ENES - ENGINEERING SCIENCE

ENES424 Engineering Leadership Capstone (3 Credits)
The work initiated in the Introduction to Engineering Leadership course brings together further exploration of leadership styles and concepts.
Prerequisite: ENES472, ENCE320, and ENES317; and permission of ENGR-A. James Clark School of Engineering.
Recommended: ENES100.

ENES440 Science, Technology and Society: Certificate Program Capstone (3 Credits)
Capstone research seminar for students in the Science, Technology and Society certificate program.
Restriction: Must be in the Science, Technology and Society certificate program; or permission of ENGR-A. James Clark School of Engineering.
Credit Only Granted for: ENES440 or UNIV401.
Formerly: UNIV401.

ENES458 Topics in International Engineering (1-4 Credits)
A variety of topics related to engineering in a global context are discussed including cultural aspects, cross-cultural communication, international standards and law, and engineering and technology issues, business behavior, attitudes and values of selected countries and regions.
Prerequisite: ENES100.
Repeatable to: 12 credits if content differs.

ENES459 Study Abroad Special Topics in Engineering IV (1-6 Credits)
Special topics course in engineering science taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ENES460 Fundamentals of Technology Start-Up Ventures (3 Credits)
Fundamental aspects of creating, organizing, funding, managing, and growing a technology startup venture. This multidisciplinary course will draw on management, business, legal, financial, as well as technical, concepts. Students form teams and develop a business plan for a technology company, based on each team's own business idea and then present the plan to a panel of outside experts.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Credit Only Granted for: ENES460, BMGT461 or HLMN470.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES461 Advanced Entrepreneurial Opportunity Analysis in Technology Ventures (3 Credits)
Explores the factors that influence entrepreneurial opportunity analysis in technology-based ventures. Uses a cognitive theoretical framework to examine the integration of motivation, emotions and information processing modes to make complex entrepreneurial decisions in technology venture environments.
Credit Only Granted for: ENES210 or ENES461.

ENES462 Marketing High-Technology Products and Innovations (3 Credits)
Examines the opportunities and challenges of marketing high-technology products in turbulent environments requiring rapid decision making with incomplete information. Explores how innovations are introduced at frequent intervals, research-and-development spending is vital, and there are high mortality rates for both products and businesses.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES463 Strategies for Managing Innovation (3 Credits)
Emphasizes how the technology entrepreneur can use strategic management of innovation and technology to enhance firm performance. Examines the process of technological change, the ways that firms come up with innovations, the strategies that firms use to benefit from innovation, and the process of formulating technology strategy. Provides frameworks for analyzing key aspects of these industries and teaches students how to apply these frameworks.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Credit Only Granted for: ENES463, BMGT467 or HLMN472.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES464 International Entrepreneurship and Innovation (3 Credits)
Focuses on the need for every entrepreneur and innovator to understand the global market in today's hypercompetitive world, and to appreciate how to compete effectively in domestic markets by managing international competitors, suppliers, and influences. Explore how the distinction between foreign and domestic markets is becoming less pronounced. Develop skills to identify and manage opportunities on a global basis.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES466 Leading and Financing the Technology Venture (3 Credits)
Focuses on the challenges of leading and financing new technology ventures. Leadership topics include team selection and formation, aligning rewards with relative contributions of team members, and how early decisions can enable or prevent founders from achieving results that align with their individual motivations for becoming an entrepreneur. Essential tools and methods for building a strong financial foundation for a new technology venture are examined. Includes important accounting principles as well as methods for keeping financial control of the technology venture. Insights are shared on navigating the multitude of financial barriers that may block your entrepreneurial success, as well as how to grow the technology venture from concept through launch.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Credit Only Granted for: ENES466, BMGT365 or HLMN471.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.
**ENES467 Engineering for Social Change (3 Credits)**
Critical analysis of issues at the intersection of engineering, philanthropy and social change. How engineering design, products and processes have created social change in the past and will do so in the future through both intended and unintended consequences. Topics covered include energy, sustainability and climate change, autonomy, the digital future, low cost engineering, manufacturing, philanthropy, ethics and the impact of electronics on society, among others. Faculty and external experts will engage with students on these topics. Students will broadly engage with organizations involved in using technology for positive social impact.
**Restriction:** Must not be in Engineering: Mechanical program, and junior standing or higher; and must be in a major in ENGR-A. James Clark School of Engineering. Also offered as: ENME467.
**Credit Only Granted for:** ENES467 or ENME467.

**ENES471 Legal Aspects of Entrepreneurship (3 Credits)**
Explores critical legal and business issues entrepreneurs face as they build and launch a new venture. Examines real world scenarios, and addresses the legal issues at all of the important junctures along the path to success. Significant attention placed on new venture formation, intellectual property management, and financing arrangements.
**Additional Information:** Course may not be used to fulfill any BMGT major or minor program requirement.

**ENES472 International Business Cultures in Engineering and Technology (3 Credits)**
The goal is to provide students with an understanding of cultural aspects pertaining to global business and engineering and develop the cultural understanding, attitudes, and communication skills needed to function appropriately within an increasingly global and multicultural working environment.
**Prerequisite:** Permission of ENGR-A. James Clark School of Engineering.
**Restriction:** Sophomore standing or higher. Also offered as: SLLC472.
**Credit Only Granted for:** ARHU439B, ARHU439E, ARHU439T, ENES472, SLLC471, SLLC472, or SLLC473.
**Formerly:** ARHU439T.

**ENES474 Global Perspectives of Engineering (3 Credits)**
Faculty supervised research on aspects of engineering in a foreign country including leading fields of research, key world markets, and the culture of the engineering workplace. Students will produce a comprehensive report exhibiting their expertise in their chosen country and the field of engineering within.
**Prerequisite:** ENES100; or permission of ENGR-A. James Clark School of Engineering.
**Restriction:** Must be in the International Engineering Minor.
**Credit Only Granted for:** ENES458M or ENES474.
**Formerly:** ENES458M.

**ENES478 Topics in Engineering Education (1 Credit)**
Topics related to teaching engineering courses, particularly project-based courses. Topics can include learning styles, student development theory, multicultural issues in teaching, facilitating team experiences, assessment, and academic integrity.
**Restriction:** Must be in the Engineering Teaching Fellow program.
**Repeatable to:** 3 credits if content differs.

**ENES480 Engineering Honors Seminar I (1 Credit)**
Introduction to engineering leadership, professionalism, and ethics. Discussions of leadership style, elements of success, professional communication, codes of ethics, handling of ethical dilemmas, and the characteristics of a professional.
**Restriction:** Must be in College of Engineering Honors; and junior standing or higher.

**ENES481 Engineering Honors Seminar II (1 Credit)**
Introduction to engineering creativity and innovation in engineering. Application of methods of creativity to topics in communication, conducting research, and leadership.
**Restriction:** Must be in College of Engineering Honors; and junior standing or higher.

**ENES489 Special Topics in Engineering (3-6 Credits)**
Special topics in engineering.
**Prerequisite:** Permission of ENGR-A. James Clark School of Engineering.
**Repeatable to:** 6 credits if content differs.

**ENES490 Quest Consulting and Innovation Practicum (4 Credits)**
Final course in the QUEST Honors Fellows Program three-course curriculum. Based on a team-based consulting project with one of QUEST’s professional partners. A project advisor and professional champion supervise each student team. Requires extensive out-of-class work.
**Prerequisite:** ENES390 or BMGT390. Also offered as: BMGT490.
**Credit Only Granted for:** BMGT490 or ENES490.

**ENES491 Defining Consulting and Innovation Projects (3 Credits)**
Cultivate relationships with new and current corporate partners and prepare project scopes for QUEST’s capstone course, BMGT/ENES 490H. Requires independent work communicating with clients and class visits to a variety of potential project sites.
**Prerequisite:** BMGT190 or ENES190.
**Restriction:** Restricted to QUEST Program (TQMP) students. Also offered as: BMGT491.
**Credit Only Granted for:** BMGT491, ENES491 or BMGT438D.
**Formerly:** BMGT438D.

**ENES498 Special Topics in Entrepreneurship (3 Credits)**
This entrepreneurship seminar and case study-based course will explore technology entrepreneurship with a focus on leadership, marketing, team-building, and management of new technology ventures and assumes baseline knowledge of entrepreneurship. Students will learn skills needed to succeed as a technology entrepreneur and how to apply best practices for planning, launching, and growing new companies. This course is a requirement of the Hinman CEOs program.
**Restriction:** Must be in Hinman CEOs Program.
**Repeatable to:** 12 credits if content differs.

**ENES499 Senior Projects in Engineering (3 Credits)**
Students will work in large teams to solve a multidisciplinary research/design problem. The course will begin with students identifying opportunities, brainstorming project concepts to address these opportunities, applying lean startup and design thinking strategies, and then selecting/proposing a project for the semester. Acceptable projects will require the multidisciplinary design, construction and testing of a project within limited budget and time constraints.
**Prerequisite:** Permission of ENGR-A. James Clark School of Engineering; and completion of all 1XX and 2xx level (lower-division) technical courses in engineering major with a C- or better.
**Restriction:** Must be in a major in ENGR-A. James Clark School of Engineering.
**Repeatable to:** 6 credits if content differs.

**ENES601 Future Faculty Program Seminar I (1 Credit)**
Introduction to and development of skills necessary to obtain and succeed in a university faculty position. Emphasis on technical writing and effective presentations. Discussion of research diversification, networking, ethics and professionalism.
**Restriction:** Must be in the Clark School Future Faculty Program.
ENES602 Future Faculty Program Seminar II (1 Credit)
Effective teaching techniques. Basic principles of education and learning. Developing a course; promoting active learning, problem solving and critical thinking; designing exam and assignments; and communicating effectively with students.
Restriction: Must be in the Clark School Future Faculty Program.

ENES603 Future Faculty Program Seminar III (1 Credit)
Developing a successful faculty research program. Establishing and maintaining a research group. Finding funding opportunities and writing grant proposals. Mentoring graduate students. Faculty position application process. Preparing research and teaching statements.
Restriction: Must be in the Clark School Future Faculty Program.

ENES604 Future Faculty Program Teaching Practicum (1 Credit)
Graduate students will co-teach a course under supervision of a faculty mentor. Graduate students will be involved in all aspects of the course including development of syllabus, presenting lectures, writing and grading examinations, and evaluating the students in the course.
Prerequisite: ENES602.
Restriction: Must be a graduate student in the Clark School Future Faculty Program; and students for whom English is not the native language must pass the Maryland English Institute ITA Evaluation prior to enrolling in this course.

ENES658 Special Topics in Engineering in a Global Context (1-3 Credits)
Advanced topics in engineering in a global context.
Restriction: Graduate standing or permission of instructor.
Repeatable to: 12 credits if content differs.

ENES662 Innovative Ideas and Concept Development (3 Credits)
Enables aspiring entrepreneurs to understand the content, methods, and models for new venture opportunity assessment and analysis. Focuses on how to identify and analyze entrepreneurial opportunities for technology-based ventures by first understanding the personal self and decision-making factors. Explores how to evaluate new venture opportunities and challenges within industries and markets.

ENES663 Strategies for Managing Innovation (3 Credits)
Emphasizes how innovative leaders can use strategic management of innovation and technology to enhance firm performance. It helps students to understand the process of technological change; the ways that firms come up with innovations; the strategies that firms use to benefit from innovation; and the process of formulating technology strategy. It provides frameworks for analyzing key aspects of these industries and teaches students how to apply these frameworks.
Credit Only Granted for: ENES663 or ENPM691.

ENES664 Business Modeling and Customer Validation (3 Credits)
Focuses on how to create and deliver value for customers and extract value for the new venture. Develop business models that encompass the product or service, customers, and the economic engine to meet the venture’s financial and growth objectives. Introduces a structured way to think about, analyze, and develop a sound business model that is customer validated.
Prerequisite: ENES662 and ENES663.

ENES665 Innovative Thinking (3 Credits)
Introduces students to new and powerful tools to boost their creative problem solving skills. Participants re-discover their communication and teaming skills. Students unlock their creativity potential, and explore win-win approaches to define and solve problems of different kinds. Students are also introduced to topics related to intellectual property.
Prerequisite: ENES662 and ENES663.

ENES666 Creative Design, Prototyping, and Testing (3 Credits)
Transition from creative, innovative, design thinking methods to prototyping and concept testing of products and services. Learn how to translate ideas into marketable offerings to create real value for customers and the new venture. Emphasis is placed on an integrated and interdisciplinary approach to engineering design, concurrent engineering, design for manufacturing, industrial design, and the business of new product development. Topics include design methods, modeling and simulation, material and manufacturing process selection, platform and modular design, mass customization, planning and scheduling, and business issues, teamwork, group dynamics, creativity, and innovation.
Prerequisite: ENES664 and ENES665.

ENES667 Market Development and Commercialization (3 Credits)
Provides an orientation to key marketing concepts critical to marketing technology-based products and services. Learn to identify market opportunities, understand customer preferences, evaluate market acceptance, and devise the appropriate going to market strategies for the new venture.
Prerequisite: ENES664 and ENES665.

ENES668 Corporate Technology Entrepreneurship (3 Credits)
Focuses on the role of entrepreneurial individuals inside of existing technology organizations. Explores developing and leading innovation inside the firm. Discusses stages of innovation in the corporate entrepreneurship process and dynamics of organizational structure, politics, decisions, financing, and personal styles.
Credit Only Granted for: ENPM 808N or ENES 668.
Formerly: ENPM 808N.

ENES670 Financial Management and New Venture Financing (3 Credits)
Provides the essential tools and skills to build a strong financial foundation for a new technology venture. Examines accounting principles as well as methods for keeping firm financial control of the venture. Discusses navigating the multitude of financial barriers that may block entrepreneurial success, as well as how to raise the right amount of capital at the right time from the right source.
Prerequisite: ENES666 and ENES667.

ENES671 Legal Aspects of Entrepreneurship (3 Credits)
Explores critical legal and business issues entrepreneurs face as they build and launch a new venture. Examines real world scenarios, and addresses the legal issues at all of the important junctures along the path to success. Significant attention placed on new venture formation, intellectual property management, and financing arrangements.
Prerequisite: ENES666 and ENES667.

ENES672 Launching Technology Startup Ventures (6 Credits)
Explores the processes and skills needed to launch and manage technology startup ventures. Learn how to apply best practices for planning, launching, and leading new companies. Discusses a wide range of issues of importance and concern to entrepreneurs, to include how to navigate uncertainty.
Prerequisite: ENES670 and ENES671.
Credit Only Granted for: ENES660 or ENES672.