

EMTM

EXECUTIVE MASTER'S IN
TECHNOLOGY MANAGEMENT

AN MSE FROM PENN ENGINEERING
CO-SPONSORED BY THE WHARTON SCHOOL
UNIVERSITY OF PENNSYLVANIA

Leadership in the Management of Technology and Innovation

SPONSOR BRIEFING : 2005

Includes:

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"It's just not enough to say the science is great. At the end of the day you have to explain the bottom line of whether it will make or save money for the company. Now I can present the science and technology in the right way to justify how it should be funded; and I can defend the resources I'm asking for by explaining the return on investment."

Niranjan Kumar, EMTM '04
Senior Scientist and Project Leader
Quality Operations Analytical Industrialization Management
Aventis-Pasteur

"Where companies get the real value is in implementing solutions that are going to drive their manufacturing and product development cycles. That's a perspective I gained from EMTM that I didn't have before."

Beth Steiner, MBA, EMTM '03
Formerly Director, SAP Business Consulting
Recently named Manager of Solution Delivery, SAP Business Process Outsourcing

"The EMTM experience broadened the scope of what I pay close attention to from a technology perspective. Now I have a broader perspective on which initiatives will have the most positive impact for our business, what technologies should be employed, and what human resources are needed to be successful."

Marlon Craig, EMTM '04
Systems Integration Manager
The Vanguard Group

"EMTM allows its students to build a plan around an idea and then run all the doors and traps to get it to implementation."

Jim McFarland
Vice President of Operations
Business Division
AT&T

Sponsor of:

Michael Mira, MBA, CPA, EMTM '01
Director of Financial Integrity and Internal Controls

Executive Summary – Executive Master’s in Technology Management (EMTM)

Mission – Bridging the Gap between Technology and Management

- To develop effective leaders in technology-intensive industries who can align business strategy with smart technology and management decisions
- To prepare experienced managers, scientists and engineers to lead within and across their teams and organizations
- To advance the ability of sponsoring organizations to respond to change and global competition, integrate multiple technologies into products and systems, and turn technological innovations into commercial success

Benefits to Sponsors – Immediate and Long-Term Impact

- Relevance and job impact
- Leadership development in a technology-oriented environment
- Pipeline of new tools and insights from faculty and fellow students
- Minimal loss of work-time
- Increased productivity, motivation, commitment

Quality – The Best of Both Worlds

- Designed to build strategic management skills while staying current with changing technologies
- The premier executive technology management master’s program in the Ivy League
- Established in 1988 with the support and input of corporate leaders
- Based in Penn Engineering, co-sponsored by the Wharton School
- Approximately half of courses taught by Engineering faculty, half by Wharton faculty
- Leads to an MSE in the management of technology from Penn Engineering, and an Executive Master’s of Technology Management certificate from Penn Engineering and Wharton

Schedule and Format – For Working Professionals

- Classes meet Friday and Saturday on alternate weekends
- 9-month Academic year: September – May (4-day Orientation session in late August)
- Full-time students complete degree in 2 years
- Flexibility for half-time option (attend on Saturdays only)

Curriculum – Foundations, Flexibility, Innovation

- 10-course technology management core modeled after the Wharton MBA core curriculum, plus Emerging Technologies Seminar during first year.
- 6-course technology requirement (selected from approx. 15 electives) – with the option to concentrate in a technology track or gain exposure across technologies
- 4+ open electives (selected from approx. 30 technology and management electives)
- One of the largest course selections and elective options available in a program at this level
- Technology courses span multiple technologies (including IT and Telecommunications, Biotechnology, Nanotechnology, Photonics and others)
- Business courses in Finance, Marketing, Operations, Strategy, Innovation, Leadership, and more
- Optional features: Field Application Projects, Executive Speaker Seminars, Global Immersion Trip, Business Plan Competition

Student Profile – Experienced and Diverse

- 10 years average work experience (range: 5 – 25+)
- More than half with advanced degrees (MS/MSE, MBA, PhD, JD, MD)
- Strong industry mix (IT, telecom, pharmaceuticals, financial services, consulting, manufacturing, aerospace, energy)

The EMTM Advantage ... A Degree of Difference

Preparing leaders to succeed in a world of accelerating technological change.

- **The first of its kind.** Established at the University of Pennsylvania in 1988, EMTM was the first graduate-level program for executives to focus on technology management in the context of new and emerging technologies. Distinct from an MBA or technical MSE, EMTM is designed for experienced engineers, scientists, IT leaders and general managers who want to build business and management skills while staying current with changing technologies.
- **Created through the foresight and collaboration of business leaders close to the issues of technology and corporate strategy.** Looking ahead at the increasingly competitive and global landscape of business and the rapid changes taking place in technology, they recognized the need to prepare a new generation of leaders who understand both technology and business.
- **Designed for experienced managers, technologists, scientists and engineers.** EMTM students bring an average of 10 years experience in organizations where understanding and exploiting rapidly changing technology is key to success. The level and quality of experience adds value for everyone in the classroom, and creates a powerful network of professional colleagues.
- **Taught by the faculty of Penn Engineering and Wharton.** EMTM offers world-class quality and a broad selection of course offerings in both technology and management. Wharton faculty teach management core and elective courses, while Penn Engineering faculty lead technology offerings that cover key developments in essential and emerging technologies like IT, Biotechnology and Pharmaceuticals, and Nanotechnology.
- **Alternate weekend schedule.** The EMTM schedule is designed to minimize time away from work, while creating maximum opportunity to learn and network. Students meet on alternate weekends (Friday and Saturday) over a 9-month academic year. They can complete their degree in two years. Options for half-time schedules are also available.
- **Immediate impact, long-term value.** For students and their organizations, the benefits are both immediate and long-term. Students advance their knowledge without interrupting their careers. Organizations see the results of their investment in new insights and tools brought back to work each week, as well as in the development of strong leadership potential within the firm.

“There’s a real focus on the big picture. It makes you start thinking in broader terms – on strategy rather than just the details. The details are important, but you can get caught in them if you don’t look at the big picture too.”

Pavan K. Heda, PhD, EMTM '05
Manager, Portfolio Management
J&J Consumer & Personal Products Worldwide

(Shortly after Pavan started EMTM in 2003, he was promoted to Project Manager, leading cross-functional new product launch teams. Recently, he has been promoted to Portfolio Manager.)

Benefits to Sponsors

Sponsors gain from the broader business perspectives, strategic frameworks and new insights on emerging technologies that EMTM students bring back to their jobs and their organizations.

- **Immediate job impact.** Many students report that they begin applying the tools and knowledge gained at EMTM from the time they begin the program. They are able to combine their own expertise with a better understanding of key business drivers and technology management to identify new opportunities for generating revenue, cost savings and competitive advantage. They evaluate projects with a sharper, more strategic analysis. They communicate more effectively with their counterparts in other areas of the business, as well as with clients.
- **Pipeline of new ideas.** With classes every other weekend, EMTM students bring a steady flow of innovative ideas and best practices back to their companies. What is learned in the class can be shared with co-workers and put to work the next week.
- **Extended knowledge network.** From the first day of classes, an EMTM student's network of contacts in different areas of business and technology expands dramatically – not only faculty with unique expertise and fellow students from across industries, but EMTM alumni and the wider communities and resources of Penn Engineering and Wharton.
- **Leadership development in a technology-oriented environment.** For companies seeking to build senior leadership in their organizations, EMTM combines top management development with courses in advanced and emerging technologies, preparing experienced technology managers and executives to assume broader responsibilities.
- **Tool to recognize, reward and retain top talent.** Organizations that want to identify and develop younger, high-potential employees use EMTM as part of a career development strategy to retain key talent and ensure that rising stars are prepared to take on new challenges as they move up in the organization.

“EMTM taught me how to apply information-based strategies to forecast the financial benefits of new technology directions. My division was getting ready to enter a new market. Our investment was justified in a project assignment in my Management of Technology class, which I shared with our senior management team. EMTM helped refocus and re-energize our strategy.”

Janice R. Maiden, EMTM '03
Global Director of Technology and Product Development
U.S. Federal-Mogul Systems Protection Group

“At Motorola I have implemented several small investment decisions in R&D and standards activities based on the concept of risk-neutral pricing that I learned in EMTM Real Options studies. Several are starting to return value exactly as predicted by the models.”

Mark E. Pecen, EMTM '05
Distinguished Member, Technical Staff
Senior Manager, Advanced Technology and Global Standards
Motorola, Inc.

Class Profile

Who are EMTM students? Senior and high-potential managers who need to understand both the technology and business drivers of their industry. Company and team leaders whose role requires the ability to communicate effectively across the organization on strategic issues of business development, technology infrastructure and resource allocation.

- **Average age:** 35 years (range - 25 years to more than 45 years)
- **Work experience:** 10+ (range - 5 to more than 25 years)
- **Education:** More than half hold advanced degrees, including MS/MSE, MBA, PhD, MD and JD degrees.
- **Prior academic and work experience:** Backgrounds are typically in an engineering, math, computing, or science-related field, or management with a technology focus.
- **Industries:** Companies range from Fortune 500 enterprises to high-tech start-ups and government agencies. They span a broad spectrum of industries, including IT, telecom, pharmaceuticals and biotech, financial services, consulting, manufacturing, aerospace, defense, energy and others.
- **Current Positions:** EMTM students hold rising and senior positions in their organizations, including presidents, CEOs and COOs of small and mid-sized firms; IT leaders and their reports; VPs and Directors of Operations, Strategic Planning, R&D, Global Facilities Management; General Corporate and Business Development Managers; Senior Scientists, Research Leaders and Project Engineers; Team Leaders, Analysts, Consultants, Architects, Marketing Managers, Product Managers and Technical Sales Executives.

“I was able to learn best practices in other fields from fellow students – for instance, how pharmaceutical companies handle R&D planning. We have to be a lot more strategic in the type of technological advancements that we pursue and how we stimulate innovation.”

Peter Hughes, MS, EMTM '04
Acting Chief Technologist
Chief, Goddard Technology Management Office
NASA Goddard Space Flight Center

(Peter's prior background at NASA focused on applied research in artificial intelligence, human/computer interaction, and software engineering. Shortly after graduating from EMTM, he was named Acting Chief Technologist of the NASA Goddard Space Flight Center.)

Curriculum and Schedule

The EMTM curriculum provides an integrated technology management core, plus the flexibility to tailor the program through a wide range of technology and management electives. The requirement for degree completion is 20 courses, but many students also take advantage of the option to complete additional courses (up to a total of 24), at no additional program cost.

| | | |
|--|----------------------|--|
| Core | 10 courses | Foundations courses include areas such as finance, management, marketing, operations, strategy and technology management |
| Technology Electives | 6 courses | A student can specialize in a discipline, or gain exposure across technology areas (e.g., biotechnology, IT, nanotechnology & materials) |
| Open Electives | 4 courses | Chosen from among a large selection of technology and management electives |
| Total | 20 courses | |
| Emerging Technologies Seminar (ETS) | 1st-year Requirement | 90-minute sessions led by faculty and experts from different areas of emerging technology |

Program Calendar 2005-2006

EMTM's alternate weekend Friday/Saturday format helps minimize time away from work. Students gain from a more focused experience, and can commute from a wider geographic region. Full-time students attend on Fridays and Saturdays, taking up to 4 courses each term. Students can switch between full-time and half-time if needed to accommodate work demands.

| Term 1 | Term 2 | Term 3 |
|---|----------------------|----------------------|
| <i>Aug 24-27*</i> <i>(Orientation)</i> | | |
| Sep 2-3 | Dec 2-3 | Mar 10-11 |
| Sep 16-17 | Dec 16-17 | Mar 24-25 |
| Sep 30/ Oct 1 | Jan 6-7 | Apr 7-8 |
| Oct 14-15 | Jan 20-21 | Apr 21-22 |
| Oct 28-29 | Feb 3-4 | May 5-6 |
| Nov 11-12 | Feb 17-18 | May 19-20 |
| <i>(Nov 18-19)**</i> | <i>(Feb 24-25)**</i> | <i>(May 26-27)**</i> |

* First Year Program Orientation Wednesday-Saturday, August 24-27.

** Final Exam Weekends for Core Courses during First Year.

Courses

Offering one of the largest, most diverse course selections among graduate technology management programs, EMTM classes are taught by Penn Engineering and Wharton faculty, as well as by experienced entrepreneurs and successful leaders from industry. The curriculum is continuously updated to reflect evolving needs in technology management. Following is an overview of recent and upcoming courses and seminar topics.

EMTM Core Courses: Foundations & Techniques

- Accounting
- Business Policy
- Corporate Finance
- Decision Models
- Management of Technology
- Managerial Economics
- Marketing Strategies
- Operations Management
- Organizational Behavior & Design
- Statistics
- Emerging Technologies Seminar (ETS)
(see sample topics below)

Technology Electives

IT and Telecommunications

- Computer Visualization
- Data Mining
- Enterprise Software Development
- Human Computer Interaction
- IT Strategy
- Software Development
- Telecom – Intro Networking
- Telecom – Advanced Networking

Nanotechnology & Materials Science

- Advanced Materials
- Microelectronics
- Nanotechnology
- Photonics

BioPharm & Biotechnology

- Biotechnology & Business Development
- Clinical Technology Innovation
- Drug Discovery
- Medicine & Biotechnology
- Modern Biotechnology

Other Technologies Electives

- Concurrent and Simultaneous Engineering
- Enabling Technologies
- R&D Management

Management Electives

Finance

- Case Studies in Corporate Finance
- Computational Finance
- Mergers & Acquisitions
- Real Options Analysis

Marketing

- Models & Tools for Marketing Tactics & Strategy

Operations & Info Management

- Creating Value through Technology: IT-Enabled Services & Strategies
- Product Design & Development
- Risk Management, Operations & Technology

Innovation / Entrepreneurship

- Legal Aspects of Entrepreneurship
- Strategic Mgmt of Innovation
- Strategic Mgmt of IP
- Technology Entrepreneurship

Leadership & Teamwork

- Foundations of Teamwork & Leadership
- Negotiations
- Politics & Networking
- Total Leadership for Technologists
- Virtual Collaboration

Emerging Technology Seminar (ETS) – Sample Topics

- Emerging Technologies: Opportunity or Risk
- Lab on a Chip and Biosensors Technology
- New Trends in Drug Discovery
- Nanotechnology: Small Things Making a Large Impact
- Penn's Automated Trading Project
- Advances in Robotics
- Quantum Computing and Information Science
- Investing in Emerging Technologies
- Tele-immersion: The Convergence of Computer Vision, Graphics and Networking
- Data-Mining for Drug Discovery

Admissions and Fees

EMTM seeks candidates who are highly qualified both academically and professionally – individuals who can both benefit from and contribute to the level of academic experience and peer networking offered by the program.

Application Requirements

- Five or more years work experience
- Bachelor's degree
- GMAT or GRE scores from within the past five years
- Completed online application, including official transcripts, three essays, two professional recommendations and application fee of \$150.00.
- From applicant's employer:
 - Letter of employer endorsement is required for all full-time applicants and recommended for all applicants. This letter confirms support for the candidate's application and for the time away from work that will be required to complete class work and other program-related obligations.
 - Financial support is encouraged, but not required.
- Interviews are encouraged. In some instances, an applicant may be asked to complete an interview on campus to provide additional perspective to his or her application.

Application Deadlines

- Early notification: March 15, 2005 (notification by April 15)
- Final deadline: June 1, 2005 (notification by July 1)

Costs

The cost of the program is comprehensive and includes all required coursework, assigned texts and reference materials, as well as program-related hotel accommodations.

For 2005-06 the annual cost of the program is:

- \$49,500 for full-time students (attending Fridays and Saturdays)
- \$24,750 for half-time students (attending Saturdays only)

(For students entering in Fall 2005, these costs will remain fixed for two academic years: 2005-06 and 2006-07. Tuition is subject to change in subsequent years.)

“Working full time and going to school full time allows me to almost instantaneously apply the learning, which translates into direct dollar generation and cost savings for my company.”

Gun-Sam Kim, MBA, EMTM '05
Research and Development Project Manager
Hewlett-Packard Company

(Sam commutes to EMTM from Vancouver, Washington. He credits EMTM with contributing to his recent success in taking a junior software development team at HP and producing the most reliable SW solution ever as indicated by recent customer call rate data.)

Sponsor FAQs

How can I maximize the value of EMTM for my company?

- **Invest in top talent.** Select candidates who have the potential to expand their current roles and provide leadership within their units or the organization as a whole. EMTM can be a retention tool for young, high-potential employees, or an accelerator to provide valued mid-career executives with the tools and exposure to assume greater responsibilities.
- **Put EMTM to work for you.** Plan how your employee can bring back ideas to issues at work. For example, EMTM can create the opportunity to focus on a strategic project that might otherwise not receive the same level of attention.
- **Recognize the value added.** Identify and assign new responsibilities that take advantage of the perspectives, knowledge set and network built through EMTM.

What's required to sponsor an EMTM student?

- **A letter of employer endorsement is required for applicants planning to attend full-time, and requested for all applicants.** This letter should confirm that the candidate's company and supervising manager (where applicable) support the individual's application and will grant the time away from work needed to attend classes and complete program requirements. The EMTM program has been designed to minimize time away from work, with classes meeting only 6 times per term; therefore each class session represents a significant component of the course.
- **Financial support is strongly encouraged, but not required.** Recognizing the value that EMTM brings to sponsoring firms as well as to students, many organizations cover all or part of the cost of the program through tuition-reimbursement programs and other compensation arrangements. For information on ways that companies have created risk-sharing sponsorship benefits, please contact the Admissions Office.

"I led our organization's redesign for technology services. I also ran the planning and implementation of our resource strategy program. ... Because of my EMTM training, I was able to do this work quickly and comprehensively. I understood the process, the language and how and what to analyze in making decisions."

Judith Zosh, MA, EMTM '03
Manager, Business Continuity and Disaster Recovery
Technology Infrastructure Group
JPMorgan Chase

(Judith has been promoted four times since she enrolled in EMTM in 1999. As Global Applications Delivery Manager for Shared Technology Operations, she created standards for technology services across JPMorgan Chase offices worldwide.)

Representative Organizations of Recent Participants

| | | |
|---------------------------------------|---|---------------------------------------|
| Aetna | First USA Bank | New York Stock Exchange |
| AGFA Co. | Fluor Daniel | Nexus Technology |
| Air Products | FMC Corporation | Nike |
| Amtrak | Ford Motor Company | Nuclear Energy Institute |
| American Cyanamid Company | GE Capital Services Corporation | Oracle |
| American Express | General Electric | Ortho-McNeil Pharmaceutical, Inc. |
| ARAMARK Corporation | General Mills | PECO Energy |
| AstraZeneca International | General Motors Corporation | Penn Mutual |
| AT&T | Gentex Corporation | Peoplesoft USA, Ltd. |
| Aventis Pasteur | GlaxoSmithKline | Pfizer Pharmaceuticals |
| BAE Systems | GTE Services | Philips Technologies |
| Bank One | Hershey Medical Center | Pitney Bowes |
| BASF Corp. | Hewlett Packard | PricewaterhouseCoopers |
| Boeing | Honeywell Micro Switch | Procter & Gamble |
| Bristol-Myers Squibb Company | IBM Corporation | Prudential Insurance |
| Campbell Soup Company | ICG Commerce | Quaker Chemical Company, Inc. |
| CIGNA | Independence Blue Cross | Quest Diagnostics Inc. |
| Cingular Wireless | ING Annuities | Raytheon Co. |
| Cisco Systems | Ingersoll-Rand Company | Rhone-Poulenc Rorer, Inc. |
| Citigroup | Intel Corporation | Rohm & Haas Company |
| The Clorox Company | International Flavors & Fragrances | Roy F. Weston, Inc. |
| CNET Computers Inc. | Janssen Pharmaceutica Products | Ryder Logistics & Transportation |
| Cognis | Jefferson Medical College | SAP America |
| Colgate-Palmolive Company | Johnson & Johnson | Schering-Plough |
| Columbia Gas Transmission Corp. | J.P. Morgan Chase & Co. | SEI Investment Co. |
| Comcast | KPMG | Siemens Power Generation |
| Computer Associates | L3 Communications | Sikorsky Aircraft |
| Computer Sciences Corporation | Lehman Brothers | Sony Music Entertainment, Inc. |
| Conrail | Litton Industries, Inc. | Sprint PCS |
| Corning | Lockheed Martin Corporation | Subaru of America, Inc. |
| Deloitte Consulting | Lucent Technologies/Bell Labs | Texas Instruments |
| Deloitte & Touche | Lyondell Chemical Company | TNS Telecom |
| Delphi Automotive Systems | MBNA America Bank | Towers Perrin |
| Deutsche Bank | MCI Worldcom | Triton PC |
| Dow Jones & Company, Inc. | McGraw-Hill Companies, Inc | Unisys Corporation |
| DuPont Company | McNeil Consumer & Specialty Products | United Parcel Service |
| Eastman Kodak | Merck & Company | US Airways |
| Electronic Data Systems | Merrill Lynch | U.S. Department of Defense |
| Environmental Protection Agency | Mobil R&D | U.S. Nuclear Regulatory Commission |
| Environmental Resources Management | Monsanto Company | U.S. Patent and Trademark Office |
| Epsilon Products Co. | Morgan Stanley | Vanguard Group |
| Ericsson | Motorola, Inc. | Verizon |
| Exelon Energy | NACCO Materials Handling Group | Wachovia |
| Exxon Company | NASA Goddard Space Light Center | Warner Lambert |
| Federal Aviation Administration | National Institute of Standards & Technology | Wyeth |
| Federal Mogul | New York Power Authority | |
| First Energy Corporation | | |
| First Union Corporation | | |

“Increasingly, I found that leveraging technology and know-how was the way we were creating competitive advantage. I already had an MBA... EMTM gave me the opportunity to look at a broad group of technologies that really define what we do as a company, understand them better, and at the same time, apply them in a competitive environment.”

**John Pullo, MBA, EMTM '99
Vice President and General Manager
Performance Materials
Gentex Corporation**

Contact Information

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Sponsors are welcome to discuss questions regarding the program with an EMTM Co-Director.
Please direct your inquiry to the EMTM Admissions Office.

*“EMTM develops leadership — how to get others to follow your vision;
how to lead a team; how to develop your own internal leadership skills; how to
take charge and how to measure yourself against others.”*

Tina Schechter (EMTM '98)
Director, LM21 Operating Excellence
Lockheed Martin