

**MARKETING AND SUPPLY
CHAIN MANAGEMENT MSC**

**Department of Marketing and
Supply Chain Management
The Eli Broad College of Business
and The Eli Broad Graduate
School of Management**

101. Introduction to Business
Fall, Spring, 3(3-0)

Role of business in society. Activities and functions of business organizations. Major issues and challenges facing business: globalization, social responsibility, diversity. Contemporary management practices.

300. Managerial Marketing
Fall, Spring, Summer, 3(3-0)

P: EC 201 or EC 251H; ACC 201 or ACC 230 or ACC 251H. R: Open only to juniors and seniors.

Analysis of and strategic integration of buyer behavior, segmentation, positioning, demand analysis, information, pricing, promotion, channels, product policies, and ethics in consumer, reseller, industrial, and service markets.

302. Consumer and Organizational Buyer Behavior
Fall, Spring, Summer, 3(3-0)

P: MSC 300. R: Open only to juniors and seniors.

Application of consumer behavior principles to customer satisfaction, market planning, and marketing mix decisions. Ethical, diversity, and international issues.

303. Introduction to Supply Chain Management
Fall, Spring, Summer, 4(4-0)

P: EC 201 or EC 251H; ACC 202 or ACC 230 or ACC 251H. R: Open only to juniors or seniors in the College of Business or in programs for which MSC 303 is a catalog-listed requirement.

Objectives, processes, and functions of supply chain management activities including procurement, manufacturing, and logistics. The role of supply chain processes in creating competitive advantage with respect to quality, flexibility, lead-time, and cost.

SA: MGT 303

304. Operations and Purchasing Management
Fall, Spring, Summer, 3(3-0) Interdepartmental with Management. Administered by Management.

P: MGT 303. R: Open only to juniors and seniors in Materials and Logistics Management.

Functions of operations and purchasing managers. Tactical issues in implementing internal and external resource plans.

305. Supply Chain Management
Fall, Spring, Summer, 4(4-0)

P: MSC 303. R: Open only to juniors or seniors in the College of Business or College of Engineering or School of Packaging.

Supply chain operating practices and principles. Strategies for customer service, quality, procurement, manufacturing, logistics, and integrated supply chain management.

310. International and Comparative Dimensions of Business
Fall, Spring, Summer, 3(3-0)

P: EC 202 or EC 251H. R: Open only to juniors or seniors in the College of Business or in programs for which MSC 310 is a catalog-listed requirement.

International and cross-cultural study of business decisions, enterprises, markets, and institutions. Globalization of industries and firm competitiveness. International business transactions and entry strategies.

SA: ML 310

313. Personal Selling and Buying Processes
Fall, Spring, 3(3-0)

The nature of channel relationships. Buying behavior and sales processes. Applications to differing industries and kinds of channel relationships.

317. Quantitative Business Research Methods
Fall, Spring, Summer, 3(3-1) Interdepartmental with Statistics and Probability.

P: STT 315. R: Open only to juniors and seniors.

Application of statistical techniques, including forecasting, to business decision making. Includes applications of linear regression and correlation, analysis of variance, selected non-parametric tests, time series, and index numbers.

319. Marketing Research
Fall, Spring, 3(3-0)

P: MSC 300 C: MSC 317 concurrently. R: Open only to juniors or seniors.

Research methods designed to obtain information for marketing decisions. Research design, data collection, and interpretation of information to provide a customer orientation.

SA: ML 319

335. Food Marketing Management
Spring, 3(3-0) Interdepartmental with Food Systems Economics and Management.

P: FSM 200 or MSC 300. R: Open only to juniors and seniors.

Management decision-making in food industry organizations (processors, wholesalers, retailers). Marketing and sales in response to customer and consumer needs. Distribution and merchandising systems in domestic and international contexts.

351. Retail Management
Fall, Spring, Summer, 3(3-0)

P: MSC 300. R: Open only to juniors and seniors.

Domestic and international retailing structure, environment, and development. Managerial strategy. Locational, purchasing, organizational, personnel and promotional techniques. Retail budgeting and control. Social and ethical considerations.

401. Procurement and Supply Management
Fall, Spring, Summer, 3(3-0)

P: MSC 305 R: Open only to juniors or seniors in the College of Business or College of Engineering or School of Packaging.

Strategic issues in procurement and supply management. Purchasing process, procurement cycle, purchasing research, relationships with suppliers, negotiation, and commodity planning. Cost, price, and value analysis.

SA: MGT 401

402. Manufacturing Planning and Control
Fall, Spring, Summer, 3(3-0)

P: MSC 305, MSC 317 R: Open only to juniors or seniors in the College of Business or College of Engineering or School of Packaging.

Production planning, demand management, master scheduling, materials requirements, and capacity planning. Shop floor control, computer-integrated manufacturing, and just-in-time systems.

SA: MGT 402

403. Topics in Purchasing and Sourcing Management
Fall of even-numbered years, 3(3-0) Interdepartmental with Management. Administered by Management.

P: MGT 304, MSC 345. R: Open only to juniors and seniors in Materials and Logistics Management.

Current topics in sourcing and negotiation strategy such as price and cost analysis, and purchasing research techniques.

410. Product Innovation and Management
Fall, 3(3-0) Interdepartmental with Materials Science and Mechanics.

P: MSC 300. R: Open only to juniors or seniors. Analytic, decision-making, and planning concepts and tools available to product managers. New product policy and development, organizational issues, and product modification and deletion.
SA: ML 410

413. Sales Management
Fall, Spring, 3(3-0)

P: MSC 300 C: MSC 317 concurrently. R: Open only to juniors or seniors.

Planning, implementing, and controlling the firm's personal selling function. Analysis of sales territories; management of recruitment, selection, training, and motivation of sales personnel; evaluation of sales performance; discussion of diversity and ethical issues.
SA: ML 413

415. International Marketing Management
Fall, Spring, 3(3-0)

P: MSC 300, MSC 310. R: Open only to juniors and seniors.

Marketing decisions, strategies, and operations of the firm involved in international business. Researching global market opportunities and formulating market entry strategies. Developing and implementing the international marketing program.

420. New Product Design and Development
Spring, 3(3-0) Interdepartmental with Materials Science and Mechanics.

R: Open only to seniors in the College of Business or College of Engineering.

Practical training and experiences in design and testing of new products.

439. Food Business Analysis and Strategic Planning
Fall, 3(3-0) Interdepartmental with Food Systems Economics and Management.

P: MSC 335 or FSM 335; STT 201 or STT 200 or STT 315. R: Open only to juniors and seniors.

Principles and techniques of business analysis and strategic planning applied to food firms. Food trend forecasts, market potential, competition and cost analyses, business and strategic planning.

442. Logistics and Transportation Management
Fall, Spring, Summer, 3(3-0)

P: MSC 305 R: Open only to juniors or seniors in the College of Business or College of Engineering or School of Packaging.

Microanalysis of logistics and transportation services. Customer service, distribution operations, purchasing, order processing, facility design and operations, carrier selection, transportation costing and negotiation.

SA: ML 442

460. Marketing Strategy (W)
Fall, Spring, Summer, 3(3-0)

P: MSC 302, MSC 317, MSC 319. R: Open only to seniors in the College of Business. Completion of Tier I writing requirement.

Identification and analysis of managerial marketing issues. Integration of marketing concepts and theories through case analysis. Ethical and international applications.

SA: ML 460

470. Supply Chain Application and Policy (W)
Fall, Spring, 2(2-0)

P: MSC 305. R: Open only to juniors or seniors in the College of Business or College of Engineering or School of Packaging. Completion of Tier I writing requirement.

Analysis and problem solving of supply chain management cases. Purchasing, manufacturing, logistics, and transportation as an integrated supply chain.
SA: ML 470

Descriptions —Marketing and Supply Chain Management of Courses

471. Topics in Purchasing and Sourcing Management

Spring, 2(2-0)

P: MSC 401, MSC 402, MSC 442. R: Open only to juniors or seniors in the Supply Chain Management major.

Current topics in sourcing and negotiation strategy such as price and cost analysis, and purchasing research techniques.

SA: MGT 403

472. Topics in Operations Management

Spring of odd-numbered years. 3(3-0)

P: MSC 402 R: Open only to juniors or seniors in the Supply Chain Management major.

Managerial aspects of current issues such as total quality, computer integrated manufacturing and simultaneous engineering.

SA: MGT 404

473. Topics in Logistics and Transportation Management

Spring, 3(3-0)

P: MSC 442. R: Open only to juniors or seniors in the Supply Chain Management major.

Current topics in logistics and transportation planning, information technology, response based strategies, third party logistics and relationship management.

490. 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 Business or approval of department. Supervised program of independent library or field research designed to supplement classroom study.

SA: ML 490

490H. Honors Independent Study

Fall, Spring. 1 to 3 credits. A student may earn a maximum of 12 credits in all enrollments for this course.

R: Open only to Honors College juniors and seniors. Supervised program of independent library or field research designed to supplement classroom study.

491. Topics in Marketing and Supply Chain Management

Fall, Spring. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course.

P: MSC 300 or MSC 303. R: Open only to juniors or seniors.

Current issues in specialized marketing, logistics knowledge of marketing, and environmental analysis. Strategy development for control.

SA: ML 491

800. Materials and Logistics Management

Spring, 3(3-0)

Fundamentals of materials and logistics management. Strategic impact of the transformation process in a global economy. Quality, inventory management, logistics strategy, customer service, international procurement, management of technology.

SA: MGT 800

801. Materials Management: Tactical and Strategic Perspectives

Fall, 3(3-0)

P: MSC 800.

Integration of procurement and operations management for competitive advantage. Strategic and tactical approaches to customer requirements. Management of supply-chains procurement, process assessment, quality, manufacturing planning and control, and technology.

SA: MGT 801

802. Procurement and Sourcing Strategies

Fall, Spring, 3(3-0)

P: MSC 800. R: Open only to MBA students.

Sourcing strategies and applications. Negotiation planning and execution.

SA: MGT 802

803. Operations Management Strategy

Spring, 3(3-0)

P: MSC 801.

Operations management issues including quality, technology, group technology, computer integrated manufacturing, and just-in-time manufacturing.

SA: MGT 803

805. Marketing Management

Spring, 3(3-0)

Strategic and decision-making aspects of marketing functions. Analysis, coordination, execution of marketing programs. Development of strategies and tactics. Segmentation, marketing mix, market response modeling, and ethics in a global context.

SA: ML 805

806. Marketing Analysis

Fall, 3(3-0)

P: MBA 820 or MSC 805

Marketing research projects, data collection and analysis, syndicated data, marketing decision support systems, sales forecasting, and scanner data analysis systems.

SA: ML 806

807. Customer-Driven Strategies

Spring, 3(3-0)

P: MBA 820 or MSC 805.

Customer satisfaction, customer loyalty, and related topics from the fields of consumer behavior and customer service.

SA: ML 807

808. Entrepreneurial Marketing

Fall, 3(3-0)

P: MBA 820 or MSC 805

Entrepreneurial processes of creating markets. Creative approaches for designing competitor-oriented strategies in mature markets.

SA: ML 808

810. Product Innovation and Management

Spring, 3(3-0)

P: MBA 820 or MSC 805.

Cross-functional integrative decision-making in the development of new products. Process of generating new product ideas, screening, concept development, and testing.

SA: ML 810

811. Marketing Communication

Fall, 3(3-0)

P: MBA 820 or MSC 805.

Communication with target markets using advertising, sales promotion, public relations, sales management approaches, and brand name development.

SA: ML 811

813. Marketing Research Methods

Spring, 3(3-0)

P: MBA 820 or MSC 805.

Collection, analysis, and interpretation of primary data from problem definition to report writing.

SA: ML 813

818. Strategic Planning

Fall, 2(2-0)

R: Open only to students in the Advanced Management Program.

Models and methods of business planning. Relationship of strategic intent, business missions and planning hierarchies. Linking marketing, financial, and human resource strategic plans.

822. Marketing Management

Spring, 3(3-0)

P: MSC 818. R: Open only to students in the Advanced Management Program.

Analysis, coordination, and execution of marketing programs. Segmentation, marketing mix, market response modeling, and ethics.

823. Operations Management

Spring, 3(3-0)

R: Open only to students in the Advanced Management Program.

Strategic issues in manufacturing operations, purchasing, and distribution. Impact of business systems on productivity and profits. Competitive strategies in an international economy.

SA: MGT 823

824. Channel and Logistics Management

Spring, 3(3-0)

P: MBA 820 or MSC 805.

Interfirm relationships in domestic and international settings. Interorganizational behavior, channel management, channel leadership and negotiations, relationship management, and strategic alliances.

SA: ML 824

828. Marketing Programming

Spring, 3(3-0)

P: MBA 820 or MSC 805.

Use of computer-based cases, simulations, and exercises to solve marketing problems and to develop marketing strategies and tactics. High-tech approaches to marketing programs.

830. Contemporary Management Issues

Summer, 2(2-0)

R: Open only to students in the Advanced Management Program.

Emerging issues in business management of critical importance to executive managers. Topics selected annually by faculty group of the AMP.

SA: MGT 830

831. Food Marketing Management

Spring, 3(2-0) Interdepartmental with Agricultural Economics.

P: MBA 820 or MSC 805

Marketing management decisions in food firms. Consumer orientation, computer technologies, food system cost reduction, global opportunities, environmental and social issues.

SA: ML 831

833. Decision Support Models

Fall, 3(3-0)

Analytical models to support decision making. Topics include multiple regression, linear optimization, decisions under uncertainty, and forecasting.

SA: MGT 833

834. Optimization Models I

Fall of odd-numbered years. 3(3-0)

Linear optimization models and algorithms. Theory of linear programming. Simplex algorithm and variations. Duality theory and sensitivity analysis. Linear programs with special structure.

SA: MGT 834

836. Management in the Global Marketplace

Summer, 5(2-6)

R: Open only to students in the Advanced Management Program.

Economic, social, political, and cultural factors associated with patterns of trade and direct investment in global industries. Focus on various specific economic regions of the world. Includes required international travel with AMP class.

SA: MGT 836

837. Introduction to Computer Simulation
Fall of even-numbered years. 3(3-0)

P: STT 442.

Discrete computer simulation and its use in research and planning. Simulation approaches and computer simulation languages. Design and interpretation of simulation experiments. Internal mechanics of simulation programs.
SA: MGT 837

838. Design and Analysis of Statistical Experiments
Spring of odd-numbered years. 3(3-0)

P: STT 442.

Basic experimental design. Non-parametric and multivariate methods. Elementary sampling theory. Response surface methodology. Data analysis using statistical packages such as BMD and SPSS.
SA: MGT 838

842. Total Quality Management
Fall. 3(3-0)

P: MSC 800.

Total quality management principles and practices, tools and techniques, implementation of continuous quality improvement programs, links to manufacturing and competitive strategies.

843. Environmentally Conscious Manufacturing
Spring. 3(3-0)

P: MSC 801, MSC 833. C: MSC 810 concurrently.

Elements of the environmentally responsible enterprise, with an emphasis on legal and regulatory trends, assessment measures and audits, tools and procedures, supply chain management, and frameworks. Corporate environmental responsibility as linked to product and process design.

844. Supply Chain Process
Fall. 5(5-0)

P: MBA 820 or MSC 800.

Processes central to supply chain management. Managing and measuring integrated purchasing, manufacturing operations, and logistics.

845. Supply Chain Activities
Spring. 6(6-0)

P: MSC 844.

Activities central to supply chain management. Tools, procedures, and metrics for purchasing, manufacturing operations, and logistics.

846. Seminar in Supply Chain Management
Spring. 1(1-0)

P: MSC 844.

Use of case studies to develop strategic and operational insight into integrated supply chain management.

847. Managerial Decision Support Models
Fall. 3(3-0)

R: Open only to students in the Advanced Management Program.

Development and application of analytical models to support decision making. Topics include multiple regression, linear optimization, decisions under uncertainty, forecasting.
SA: MGT 847

860. International Business
Fall, Spring. 3(3-0)

Management of the firm in the multinational environment. Assessment of international modes of operations, markets, financial strategies, services, and resources. Competitive strategy.
SA: ML 860

862. Developing Global Markets
Spring. 3(3-0)

P: MBA 820 or MSC 805.

Development of marketing strategies for international expansion. Evolution of global markets, market selection, timing, entry sequence, modes of entry, and the corporate infrastructure for global marketing expansion.
SA: ML 862

865. Emerging Topics in Business
Spring. 3(3-0)

P: MBA 820 or MSC 805.

Perspectives on new and emerging issues of business administration. Topics vary.
SA: ML 865

888. Capstone Project in Manufacturing
Spring. 3(1-6) Interdepartmental with Engineering. Administered by Engineering.

R: Open only to juniors or seniors in the Manufacturing Engineering major or to students in the Business Management of Manufacturing major.
Problem solving in manufacturing. Design of products and processes for manufacturing using a systems approach. Teaming and communication skills are emphasized.

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.

Faculty-supervised independent study.
SA: ML 890

905. Theory Development and Research Design in Marketing
Fall. 3(3-0)

R: Open only to Ph.D. students

Research concepts and scientific methods for the study of marketing. Formulation of hypotheses, concepts of measurement, and quantitative methods.
SA: ML 905

906. Quantitative Methods in Marketing
Spring. 3(3-0)

P: MSC 905 or approval of department. R: Open only to Ph.D. students.

Concepts and methods in the scientific investigation of marketing phenomena. Focus on the use of multivariate analytic tools.
SA: ML 906

907. Causal Modeling in Marketing
Fall. 3(3-0)

P: MSC 906. R: Open only to Ph.D. students.

Statistical methods in marketing, emphasis on causal modeling.
SA: ML 907

908. Marketing Decision Models
Fall. 3(3-0)

P: MSC 906. R: Open only to Ph.D. students.

Applications of marketing decision models in new product development, pricing, distribution, advertising, and sales promotion.
SA: ML 908

910. History of Marketing Thought
Fall. 3(3-0)

R: Open only to Ph.D. students.

Evolution of marketing institutions, techniques, theories, and critiques. Influence of changing environmental and technological factors.
SA: ML 920

911. Theories of Competition in Marketing
Spring. 3(3-0)

R: Open only to Ph.D. students

Relationships among competition, marketing, and corporate and economic growth. Competition phenomena studied through a variety of disciplines, including marketing, economics, political science, sociology and social psychology.
SA: ML 921

912. Seminar in Social Sciences in Marketing
Spring. 3(3-0)

R: Open only to Ph.D. students.

Social science perspectives on marketing.
SA: ML 922

913. Seminar in Spatial and Temporal Marketing
Spring. 3(3-0)

R: Open only to Ph.D. students.

Theory concerning marketing strategies and programs in logistics, channels, and pricing. Field research needs.
SA: ML 923

918. Procurement and Sourcing Theory
Fall of even-numbered years. 3(3-0)

R: Open only to Ph.D. students.

Theoretical models explaining procurement and sourcing strategy. Frameworks to guide research.
SA: MGT 918

919. Procurement and Sourcing Management Strategy
Spring of odd-numbered years. 3(3-0)

P: MSC 918. R: Open only to Ph.D. students.

Management issues affecting the contribution of procurement and sourcing strategies to the competitiveness of the firm.
SA: MGT 919

920. Seminar in Manufacturing Strategy
Fall of even-numbered years. 3(3-0)

P: MSC 803. R: Open only to Ph.D. students.

Research in manufacturing strategy. Quality, technology, flexibility, innovation. Theory building.
SA: MGT 920

921. Seminar in Inventory Management
Fall of odd-numbered years. 3(3-0)

P: MSC 803 R: Open only to Ph.D. students

Classical, just-in-time, and multi-echelon inventory control models. Forecasting.
SA: MGT 921

923. Topics in Operations Management
Spring of odd-numbered years. 3(3-0)

P: MSC 803 R: Open only to Ph.D. students

Current research in the field. Topics vary.
SA: MGT 923

930. Theory of Transportation-Distribution Systems
Fall of odd-numbered years. 3(3-0)

P: MSC 805. R: Open only to Ph.D. students.

Transportation-distribution research on systems integration. Elements of networks, systems, and economic theory in the design, evaluation, and control of logistics systems. Topics include strategic logistics, forecasting, and system integration models.
SA: ML 930

931. Transportation and Distribution Research Methods
Spring of odd-numbered years. 3(3-0)

P: MSC 930. R: Open only to Ph.D. students.

Techniques and methodology of system design, customer service and policy formulation.
SA: ML 931

**Descriptions —Marketing and Supply Chain Management
of
Courses**

**932. Transportation and Distribution
Development Policy**

Fall of even-numbered years. 3(3-0)

P: MSC 805. R: Open only to Ph.D. students.

The interaction of government, carrier, and user logistics and distribution strategies, particularly at the macro-corporate and national policy levels.

SA: ML 932

940. International Business Theory

Fall of even-numbered years. 3(3-0)

P: MSC 860 or MSC 862. R: Open only to Ph.D. students.

Theories explaining international business phenomena. Varying perspectives on international business activities, concepts, and frameworks.

SA: ML 940

941. International Business Research Issues

Spring of odd-numbered years. 3(3-0)

P: MSC 940. R: Open only to Ph.D. students.

Scientific methods of research on international business. Topics include cultural bias and organizing multi-country studies.

SA: ML 941

990. Independent Study

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 Ph.D. students.

Intensive reading and research on a marketing topic of mutual interest to a faculty member and a Ph.D. student.

SA: ML 924

995. Directed Research Paper

Fall, Spring, Summer. 1(1-0)

R: Open only to Ph.D. students in the Department of Marketing and Supply Chain Management.

Production of research paper under the direction of a senior faculty member.

SA: ML 995

999. Doctoral Dissertation Research

Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course.

R: Open only to Ph.D. students in the Department of Marketing and Supply Chain Management. Approval of department.

SA: ML 999

**MATERIALS SCIENCE AND
MECHANICS**

MSM

**Department of Materials Science
and Mechanics
College of Engineering**

160. Engineering Communications

Fall, Spring. 3(2-3)

P: MTH 116 or concurrently.

Computer-aided design and drafting. Freehand sketching. Two and three dimensional visualization. Preparation of spread sheets and technical reports.

205. Statics

Fall, Spring. 3(3-0)

P: MTH 132.

Vector description of forces and moments. Two and three dimensional equilibrium of particles and rigid bodies. Analysis of trusses, frames and machines. Coulomb friction.

211. Mechanics of Deformable Solids

Fall, Spring. 3(3-2)

P: MSM 205, MTH 133 or concurrently.

Tension compression and shear stresses. Axially loaded bars. Torsion of circular shafts. Beam theory. Combined stresses. Mohr's circles. Columns.

250. Materials Science and Engineering

Fall, Spring. 3(3-2)

P: CEM 141 or CEM 151.

Structure of metals, ceramics and polymers. Phase diagrams, thermomechanical treatments, physical and mechanical properties, diffusion, microstructure studies, environmental effects.

306. Dynamics

Fall, Spring. 3(3-0)

P: MSM 205, MTH 235. R: Open only to College of Engineering students.

Kinematics of particles, rigid bodies, and mass moments of inertia. Kinetics of particles and rigid bodies. Energy and momentum principles.

351. Thermochemistry of Materials

Fall. 3(3-0)

P: CEM 151. C: MTH 234 concurrently.

State variables, laws of thermodynamics, phase and chemical equilibria. Gas and condensed phase relationships, solutions, interfaces, point defects, electrochemistry.

352. Diffusion in Solids

Spring. 3(3-0)

P: MSM 250, MSM 351. R: Open only to Materials Science and Engineering majors or approval of department.

Diffusion and mass transport. Kinetics of diffusion-controlled processes. Point defects, nucleation and growth, interface motion.

355. Mechanical Behavior of Materials

Fall. 3(3-0)

P: MSM 211, MSM 250. R: Open only to Materials Science and Engineering, Mechanics, Mechanical Engineering majors or approval of department.

Stress and strain, crystal elasticity, anelasticity and viscoelasticity. Mechanical properties in tension and torsion. Crystallographic aspects of plasticity.

356. Deformation Mechanisms

Spring. 3(3-0)

P: MSM 355. R: Open only to Materials Science and Engineering majors.

Elementary dislocation theory, slip and twinning. Deformation of single and polycrystals. Temperature and strain rate effects. Work hardening, solution and particle strengthening. Creep, fatigue and fracture in metals, ceramics and polymers.

365. Physical Metallurgy I

Fall. 3(3-0)

P: MSM 250; MSM 351 or concurrently. R: Open only to Materials Science and Engineering, and Mechanics majors or approval of department.

Complex binary and ternary phase diagrams. Solidification. Recovery, recrystallization and grain growth. Phase transformations.

366. Physical Metallurgy II

Spring of even-numbered years. 3(3-0)

P: MSM 365. R: Open only to Materials Science and Engineering majors.

Theory of alloy phases. Surfaces and interfaces. Diffusion controlled phase transformations in ferrous and non-ferrous alloys. Martensitic transformation. Amorphous structures.

375. Materials Science Laboratory I

Fall. 1 credit.

P: MSM 355 or concurrently, MSM 365 or concurrently. R: Open only to Materials Science and Engineering, and Mechanics majors.

Phase transformations. Recrystallization. Precipitation and aging. Microscopy. Structure-property relations.

376. Materials Science Laboratory II

Spring. 1 credit.

P: MSM 355. R: Open only to Materials Science and Engineering, and Mechanics majors.

Strengthening. Yielding, creep, and fracture. Plasticity. Thermal activation. Damping. Martensite and shape memory.

380. Polymeric Materials

Spring. 3(3-0)

P: CEM 152. R: Open only to Materials Science and Engineering majors.

Polymers and engineering plastics. Chemical, physical and mechanical properties. Environmental effects on polymers. Manufacturing processes. Coatings.

401. Intermediate Mechanics of Deformable Solids

Fall. 3(3-0)

P: MSM 211. R: Open only to College of Engineering majors.

Stress, strain and linearly elastic behavior. Plane stress and plane strain. Torsion. Yield criteria. Elastoplastic behavior of beams, shafts and cylinders. Unsymmetrical bending. Curved beams.

402. Computational Mechanics

Spring. 3(3-0)

P: MSM 401 or ME 471. R: Open only to College of Engineering majors.

Energy methods with applications. Finite element methods. Buckling and stability. Green's functions.

403. Intermediate Dynamics

Fall of even-numbered years. 3(3-0)

P: MSM 306. R: Open only to College of Engineering majors.

Kinematics and kinetics of particle and rigid body systems. Virtual work, Lagrangian method, and Euler equations. Basic vibrations of discrete and continuous systems. Elementary wave propagation.

405. Experimental Mechanics

Fall of odd-numbered years. 3(2-3)

P: MSM 211. R: Open only to College of Engineering majors.

Measurement of stress, strain, vibration, and motion using strain gauges, accelerometers, photoelasticity, holography, Moire patterns, laser speckle and electronic imaging. Transducer design.

410. Product Innovation and Management

Fall. 3 credits. Interdepartmental with Marketing and Supply Chain Management. Administered by Marketing and Supply Chain Management.

P: MSC 300. R: Open only to juniors or seniors.

Analytic, decision-making, and planning concepts and tools available to product managers. New product policy and development, organizational issues, and product modification and deletion.

SA: ML 410

420. New Product Design and Development

Spring. 3 credits. Interdepartmental with Marketing and Supply Chain Management. Administered by Marketing and Supply Chain Management.

R: Open only to seniors in the College of Business or College of Engineering.

Practical training and experiences in design and testing of new products.

424. Biomaterials and Biocompatibility

Spring of even-numbered years. 3(3-0) Interdepartmental with Biomedical Engineering. Administered by Biomedical Engineering.

P: MSM 250, PSL 250.

Materials science of human implants. Design requirements imposed by the body's milieu and the need to protect the body.