

# ENGINEERING MANAGEMENT

The part-time Engineering Management program prepares ethically grounded, technically competent professional leaders with the technical, managerial, and leadership skills to produce innovative solutions to technical organizations' challenges. While management courses serve as the core of the program at Johns Hopkins Engineering for Professionals, students work within specialty tracks that span various engineering disciplines or within a technical leadership track. The tracks provide students a unique graduate-level opportunity to mix their chosen track with engineering management perspectives. For students pursuing a career in systems acquisition, systems development, or production domains as a project manager, program manager, or in general management, the Technical Leadership track is oriented for you. For the functional manager who wants to further develop a mix of management and technical skills, the specialty tracks advance technical skills in your chosen area while enhancing your ability to manage and supervise technical personnel. The curriculum provides a unique opportunity to build both technical and leadership skills in order to contribute to a multi-disciplinary engineering management team. Instructors are experienced technical leaders and executives who discuss real-world challenges in formats that are convenient for professionals working at the nation's top engineering firms and R&D organizations.

Tracks offered: Applied Biomedical Engineering; Applied and Computational Mathematics; Applied Physics; Artificial Intelligence; Civil Engineering; Computer Science; Cybersecurity; Data Science; Electrical and Computer Engineering; Environmental Engineering, Science, and Management Programs; Healthcare Systems Engineering; Information Systems Engineering; Materials Science and Engineering; Mechanical Engineering; Structural Engineering; Space Systems Engineering; Systems Engineering; and Technical Leadership.

## Engineering Management Program Committee

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**Stas Tarchalski**  
Director, IBM (retired)

## Programs

- Engineering Management, Graduate Certificate (<https://e-catalogue.jhu.edu/engineering/engineering-professionals/engineering-management/engineering-management-graduate-certificate/>)
- Engineering Management, Master of Engineering Management (<https://e-catalogue.jhu.edu/engineering/engineering-professionals/engineering-management/engineering-management-master/>)

## Courses

### EN.595.660. Planning and Managing Projects. 3 Credits.

This course concentrates on the general methodology of managing a technical project from concept to operational use, with emphasis on the functions, roles, and responsibilities of the project manager. Topics include career aspects of project management; business factors affecting the project and the manager; project organization, planning, execution, and communications; project life cycle; risk analysis; interface management; design review; design control assessment; reporting; and reaction to critical problems. Students are formed into groups, presented with a scenario that simulates the development of a high-technology system, and assigned to make decisions required of the project manager in the execution of the project. The project manager's decisions must then be effectively communicated (and perhaps defended) to a variety of audiences (represented by other students and faculty) that include top management, the customer, functional management, and members of the project team.

### EN.595.662. Technical Organization Management. 3 Credits.

This course reviews the challenges of group management and personnel management in a technical organization. Students examine core functions of a technical group-level manager for planning, organizing, controlling, and leading. The course introduces topics relevant to technical group managers, including ethical leadership, team building, innovation environment, customer responsiveness, recruiting, hiring, compensation, delegation, motivation, performance management, conflict management, and organizational learning. Students address typical organization management situations and apply concepts to address expectations and challenges for a group-level manager in a technical organization.

**Prerequisite(s):** 595.660 Planning and Managing Projects. Systems Engineering majors may contact the Systems Engineering Vice Chair regarding prerequisite substitution opportunities (this does not apply to Engineering Management / Systems Engineering Track students).

**EN.595.665. Strategic Communications in Technical Organizations. 3 Credits.**

This course covers problems and instruction in human communications within a technical organization. Topics include the nature of difficulties in human communications (perception and cognition, semantics, individual differences in processing information, and listening), techniques for effective oral and written communications and presentations, problems in communication between supervisors and subordinates, assignment of work, and reporting to management and sponsors. Students assume roles in various interpersonal situations, meetings, discussions, and conflicts calling for a supervisor to write letters and memoranda; they also deliver oral presentations and participate in group and one-on-one discussions. This course also includes writing winning proposals and developing a technical strategy aligned with the organization's business strategy.

**Prerequisite(s):** 595.660 Planning and Managing Projects. Systems Engineering majors may contact the Systems Engineering Vice Chair regarding prerequisite substitution opportunities (this does not apply to Engineering Management / Systems Engineering Track students).

**EN.595.676. Finance, Contracts, and Compliance for Technical Professionals. 3 Credits.**

This course introduces the technical manager to all aspects of business management within an organization, ranging from tactical project planning and control, and contract management to higher level corporate financial and legal topics. Students will be guided through weekly topics in the areas of planning a project, scheduling, tracking and the evaluation/assessment of a project. It will also cover contractual considerations for the technical manager. The course will move from managerial business management to financial accounting topics such as direct and indirect costs, revenues, and profits; indices to financial position; use of financial reports; return on investment, net present value; internal rate of return; and financial management (including cash and funds flow statements). Finally, this course will also use the management approaches and practices above and apply them to the world of contracting and legal analysis. Tactical contracting principles, including acquisition planning, contract award, performance, and termination will be covered. Basic legal principles that a senior technical leader will encounter in their career will also be presented. Course discussions covering corporations and partnerships, professional liability, risk management, intellectual property negotiations, and ethics are presented for students to recognize issues that are likely to arise in the engineering profession and introduces them to the complexities and vagaries of the legal profession.

**Prerequisite(s):** 595.660 Planning and Managing Projects. Systems Engineering majors may contact the Systems Engineering Vice Chair regarding prerequisite substitution opportunities (this does not apply to Engineering Management / Systems Engineering Track students).

**EN.595.701. Product and Supply Chain Management for Technical Professionals. 3 Credits.**

This course provides foundational knowledge of Product and Supply Chain Management for effective engineering and technical leadership, while giving students a taste for the experience of being a product/supply chain manager. Topics include product management life cycles, investment strategies and business cases, product types (digital vs. physical vs. cyber-physical), product structures (build to spec vs. build to market), product and services portfolios, cross-organizational structures and governance, product, and services value chains as the basis for the supply chain, mergers and acquisitions, product platforms, and ethics and social responsibility related to products and supply chains. This course also addresses product-as-a-service and agile product/services development. The concepts in the course are reinforced with short case studies, a case-based team project, and fortified by interviews with practicing/retired product and supply chain executives and managers who discuss practical career experiences. Microsoft Teams is used extensively for instructor-student and student-team communication and collaboration. Note: This course is presented in a non-standard combination of asynchronous and synchronous delivery. Lectures are provided asynchronously online. Online (synchronous) attendance is required at bi-weekly seminar-type discussions. These discussions guide the incremental development, launch, sustainment and retirement plan for a product/product portfolio, and include mid-course and semester-end team presentations.

**Prerequisite(s):** EN.595.660 Planning and Managing Projects.

**EN.595.727. Advanced Concepts in Agile Technical Management. 3 Credits.**

The emergence of overarching strategies, represented primarily by DoD's Digital Engineering initiatives along with the commercial equivalent of Digital Transformation, are sound responses to previously unsatisfactory outcomes to a common question: How can organizations meet the challenge of complex projects and programs whose emergent characteristics and requirements demand continuous innovation and adaptation in order to succeed? High-tech firms and government agencies increasingly are searching for engineering managers and technical leaders who have the relevant skills to address these challenges, and are rewarding them accordingly. This course will provide students with the expertise needed to lead a highly skilled, cross-functional technical workforce capable of successfully executing these most demanding projects and programs. Students will learn advanced methods of technical leadership that apply a careful blend of agile, lean and design-thinking constructs designed to achieve the levels of success these high-tech firms and government agencies are seeking. Furthermore, students will learn how to employ a portfolio of advanced concepts to meet these challenges that include Digital Engineering (DE), Model-Driven Engineering (MDE), and just-in-time architecture development. Students will engage with fellow students in this course to draw from a popular style of team-based learning. This activity will help students acquire the necessary skills to implement these advanced leadership concepts to deliver transformational value to their customers.

**EN.595.731. Business Law for Technical Professionals. 3 Credits.**

This course addresses legal issues commonly encountered by technical professionals, best practices in identifying and mitigating legal risks, and strategies to avoid costly legal errors and to recognize when professional legal advice is necessary. The course will acquaint students with various areas of the law that can interact to affect a single business transaction and will provide students with legal reasoning skills that can be applied in a technical business environment. Topics include the legal environment of business, contract basics, effective contract negotiations, breach of contract and remedies, intellectual property rights, licensing and technology transfer, protecting confidential and proprietary business information, employment law, Internet law, corporate policies, business ethics, export control regulations, and an overview of the American court system.

**EN.595.742. Quality Management in Technical Organizations. 3 Credits.**

This course addresses quality management topics and applications vital to steering leadership and business process approaches for various organizations. Course discussions range from the history and development of modern quality programs to the latest in quality and business management, strategic planning, productivity improvement tools, techniques, and the implementation of quality initiatives needed to be successful in today's highly dynamic and competitive global market. Advanced topics related to the principles and application of quality methodologies are presented such as the impact of leadership and corporate culture on quality and the importance of quality during the proposal and contract review process. Students will understand the elements and implementation strategies of quality assurance tools and systems, including benchmarking, process control, quality measurement, supplier quality management, and auditing. Current applications and strategies for implementing effective quality management are introduced including lean manufacturing philosophies, Deming's PDCA cycle, Kaizen continuous improvement processes, and risk management. The course also covers a comprehensive and practical understanding of the implementation of quality management systems such as ISO 9001. As a result of the significant impact that software and system safety now have on today's organizations, sessions dedicated to both topics are also included.

**EN.595.758. Data Science for the Technical Leader. 3 Credits.**

The course provides an immersive introduction to data science for scientists and engineers who are in technical leadership positions and recognize the need to lead their organizations into a data-driven future. Through lectures, hands-on exercises, and project assignments, the course illustrates the fundamental concepts of data science and introduces the students to the skills required to apply the tools and techniques through the data science process to problems in support of fulfilling mission objectives. The course exposes the students to data management, data science tools and techniques, the basics of Artificial Intelligence (AI) and Machine Learning (ML), creating and delivering data-driven solutions, evaluating their efficacy, policy, and ethical considerations. Familiarity with desktop operating systems and software is required for this course. While students will perform hands-on coding exercises, only basic familiarity with software coding concepts is required.

**EN.595.762. Leading Technical Organizations. 3 Credits.**

The course reviews challenges in the leadership of high-technology organizations at the senior technical management level. Using leadership and organizational behavior theories and practices in conjunction with critical thinking, the student will explore topics that include: senior technical leader roles and responsibilities in relation to ethics, leadership style, motivation, and performance of top management teams. The student will also evaluate leading change, communications and organizational relationships, and the potential effects organizational design and processes play in influencing leader behavior. The student will assume the role of a senior technical leader dealing with typical leadership problems in rapidly changing environments.

**Prerequisite(s):** EN.595.662 Technical Organization Management (or EN.595.661 Technical Group Management or EN.595.663 Technical Personnel Management)

**EN.595.766. Advanced Technology. 3 Credits.**

This course emphasizes the impact of recent technological advances on new products, processes, and needs, as well as the role of the technical manager in rapidly evolving technologies. Subject areas and lecture content track current topics of interest, such as trends and developments in microelectronics, communications, computers, intelligent machines, and expert systems. Advanced technologies in application areas such as transportation, space, manufacturing, and biomedicine are also discussed. Students are encouraged to explore new technology areas and share information with each other. The seminar format encourages student participation and culminates in a term paper on a new or emerging technology area.

**EN.595.781. Executive Technical Leadership. 3 Credits.**

This Capstone course explores the roles and responsibilities of technical executive leaders (VPs of Engineering, Manufacturing, CTO, CIO) in the context of a strategic framework. Topics relevant to technical executives are explored, from leading technical strategy development to tactical operations. The concepts in the course are reinforced using case studies, a team project, and fortified by interviews with practicing/retired technical executives who discuss practical career experiences. The format of this course is very different from other Engineering Management courses. Lectures are provided asynchronously online. Required weekly online seminar-type discussions guide the incremental development of a technical strategy, and include a mid-course team presentation. The semester ends with a Capstone presentation, and an executive roundtable discussion. Students will be evaluated on their application of the principles presented in the course, critical thinking applied to the issues posed in the case study, and teamwork as assessed by both the instructors and peer students. The course includes one Sat Capstone session in the Balt, MD area at the end of the semester. In-person participation with other team members is encouraged. Students unable to attend in person will be able to participate online. The Sat session consists of student teams presenting their capstone technical strategic plan, issues, actions, and execution plans built around an evolving case study. A roundtable discussion will also be held where students have the opportunity to ask probing questions of visiting executives as part of the Capstone Day experience. This course is only offered in the Spring and Fall terms.

**Prerequisite(s):** Prerequisite(s): EN.595.660 Planning and Managing Projects, EN.595.662 Technical Organization Management (or EN.595.661 Technical Group Management or EN.595.663 Technical Personnel Management), EN.595.676 Finance, Contracts, and Compliance for Technical Organizations (or EN.595.664 Project Planning and Control or EN.595.666 Financial and Contract Management), EN.595.665 Strategic Communications in Technical Organizations

**EN.595.793. Applied Innovation for Technical Professionals. 3 Credits.**

"Fail fast", "crowdfunding", "agile", "open innovation"—the nature of innovation is radically changing in the 21st century. How can technical professionals thrive amidst the new models, tools and processes that are creating faster cycles of disruption? This course will address challenges faced by technical managers in creating and sustaining innovation across a wide range of organizations and environments: from government labs to Fortune 1,000 companies to small businesses and startups. Students will learn the many issues involved in turning creative ideas into a product or service and how to gain support for projects, demonstrate value of the innovation, scale to a profitable venture, and sustain the innovation through successive competitive life cycles. Students will also learn about the challenges and techniques for sustaining innovative cultures in large organizations and how to foster "intreprenurship"—the concept of creating innovations within the processes and cultures of an already established organization. Case studies and interviews with experienced senior managers will provide students with the latest real-world insights.

**EN.595.802. Directed Studies in Engineering Management. 3 Credits.**

In this course qualified students are permitted to investigate possible research fields or to pursue problems of interest through reading or nonlaboratory study under the direction of faculty members.

Prerequisite(s): The Independent Study/Project Form ([ep.jhu.edu/student-forms](http://ep.jhu.edu/student-forms)) must be completed and approved prior to registration.

Course Note(s): This course is open only to candidates in the Master of Engineering Management /Technical Leadership track.