6350. Management of Information Resources in Organizations. 3 hours. Role of information in decision making, and management as an information-intensive activity. Information and productivity. Information audit in organizations. Special issues and problems in managing information in different organizational environments.

6600. Readings in Information Science. 3 hours. Broad reading in a defined area of information science related to the student’s research interest. Requires the critical evaluation of sources with particular emphasis on methodological issues. Prerequisite(s): reading proposal requires prior approval by instructor and adviser.

6700. Seminar in Communication and Use of Information. 3 hours. The nature of information as a phenomenon and of the communication processes. Conceptual linkage to treatments in various fields. The role of information and communication in individual, social and institutional behavior.

6720. Human Information and Communication Behavior. 3 hours. Variety of human information and communication behaviors, why people engage in them and how they can be described and understood. Relation to problems of effectiveness and evaluation of communication in information provision.

6740. Scholarly and Scientific Communication. 3 hours. Process by which scholarly, scientific and technical ideas and innovations are communicated. The role of formal and informal communication in the development of knowledge. The process of scholarly and scientific publishing. The role of information in the advancement of science, technology, social sciences, humanities and the arts.

6880. Seminar in Information Science and Technology. 3 hours. Advanced topics and problems in information science and technology. Individual investigation of selected problems. Prerequisite(s): consent of school. May be repeated for credit as topics vary.

6900-6910. Special Problems. 1-3 hours each. Supervised individual or small group study of special problems or topics not otherwise covered by regular course offerings. Prerequisite(s): consent of instructor and dean of school. May be repeated for credit as problems and topics vary.

6930. Information and Communication Measurement. 3 hours. Criteria for development of measures suitable for information and communication. Includes measures from such physical sciences as entropy and such social sciences as impact measures. Bibliometric and scientometric empirical laws and patterns. Measurement in communication science.

6940. Seminar in Research and Research Methodology. 1-12 hours. Advanced topics in research methodology. Research proposal development. Directed research study. May be repeated for credit as topics vary.

6945. Doctoral Seminar in Information Issues. 1 hour. Discussion of general issues and specific research efforts in information science and related fields by faculty, students and guests. Presentation of dissertation proposals and completed dissertations by students.

Information Science, INFO

6660. Readings in Information Science. 3 hours. (0;0;3) Broad reading in a defined area of information science. Topics vary. Course may be repeated for credit.

6950. Doctoral Dissertation. 3, 6 or 9 hours. To be scheduled only with consent of school. 12 hours credit required. No credit assigned until dissertation has been completed and filed with the graduate dean. Doctoral students must maintain continuous enrollment in this course subsequent to passing qualifying examination for admission to candidacy. May be repeated for credit.

Linguistics
see English

Logistics and Supply Chain Management
see Marketing and Logistics

Management

Management, MGMT

5070. Management Issues. 1.5 hours. The basic concepts in managing the complete flow of materials that represent a supply chain from suppliers to customers. Emphases within the module are placed on production concepts with business wide applications, determining demand, transformation processes used to satisfy demand, and finally managing the supply activity supporting the transformation processes.

5120. Managing Organizational Design and Change. 3 hours. Examination of the development of organizational competencies and capabilities through the study of the theory and tools related to organizational design and change. Emphasis is placed on the use of horizontal and vertical linkage mechanisms that provide the organization with the flexibility to adapt to a rapidly changing competitive environment. Definition of management roles and the use of teams are emphasized in the change management process.

5140. Organizational Behavior and Analysis. 3 hours. Research emphasis in organizational behavior stressing organization-people linkages and interrelationships, including selection, orientation and training; job design and reward systems; supervision; formal participation schemes; appraisals and development; organizational structure and design; communications; control; and conflict resolution. Examination of behavioral science methodologies and strategies. Applications to tangential areas of organization theory, development, planning and implications for management and employee relations.

5210. Human Resource Management Seminar. 3 hours. A study of the creation and implementation of human resource policies in public and private organizations. Topics include employment, placement and personnel planning; compensation and benefits; employee and labor relations; training and development; health, safety and security. Designed for non-business graduate students and business graduate students with limited or no background in personnel management.

5230. Management Seminar. 3 hours. Development of philosophy, strategy and tactics in managing an enterprise. Administrative processes common to all enterprises, including variations needed to meet different situational requirements. Methods of study include extensive reading, exploratory research and seminar discussion.
5240. Project Management. 3 hours. Analysis and application of project management techniques and processes to large scale, complex and unique projects. Topics include project selection; planning and organization; negotiation and conflict resolution; budgeting and cost estimation; scheduling; resource allocation; monitoring and control; project auditing; and termination. Prerequisite(s): MGMT 5070 or equivalent.

5250. Alternative Dispute Resolution. 3 hours. Theory and practice of voluntary arbitration. Nature of disputes; nature and philosophy of voluntary arbitration; scope of the arbitrator’s authority; selection of the arbitrator; the agreement to arbitrate; rules and procedures of the hearing; the award; legal status of arbitration; current problems in arbitration; and other selected issues and problems. Mock arbitration hearings and case analysis are integral parts of the course.

5260. Employment, Placement and Personnel Planning. 3 hours. Review of the basic elements of employed performance, with analysis of the factors involved in employment, placement and personnel planning. This course blends theory and practice so the student may better understand the policies and procedures required for recruitment selection and personnel planning.

5280. Analysis and Design of Operations System. 3 hours. Planning, analysis and design of operating systems, including functions such as forecasting, inventory management, facility location and layout, aggregate planning, scheduling and supply chain management. Appropriate decision making tools and processing are emphasized.

5300. Entrepreneurship and Venture Management. 3 hours. The creation of new business enterprises and the expansion of current enterprises through the venture. Topics include assessment of entrepreneurial characteristics, the entrepreneurial team, generation and screening of venture ideas, market analysis and technical analysis.

5510. Health Care Delivery Systems. 3 hours. Examines the evolution, structure, function and issues in the health care delivery system, considers the concepts and processes of health and illness; presents the economics of health care and the basic issues in health care policy; and provides a comprehensive introduction to the organization and management of health service institutions.

5520. Management of Health Service Organizations I. 3 hours. Provides advanced study of the unique operational applications of business/managerial theory, methodology and best practice to acute, home and long-term care health service institutions, including facilities design and management, financial analysis and management, systems analysis and evaluation, application and management of information technology, assessment of health needs and marketing, quality improvement, human resource management and the legal/ethical aspects of health care.

5530. Operation and Management of Physician Practice Organizations. 3 hours. Provides advanced study of the unique operational application of business/managerial theory, methodology and best practice to physician practice management including facilities design and management, financial analysis and management, systems analysis and evaluation, application and management of information technology, assessment of health needs and marketing, quality improvement, human resource management and the legal/ethical aspects of health care.

5540. Management of Health Service Organizations II. 3 hours. Provides advanced study of the unique operational applications of business/managerial theory, methodology and best practice to integrated health care delivery systems and managed care organizations, including their history and evolution; the processes to manage the price, volume, technology and quality of care; impact of employer and third part organizations; financial analysis and management; systems analysis and evaluation; application and management of information technology; assessment of health needs and development; pricing; and marketing of health plan benefit packages; quality improvement; and the legal/ethical aspects of contracting between the health plan and the delivery system.

5550. Professional Project in Health Services Management. 3 hours. Applied research and/or fieldwork focusing on operational and management problems in health services settings. Project assignments directed by a selected health services administrator and by faculty.

5660. International Management. 3 hours. Designed to expose the student to the international aspects of management. Cultural differences in management applications, management of multinational corporations and integration of domestic business functions and international operations.

5710. Management Strategies for Public Issues. 3 hours. Public issues confronting business leaders stemming from profound changes in societal expectations and demands as manifested in political forums and government action. Focuses on the social and political environment of business and explores the role of the corporation in today’s society.

5760. Strategic Management. 3 hours. Examination and evaluation of current theories, issues and programs involved in the formation, administration and implementation of administrative policies and planning systems. Includes both study of relevant literature and examination of policy and planning systems in operation within organizations.

5800. Internship. 3 hours. A supervised, productive and educationally meaningful work experience in a job related to the student’s career objective. Prerequisite(s): student must meet employer’s requirements and have consent of department. May not be used to meet professional field requirements. Pass/no pass only.

5850. Materials Management. 3 hours. Specialized application of fundamental principles of economics, accounting and management to the coordination of all business functions relating to materials.

5860. Contract Negotiation and Administration. 3 hours. Policies, practices, programs and techniques of negotiating and administering collective bargaining contracts.

5870. Leadership Research and Development. 3 hours. Theories and current research on leadership with emphasis placed on leadership development and specific applications within the organizational setting.
5890. Seminar in Compensation and Motivation Theory. 3 hours. An interdisciplinary seminar designed to study the theories, practices and techniques involved in developing and implementing total compensation programs for public and private organizations. The relationship of motivation theory to compensation theory is emphasized in an effort to develop the optimum package for employee productivity and satisfaction and organizational costs. Topics included are compensation theory, conceptual framework for job satisfaction, job design, relationship of incentive compensation packages and international compensation.

5900. Special Problems. 1-3 hours. Open to graduate students who are capable of developing a problem independently. Problem chosen by the student and developed through conferences and activities under the direction of the instructor. Prerequisite(s): approved applications for special problems/independent research/dissertation credit must be submitted to the COBA Graduate Advising Office prior to registration.

6010. Seminar in Business Administration. 3 hours. Covers one or more special fields. May be repeated for credit, and two or more sections may be taken concurrently.

6030. Seminar in Strategic Management. 3 hours. Examination of the theoretical and empirical research on the question of why some firms outperform others. Includes the study of formulation and implementation issues from economic, organizational and other perspectives and prepares the student for participation in research within the field.

6100. Seminar in Organizational Behavior. 3 hours. An in-depth study of research in organizational behavior that familiarizes students with the classic and current literature in the discipline. Students will develop skills in theory-building and empirical research in the field.

6200. Seminar in Organizational Theory. 3 hours. Examination of the major theoretical streams in the study of organizations and the process of organizing. Extensive reading and seminar discussion are used to understand and extend both historical perspectives and emerging views and assist students in becoming active researchers within the discipline.

6820. Seminar in Organizational Theory. 3 hours. An in-depth study of research in organizational behavior that familiarizes students with the classic and current literature in the discipline. Students will develop skills in theory-building and empirical research in the field.

6860. Seminar in Human Resource Management. 3 hours. An examination of the major research in the field of human resources management, including the critical evaluation of research in terms of both theory and methodology. The integration and application of contemporary management theory to the field of human resource management in order to develop skills in theory-building and the design and implementation of empirical research.

6880. Production and Operations Management. 3 hours. Reading, research and analysis in the field of operations management, using a topical approach, with emphasis on such areas as design, operation and control of productive systems; methods of analysis; and operations policy formulation. Prerequisite(s): MGMT 5280 or equivalent, or consent of department. May be repeated for credit as topics vary.

6900-6910. Special Problems. 1-3 hours each. Research by doctoral students in fields of special interest. Includes project research studies and intensive reading programs, accompanied by conferences with professors in fields involved. Prerequisite(s): approved applications for special problems/independent research/dissertation credit must be submitted to the COBA Graduate Advising Office prior to registration.

6940. Individual Research. Variable credit. Individual research for the doctoral candidate. Prerequisite(s): approved applications for special problems/independent research/dissertation credit must be submitted to the COBA Graduate Advising Office prior to registration.

6950. Doctoral Dissertation. 3, 6 or 9 hours. To be scheduled only with consent of department. 12 hours credit required. No credit assigned until dissertation has been completed and filed with the graduate dean. Doctoral students must maintain continuous enrollment in this course subsequent to passing qualifying examination for admission to candidacy. Prerequisite(s): approved applications for special problems/independent research/dissertation credit must be submitted to the COBA Graduate Advising Office prior to registration. May be repeated for credit.

Management Science
see Business Computer Information Systems

Manufacturing Engineering Technology
see Engineering Technology

Marketing and Logistics

Logistics and Supply Chain Management, LSCM

5300. Strategic Supply Chain Management. 3 hours. The distribution and logistics imperative is to achieve cost-containment while delivering customer satisfaction. Course examines how channel integration fosters the coordination, systemization needed to maximize efficiency and produces the greatest net value for the customer. Students explore how resource allocation and channel relationship decisions impact inventory, transportation, warehousing, purchasing and packaging systems. Prerequisite(s): MKTG 5150 or consent of department.

5560. Strategic Logistics Management. 3 hours. Analysis of internal and environmental factors affecting logistical systems and operations. Includes the integration of transportation, inventory, facility location, informational flow, materials handling and packaging activities into a system for managing a physical flow of inbound and outbound products and materials in a global environment. The total-cost and total-system approaches are developed in relationship to planning and managing the logistical function within the organization. Prerequisite(s): MKTG 5150 or consent of department.

5860. Advanced Supply Chain Management Problems. 3 hours. Decision-making tools and skills as they apply to logistics and supply chain management. Course stresses developing skills to analyze technical problems and their interrelationships within a company. Prerequisite(s): LSCM 5300 and 5560.
Marketing, MKTG

5000. Marketing Concepts. 1.5 hours. A functional analysis of marketing and its importance in the economy as well as in business management. Develops an understanding of the increased complexity of the modern marketing system, why it is essential and how it performs. Embraces business activities involved in moving goods from production to consumption. This course meets the deficiency requirement in marketing for MBA candidates.

5150. Marketing Management. 3 hours. Application of concepts, tools and procedures employed by practicing marketing managers. Specific attention is given to product development and management, promotion development and management, channel selection and management, physical distribution management, and price setting and management. Students acquire skills in the essentials of case analysis and written as well as oral presentation of their analysis. Oral presentations may be made using electronic media. Groups may be required for case work. Prerequisite(s): MKTG 3650 or 5000.

5200. Customer Behavior. 3 hours. In a marketplace increasingly characterized by enduring buyer-seller relationships, marketers must be acutely aware of the individual and organizational characteristics that foster brand loyalty and equity. The identification of changing trends in customer behavior as applied to domestic and global markets, consumer markets, business-to-business markets, institutional markets, not-for-profit markets and governmental markets is critical for competitive success in today’s dynamic markets and environments. The student will be introduced to models of buying behavior in consumer, business-to-business and not-for-profit marketing exchanges.

5250. Information for Strategic Marketing Decisions. 3 hours. Overview of methods for conducting market research. Research methodology topics covered include why and when to do marketing research; data types, sources and collection methods; sampling; and data analysis techniques. Use of the Internet as a major resource for conducting market research. Prerequisite(s): MKTG 5150 and MSCI 5010; MSCI 5180 is recommended; or consent of department.

5260. Applied Multivariate Methods for Marketing Decision Making. 3 hours. Develop a better understanding of the relevance of multivariate techniques such as multiple regression, discriminant, factor, cluster, logistics regression, conjoint analysis, etc., to marketing problems. Using a “hands-on, applications, managerial orientation,” the course emphasizes appropriate statistical and presentation software and packages that enhance correct application, interpretation and presentation of each technique. Prerequisite(s): MKTG 5250 and MSCI 5180 or consent of department.

5550. Decision Making in Global Markets. 3 hours. The first half of the 21st century will be characterized by significant shifts in the manufacturing, distribution and consumption of products and services. As transitional and emerging economies mature, foreign entry, local marketing and global management become compelling issues in the design and implementation of marketing strategies. Emphasis on the rapidly changing nature of global markets and implications for the desirability and potential profitability of these markets. Significant sources of threats and opportunities, along with those internal resources of a firm necessary for coping with these opportunities and threats will form the core material of the course. Particular emphasis will be given to the market entry and expansion strategies available to multi-national and global marketers. Prerequisite(s): MKTG 5150.

5600. Emerging Issues in Strategic Marketing. 3 hours. Investigation, analysis and discussion of selected emerging problems, methods, concepts relevant to strategic marketing decision-making in dynamic markets and environments. Examines a wide variety of marketing topics. Prerequisite(s): MKTG 5150 or consent of department.

5800. Internship in Marketing or Logistics. 3 hours. Supervised work experience in a position related to the student’s career objective that meets the department’s internship requirements. Prerequisite(s): 12 hours of graduate-level marketing courses. Student must meet employer’s requirements and have consent of the department’s MBA adviser and the internship director.

5850. Effective Marketing Planning in Dynamic Environments. 3 hours. Development of a strategic marketing plan for a specific product or service utilizing techniques and information from earlier courses in the program. Implementation, control and evaluation plans are developed. Course also addresses the practical aspects of appraisal, prediction and monitoring of external market factors that will impact organizational performance. A major theme of the course is how marketing decisions contribute to developing and maintaining competitive advantage in dynamic markets. Prerequisite(s): must be taken in the final semester of the student’s program.

5900. Directed Study. 3 hours. Topic chosen by the student and developed through meetings and activities under the direction of the instructor; activities include required, regular participation in a specified 4000-level class. Prerequisite(s): approved applications for special problems/independent research/dissertation credit must be submitted to the COBA Graduate Advising Office prior to registration.

5910. Independent Study. 1-3 hours. Open to graduate students capable of developing a problem independently. Problem chosen by the student and developed through conferences and activities under the direction of the instructor. Prerequisite(s): approved applications for special problems/independent research/dissertation credit must be submitted to the COBA Graduate Advising Office prior to registration.

6010. Seminar in Marketing Thought. 3 hours. Understanding of the history of marketing, theoretical definitions of marketing, and controversies in marketing thought. Investigation, analysis, and discussion of significant issues in the field of marketing.

6020. Seminar in Advanced Consumer Behavior. 3 hours. Interdisciplinary course examining empirical and theoretical studies of the factors that influence the acquisition, consumption and disposition of goods, services and ideas. Analysis of the psychological, sociological, anthropological, demographic and regulatory forces that impact consumers. Examination of research methodologies employed to conduct empirical studies of consumer behavior.

6600. Seminar in Marketing Issues. 3 hours. Investigation, analysis and discussion of significant issues in marketing. May be repeated for credit.
6900-6910. Special Problems. 1-3 hours each. Research by doctoral students in fields of special interest. Includes project research studies and intensive reading conferences with professors in fields involved. Prerequisite(s): approved applications for special problems/independent research/dissertation credit must be submitted to the COBA Graduate Advising Office prior to registration.

6940. Individual Research. Variable credit. Individual research for the doctoral candidate. Prerequisite(s): approved applications for special problems/independent research/dissertation credit must be submitted to the COBA Graduate Advising Office prior to registration. May be repeated for credit.

6950. Doctoral Dissertation. 3, 6 or 9 hours. To be scheduled only with consent of department. 12 hours credit required. No credit assigned until dissertation has been completed and filed with the graduate dean. Doctoral students must maintain continuous enrollment in this course subsequent to passing qualifying examination for admission to candidacy. Prerequisite(s): approved applications for special problems/independent research/dissertation credit must be submitted to the COBA Graduate Advising Office prior to registration. May be repeated for credit.

Master’s Engineering Technology
See Engineering Technology

Materials Science and Engineering

Materials Science, MTSC

5000. Thermodynamics of Materials. 3 hours. The zeroth law of thermodynamics, work, energy and the first law of thermodynamics; the second law of thermodynamics, thermodynamic potentials, the third law of thermodynamics, thermodynamic identities and their uses, phase equilibria in one-component systems, behavior and reactions of gases. Solutions, binary and multicomponent systems: phase equilibria, materials separation and purification. Electrochemistry. Thermodynamics of modern materials including liquid crystals.


5200. Advanced Concepts of Metallurgical Science. 3 hours. Chemical and physical properties of metals and alloys. Emphasis on the relationship of structure and thermodynamics to behavior. Topics include crystal structure, thermodynamics, phase diagrams, phase transformations, oxidation, mechanical, electrical and magnetic properties. Prerequisite(s): PHYS 4110, CHEM 3510 or consent of department.

5210. Corrosion and Oxidation of Materials. 3 hours. Electrochemical corrosion mechanisms, corrosion prevention and high temperature corrosion. Oxidation mechanisms of metals and alloys, internal oxidation, oxidation resistant alloys and other methods of oxidation protection. Prerequisite(s): MTSC 5200 or consent of department.

5300. Science and Technology of Modern Ceramics. 3 hours. Emphasis on structure-property relationships: chemical bonding, crystal structures, crystal chemistry, electrical properties, thermal behavior, defect chemistry. Processing topics: powder preparation, sol-gel synthesis, densification, toughening mechanisms. Materials topics: glasses, dielectrics, superconductors, aerogels. Prerequisite(s): MTSC 5100, 5200 or consent of department.

5310. Sol-Gel Processing. 3 hours. Elements of sol-gel synthesis and processing, including colloids, sols, alkoxyide chemistry, hydrolysis and condensation reactions, gelation mechanisms, novel synthesis methods, sol-gel thin films, thin film processing and characterization of sol-gel products. Prerequisite(s): MTSC 5300 or consent of department.


5410. Polymer Reliability. 3 hours. Reliability of polymers and polymer-based composites (PPCs); flexible, semirigid, rigid, elastomeric, crosslinked polymers, heterogeneous polymer-containing (such as polymer + ceramic) composites and polymer liquid crystals. Prediction of long-term performance from short-term tests. Prerequisite(s): MTSC 5400 or consent of department.

5415. Polymer Viscoelasticity. 3 hours. Polymer structure-property relations, linear and nonlinear viscoelasticity, dynamic mechanical analysis, time temperature superposition, creep and stress relaxation, mechanical models for prediction of polymer deformation, rubber elasticity, environmental effects on polymer deformation, instrumentation for prediction of long term properties. Prerequisite(s): MTSC 5400.

5430. Polymer Rheology and Processing. 3 hours. Experimental methods for viscosity-temperature-shear rate measurements, application to melts, filled systems and suspensions. Injection, extrusion, thermoforming, blow molding, rotational molding, compression and transfer molding, calendaring and post-manufacturing operations. Prerequisite(s): MTSC 5400 or consent of department.

5440. Thermal Analysis. 3 hours. Differential scanning calorimetry; thermogravimetric metric analysis; dynamic mechanical and thermomechanical analysis; glass transition; melting transitions, relaxations in the glassy state, liquid crystalline phase changes. Prerequisite(s): MTSC 5400 or consent of department.

5500. Electronic, Optical and Magnetic Materials. 3 hours. Intensive study of the properties of electronic, optical and magnetic materials. Electrical and thermal conduction, elementary quantum physics, bonding, band theory, semiconductors, dielectrics, magnetic properties, superconductivity, optical properties. Prerequisite(s): PHYS 4500 or consent of department.
5515. Materials and Solid State Devices. 3 hours. How electronic, optical and magnetic devices actually work based on a materials perspective. P-N junctions, MOS capacitors, mosfets, CMOS, Bi-CMOS, RF, MRAM and optical detectors/switches; emphasis on the importance of mastering materials properties in electrical engineering device design and integration. Prerequisite(s): MTSC 5500 or consent of department.

5520. Physical and Chemical Basis of Integrated Circuit Fabrication. 3 hours. Current requirements and future trends in processing technology for very large scale integrated circuits and related application. Wafer fabrication, lithography, oxidation, diffusion, ion implantation, film deposition, wet and dry etching, multilevel metal interconnect, process integration and process simulation. Prerequisite(s): MTSC 5500 or consent of department.

5530. Integrated Circuit Packaging. 3 hours. Basic packaging concepts, materials, fabrication, testing and reliability, as well as the basics of electrical, thermal and mechanical considerations as required for the design and manufacturing of microelectronics packaging. Current requirements and future trends are presented. General review of analytical techniques used in the evaluation and failure analysis of microelectronic packages. Prerequisite(s): MTSC 5500 or consent of department.

5540. Materials for Advanced Displays. 3 hours. Materials and processing requirements for new display concepts including field emission displays, organic light emitting displays, flexible displays, laser-based displays and inorganic electroluminescent displays. Special emphasis will be placed on the materials effects on device reliability. Prerequisite(s): MTSC 5500 or consent of department.

5550. Materials and Mechanics for MEMS Devices. 3 hours. Methods, techniques and philosophies used to characterize MEMS structures for engineering applications. Topics include fundamentals of elastic and plastic deformation in microscale, anisotropic material properties, crystalline and non-crystalline materials, and mechanical behavior such as strength, fracture, creep and fatigue as they relate to the microscale design. Material characterization, mechanical testing and mechanical characterization are discussed. Emphasis is on emerging techniques to assess design-relevant mechanical properties. Prerequisite(s): MTSC 5500 or consent of department.

5600. Materials Characterization. 3 hours. Survey of atomic and structural analysis techniques as applied to surface and bulk materials. Physical processes involved in the interaction of ions, electrons and photons with solids; characteristics of the emergent radiation in relation to the structure and composition. Prerequisite(s): MTSC 5200, 5300, 5400 or consent of department.

5610. Fundamentals of Surface and Thin Film Analysis. 3 hours. Survey of materials characterization techniques; optical microscopy; Rutherford backscattering; secondary ion mass spectroscopy; ion channeling; scanning tunneling microscopy; x-ray photoelectron spectroscopies; surface properties. Prerequisite(s): MTSC 5600 or consent of department.


5800-5810. Special Studies in Materials Science. 3 hours each. Organized classes specifically designed to accommodate the needs of students and the demands of program development that are not met by regular offerings. Short courses and workshops on specific topics, organized on a limited-offering basis, to be repeated only upon demand. May be repeated for credit.

5820. Internship in Materials Science. 3 hours. A supervised industrial internship requiring a minimum of 150 clock hours of work experience. Prerequisite(s): consent of department.

5830. Cooperative Education in Materials Science. 3 hours. Supervised work in a job directly related to the student’s major, professional field of study or career objective.

5900-5910. Special Problems in Materials Research. 1-6 hours each. Special problems in advanced materials science for graduate students. Problems chosen by the student with approval of the supervising professor and the department chair.

5920-5930. Research Problems in Lieu of Thesis. 3 hours each. An introduction to research; may consist of an experimental, theoretical or review topic.

5940. Seminar in Current Materials Science Literature. 1-3 hours. Reports and discussion of current materials science research published in journals and other means of dissemination of research.

5950. Master’s Thesis. 3 or 6 hours. To be scheduled only with consent of department, 6 hours of credit required. No credit assigned until thesis has been completed and filed with the graduate dean. Continuous enrollment required once work on thesis has begun. May be repeated for credit.

5960. Materials Science Institute. 1-6 hours. For students accepted by the university as participants in special institute programs. May be repeated for credit, not to exceed a total of 6 hours in each course. Laboratory fee required.

6000. Quantum Mechanics for Materials Scientists. 3 hours. The Schrödinger equation, atomic theory, solid state theory, band structure, tunneling and scattering with an emphasis on materials properties. Prerequisite(s): MTSC 5500 or consent of department.

6100. Mechanical Properties of Materials. 3 hours. Stress, strain and the basics of concepts in deformation and fracture for metals, polymers and ceramics. Analysis of important mechanical properties such as plastic flow, creep, fatigue, fracture toughness and rupture. Application of these principles to the design of improved materials and engineering structures. Prerequisite(s): MTSC 5600 or consent of department.

6110. Applied Fracture Mechanics. 3 hours. Linear elastic fracture mechanics, elastic-plastic fracture mechanics, time dependent failure, creep and fatigue, experimental analysis of fracture and failure of metals, ceramics, polymers and composites. Failure analysis related to material, product design, manufacturing and product. Prerequisite(s): MTSC 6100 or consent of department.

6120. Composite Material. 3 hours. Fibers; matrix materials; interfaces; polymer matrix composites; metal matrix composites; ceramic matrix composites; carbon fiber composites; micromechanics, macromechanics, laminate theory and application, design, failure analysis. Prerequisite(s): MTSC 6100 or consent of department.
6200. Imperfections in Solids. 3 hours. Point defects in semiconductors, metals, ceramics and non-ideal defect structures; non-equilibrium conditions produced by irradiation or quenching; effects or defects on electrical and physical properties, effects of defects at interfaces between differing materials. Prerequisite(s): MTSC 5500 or consent of department.

6210. Deformation Mechanisms in Solid Materials. 3 hours. Discussions on microelasticity and microplasticity of materials. Application of dislocation theory to understand deformation mechanisms related to strengthening. Interactions of dislocation with solute precipitates, dispersed grain boundary and barriers are presented. Deformation mechanisms in amorphous and polymeric materials. Micromechanisms of deformation in fatigue, creep, creep-fatigue and strain-rate loading are described.

6300. Phase Transformations. 3 hours. Thermodynamics, kinetic and structural aspects of metallic and ceramic phase transformations; mechanisms and rate-determining factors in solid-phase reactions; diffusion processes, nucleation theory, precipitations from solid solution, order-disorder phenomena and applications of binary and ternary phase diagrams. Prerequisite(s): MTSC 5300 or consent of department.

6400. Advanced Electron Microscopy. 3 hours. Theory and applications of scanning and transmission electron microscopy; sample preparation and analytical techniques. Prerequisite(s): MTSC 5600 or consent of department.

6610. Diffraction Science. 3 hours. Diffraction theory; scattering and diffraction experiments; kinematic theory; dynamical theory; x-ray topography; crystal structure analysis; disordered crystals; quasi-crystals. Prerequisite(s): MTSC 5600, 5610 or consent of department.

6800. Selected Topics in Materials Science. 3 hours. Topics from specialized areas of materials science, physics and chemistry. May be repeated for credit as topics vary.

6900-6910. Special Problems. 1-3 hours each. Special problems in experimental or theoretical for advanced materials science graduate students. Problem chosen by the student with the approval of the supervising professor.

6940. Individual Research. Variable credit. To be scheduled by the doctoral candidate engaged in research. May be repeated for credit.

6950. Doctoral Dissertation. 3, 6 or 9 hours. To be scheduled only with consent of department. 12 hours credit required. No credit assigned until dissertation has been completed and filed with the graduate dean. Doctoral students must maintain continuous enrollment in this course subsequent to passing qualifying examination for admission to candidacy. May be repeated for credit.

6970. Seminar for Doctoral Candidates. 3 hours. Demonstration of competence in a specific area of materials science as evidenced by criteria established by the faculty of each discipline. May be repeated for credit.

6990. Postdoctoral Research. 3 hours. For postdoctoral fellows to further training and research experience in developing and solving problems independently. Prerequisite(s): consent of department. May be repeated for credit.

Mathematics, MATH

5000. Instructional Issues for the Professional Mathematician. 3 hours. Focus on various instructional issues from the perspective of the professional mathematician. Some major topics include course planning, the content of a course syllabus, lecture styles, the preparation and mechanics of lectures, the conduct of problem solving sessions, classroom management, the student-instructor relationship, examination formats, the preparation, administration and grading of examinations and the management of teaching assistants and graders. Prerequisite(s): consent of department.

5010. Foundations of Mathematics. 3 hours. Mathematical logic and set theory; axiomatic methods; cardinal arithmetic; ordered sets and ordinal numbers; the axiom of choice and its equivalent forms; the continuum hypothesis. Prerequisite(s): consent of department.

5050. Linear Programming. 3 hours. Convex polyhedra, simplex method, duality theory, network flows, integer programming, ellipsoidal method, applications to modeling and game theory. Prerequisite(s): consent of department.

5110-5120. Introduction to Analysis. 3 hours each. A rigorous development for the real case of the theories of continuous functions, differentiation, Riemann integration, infinite sequences and series, uniform convergence and related topics; an introduction to the complex case.

5200. Topics in Dynamical Systems. 3 hours. Dynamical systems in one and higher dimensions. Linearization of hyperbolic fixed points. Hamiltonian systems and twist maps. The concept of topological conjugacy and structural stability. Anosov diffeomorphisms, geodesic flow and attractors. Chaotic long-term behavior of these hyperbolic systems. Measures of complexity. Prerequisite(s): consent of department.

5210-5220. Numerical Analysis. 3 hours each. A rigorous mathematical analysis of numerical methods: norms, error analysis, linear systems, eigenvalues and eigenvectors, iterative methods of solving non-linear systems, polynomial and spline approximation, numerical differentiation and integration, numerical solution or ordinary and partial differential equations. Prerequisite(s): FORTRAN programming or consent of department.

5290. Numerical Methods. 3 hours. A non-theoretical development of various numerical methods for use with a computer to solve equations, solve linear and non-linear systems of equations, find eigenvalues and eigenvectors, approximate functions, approximate derivatives and definite integrals, solve differential equations and solve other such problems of a mathematical nature. Errors due to instability of method and those due to the finite-precision computer will be studied. Prerequisite(s): a programming language and consent of department.
5310-5320. **Functions of a Real Variable.** 3 hours each.
- **5310.** Sets and operations; descriptive set properties; cardinal numbers; order types and ordinals; metric spaces; the theory of Lebesgue measure; metric properties of sets.
- **5320.** Set functions and abstract measure; measurable functions; types of continuity; classification of functions; the Lebesgue integral; Dini derivatives and the fundamental theorem of the calculus.

5350. **Markov Processes.** 3 hours. The ergodic theorem; regular and ergodic Markov chains; absorbing chains and random walks; mean first passage time; applications to electric circuits, entropy, genetics, games, decision theory and probability.

5400. **Introduction to Functions of a Complex Variable.** 3 hours. Algebra of complex numbers and geometric representation; analytical functions; elementary functions and mapping; real-line integrals; complex integration; power series; residues, poles, conformal mapping and applications. Only one course, MATH 5400, 5500 or 5600, may be used towards satisfying the course work requirements for a graduate degree in mathematics.

5410-5420. **Functions of a Complex Variable.** 3 hours each. The theory of analytic functions from the Cauchy-Riemann and Wirerstrass points of view.

5450. **Calculus on Manifolds.** 3 hours. Introduction to differential geometry and topology. Topics include implicit and inverse function theorems, differentiable manifolds, tangent bundles, Riemannian manifolds, tensors, curvature, differential forms, integration on manifolds and Stokes’ theorem. Prerequisite(s): consent of department.

5460-5470. **Differential Equations.** 3 hours each.

5500. **Introduction to the Theory of Matrices.** 3 hours. Congruence (Hermitian); similarity; orthogonality, matrices with polynomial elements and minimal polynomials; Cayley-Hamilton theorem; bilinear and quadratic forms; eigenvalues. Only one course, MATH 5400, 5500 or 5600, may be used towards satisfying the course work requirements for a graduate degree in mathematics.

5520. **Modern Algebra.** 3 hours. Groups and their generalizations; homomorphism and isomorphism theories; direct sums and products; orderings; abelian groups and their invariants. Prerequisite(s): MATH 3510 or equivalent.

5530. **Selected Topics in Modern Algebra.** 3 hours. Ring and field extensions, Galois groups, ideals and valuation theory.

5600. **Introduction to Topology.** 3 hours. Point set topology; connectedness, compactness, continuous functions and metric spaces. Only one course, MATH 5400, 5500 or 5600, may be used towards satisfying the course work requirement for a graduate degree in mathematics.

5610-5620. **Topology.** 3 hours each. A rigorous development of abstract topological spaces, mappings, metric spaces, continua, product and quotient spaces; introduction to algebraic methods.

5810-5820. **Probability and Statistics.** 3 hours each.
- **5810.** Important densities and stochastic processes; measure and integration; laws of large numbers; limit theorems.
- **5820.** Markov processes and random walks; renewal theory and Laplace transforms; characteristic functions; infinitely divisible distribution; harmonic analysis.

5900-5910. **Special Problems.** 1-3 hours each.

5940. **Seminar in Mathematical Literature.** 1-3 hours.

5950. **Master’s Thesis.** 3 or 6 hours. To be scheduled only with consent of department. 6 hours credit required. No credit assigned until thesis has been completed and filed with the graduate dean. Continuous enrollment required once work on thesis has begun. May be repeated for credit.

6010. **Topics in Logic and Foundations.** 3 hours. Mathematical logic, metamathematics and foundations of mathematics. May be repeated for credit.

6110. **Topics in Analysis.** 3 hours. Measure and integration theory, summability, complex variables and functional analysis. May be repeated for credit.

6130. **Infinite Processes.** 3 hours. Topics selected from infinite series, infinite matrices, continued fractions, summation processes and integration theory.

6150. **Functional Analysis.** 3 hours. Normed linear spaces; completeness, convexity and duality. Topics selected from linear operators, spectral analysis, vector lattices and Banach algebras. May be repeated for credit.


6200. **Topics in Ergodic Theory.** 3 hours. Basic ergodic theorems. Mixing properties and entropy. Oseledec’s multiplicative ergodic theorem and Lyapunov exponents. Applications to dynamical systems. Rational functions and Julia sets. Wandering across Mandelbrot set. Sullivan’s conformal measure. Thermodynamical formalism and conformal measures applied to compute Hausdorff measures and packing measures of attractors, repellors and Julia sets. Dimension invariants (Hausdorff, box and packing dimension) of these sets. Prerequisite(s): consent of department. May be repeated for credit.

6310. **Topics in Combinatorics.** 3 hours. Selected topics of current interest in combinatorics such as enumeration, combinatorial optimization, Ramsey theory, topological graph theory, random methods in combinatorics (random graphs, random matrices, randomized algorithms, etc.), combinatorial designs, matroids, formal languages and combinatorics on words, combinatorial number theory, combinatorial and symbolic methods in dynamical systems. May be repeated for credit.
6510. Topics in Algebra. 3 hours. Groups, rings, modules, fields and other algebraic structures; homological and categorical algebra. Multiplicative and additive number theory, diophantine equations and algebraic number theory. May be repeated for credit.

6610. Topics in Topology and Geometry. 3 hours. Point set and general topology, differential geometry and global geometry. May be repeated for credit.

6620. Algebraic Topology. 3 hours. Topics from algebraic topology such as fundamental group, singular homology, fixed point theorems, cohomology, cup products, Steenrod powers, vector bundles, classifying spaces, characteristic classes and spectral sequences. Prerequisite(s): MATH 5530 and 5620. May be repeated for credit.

6710. Topics in Applied Mathematics. 3 hours. Optimization and control theory, perturbation methods, eigenvalue problems, generalized functions, transform methods and spectral theory. May be repeated for credit.

6810. Probability. 3 hours. Probability measures and integration, random variables and distributions, convergence theorems, conditional probability and expectation, martingales, stochastic processes. May be repeated for credit.

6900-6910. Special Problems. 1-3 hours each.

6940. Individual Research. Variable credit. To be scheduled by the doctoral candidate engaged in research. May be repeated for credit.

6950. Doctoral Dissertation. 3, 6 or 9 hours. To be scheduled only with consent of department. 12 hours credit required. No credit assigned until dissertation has been completed and filed with the graduate dean. Doctoral students must maintain continuous enrollment in this course subsequent to passing qualifying examination for admission to candidacy. May be repeated for credit.

5080. Merchandising Ventures. 3 hours. Exploration of the merchandiser’s role in establishing new ventures with fashion and home furnishings products. Includes non-traditional merchandising formats. Prerequisite(s): SMHM 2400 or 2490, and SMHM 3510, and ACCT 2020.

5090. Virtual Merchandising. 3 hours. Study and application of visual merchandising in a virtual format. Emphasis on merchandising processes that convey product characteristics to the consumer from production through distribution. Prerequisite(s): SMHM 2360, and SMHM 2490 or 2400.

5240. Merchandising Practices. 3 hours. Case analysis of merchandising principles practiced by representative consumer-driven international and domestic textile, apparel and home furnishings companies. Interpretation of global trends and issues influencing the vertical and horizontal integration of merchandising practices in the distribution pipeline.

5250. Restaurant Development. 3 hours. The identification, examination and application of restaurant development principles. Topics include menu planning, service styles, dining room and kitchen design, materials purchasing and receiving, food production techniques, accounting and financial management, and merchandising.

5280. Hotel and Restaurant Operations: Theory and Analysis. 3 hours. A study of hotel and restaurant management operations problems, including the areas of budgeting, human resource scheduling and payroll control, sales forecasting, costing and financial statement analysis. Students will be actively involved in writing and discussing cases on current operations issues.

5300. Research Methods in Merchandising and Hospitality Management. 3 hours. Critical evaluation of research methods in merchandising and hospitality management fields. Develop research framework and formulate research design questions. Enhance research skills through writing a thesis proposal or research proposal.

5350. Issues and Trends in Merchandising and Hospitality Management. 3 hours. An analysis of current issues, trends and future projections influencing the field of either hotel and restaurant management or fashion merchandising.

5400. Research Applications in Merchandising and Hospitality Management. 3 hours. Execute research projects with implications for marketers in textile, apparel, home furnishings or hospitality industries. Emphasis is on conceptualizing problems, analyzing and interpreting data, and writing for industry and/or scholarly dissemination. Prerequisite(s): SMHM 5300; statistics; or consent of instructor.

5440. Consumer Theory. 3 hours. Classic and contemporary consumer theories analyzed in situational contexts. Emphasis on formulating integrated consumer behavior models for strategic decision-making in both domestic and international consumer-driven markets in merchandising and hospitality industries.

5460. Human Relations in Merchandising and Hospitality Management. 3 hours. Major areas of human relations skills necessary for managing employees and customers in merchandising and hospitality management are studied. Topics include employee supervision, motivation, communication, training, management development, problem-solving, decision making and stress management.
5500. Merchandising Strategies. 3 hours. Merchandising theory, principles and practice applied to the strategic planning, developing and presenting of textile, apparel and home furnishings product lines. How consumer driven markets motivate product sourcing, pricing, assortment, styling and timing in the global distribution pipeline.

5550. Promotional Strategies. 3 hours. Analyze internal, external and situational factors that influence promotion strategies including advertising, public relations, promotions and salesmanship. Formulate and judge promotion strategies that generate added economic value to textile, apparel, home furnishings, or hospitality products or companies.

5600. Concept Merchandising. 3 hours. Explore concept merchandising of tangible and intangible products, services and experiences that are linking merchandising and hospitality segments. Apply merchandising strategies of planning, developing and presenting products to consumers with the experiential components of the hospitality industry to provide a total concept-based experience. Topics include: lifestyle merchandising, thematic merchandising, experience packaging, immersive environments, brand extension, co-branding, product category management, blurring, customization, innovation (planned obsolescence), consumer value orientations, value-added merchandising, core competencies in products and services, collaborative partnerships and globalization.

5650. Global Merchandising. 3 hours. Critical analysis of merchandising principles and practices in a global context with emphasis on economic, political, environmental, cultural and social issues; geographic distribution; trade theory; trade data; and technological developments. Contrast the global dominance of textile, apparel and home furnishings industries on world trade and on consumer-driven markets by country and geo-political regions.

5660. Advanced Merchandising Applications. 3 hours. (2,2) An experiential retail laboratory serves as a real-world case study of merchandising theory, principles and operations. Emphasis on problem solving, case analysis, creative thinking, fact finding, data analysis and data interpretation to operate a for-profit business. Prerequisite(s): SMHM 3510 and 3850, or consent of instructor.

5700. Service Excellence. 3 hours. Explores the dynamics of service excellence in the merchandising and hospitality industries. How consumer-driven trends motivate service approaches, management and training procedures, and their impact in the marketplace.


5790. Field Experiences in Various Areas of Concentration. 3 hours. Arranged.

5800. Seminar in Various Areas of Concentration. 3 hours. May be repeated for credit as topics vary.

5850. Brand Development. 3 hours. Students plan, develop and present a merchandise group for private label apparel or home furnishings goods using a multi-functional team approach. Includes application of computer software. Prerequisite(s): SMHM 1650 or 2400; 2360 and 2650, or consent of instructor.

5900-5910. Special Problems in Various Areas of Concentration. 3 hours each. Arranged. Prerequisite(s): consent of instructor.

5920. Problem in Lieu of Thesis. 3 hours. No credit given until problem in lieu of thesis is completed.

5950. Master’s Thesis. 3 or 6 hours. To be scheduled only with consent of department. 6 hours credit required. No credit assigned until thesis has been completed and filed with graduate dean. Continuous enrollment required once work on thesis has begun. May be repeated for credit.

Microsystems Engineering Technology
see Undergraduate Catalog

Music

MUAG — Music Applied General Courses
MUAM — Music Applied Private Lessons (Major)
MUAC — Music Applied Private Lessons (Concentration)
MUAS — Music Applied Private Lessons (Secondary)
MUCM — Chamber Music
MUCP — Music Composition
MUED — Music Education
MUEN — Music Ensembles
MUEE — Music Ethnomusicology
MUGC — Music General Courses
MUMH — Music History and Literature, and
Musicology
MUJS — Music Jazz Studies
MULB — Music Laboratories
MUTH — Music Theory

Courses that may be repeated for credit are
MUAG 5000, 5210, 5390, 5640, 5650, 5660, 5800, 5810, 5850, 5860, 5890, 6460 and 6850; all courses in MUAM, MUAC and MUAS; all courses in MUCM; MUCP 5180, 5190, 5590, 6190, 6200 and 6400; MUED 5300, 5821, 5822, 5823, 5831, 5832, 5840, 5880 and 6480; all courses in MUEN; MUJS 5470 and 5760; all courses in MULB; MUMH 5200, 5210, 6160, 6520, 6530 and 6540; MUTH 5090, 5381, 5382, 5383 and 6680; and MUGC 5890, 5900-5910, 5930, 5950, 6900-6910 and 6950.

Applied General Courses, Music, MUAG

5000. Choral Techniques. 3 hours. Choral organizations, singing, conducting, performing, repertoire and history. Actual experience in a model a cappella choir.

5210. Studies in Vocal Literature. 2 hours. An intensive study of a style period or genre of solo vocal literature. May be repeated for credit as topics vary.

5260. Piano Accompanying (Vocal). 3 hours. Sight reading and transposition; lieder and art-song repertoire; orchestral reductions for aria accompaniment. Prerequisite(s): consent of college.