923. Topics in Operations Management
Spring of even-numbered years. 3(3-0)
P: MGT 801, MGT 803. R: Open only to Ph.D. students in Business.
Current research in the field. Topics vary.
QP: MGT 801, MGT 821 QA: MGT 923

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 Management.

QA: MGT 999

MARKETING AND LOGISTICS ML

Department of Marketing and Logistics
The Eli Broad College of Business and The Eli Broad School of Management

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.
QP: EC 201 or EC 251H, ACC 201 or ACC 230 or ACC 251H or HRI 203 QA: MTA 300

302. Consumer and Organizational Buyer Behavior
Fall, Spring, Summer. 3(3-0)
P: ML 300. R: Open only to juniors and seniors in the College of Business or students in programs for which ML 302 is a catalog-listed requirement.
Application of consumer behavior principles to customer satisfaction, market planning, and marketing mix decisions. Ethical, diversity, and international issues.
QP: MTA 300 QA: MTA 302

310. International and Comparative Dimensions of Business
Fall, Spring, Summer. 3(3-0)
P: EC 202 or EC 251H; MGT 302 or concurrently, ML 300 or concurrently. R: Open only to juniors and seniors.
International and cross-cultural study of business decisions, enterprises, markets, and institutions. Globalization of industries and firm competitiveness. International business transactions and entry strategies.
QP: MTA 300, EC 202 or EC 251H, MGT 302 QA: MTA 301

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 in College of Business.
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.
QP: STT 315 or STT 201 or STT 421 QA: MTA 317

319. Marketing Research
Fall, Spring. 3(3-0)
P: ML 300, STT 315. R: Open only to juniors and seniors in the College of Business.
Research methods designed to obtain information for marketing decisions. Research design, data collection, and interpretation of information to provide a customer orientation.
QP: MTA 300, MTA 317 QA: MTA 319

335. Food Marketing Management
Spring. 3(3-0) Interdepartmental with Food Systems Economics and Management.
P: FSM 200 or ML 300. R: Open only to juniors and seniors in College of Business and in programs for which ML 335 is a catalog-listed requirement.
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.
QP: MTA 300 or FSM 200 QA: MTA 335

345. Logistics Management
Spring. 3(3-0) Interdepartmental with Management.
P: MGT 303. R: Open only to juniors and seniors in College of Business.
Activities and decisions necessary to plan, implement, and control private and public physical distribution and transportation channel systems. Physical, human, informational, and organizational system components.
QP: MGT 303 or MTA 301 QA: MTA 345

351. Retail Management
Fall, Spring, Summer. 3(3-0)
P: ML 300. R: Open only to juniors and seniors in the College of Business or in programs for which MTA 351 is a catalog-listed requirement.
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.
QP: MTA 300 QA: MTA 351

413. Personal Selling and Sales Management
Fall. 3(3-0)
P: ML 302. R: Open only to juniors and seniors in the College of Business.
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. Diversity and ethical issues.
QP: MTA 302 QA: MTA 413

415. International Marketing Management
Fall, Spring. 3(3-0)
P: ML 300, ML 310. R: Open only to juniors and seniors in the College of Business.
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.
QP: MTA 300, MTA 301 or EC 428 or EC 429 QA: MTA 415

439. Food Business Analysis and Strategic Planning
Fall. 3(3-0) Interdepartmental with Food Systems Economics and Management.
P: ML 335 or FSM 335; STT 201 or STT 200 or STT 315. R: Open only to juniors and seniors in College of Business and in programs for which MTA 439 is catalog-listed requirement.
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.
QP: MTA 335, STT 201, STT 315 QA: MTA 439

442. Traffic and Transportation Management
Fall. 3(3-0) Interdepartmental with Management.
P: MGT 304, ML 345. R: Open only to juniors and seniors in College of Business.
Analysis of purchasing and operating transportation services including carrier selection, pricing and rates, and negotiation. Managing the transportation function including consolidation, fleet management, and transporation strategies. International and intermodal distribution.
QP: MGT 303, MTA 341, MTA 345 QA: MTA 442

446. Physical Distribution Operations
Spring. 3(3-0) Interdepartmental with Management.
P: MGT 304, ML 345. R: Open only to juniors and seniors in College of Business.
Analysis of distribution operations from a firm and facility perspective. Customer service strategy. Information and order processing systems. Warehouse design and operations. Material handling systems and assessment of performance.
QP: MGT 303, MTA 341, MTA 345 QA: MTA 446

460. Marketing Strategy
Fall, Spring, Summer. 3(3-0)
P: ML 302, ML 319, and one other ML course. R: Open only to seniors in the College of Business.
Identification and analysis of managerial marketing issues. Integration of marketing concepts and theories through case analysis. Ethical and international applications.
QP: MTA 302, MTA 319 QA: MTA 460

470. Materials and Logistics Policy
Fall, Spring. 3(3-0) Interdepartmental with Management.
P: MGT 304, ML 345, one additional course in materials and logistics management. R: Open only to juniors and seniors in College of Business and in programs for which MTA 470 is a catalog-listed requirement.
Case studies of strategic and tactical decisions in materials and logistics management. Identification and definition of problems, evaluation of integrated alternatives, and development of recommendations.
QP: MGT 304, MTA 345 QA: MTA 407

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 majors in Marketing and Transportation Administration and in Materials and Logistics Management. Approval of department.
Supervised program of independent library or field research designed to supplement classroom study.
QA: MTA 409

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. Approval of department.
Supervised program of independent library or field research designed to supplement classroom study.
QA: MTA 400H

491. Topics in Marketing
Fall, Spring. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course.
P: ML 300. R: Open only to juniors and seniors in the College of Business.
Current issues in specialized marketing, logistics knowledge of marketing, and environmental analysis. Strategy development for control.
QP: MTA 300 QA: MTA 399

805. Marketing Management
Fall, Spring. 3(3-0)
R: Open only to graduate students in Business or students in programs for which ML 805 is a catalog-listed requirement.
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.
QP: ACC 839, MGT 806, MGT 833 QA: MTA 805

806. Decision Support Systems for Marketing
Fall, Spring. 3(3-0)
P: ML 805. R: Open only to graduate students in Business.
Analytical marketing decision-making using existing data bases. Expert system development and application in marketing management.
QP: MTA 805

807. Customer-Driven Strategies
Fall, Spring. 3(3-0)
P: ML 806. R: Open only to graduate students in Business.
Marketing strategies based on the analysis of consumer and organizational buyers. Strategy development designed to meet or exceed customers' expectations.
QP: MTA 805

808. Market-Driven Strategies
Fall, Spring. 3(3-0)
P: ML 806. R: Open only to graduate students in Business.
Marketing strategies based on the analysis of competitors. Alternative approaches to competitive strategies.
QP: MTA 805 QA: MTA 851

809. Logistics and Transportation Strategy
Fall, Spring. 3(3-0) Interdepartmental with Management.
P: MGT 800. R: Open only to graduate students in College of Business.
Planning, control and measurement for logistics and transportation systems. Customer service, transportation, inventory, order processing, warehousing and materials handling.
QP: MGT 800 QA: MTA 809

810. Product Innovation and Management
Fall. 3(3-0)
P: ML 805 or approval of department. R: Open only to graduate students in the College of Business and College of Engineering.
Analytic, decision-making, and planning tools. Topics include new product policy and development, organizational issues, and product modification and deletion.
QP: MTA 805

811. Marketing Communication
Spring. 3(3-0)
P: ML 805. R: Open only to graduate students in Business.
Marketing communication programs for consumer, industrial, and service firms. Communication mix objectives, positioning, budgeting, media, trade promotion, and brand name strategies. Regulation and ethical issues.
QP: MTA 805

812. Logistics Research and Analysis
Fall. 3(3-0) Interdepartmental with Management.
P: ML 809. R: Open only to graduate students in College of Business.
Research methodology in the design and analysis of transportation and distribution systems. System design, customer service, and policy studies.
QP: MTA 809

813. Marketing Research Methods
Spring. 3(3-0)
P: ML 806. R: Open only to graduate students in Business.
Collection, analysis, and interpretation of primary data from problem definition to report writing.
QP: MTA 805 QA: MTA 802

816. Transportation Policy and Plans
Spring. 3(3-0) Interdepartmental with Management.
P: ML 809. R: Open only to graduate students in College of Business.
Policy models and managerial perspectives on future national and corporate transportation policies. Interaction of government, carrier management, and user logistics and distribution strategies.
QA: MTA 816

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: ML 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.
QA: MTA 805

824. Marketing Channel Management
Spring. 3(3-0)
P: ML 805. R: Open only to graduate students in Business.
Design, selection, and performance measurement of channel structures in domestic and international settings.
QP: MTA 805 QA: MTA 824

831. Food Marketing Management
Fall. 3(3-0) Interdepartmental with Agricultural Economics.
P: ML 805 or approval of department. R: Open only to graduate students in Business or approval of department.
Marketing management decisions in food firms. Consumer orientation, computer technologies, food system cost reduction, global opportunities, environmental and social issues.
QP: MTA 805 QA: MTA 831

841. Materials and Logistics Policy
Fall, Spring. 3(3-0) Interdepartmental with Management.
P: ML 801, MGT 809. R: Open only to graduate students in College of Business.
Case study of strategy, policy, and planning. Customer satisfaction, quality, organization, information use, and strategic alliance issues.
QP: MTA 809, MGT 803 QA: MTA 841

850. Business Communication I
Fall, Spring. 2(1-2)
R: Open only to MBA students.
Analysis of planning and execution of business communications. Development of oral and written communication skills.

851. Business Communication II
Fall, Spring. 1(1-0)
P: ML 801. R: Open only to MBA students.
Integrating and applying written and oral business communication skills with other courses in the MBA program.

860. International Business
Fall, Spring. 3(3-0)
R: Open only to graduate students in Business.
Management of the firm in the multinational environment. Assessment of international modes of operations, markets, financial strategies, services, and resources. Competitive strategy.
QA: MTA 860

862. International Marketing
Spring. 3(3-0)
P: ML 805, ML 860. R: Open only to graduate students in Business.
Marketing decisions, strategies, performance and operations of the international firm. Attention to multinational enterprises, exporters, service marketers, and contractors.
QP: MTA 860, MTA 805 QA: MTA 862

865. Emerging Topics in Business
Spring. 3(3-0)
R: Open only to second-year MBA students.
Perspectives on new and emerging issues of business administration. Topics vary.
QP: MTA 805

880. Seminar in Marketing and Logistics
Fall, Spring. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course.
P: ML 805. R: Open only to graduates in College of Business.
Issues in marketing and logistics in an environment of rapid change. Topics vary.
QP: MTA 805

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.
P: ML 805. R: Open only to graduate students in Business. Approval of department.
Faculty-supervised independent study.
QP: MTA 805 QA: MTA 890

905. Theory Development and Research Design in Marketing
Fall. 3(3-0)
Research concepts and scientific methods for the study of marketing. Formulation of hypotheses, concepts of measurement, and quantitative methods.
QA: MTA 905

906. Quantitative Methods in Marketing
Spring. 3(3-0)
P: ML 905 or approval of department.
Concepts and methods in the scientific investigation of marketing phenomena. Focus on the use of multivariate analytic tools.
QP: MTA 905 QA: MTA 906

907. Causal Modeling in Marketing
Fall. 3(3-0)
P: ML 906. R: Open only to Ph.D. students in the College of Business.
Statistical methods in marketing, emphasis on causal modeling.
QP: MTA 906 QA: MTA 907

908. Marketing Decision Models
Fall. 3(3-0)
P: ML 906.
Applications of marketing decision models in new product development, pricing, distribution, advertising, and sales promotion.
QP: MTA 906 QA: MTA 908

920. History of Marketing Thought
Fall. 3(3-0)
P: ML 805. R: Open only to Ph.D. students in Business.
Evolution of marketing institutions, techniques, theories, and critiques. Influence of changing environmental and technological factors.
QP: MTA 805 QA: MTA 920

921. Theories of Competition in Marketing
Spring. 3(3-0)
P: ML 920. R: Open only to Ph.D. students in Business.
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.
QP: MTA 920 QA: MTA 921

922. Seminar in Social Sciences in Marketing
Spring. 3(3-0)
P: ML 906 or concurrently. R: Open only to Ph.D. students in Business.
Social science perspectives on marketing.
QP: MTA 906 QA: MTA 922

923. Seminar in Spatial and Temporal Marketing
Spring. 3(3-0)
P: ML 920. R: Open only to Ph.D. students in College of Business.
Theory concerning marketing strategies and programs in logistics, channels, and pricing. Field research needs.
QP: MTA 920 QA: MTA 923

924. Special Topics Seminar
Fall, Spring. 1 to 3 credits in increments of 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
R: Open only to Ph.D. students in College of Business.
Intensive reading and research on a marketing topic of mutual interest to a faculty member and a Ph.D. student.
QP: MTA 921 QA: MTA 924

930. Theory of Transportation-Distribution Systems
Fall of odd-numbered years. 3(3-0)
P: ML 805. R: Open only to Ph.D. students in the College of Business.
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.
QP: MTA 809 QA: MTA 930

931. Transportation and Distribution Research Methods
Spring of even-numbered years. 3(3-0)
P: ML 930. R: Open only to Ph.D. students in Business.
Techniques and methodology of system design, customer service and policy formulation.
QP: MTA 930 QA: MTA 931

932. Transportation and Distribution Development Policy
Fall of even-numbered years. 3(3-0)
P: ML 805. R: Open only to Ph.D. students in College of Business.
The interaction of government, carrier, and user logistics and distribution strategies, particularly at the macro-corporate and national policy levels.
QP: MTA 931 QA: MTA 932

940. International Business Theory
Fall of even-numbered years. 3(3-0)
P: ML 860 or ML 862.
Theories explaining international business phenomona. Varying perspectives on international business activities, concepts, and frameworks.
QP: MTA 860 or MTA 862

941. International Business Research Issues
Spring of even-numbered years. 3(3-0)
P: ML 940.
Scientific methods of research on international business. Topics include cultural bias and organizing multi-country studies.
QP: MTA 862 QA: MTA 863

995. Directed Research Paper
Fall, Spring, Summer. 1(1-0)
P: ML 921. R: Open only to Ph.D. students in Marketing and Transportation Administration.
Production of research paper under the direction of a senior faculty member.
QP: MTA 921

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: Approval of department.

QA: MTA 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.
QA: MMM 160

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.
QP: MTH 215 QA: MMM 205

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.
QP: MMM 205, MTH 310, MMM 215 QA: MMM 211, MMM 215

250. Materials Science and Engineering
Fall, Spring. 3(3-2)
P: CEM 141, MTH 133.
Structure of metals, ceramics and polymers. Phase diagrams, thermomechanical treatments, physical and mechanical properties, diffusion, microstructure studies, environmental effects.
QP: CEM 141, MTH 113 QA: MMM 250, MMM 230

306. Dynamics
Fall, Spring. 3(3-0)
P: MSM 205, MTH 235. R: Open only to College of Engineering students.
Kinematics of motion. Mass moments of inertia. Kinetics of particles and rigid bodies. Energy and momentum principles.
QP: MMM 205, MTH 310 QA: MMM 306

351. Thermochemistry of Materials
Fall. 3(3-0)
P: CEM 152, MTH 234. R: Open only to Materials Science and Engineering majors. Not open to students with credit in CHE 311, ME 201.
State variables, laws of thermodynamics, phase and chemical equilibria. Gas and condensed phase relationships, solutions, interfaces, point defects, electrochemistry.
QP: CEM 152, MTH 215 QA: MMM 330

352. Diffusion in Solids
Spring. 3(3-0)
P: MSM 250, MSM 351. R: Open only to Materials Science and Engineering majors.
Diffusion and mass transport. Kinetics of diffusion-controlled processes. Point defects, nucleation and growth, interface motion.
QP: MMM 330 QA: MMM 452

355. Mechanical Behavior of Materials
Fall. 3(3-0)
P: MSM 211, MSM 250. C: MSM 375 R: Open only to Materials Science and Engineering, Mechanical Engineering majors.
Stress and strain, crystal elasticity, anelasticity and viscoelasticity. Mechanical properties in tension and torsion. Crystallographic aspects of plasticity.
QP: MMM 211, MMM 250 QA: MMM 350, MMM 351

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.
QP: MMM 350, MMM 351 QA: MMM 351, MMM 456

365. Physical Metallurgy I
Fall. 3(3-0)
P: MSM 250, MSM 351 or concurrently. C: MSM 375 R: Open only to Materials Science and Engineering majors.
Complex binary and ternary phase diagrams. Solidification. Recovery, recrystallization and grain growth. Phase transformations.
QP: MMM 250, MMM 330, MMM 360 QA: MMM 360, MMM 361

366. Physical Metallurgy II
Spring. 3(3-0)
P: MSM 365. C: MSM 376 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.
QP: MMM 360, MMM 330 QA: MMM 453, MMM 361

375. Materials Science Laboratory I
Fall. 1(0-3)
P: MSM 355; C: MSM 365 R: Open only to Materials Science and Engineering majors.
Phase transformations. Recrystallization. Precipitation and aging. Microscopy. Structure-property relations.
QP: MMM 350, MMM 360 QA: MMM 362

376. Materials Science Laboratory II
Spring. 1(0-3)
P: MSM 356 or concurrently. R: Open only to Materials Science and Engineering majors.
Strengthening. Yielding, creep, and fracture. Plasticity. Thermal activation. Damping. Marsensite and shape memory.
QP: MMM 350, MMM 360 QA: MMM 352

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.
QP: CEM 152

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.
QP: MMM 211 QA: MMM 401

402. Computational Mechanics
Spring. 3(3-0)
P: MSM 401, ME 471. R: Open only to College of Engineering majors.
Energy methods with applications. Finite element methods. Buckling and stability. Green's functions.
QP: MMM 401 QA: MMM 402

403. Intermediate Dynamics
Fall of even-numbered years. 3(3-0)
P: MSM 306. R: Open only to College of Engineering majors.
Kinematics and dynamics of particle and rigid body systems. Virtual work, Lagrangian method, Euler equations. Basic vibrations of discrete and continuous systems. Elementary wave propagation.
QP: MMM 306 QA: MMM 403

405. Experimental Mechanics
Fall of odd-numbered years. 3(2-3)
P: MSM 211, MSM 306. 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.
QP: MMM 211, MMM 215, MMM 306 QA: MMM 405

444. Introduction to Composite Materials
Spring. 3(3-0)
P: MSM 211. R: Open only to Materials Science and Engineering or Mechanics majors or approval of department.
Constituents and interfacial bonding. Manufacturing techniques. Microstructure and micromechanics. Theory of anisotropy. Classical laminate theory. Material characterization. Failure and damage. Composite structure design.
QP: MMM 211 QA: MMM 444

451. X-Ray Crystallography
Fall. 3(2-3)
P: MSM 250. R: Open only to Materials Science and Engineering seniors and graduate students.
General properties, generation and detection of x-rays. Interaction with solids. Crystallography, reciprocal lattice, diffraction analysis and techniques. Single crystal methods, stereographic projection. X-ray microanalysis.
QP: MMM 250 QA: MMM 430