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

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Time: Tuesdays and Thursdays, 12:00 Noon –1:45 PM

Location: E2, Room 192

Office Hours: Tuesday 3-5 PM

About the course:
MOT I is the first in a sequence of courses on the management of technology. Briefly, the first course MOT I deals with product/technology 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. In addition, ISM 205 has an additional comprehensive mathematical topic, Design of Experiments (aka Robust Design), that is not required of the students in ISM 105. This ISM 205 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 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:
• Form project teams and choose technology/product domain
• Formulate Project Proposal and preliminary “market needs” assessment: 10/5
• Phase 1 (Technology Strategy; Business Strategy; Market Strategy): 10/19
• Phase 2 (Product Design and Development; Manufacturing, Product Platform) 11/2
• Phase 3: (Financial Analysis; Quality and Robustness; Integration): due 11/16
• Final Report due 11/30

Instructions outlining the requirements 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.

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

The first book listed below is highly recommended for the course.


**Course Topics** (* denotes an “ISM 205 only” topic; 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>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction: Objectives of MDC of Tech/Products</td>
<td>__________________________</td>
<td>Northern Electronics</td>
<td>MNPPD, PDD</td>
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<tr>
<td>The need for an integrated MDC Strategy</td>
<td>General Problem Solving Methodology</td>
<td>Honda</td>
<td>MNPPD</td>
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<td>MDC Framework</td>
<td>Integrated DMC Framework</td>
<td>Dayton Electric</td>
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<tr>
<td>M1: Creating Functional Maps to align technology marketing, and business</td>
<td>Business-Technology-Marketing Mapping</td>
<td>Apple, Sun</td>
<td>MNPPD</td>
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<tr>
<td>M2: Market/Competitive Analysis of Technology</td>
<td>Porter’s Five Forces Framework</td>
<td>Intel, Microsoft</td>
<td>SBL</td>
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<tr>
<td>M3: Establishing Customer Needs and Technical Specifications</td>
<td>Quality Function Deployment (QFD)</td>
<td>Specialized Bicycle Components</td>
<td>PDD</td>
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<td>M4: Aggregate Project Planning</td>
<td>Probabilistic Decision Analysis</td>
<td>Enterprise Software</td>
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<td>M5: Structuring the Development Funnel</td>
<td>Development funnel models</td>
<td>Honda</td>
<td>MNPPD</td>
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<td>M6: Cross Functional Integration (optional)</td>
<td>Activity Matrix</td>
<td>Boeing</td>
<td>MNPPD</td>
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<tr>
<td>D1: Conceptual Design</td>
<td>Function Analysis</td>
<td>Robotics</td>
<td>PDD</td>
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<td>D2: Product Planning: Technology Platforms and Architectures</td>
<td>Modular Design</td>
<td>Intel, Apple</td>
<td>PSHTC</td>
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<td>D3: Development Project Planning</td>
<td>Design Structure Matrix, GANT and PERT charts</td>
<td>Applied Materials</td>
<td>PDD</td>
</tr>
<tr>
<td>D4: Prototyping, Detailed Design, Design Review</td>
<td>Concurrent Engineering (CE), Virtual Integrated Prototyping (VIP)</td>
<td>SONY, GMR thin-film fabrication</td>
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<tr>
<td>*C1: Quality/Robustness (ISM 205 only)</td>
<td>Statistical Design of Experiments (DOE), Taguchi methods</td>
<td>Semiconductor processing, Computer systems</td>
<td>QERD</td>
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<tr>
<td>C2: Manufacturing</td>
<td>Design for Manufacturing (DFM), Failure Modes and Effects Analysis (FMEA)</td>
<td>Intel, Boeing</td>
<td>QTD</td>
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<tr>
<td>C3: Economics of Product Development</td>
<td>Net Present Value (NPV) Analysis</td>
<td>Polaroid</td>
<td>PDD</td>
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<tr>
<td>C4: Product Marketing Planning (optional)</td>
<td>Product Release Roadmap</td>
<td>Microsoft</td>
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