MSE—Materials Science and Engineering

MASTER OF MBA BUSINESS ADMINISTRATION

The Eli Broad College of Business and The Eli Broad Graduate School of Management

800 The Global Organization and the Firm's Strategic Position
Fall, Spring. 2(2-0) R: Open only to MBA students.
Organizational goals, design, and control of the global business enterprise. Maximization of shareholder value, competitive forces, configuring the value-added chain. Strategies for implementing new organizational forms. Designing and managing strategic change.

802 Financial Accounting
Fall. 2(2-0) R: Open only to MBA students.

804 Applied Data Analysis for Managers
Fall. 2(2-0) RB: (STT 315) R: Open only to MBA students. Not open to students with credit in MSC 833.
Analysis of business and economic data to support managerial decision-making. Building, interpreting, and applying regression models. Time series and forecasting. Offered second half of semester.

806 Business Ethics and the Legal Environment
Spring. 2(2-0) R: Open only to MBA students.
Framework for identifying, analyzing, and resolving ethical dilemmas in business. Key legal topics in business using critical thinking analysis.

808 Leadership and Teamwork
Fall. 1(1-0) R: Open only to MBA students.
Understanding team management and leadership through experiential and skill-based learning. Effective communication, including the use of electronic communication technologies for team development and maintenance. Active practice of teamwork, communication, and leadership skills. Offered first half of semester.

812 Managerial Accounting
Spring. 2(2-0) R: Open only to MBA students.

814 Applied Economics
Spring. 2(2-0) R: Open only to MBA students.
Economic view of the firm. Modeling market mechanics in supply and demand, marginal concepts, elasticity, market characteristics, pricing with market power, and strategic behavior. Applications to business problems and situations. Principal-agent relationships and wealth maximization. Offered first half of semester.

816 Business Presentations
Fall. 1(1-1) R: Open only to MBA students.
Development of effective interpersonal communication skills. Oral communications in business settings.

820 Marketing Management
Fall. 3(3-0) R: Open only to MBA students.
Leadership principles. Decision-making. Fundamental marketing concepts such as segmentation, target marketing, positioning, growth strategies, revenue management, product management, and communication strategies. Problem-solving and marketing planning.

821 Supply Chain Management
Fall. 3(3-0) R: Open only to MBA students.
Integrative approach to product design, development, and delivery. Flow of products from concept development through delivery to the final user, including product and process development, managing information and product flows, total quality management, and resource and capacity management.

822 Financial Management
Fall. 3(3-0) R: Open only to MBA students.
Investment decisions by firms. Value creation, risk and return, pricing models, and financial markets. Financing alternatives, market efficiency, capital budgeting, and leverage and risk relationships. Optimizing firm value. Agency problems and effects on investment and financing decisions.

823 Information Technology Management
Spring. 2(2-0) R: Open only to MBA students.
Role of information technology in operations, decision making, and learning in organizations. Competitive and economic benefits from managing information technology resources. Competitive advantage, efficient operations, and improved decision quality. Offered second half of semester.

824 Managing the Workforce
Spring. 2(2-0) R: Open only to MBA students.
Role of workforce management in fulfilling the goals and mission of the organization. Theories and applications of management principles to acquiring, motivating, and rewarding employees and structuring their work. Domestic and international issues in the workplace. Offered first half of semester.

826 International, Comparative, and Cross-Cultural Business
Spring, Summer. 2(2-0) R: Open only to MBA students.

841 Studies in the Global Marketplace
Summer. 3(1-4) Summer: International trip. R: Open only to MBA students.

850 Strategic Management
Fall. 2(2-0) R: Open only to MBA students.
Concepts and methods that integrate previous training in functional areas of management. Total firm perspective and ways top managers create and sustain competitive advantage in today's challenging global marketplace.

891 Special Topics in Business Management
Fall, Spring. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to MBA students.
Current and emerging issues in management. New and changing developments affecting managers.

893 MBA Internship Experience
Fall, Spring. 1 credit. A student may earn a maximum of 2 credits in all enrollments for this course. RB: Completion of at least one semester in the MBA program. R: Open to MBA students except students in the Advanced Management Program or Program in Integrative Management. Internship in business organizations; application of business knowledge and management techniques in a work environment.

MATERIALS SCIENCE AND ENGINEERING

Department of Chemical Engineering and Materials Science
College of Engineering

101 Materials and Society
Fall. 2(2-0) RB: High school physics, chemistry, mathematics.
Material capabilities, limitations, and their utilization in the service and advancement of society.

250 Materials Science and Engineering
Fall, Spring. Summer. 3(2-2) P.M. (CEM 141 or CEM 151 or LBS 171) SA: MSM 250 Structure of metals, ceramics and polymers. Phase diagrams, thermomechanical treatments, physical and mechanical properties, diffusion, microstructure studies, environmental effects.
Phase Equilibria in Materials
Fall. 3(3-0) P:M: (MSE 250 or concurrently) and (MTH 234 or MTH 254H or LBS 220) R: Open only to juniors or seniors in the College of Engineering. SA: MSE 351

Mechanical Behavior of Materials
Fall. 3(3-0) P:M: (ME 222 or concurrently) and (MSE 250) R: Open only to juniors or seniors in the Materials Science and Engineering major. SA: MSE 355

Materials Characterization Methods I
Fall. 1(0-3) P:M: (MSE 310 or concurrently and MSE 320 or concurrently) R: Open only to juniors or seniors in the Materials Science and Engineering major. SA: MSE 375

Thermal analysis. Optical and Scanning Electron Microscopy Laboratory for characterizing microstructure-property-relationships. Effects of processing on microstructure, properties, and fracture surfaces in metal, ceramic, and polymer systems.

Electronic Structure and Properties of Materials
Fall. 3(3-0) P:M: (PHY 184 or concurrently) and (CEM 141 or CEM 151 or LBS 171) Not open to students with credit in MSE 455.

Fundamentals of electrical, thermal, magnetic and optical properties of metals, dielectrics, semiconductors and polymers. Crystal structure, reciprocal space, quantum mechanics, electron band structure, and phonons. Materials applications in electronics and optoelectronics.

Fundamentals of Microstructural Design
Spring. 3(3-0) P:M: (MSE 310 and MSE 350 or concurrently) R: Open only to juniors or seniors in the College of Engineering. SA: MSE 455

Fick’s laws of diffusion. Models of solid state diffusion. Arhenius plots. Use of non-equilibrium energy storage from solidification, phase changes, and deformation to predict and control microstructural changes and stability during processing in metal, ceramic, and polymer systems.

Physical Processing of Materials
Spring. 3(3-0) P:M: (MSE 310 and MSE 350 or concurrently) R: Open only to juniors or seniors in the Materials Science and Engineering major. SA: MSE 352

Physical processing of powders. Mixing and casting. Surface modification of ceramic, polymeric, and metallic materials in order to engineer the microstructure, properties, and form of components.

Materials Characterization Methods II
Spring. 2(1-3) P:M: (MSE 360 or concurrently) and (MSE 370 or concurrently) R: Open only to juniors or seniors in the Materials Science and Engineering major. SA: MSE 370

X-ray and infrared spectroscopic analysis laboratory for the characterization of microstructure-property-relationships. Effects of processing on microstructures, properties, and fracture surfaces in metal, ceramic, and polymer systems.

Quantitative Human Biology
Spring. 3(4-0) Interdepartmental with Biomedical Engineering; Radiology; Human Anatomy. Administered by College of Engineering. P:M: (MTH 235 and PHY 184) and (PSL 250 or concurrently or PSL 431 or concurrently) and (CEM 141 or CEM 151) and (ANTR 350 or concurrently) RB: (CSE 131 or concurrently or CSE 231 or concurrently or PSL 410)

Qualitative description and quantitative engineering analysis of selected, tractable human-biological systems. Multi-disciplinary problem-solving among medical and engineering professionals.

Biomechanics and Biocompatibility
Spring. 3(3-0) Interdepartmental with Biomedical Engineering. P:M: (PSL 250 or concurrently and MSE 250) SA: MSE 424, BME 424, BME 324, MSE 324

Materials science of human implants. Design requirements imposed by the human body, and need for bodily protection.

Introduction to Composite Materials
Spring. 3(3-0) Interdepartmental with Mechanical Engineering. P:M: (ME 222) R: Open only to juniors or seniors in the College of Engineering. SA: MSE 444


Microscopic and Diffraction Analysis of Materials
Fall. 3(2-3) P:M: (PHY 184 or PHY 184B or PHY 234B) RB: (MSE 350 and MSE 381) R: Open only to juniors or seniors or graduate students in the College of Engineering or Natural Science. SA: MSE 441


Ceramic and Refractory Materials
Fall. 3(3-0) P:M: (PHY 184) RB: (MSE 350 and MSE 381) R: Open only to seniors in the College of Engineering. SA: MSE 454

Ceramic and glassy materials. High temperature processes. Mechanical and physical properties of technical ceramics.

Design and Application of Engineering Materials (W)
Spring. 3(3-0) P:M: (MSE 331 and MSE 381) and completion of Tier I writing requirement. R: Open only to students in the Engineering Mechanics or Materials Science and Engineering major. SA: MSE 465

Fundamental principles of strengthening: toughening, specific strength and stiffness. Material development based on environmental, temperature, wear, damping, fatigue and economic considerations.

Design and Failure Analysis (W)
Spring. 3(2-3) P:M: (MSE 350) and completion of Tier I writing requirement. RB: (MSE 320 and MSE 331) and (MSE 381) R: Open only to seniors in the College of Engineering. SA: MSE 466


Physical Metallurgy of Ferrous and Aluminum Alloys
Fall. 3(3-0) P:M: (MSE 250) RB: (MSE 310) and (MSE 360) R: Open only to seniors in the College of Engineering. SA: MSE 476

Heat treatment and properties of ferrous and aluminum alloys. Casting and solidification. Effects of alloying elements, high strength low alloy steels, hardenable, and case hardening. Joining of materials, such as welding.

Manufacturing Processes
Fall. Spring. 3(3-0) Interdepartmental with Mechanical Engineering. Administered by Department of Mechanical Engineering. P:M: (ME 222 and MSE 250) and completion of Tier I writing requirement. R: Open only to students in the Applied Engineering Sciences, Materials Science and Engineering, and Mechanical Engineering majors. SA: MSE 481

Fundamentals of manufacturing processes such as casting, heat treating, particle processing, forming, machining, joining, and surface processing. Selection of manufacturing processes based on design and materials.

Independent Study
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to juniors or seniors in the College of Engineering. Approval of department. SA: MSE 490

Individualized reading and research.

Selected Topics
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to students in the Department of Chemical Engineering and Materials Science. SA: MSE 491

Topics of current interest in materials science or engineering.

Senior Research and Design Project (W)
Fall, Spring, Summer. 2 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P:M: Completion of Tier I writing requirement. R: Open only to seniors in the Materials Science and Engineering or Applied Engineering Sciences major. Approval of department. SA: MSE 499

Design and analysis to solve materials and/or mechanical engineering problem. Preparation of written report, oral presentation, and defense of the project.

Thermodynamics of Solids
Fall. 3(3-0) SA: MSM 851


Advanced Rate Theory and Diffusion
Spring. 3(3-0) RB: (MSE 851) SA: MSM 855

862 Dislocation Theory
Fall. 3(3-0) SA: MSM 862
Advanced theory of dislocations and other crystal defects in metals, ceramics, aggregates and ordered compounds. Elasticity theory of straight dislocations, dislocation strain energy, mobility, obstacle interactions, reactions, and core effects.

865 Advanced Theory of Solids
Spring. 3(3-0) SA: MSM 865

870 Electron Microscopy in Materials Science
Spring. 3(2-3) R: Open only to graduate students in the Materials Science and Engineering major or approval of department. SA: MSM 870

871 Material Surfaces and Interfaces
Fall of odd years. 3(3-0) interdepartmental with Chemical Engineering. RB: (CEM 392 or CEM 434 or MSE 351) R: Open only to graduate students in the Department of Chemical Engineering and Materials Science or Department of Chemistry or School of Packaging. SA: MSM 871
Physical and chemical nature of solid surfaces and their interaction with gases, liquids, and other solids. Characterization of surfaces and solid-solid interfaces. Relation of surface and interfacial structure to engineering phenomena.

875 Engineering Ceramics
Fall of odd years. 3(3-0) RB: (MSE 851) SA: MSM 875
Physical properties of engineering ceramics. Transport properties of ceramics, especially in ferrites and garnets. Optical ceramic materials.

876 Advanced Polymeric Materials
Fall of even years. 3(3-0) SA: MSM 876
Advanced topics in polymer structure and properties. Thermoplastics, thermosets, polyblends and elastomers. Processing techniques. Deformation and mechanical properties. Thermal, optical and chemical properties. Composites.

885 Seminar
Fall, Spring. 1(1-0) SA: MSM 885
Oral presentations of students’ research or literature survey.

890 Independent Study
Fall, Spring. Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of department. SA: MSM 890
Individualized reading and research of student’s interest.

891 Selected Topics
Fall, Spring. Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of department. SA: MSM 891
Special topics of current importance in materials science or engineering.

899 Master’s Thesis Research
Fall, Spring. Summer. 1 to 8 credits. A student may earn a maximum of 24 credits in all enrollments for this course. SA: MSM 899
Master’s thesis research.