ISM 105/205: Management of Technology I: Management, Development and Commercialization (MDC) of Technology and Products

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About the course:
MOT I is the first in a sequence of courses on the management of technology. Briefly, the first course MOT I focuses on new product/technology design and development, while the second course MOT II deals with the end-to-end design of the supply chain network necessary to distribute the product from the supplier through manufacturer to customer.

MOT I will provide students with a systematic methodology and the corresponding set of methods and analytical tools to address the management, development and commercialization (MDC) of technology and products in an integrated manner, which enables the cost-effective and rapid development of profitable and high quality technologies and products. Topics covered will include engineering/product design and development, strategic analysis of the business landscape, integrated cross-functional development strategy, and finance. These topics will be addressed within the context of high technologies such as software, computers, information systems, semiconductors, storage, nanotechnology, and biotechnology.

ISM 105 is the undergraduate version of the course, while ISM 205 is the graduate version of the course. The two courses differ in the amount (“load”) and level of work required of the students in both the weekly class assignments, and the comprehensive team project. More specifically, ISM 205 will require analysis of additional case-studies and will cover a comprehensive mathematical topic, Design of Experiments (DOE, aka Robust Design), that are not required of the students in ISM 105. The DOE topic will be covered in separate lectures and through directed readings, including a case study.

Objectives of the course:
• To understand the functional areas (e.g., technology, business, marketing) and phases involved in the end-to-end design, development, and delivery of technology and products from competitive strategy and customer needs through conceptual design, prototyping, and manufacturing to product release and marketing.
• To develop and apply an integrated framework for the management, development, and commercialization (MDC) of technology.
• To develop and apply methods and tools that make technology management, development and commercialization more effective. These tools will be both qualitative and quantitative in nature.
• To gain experience with MDC of high tech through comprehensive case studies and the term project.
Grading:
• Homework: 25%
• Project: 25%
• Midterm Exam: 25%
• Final Exam: 25%

Project Plan (due dates are in parentheses):
• Form project teams and choose technology/product domain (9/30/10)
• Project Proposal; preliminary “market needs” assessment; preliminary competitive and market strategy (10/12/10)
• Phase 1: Strategy (technology strategy; competitive/business strategy; market strategy) and Product Portfolio (10/26/10)
• Phase 2: Product Design and Development; Product Platform (11/09/10)
• Phase 3: Commercialization: Product Architecture and Product Line Strategy; Financial Analysis; Quality; Robustness (11/23/10)
• Phase 4: Integration, Final Report, and Project Presentation (11/30/10)

In general, you will be applying what you learn from the lectures and home-works to your team project. To help you in this application process, instructions, which outline the requirements (“deliverables”) for each phase of the project, will be provided as part of the homework assignments.

General comments:
• No single textbook covers the diverse set of topics and tools that constitute this course (see table on Page 3). It is therefore critical that you attend the lectures and take good notes. A list of reference texts is provided below. Also, the course topics table on Page 3 provides a text reference for each topic.
• The course will cover both qualitative and quantitative methods and tools that are useful in the development and commercialization of technology.
• This course is very interactive. We will be actively discussing case studies and homework in class. Therefore, attendance is mandatory. Please contact me ahead of time if you have to miss a lecture for some important reason.
• Keep a project notebook, which will be used when grading your term project.
• If you have any problems related to the course, please see me immediately so that we can quickly resolve the issue.

Required Text Book for the course:

Course Reading List:
(The acronyms preceding each reference are used in the last column of the table of course topics on Page 3.)


**Course Topics** (* denotes an “ISM 205 only” topic or “ISM 205 only” case-study; M denotes management, D denotes Development, C denotes commercialization; topics might vary slightly depending on specialization of the students)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Methodology/Tools</th>
<th>Case Study (Company or Tech. Domain)</th>
<th>Reference</th>
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</thead>
<tbody>
<tr>
<td>Introduction: The Structure of the MOT I course</td>
<td>Structured Problem-Solving</td>
<td>Xerox</td>
<td>PDD, Chapters 1-3</td>
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<tr>
<td>MDC Framework</td>
<td>Integrated MDC Framework</td>
<td>Sun*</td>
<td>Lec. Notes</td>
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<tr>
<td>M1: Technology, Market and Competitive Strategy</td>
<td>Functional Maps</td>
<td>The Disc-Drive Industry, Apple</td>
<td>MNPPD</td>
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<td>M2: Market/Competitive Analysis of Industry</td>
<td>Porter’s Five Forces Framework</td>
<td>Intel, Microsoft</td>
<td>SBL</td>
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<td>M3: Establishing Customer Needs and Technical Specifications</td>
<td>Quality Function Deployment (QFD)</td>
<td>Specialized Bicycle Components</td>
<td>PDD, Chap. 4,5</td>
</tr>
<tr>
<td>M4: Aggregate Project Planning</td>
<td>Probabilistic Decision Analysis</td>
<td>Enterprise Software</td>
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<tr>
<td>D1: Development Project Planning</td>
<td>Design Structure Matrix, GANT and PERT charts</td>
<td>Kodak</td>
<td>PDD, Chap. 16</td>
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<tr>
<td>D2: Conceptual Design</td>
<td>Function Analysis System Technique (FAST), Function Structure, Utility Functions</td>
<td>Robot design; Stanley-Bostitch</td>
<td>PDD, Chap. 6,7,8</td>
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<tr>
<td>D4: Prototyping, Detailed Design, Design Review</td>
<td>Concurrent Engineering (CE), Virtual Integrated Prototyping (VIP)</td>
<td>iRobot; Sony; Applied Materials*</td>
<td>PDD, Chap. 11-12</td>
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<tr>
<td>C2: Manufacturing</td>
<td>Design for Manufacturing (DFM), Failure Modes and Effects Analysis (FMEA)</td>
<td>Boeing, Intel*</td>
<td>QTD</td>
</tr>
<tr>
<td>C3: Economics of Product Development</td>
<td>Net Present Value (NPV) Analysis</td>
<td>Polaroid</td>
<td>PDD, Chap. 15</td>
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<tr>
<td>*C1: Quality/Robustness (ISM 205 only)</td>
<td>Design of Experiments (DOE)</td>
<td>Semiconductors, Computer systems</td>
<td>QERD</td>
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