a design action on multiple attributes, Ranking actions under consideration, Price and revenue versus investment level.

**Week 7 Marketplace Math** (Slide Set 4):

**Suggested reading: Sections 3.1 and 3.2 of Chapter 3, Appendix C**

**HW#3 Due; HW#4 Handed out:**

Derivation of linear demand for monopoly and oligopoly; Price elasticities; Logit model for relative market share, Use of Satterthwaite's degrees of freedom and approximate t-test to analyze survey results. (The Maximum Likelihood method in Section 3.4 is **NOT** covered in course.)

**Week 8 Marketplace Math cont.** (Slide Set 4)

Analysis of Direct Value stated choice surveys for relative value and its uncertainty (Excel Template DV6 distributed as email attachment is used for in-class analysis).

**Week 9 Marketplace Math cont.**

**Suggested reading: Case Study 12:**

Using Value Trend Template and Cournot Costs Templates (distributed as email attachment).

**Week 10 Value and Profit Predictions of Multiple Design Actions:**

**HW#4 Due; HW#5 Handed out:**

Template distributed as email attachment.

**Week 11 Value of Product Options and Brand Value**

**Readings Case Study 9 and Case Study 12:**

General considerations of the value of product options and brands; Value of automatic transmission, anti-lock brakes, V8 versus V6; Relative brand value of earth moving machines.

**Week 12 Bubble Generation due to Value Speculation in a Stock's Price**

**Suggested Reading: Case Study 1 and "On Modeling and Mitigating Financial Bubbles"** (distributed via email):

Modification of linear demand model to include speculation, Simulation of crash of 1929; Simulation of current housing bubble, Discuss impact of bubbles on product development..

**Weeks 13 and 14**

**HW#5 Due:**

**Grad students turn in Special Project**

Review of course material