

- 717: Grants Planning and Management.** 0-3-3. Strategies are presented to identify relevant funding sources at the local, regional, and national levels and to prepare, submit, and manage effective proposals.
- 718: Principles and Practices in Instructional Supervision.** 0-3-3. Strategies and techniques of supervising instruction are presented and reviewed. Models of supervising instructional programs are analyzed, interpreted, and evaluated.
- 750: LEC Cognate/Elective.** 1-6 hours credit. Course number used to register and pay fees for cognates and approved electives, which are not listed in the respective course databases of LEC member institutions. Course number is replaced at the end of the enrollment period by actual cognates/electives titles.
- 776: Doctoral Internship Seminar.** 0-3-3. This seminar is designed to enable students to demonstrate and apply knowledge bases and dispositions acquired/refined in the other program components and courses and to share their internship experiences with other students.
- 777: Internship.** 3-6 hours credit (Pass/Fail). This course is a supervised on-site educational experience in curriculum, instruction, supervision, or administration.
- 788: Research Design Seminar.** 0-3-3 (6). This course is a research seminar concentrating on the selection and utilization of qualitative and quantitative field-based research designs.
- 799: Dissertation.** 3 hours credit (12).

MANAGEMENT (MGMT)

- 201: Supervisory Techniques.** 0-3-3. Basic supervision of small employee groups including employee hiring and dismissal, planning and organizing work assignments, evaluating performance, necessary records, and legal aspects.
- 310: Management of Organizations.** 0-3-3. Preq., junior standing. Introduction to fundamental principles of management practice with a particular emphasis on developing an understanding of human behavior in organizations.
- 333: Operations Management.** 0-3-3. Preq., QA 233. Concepts and strategies concerning the management of production and operations processes in manufacturing and service organizations; capacity; quality and inventory management; planning and control systems.
- 340: Small Business Management and Entrepreneurship.** 0-3-3. Organizing and operating the small business, with special attention to personal qualifications, capital requirements, location, sources of assistance. MGMT 350 at GSU.
- 400: Entrepreneurship/New Venture Creation.** 0-3-3. A study of the entrepreneur's role in business, including an introduction to the process of developing an idea into a feasible business plan.
- 401: Internship in Management I.** 3 hours credit. (Pass/Fail) Preq., consent of instructor and senior standing. On site, supervised, structured work experiences in the field of business.
- 402: Internship in Management II.** 3 hours credit. (Pass/Fail) Preq., consent of instructor and senior standing. On site, supervised, structured work experiences in the field of business.
- 419: Collective Bargaining.** 0-3-3. Preq., ECON 202 or 215 or consent of instructor. History of American labor union movement, collective bargaining, labor-management problems, and government and labor relations. Considerable emphasis is given to case studies. MGMT 320 at GSU. (G)
- 447: Personnel Law.** 0-3-3. A survey of landmark cases involving the labor movement, federal and state wage and hour laws, industrial relations and current issues in personnel law. (G)
- 460: Purchasing and Materials Controls.** 0-3-3. Preq., MKTG 300. Principles of procurement and analysis of purchasing problems, with emphasis on quality and quantity control, pricing policy inspection, and standards of performance. (G)
- 470: Personnel Management.** 0-3-3. A study of the functions and procedures in personnel management with emphasis on the procurement, development, maintenance and utilization of the work force. (G)
- 472: Compensation Systems.** 0-3-3. Design of total compensation systems with emphasis on compensation policies, programs, and practices including job analysis, position descriptions, job evaluation and job design.
- 475: Industrial Management.** 0-3-3. Preq., MGMT 333. Management principles as applied to industrial production with emphasis on manufacturing strategy, just in time, quality control, scheduling, plant layout, and supplier relations. (G)
- 476: Systems and Operations Management.** 0-3-3. Preq., MGMT 333. Advanced studies and problems in the planning, management, and control of industrial operations. Scheduling, capacity, and shop floor control are emphasized. (G)
- 478: Seminar in Personnel and Industrial Relations.** 0-3-3. Preq., MGMT 470. Readings, problems and cases in human resource management. Analysis of current problems and future prospects are emphasized. (G)
- 485: International Business Management.** 0-3-3. Readings and cases in international business: governmental activities, regionalism, market opportunities, structure of international companies, company intelligence, human relations, operating policies, procedures and problems. (G)
- 510: Contemporary Management.** 0-3-3. An analysis of management principles, functions, and practices with a particular emphasis on the application of theory to contemporary management issues and problems.
- 537: Human Resources Management.** 0-3-3. Preq., MGMT 510 or consent of instructor. An advanced course in human resource management with an emphasis on personnel functions, within the context of the strategy, structure, and environment of contemporary organizations.
- 539: Organization Theory.** 0-3-3. Preq., MGMT 510 or consent of instructor. A macro approach to the study of complex organization emphasizing current research findings.
- 544: Advanced Production and Operations Management.** 0-3-3. Preq., MGMT 510 or consent of instructor. An in-depth analysis of production/operations concepts, methods, and techniques from a systems perspective.
- 547: Seminar in Industrial Relations.** 0-3-3. Preq., MGMT 510 or consent of instructor. An in-depth study of current issues in the area of labor-management relations.
- 550: Directed Study in Management.** 1-3 hours credit. Hours and credits to be arranged. Consent of instructor and approval of department head required. Special problem or specific area of management.
- 560: Materials Management.** 0-3-3. Preq., MGMT 510 or consent of instructor. Basic concepts of the materials management function including quality management, MRP II, scheduling, inventory management, purchasing, materials handling, JIT, and manufacturing strategy.
- 571: Organizational Behavior.** 0-3-3. Preq., MGMT 510 or consent of instructor. A seminar with emphasis on theories and concepts of the behavioral sciences relevant to the internal operations of the organization.
- 580: Seminar in Venture Assessment and Management.** 0-3-3. Preq., MGMT 510 or consent of instructor. An in-depth seminar applying the tools of analysis from functional business areas to the problems of proposed and existing firms utilizing actual cases.
- 595: Administrative Policy.** 0-3-3. Preq., ACCT 505, CIS 510, ECON 510, FINC 515, MGMT 510, MKTG 530, QA 525. A synthesis of the material covered in the courses required for the MBA. Specific problems and cases are used to develop executive decision-making.
- 601: Research Methods I.** 0-3-3. Preq., QA 605. An in-depth study of principles, theories, objectives, techniques, and problems as applied in social science research.
- 602: Research Methods II.** 0-3-3. Preq., QA 610 and MGMT 601 or MKTG 601. A course designed to introduce the student to the collection, analysis, and interpretation of survey research data with an emphasis on the application of multivariate statistical techniques.
- 610: Current Research Issues in Management.** 0-3-3. A seminar emphasizing the nature of theory and theory development and the analysis of current theoretical and empirical literature within the field of management.
- 615: Seminar in Behavioral Research Methodology.** 0-3-3. May repeat one time for credit. Analysis and intensive study of research and research methodology utilized in the behavioral sciences. The method of science as applied to management is emphasized.
- 620: Doctoral Seminar in Research.** 0-3-3 (6). May be repeated one time for credit. Research on individual topics. Should be taken near completion of course work.
- 629: Organization Theory.** 0-3-3. Preq., MGMT 510 or consent of instructor. Requires Doctoral standing. May require additional class meetings. A macro approach to the study of complex organization emphasizing current research findings. Credit will not be given for MGMT 629 if credit is given for MGMT 539.
- 637: Human Resources Management.** 0-3-3. Preq., MGMT 510 or consent of instructor. Requires Doctoral standing. May require additional class meetings. An advanced course in human resource management with an emphasis on personnel functions, within the context of the strategy,

structure, and environment of contemporary organizations. Credit will not be given for MGMT 637 if credit is given for MGMT 537.

- 639: Seminar in Strategy & Organizational Theory.** 0-3-3. Preq., MGMT 510 or consent of instructor. A doctoral seminar focusing on strategy and organization theory with emphasis on theoretical and empirical research and its application.
- 644: Advanced Production and Operations Management.** 0-3-3. Preq., MGMT 510 or consent of instructor. Requires Doctoral standing. May require additional class meetings. An in-depth analysis of production/operations concepts, methods, and techniques from a systems perspective. Credit will not be given for MGMT 644 if credit is given for MGMT 544.
- 645: Evolution of Management Thought.** 0-3-3. Preq., MGMT 510 or consent of instructor. Seminar with emphasis on important contributions to modern management thought as evidenced in the writings of major contributors.
- 647: Seminar in Industrial Relations.** 0-3-3. Preq., MGMT 510 or consent of instructor. Requires Doctoral standing. May require additional class meetings. An in-depth study of current issues in the area of labor-management relations. Credit will not be given for MGMT 647 if credit is given for MGMT 547.
- 650: Directed Study in Management.** 1-3 hours credit. Hours and credits to be arranged. Consent of instructor and approval of department head required. Special problem or specific area of management.
- 660: Materials Management.** 0-3-3. Preq., MGMT 510 or consent of instructor. Requires Doctoral standing. May require additional class meetings. Basic concepts of the materials management function including quality management, MRP II, scheduling, inventory management, purchasing, materials handling, JIT, and manufacturing strategy. Credit will not be given for MGMT 660 if credit is given for MGMT 560.
- 671: Organizational Behavior.** 0-3-3. Preq., MGMT 510 or consent of instructor. Requires Doctoral standing. May require additional class meetings. A seminar with emphasis on theories and concepts of the behavioral sciences relevant to the internal operations of the organization. Credit will not be given for MGMT 671 if credit is given for MGMT 571.
- 680: Seminar in Venture Assessment and Management.** 0-3-3. Preq., MGMT 510 or consent of instructor. Requires Doctoral standing. May require additional class meetings. An in-depth seminar applying the tools of analysis from functional business areas to the problems of proposed and existing firms utilizing actual cases. Credit will not be given for MGMT 680 if credit is given for MGMT 580.
- 685: Comprehensive Exam in Management.** No credit. Doctoral standing required. Required for all business administration doctoral students seeking to take the comprehensive exam in management. Successful completion is a prerequisite to the oral comprehensive exam for those seeking a primary field or examined minor in management. Requires consent of graduate director.

MARKETING (MKTG)

- 235: Fundamentals of Retail Store Operation.** 0-3-3. An introduction to operation of retail stores; retail salesmanship, purchasing control, and supervision.
- 300: Marketing Principles and Policies.** 0-3-3. Preq., ECON 202 or 215 and junior standing. Marketing functions; institutions; policies and strategies with their business, economic, and social implications.
- 307: Salesmanship.** 0-3-3. Preq., junior standing. A study of the selling process with emphasis on the economic aspects of salesmanship and the role of the salesman in buyer-seller relationships.
- 320: Consumer Behavior.** 0-3-3. Preq., junior standing. A study of the consumer and the relation to the marketing process.
- 401: Internship in Marketing I.** 3 hours credit. (Pass/Fail) Preq., consent of instructor and senior standing. On site, supervised, structured work experiences in the field of business.
- 402: Internship in Marketing II.** 3 hours credit. (Pass/Fail) Preq., consent of instructor and senior standing. On site, supervised, structured work experiences in the field of business.
- 420: Business Advertising.** 0-3-3. Preq., MKTG 300. A study of the analysis of principles of successful advertising enabling the student to appraise their effectiveness as marketing tools and their social and economic significance. (G)
- 425: Sales Management.** 0-3-3. Preq., MKTG 307 or consent of instructor. Relation of sales department to other departments; types of sales

organizations, management of sales force; market analysis; price policies, sales budgets; distribution costs.

- 435: Retailing Management.** 0-3-3. Preq., MKTG 300 and senior standing. Merchandise distribution by retail organization; emphasis on retailing in the distributive system and problems of management and control. (G)
- 473: Marketing Administration.** 0-3-3. Preq., MKTG 320, 420, or 435, or consent. An in-depth analysis and use of marketing principles to construct marketing plans and decisions utilizing current studies, readings, and simulations.
- 482: Marketing Research.** 0-3-3. Preq., QA 233. A consideration of marketing research as a management tool; application of research techniques to various marketing problems. (G)
- 485: International Marketing.** 0-3-3. Preq., MKTG 300 or consent of instructor. International marketing opportunities and principles; marketing tools as a means of adapting the individual domestic business firm and its marketing methods to the international environment. (G)
- 530: Marketing Management.** 0-3-3. A course to introduce the student to the role of the marketing manager in the development and implementation of strategies in the areas of products, pricing, channels, and promotion.
- 533: Advanced Marketing Research.** 0-3-3. Preq., MKTG 530 or consent of instructor. An in-depth study of research philosophy, theory, objectives, techniques, and problems as applied to marketing.
- 534: Marketing Dynamics.** 0-3-3. Preq., MKTG 530 or consent of instructor. A course designed to examine the marketing organism and its adjustments to the legal, political, economic, social, and cultural environment.
- 537: Seminar in Buyer Behavior.** 0-3-3. Preq., MKTG 530 or consent of instructor. An in-depth examination of the conceptual and theoretical foundations of consumer and industrial buyer behavior.
- 550: Directed Study in Marketing.** 1-3 hours credit. Hours and credits to be arranged. Consent of instructor and approval of department head required. Special problem or specific area of marketing.
- 600: Survey of Marketing Theory & Practice.** 0-3-3. Preq., MKTG 530 or consent of instructor. A survey of marketing literature examining the evolution of marketing theory and theoretical and empirical research including the philosophy of science, promotion, buyer behavior, distribution, ethics, global marketing, pricing, product development, and marketing strategy.
- 601: Research Methods I.** 0-3-3. Preq., QA 605. An in-depth study of principles, theories, objectives, techniques, and problems as applied in social science research.
- 602: Research Methods II.** 0-3-3. Preq., QA 610 and MGMT 601 or MKTG 601. A course designed to introduce the student to the collection, analysis, and interpretation of survey research data with an emphasis on the application of multivariate statistical techniques.
- 610: Seminar in Price Policies.** 0-3-3. Problems and practices involved in formulating and administering price policies.
- 615: Seminar in Marketing.** 0-3-3 (6). May be repeated one time for credit. An examination of concepts and research findings related to selected topics in marketing. Presentation and critical evaluation of reports from related disciplines.
- 633: Advanced Marketing Research.** 0-3-3. Preq., MKTG 530 or consent of instructor. Requires Doctoral standing. May require additional class meetings. An in-depth study of research philosophy, theory, objectives, techniques, and problems as applied to marketing. Credit will not be given for MKTG 633 if credit is given for MKTG 533.
- 634: Marketing Dynamics.** 0-3-3. Preq., MKTG 530 or consent of instructor. Requires Doctoral standing. May require additional class meetings. A course designed to examine the marketing organism and its adjustments to the legal, political, economic, social, and cultural environment. Credit will not be given for MKTG 634 if credit is given for MKTG 534.
- 637: Seminar in Buyer Behavior.** 0-3-3. Preq., MKTG 530 or consent of instructor. Requires Doctoral standing. May require additional class meetings. An in-depth examination of the conceptual and theoretical foundations of consumer and industrial buyer behavior. Credit will not be given for MKTG 637 if credit is given for MKTG 537.
- 650: Directed Study in Marketing.** 1-3 hours credit. Hours and credits to be arranged. Consent of instructor and approval of department head required. Special problem or specific area of marketing.
- 685: Comprehensive Exam in Marketing.** No credit. Doctoral standing required. Required for all business administration doctoral students seeking to take the comprehensive exam in marketing. Successful completion is a prerequisite to the oral comprehensive exam for those

seeking a primary field or examined minor in marketing. Requires consent of graduate director.

MATHEMATICS (MATH)

099: Preparation for College Mathematics. 0-4-4. Required if Mathematics ACT score is less than 18, or Mathematics SAT is less than 430, unless a passing score is achieved on Placement Exam A. Real numbers; exponents; polynomials and factoring; algebraic fractions; linear equations and inequalities; quadratic equations; graphing; radicals. (Pass/Fail)

100C/100B: College Algebra. 0-5-5. Preq., Mathematics ACT score between 18 and 21 inclusive, or Mathematics SAT score between 430 and 510 inclusive, or Placement by Exam to bypass MATH 099, or successful completion of MATH 099. MATH 100B-C covers the same material as MATH 101 and includes additional supplementary review material. **Credit will not be given for MATH 100B-C if credit is given for MATH 101.**

MATH100C: 0-3-3. Radical expressions; rational exponents; complex numbers; quadratic, absolute value, rational equations; systems of linear equations; inequalities; functions; conics; graphs; inverse, exponential, logarithmic functions; applications. **Concurrent enrollment in the corresponding section of MATH 100B is required.**

MATH100B: 2-0-2. (Pass/Fail) Supplementary review material including rational exponents, integer exponents, multiplying polynomials, factoring, rational expressions. **Concurrent enrollment in the corresponding section of MATH 100C is required.** A grade of S will be assigned in MATH 100B if and only if the student earns a minimum grade of D in MATH 100C. A student who drops MATH 100C and wishes to continue attending class to be better prepared for repeating MATH 100B-C may remain enrolled in MATH 100B for the remainder of the quarter. Such a student who does continue to attend class will be assigned a grade of NC in MATH100B.

101: College Algebra. 0-3-3. Preq., Mathematics ACT score is greater than or equal to 22, or Mathematics SAT score is greater than or equal to 520. Radical expressions; rational exponents; complex numbers; quadratic, absolute value, rational equations; systems of linear equations; inequalities; functions; conics; graphs; inverse, exponential, logarithmic functions; applications. Credit will not be given for both MATH 100 and MATH 101.

111: Precalculus Algebra. 0-3-3. Preq., Mathematics ACT score is greater than or equal to 26, or Mathematics SAT score is greater than or equal to 590, or Placement by Exam, or MATH 101. Precalculus functions, graphs; miscellaneous equations, inequalities; polynomial functions; conic sections; exponential, logarithmic equations; systems of equations; matrices; determinants; sequences; series.

112: Trigonometry. 0-3-3. Preq., Mathematics ACT score is greater than or equal to 26, or Mathematics SAT score is greater than or equal to 590, or Placement by Exam or MATH 101. Solution of right triangles, reduction formulas, functions of multiple angles, trigonometric equations, inverse functions, and complex numbers. Credit will not be given for MATH 112 if credit is given for MATH 212 or 241.

113: Plane Geometry. 0-3-3. Preq., MATH 111 or 240. A course in plane Euclidean geometry for a student who is planning to teach high school geometry.

125: Algebra for Management and Social Sciences. 0-3-3. Preq., Mathematics ACT score is greater than or equal to 26, or Mathematics SAT score is greater than or equal to 590, or Placement by Exam or MATH 101. Linear and quadratic equations and functions, graphs, matrices, systems of linear equations, mathematics of finance, sets, probability and statistics, exponential and logarithmic functions.

203: Introduction to Number Structure. 0-3-3. Preq., MATH 101; Elementary Education majors only. Developing number sense and concepts underlying computation, estimation, pattern recognition, and function definition. Studying number relationships, systems, and theory. Applying algebraic concepts to solve problems.

204: Conceptual Geometry and Quantitative Analysis. 0-3-3. Preq., MATH 203; Elementary Education majors only. Studying the geometry of one, two, and three dimensions and applications to problems in the physical world. Exploring probability and statistics in real-world situations.

212: Applied Technical Mathematics with Calculus. 0-3-3. Preq., Mathematics ACT score greater than or equal to 26, or Mathematics SAT score is greater than or equal to 590, or Placement by Exam, or MATH

101. Applied trigonometry, vectors, basic applied differential calculus. Credit will not be given for MATH 212 if credit is given for MATH 112.

220: Applied Calculus. 0-3-3. Preq., MATH 101 and MATH 112 or Placement by Exam. Functions and graphs, the derivative, applications of derivatives, indefinite integrals, application of definite integrals. Credit will not be given for MATH 220 if credit is given for MATH 222 or 240 or 241 or 242.

222: Calculus for Business Administration and Economics. 0-3-3. Preq., MATH 111 or MATH 125 or Placement by Exam. Functions and graphs, the derivative, the indefinite integral and the definite integral; applications as applied to business and economics. Credit will not be given for MATH 222 if credit is given for MATH 220 or 240 or 241 or 242.

223: Applied Calculus for Electrical Technology. 0-3-3. Preq., MATH 220. Applications of calculus and differential equations to electrical technology; includes integration techniques, series, differential equations, and transforms.

240: Mathematics for Engineering & Science I. 3-2-3. Preq., Mathematics ACT score of 26 or better, or Mathematics SAT score of 590 or better, or Placement by Exam, or MATH 101. Functions, graphs, polynomial functions; trigonometric functions, exponential and logarithmic functions and equations; inverse functions; introduction to analytic geometry; limits; derivatives; continuity. Credit will not be given for MATH 240 if credit is given for MATH 220 or 222.

241: Mathematics for Engineering & Science II. 0-3-3. Preq., MATH 240. Differentiation rules; trigonometric reduction formulas, trigonometric equations, derivatives of algebraic, exponential, logarithmic, and trigonometric functions; application of differentiation. Credit will not be given for MATH 241 if credit is given for MATH 112 or 220 or 222.

242: Mathematics for Engineering & Science III. 0-3-3. Preq., MATH 241. Optimization, antidifferentiation, definite integrals, techniques of integration, separable differential equations and linear constant coefficient differential equations (homogenous and inhomogenous). Credit will not be given for MATH 242 if credit is given for MATH 220 or 222.

243: Mathematics for Engineering & Science IV. 0-3-3. Preq., MATH 242. Areas and volumes, numerical integration, improper integrals, single variable continuous statistics, vectors, three-dimensional coordinates, introduction to multivariate integration.

244: Mathematics for Engineering & Science V. 0-3-3. Preq., MATH 243. Triple integrals, space curves, differentiation of functions of several variables, vector calculus, Green's and Stokes' theorem.

245: Mathematics for Engineering & Science VI. 0-3-3. Preq., MATH 244. Infinite sequences, power series, Taylor series, elementary partial differential equations, use of series to solve differential equations, Laplace transforms.

307: Fundamentals of Mathematics. 0-3-3. Preq., MATH 243. Sets, relations, functions, equations, inequalities, proofs, development of the integers and rational numbers, evaluation of experimental programs in mathematics.

308: Introduction to Linear Algebra. 0-3-3. Preq., MATH 244. Matrices, systems of linear equations, vectors, vector spaces, linear transformations, eigenvalues and eigenvectors.

311: Discrete Mathematics I. 0-3-3. Preq., MATH 243. Logic, sets, functions, finite and infinite sets, permutations and combinations.

312: Discrete Mathematics II. 0-3-3. Preq., MATH 311. Binomial and Multinomial Theorems, principle of inclusion-exclusion, recurrence relations, directed graphs, network flows, and selected topics.

313: Introductory Numerical Analysis. 0-3-3. Preq. MATH 243 and knowledge of FORTRAN. Introduction to numerical techniques in finding roots of equations, solving systems of equations, approximating functions, derivatives and integrals.

318: Introduction to Abstract Algebra. 0-3-3. Preq., MATH 307. Fundamental set concepts, groups, rings, integral domains, fields, polynomials.

340: Introduction to Real Analysis. 0-3-3. Preq., MATH 244 and MATH 311 or 307. A rigorous introduction to the calculus of functions of one real variable.

401: College Geometry. 0-3-3. Preq., MATH 113 or equivalent, and MATH 243; or consent of instructor. Logical systems and basic laws of reasoning, axiomatic geometry, geometric transformations, selected Euclidean geometry, non-Euclidean and projective geometries. (G)

405: Linear Algebra. 0-3-3. Preq., MATH 308 or consent of instructor. Study of linear systems, matrices, and algebra of matrices, determinants, vector

- spaces and subspaces, linear transformations and representations by matrices. (G)
- 407: Partial Differential Equations.** 0-3-3. Preq., MATH 245. Solution of linear first order equations. Formation and solution of second order problems of parabolic, elliptic, and hyperbolic type. (G)
- 410: Advanced Engineering Mathematics.** 0-3-3. Preq., MATH 245. Mechanical systems and electrical circuits, Fourier series, Laplace transforms, partial differential equations. (G)
- 411: Advanced Engineering Mathematics.** 0-3-3. Preq., MATH 244. Vectors spaces and linear transformations, applications of matrices, vector analysis, calculus of variations. (G)
- 412: Vector and Tensor Analysis.** 0-3-3. Preq., MATH 411 or consent of instructor. The algebra of vectors, differential vector calculus, differential geometry, integration, static and dynamic electricity, mechanics, hydrodynamics, and electricity, tensor analysis and Riemann geometry, further applications of tensor analysis. (G)
- 413: Foundations and Fundamental Concepts.** 0-3-3. Preq., MATH 242, or consent of instructor. Mathematics before Euclid, Euclid's "elements," non-Euclidean geometry, Hilbert's "Grundlagen," algebraic structure, the modern mathematical method, sets, logic and philosophy. (G)
- 414: Numerical Analysis.** 0-3-3. Preq., MATH 308, Knowledge of FORTRAN, or consent of instructor. Roots of polynomial and other nonlinear equations. Solutions of systems of simultaneous equations. Numerical applications of matrix theory and linear algebra. Interpolating polynomials. (G)
- 415: Numerical Analysis.** 0-3-3. Preq., MATH 245 and 414, or consent of instructor. Curve fitting techniques. Function approximation techniques. Numerical differentiation. Numerical integration. Numerical solution of differential equations and systems of differential equations and boundary value problems. (G)
- 416: Abstract Algebra.** 0-3-3. Preq., MATH 318 or consent of instructor. Number theory, equivalences, and congruences, groups, ideals. (G)
- 430: Projective Geometry.** 0-3-3. Preq., MATH 244 and 308, or consent of instructor. Ideal elements, duality, harmonic sets, projectivity, projective theory of conics, theory of poles and polars. (G)
- 440: Linear Programming.** 0-3-3. Preq., MATH 241 and 308, or consent of instructor. Characteristics of linear programming problems, properties of linear programming solutions, the simplex method with variations, optimality analysis, the dual problem, the transportation problem. (G)
- 441: Non-linear Programming.** 0-3-3. Preq., MATH 440. Advanced topics in linear programming, quadratic programming, dynamic programming. (G)
- 445: Theory of Functions of Complex Variables.** 0-3-3. Preq., MATH 244. Complex numbers, analytic functions, elementary functions, mapping elementary functions, integrals, power series, residues, poles, conformal mappings, applications of conformal mappings. (G)
- 450: Ordinary Differential Equations.** 0-3-3. Preq., MATH 245 and 340, or consent. First-order equations, second-order linear equations, general linear equations and systems, existence and uniqueness theorems, plane autonomous systems. (G)
- 460: Number Theory.** 0-3-3. Preq., MATH 318. Divisibility properties of integers, prime numbers, congruences, number theoretic functions. (G)
- 470: Introduction to Topology.** 0-3-3. Preq., MATH 244, or consent of instructor. Introduction of concepts, metric spaces, countability axioms, separation axioms, connectedness, compactness, product spaces, continuous mappings and homeomorphisms, homotopy, quotient spaces. (G)
- 480: Introductory Analysis.** 0-3-3. Preq., MATH 340. A study of functions in metric spaces-limits, continuity, integration, uniform convergence, approximations. (G)
- 490: Topics in Mathematics.** 0-3-3 (6). Various topics in the field of Mathematics. May be repeated for credit. (G)
- 502: Special Functions in Applied Mathematics.** 0-3-3. Preq., MATH 245. Orthogonal functions, solutions of differential equations of Legendre, Gauss, Hermite, Tchebysheff, Laguerre, and Bessel, properties of these solutions, coordinate system, and boundary value problems.
- 507: Partial Differential Equations.** 0-3-3. Preq., MATH 407. Continuation of MATH 407. Existence, uniqueness, and representation of solutions, problems in higher dimensions, Green's formulas, multiple Fourier series, Fourier transforms, boundary value problems in infinite domains.
- 510: Functional Analysis.** 0-3-3. Preq., MATH 405, 470. Linear spaces, normed spaces, metric spaces, Banach spaces, Hilbert spaces.
- 511: Functional Analysis.** 0-3-3. Preq., MATH 510. Linear topological spaces, metric spaces, Banach spaces, Hilbert spaces.
- 515: Numerical Analysis.** 0-3-3. Preq., Consent of instructor. Numerical analysis of problems in linear algebra, norms for vectors and matrices, convergence properties of sequences and series of vectors and matrices, convergence of iterative techniques for linear systems. Numerical differentiation and integration. Numerical solutions of differential equations.
- 520: Theory of Ordinary Differential Equations.** 0-3-3. Preq., MATH 450. Existence and uniqueness theorems, dependence of solutions on a parameter, linear and nonlinear differential equations, differential inequalities, oscillation and comparison theorems, stability of solutions, perturbation theory.
- 530: Algebraic Topology.** 0-3-3. Preq., MATH 470 and 416. Categories and functors, Eilenberg-Steenrod axioms, construction of the homology and cohomology groups, homology of finite complexes, universal coefficient theorems, Eilenberg-Zilber theorem, the cohomology ring, the cross product operation, fundamental group, higher homotopy groups.
- 544: Modern Operational Mathematics.** 0-3-3. Preq., MATH 245. Theory and applications of transforms of Laplace and Fourier, inverse transforms by complex variable methods. Applications to analysis and linear operations.
- 545: Complex Analysis.** 0-3-3. Preq., MATH 445. Rigorous development of limits, continuity, analyticity, sequences, uniform convergence, power series, exponential and trigonometric functions, conformality, linear transformations, conformal mapping and elementary Riemann surfaces.
- 546: Complex Analysis.** 0-3-3. Preq., MATH 545. Continuation of MATH 545. Fundamental theorems in complex integration, local properties of analytic functions, calculus of residues, harmonic functions, entire functions, normal families, conformal mappings and Dirichlet's problem, elliptic and global analytic functions.
- 550: Algebraic Geometry.** 0-3-3. Preq., MATH 244 and 405, or consent. Homogeneous linear equations and linear dependence, projections and rigid motions, homogeneous cartesian coordinates, linear dependence of points and lines, point geometry and line geometry, harmonic division and cross ratio, one-and-two dimensional projective transformations.
- 551: Research and Thesis in Mathematics.** 3 credit hours (6). Registration in any quarter may be for three semester hours credit or multiples thereof. Maximum credit allowed is six semester hours.
- 562: Advanced Linear Algebra.** 0-3-3. Preq., MATH 405. Eigenvalues, linear functionals, bilinear and quadratic forms, orthogonal and unitary transformations, normal matrices.
- 566: Advanced Abstract Algebra.** 0-3-3. Preq., MATH 416. Concepts from set theory, groups, rings, integral domains, fields, extensions of rings and fields, modules, ideals.
- 574: Numerical Solution for PDE I.** 0-3-3. Preq., MATH 407, 414. Finite difference schemes and their accuracy, stability, and convergence. Schemes for parabolic and hyperbolic PDEs.
- 575: Numerical Solution for PDE II.** 0-3-3. Preq., MATH 407, 414, 574. Finite difference schemes for elliptic PDEs, iterative methods, and introduction to finite element methods and multigrid methods.
- 578: Probability Theory.** 0-3-3. Preq., MATH 480 or consent of instructor. Probability spaces and random variables, characteristic functions and distribution functions, probability laws and types of laws, limit distributions, independent and dependent sums of random variables.
- 580: Mathematical Analysis.** 0-3-3. Preq., MATH 480. Real number system, measures with emphasis on Lebesgue measure, abstract integration with emphasis on the Lebesgue integral.
- 581: Mathematical Analysis.** 0-3-3. Preq., MATH 580. Metric Spaces, Topological Spaces and Banach Spaces.
- 584: Topics in Algebra.** 0-3-3 (15). May be repeated for 3 hours credit each time.
- 586: Topics in Analysis.** 0-3-3 (15). May be repeated for 3 hours credit each time.
- 587: Topics in Applied Mathematics.** 0-3-3 (15). May be repeated for 3 hours credit each time.
- 588: Topics in Topology.** 0-3-3 (15). May be repeated for 3 hours credit each time.
- 599: Graduate Training Seminar.** 0-3-3 (15). Preq., Consent of instructor. Guided and/or directed study, readings, discussion, observation, and training in the teaching of college mathematics. (Pass/Fail)
- 655: Mathematical Modeling.** 0-3-3. Preq., MATH 245 and STAT 620, or consent of instructor. Building deterministic and probabilistic models; applications from physical and life sciences. Transient and stationary models, stability, and optimal solutions. Model validation: acceptance, improvement, or rejection.

MECHANICAL ENGINEERING (MEEN)

- 215: Engineering Materials Laboratory.** 3-0-1. Coreq., MEMT 201. A laboratory course studying the experimental behavior of engineering materials. Labs will include hardness testing, impact testing, tensile testing, and heat treating of materials.
- 292: Mechanical Engineering Computer Applications.** 0-3-3. Preq., credit or registration in MATH 245. Application of modern computer programming principles to mechanical engineering problems. Numerical solutions of linear and nonlinear algebraic equations, numerical quadrature problems, and ordinary differential equations.
- 321: Manufacturing Processes.** 3-1-2. Preq., MEMT 201 and MEEN 351. A study of the processes used in manufacturing machine parts. Designing for manufacturability. Laboratory is operational practice and demonstrations of machine tool, foundry, and welding.
- 334: Thermodynamics II.** 0-2-2. Preq., ENGR 222. Continuation of ENGR 222. Study of gas mixtures, thermodynamic property relations, chemical reactions, combustion, and thermodynamics of fluid flow.
- 351: Computer-Aided Modeling.** 3-1-2. Preq., MATH 244. Construction of virtual systems models using constructive solid geometry, swept volumes and trimmed parametric surfaces with engineering applications.
- 353: Heat Transfer.** 0-3-3. Preq., MEEN 292 and ENGR 222. Fundamental concepts of heat transfer including conduction, convection, and radiation. Introduction to thermal systems design.
- 361: Advanced Mechanics of Materials.** 0-3-3. Preq., MEMT 211, 312. Theories of stress and strain, failure criteria, energy methods, design for static strength, design for fatigue strength.
- 363: Dynamics of Machine Elements.** 0-3-3. Preq., MEMT 312. Kinematics and kinetics of machine elements such as linkages, cams, and gear trains.
- 371: Dynamic Systems.** 3-2-3. Preq., MEEN 292, MEMT 312; Coreq., ENGR 222. Modeling and design of dynamic mechanical and fluid systems. Introduction to linear vibrations and automatic controls. Numerical and Laplace transform solutions to ordinary differential equations.
- 382: Basic Measurements.** 3-1-2. Preq., ENGR 221. Techniques and instruments for making and analyzing measurements in engineering.
- 400: Mechanical Engineering Seminar.** 3-0-1. Preq., Senior standing. Professionalism, ethics, and service for mechanical engineers.
- 413: Composite Materials Design.** 0-3-3. Preq., MEEN 361. An introduction to modern composite materials. Application of lamination theory to analysis of composites. Deformation and failure of composites. Structural design using composite materials. (G)
- 414: Failure Analysis.** 0-3-3. Preq., MEEN 361. An introduction to failure analysis. Using analysis of failed parts to determine the cause of failure. Using failure analysis techniques to design to avoid failure.
- 432: Renewable Energy Design.** 0-3-3. Preq., MEEN 334 or equivalent. Analysis and design of systems, which utilize renewable energy sources, such as solar energy, wind energy and geothermal energy. (G)
- 434: Cryogenic Systems.** 0-3-3. Preq., MEEN 334 or equivalent. Analysis and design of systems which produce, maintain, or utilize low temperatures; liquefaction systems; refrigeration systems; separation and purification systems; storage systems. (G)
- 435: Internal Combustion Engines.** 0-3-3. Preq., MEEN 334. Theory of IC engines. Fuels, combustion and thermodynamics. Carburation and fuel injection. Lubrication. Mechanical design of a typical engine. (G)
- 436: Air Conditioning and Refrigeration.** 0-3-3. Preq., MEEN 334 and 353. Analysis and design of heating, ventilating and air conditioning systems for residential, commercial, and industrial applications. (G)
- 446: Advanced Fluid Mechanics.** 3-2-3. Preq., MEMT 313 and MATH 245. Principles of viscous fluid flow including dimensional analysis and similarity, duct flows, boundary layer flow, turbomachinery, flow measurement and control and design of fluid systems. (G)
- 448: Gas Dynamics.** 0-3-3. Preq., MEEN 334 and MATH 245. Study of the fundamental laws applied to compressible fluid flow. Isentropic flow, normal and oblique shocks, Prandtl-Meyer, Fanno, Rayleigh flow and supersonic design. (G)
- 450: Special Problems.** 1-4 hours credit. Preq., senior standing and consent of instructor. Topics selected will vary from term to term for the purpose of covering selected topics of current importance or special interest.
- 451: Thermal Design.** 3-2-3. Preq., MEEN 353 and MEMT 313. Design of thermal components and systems.
- 465: Machine Element Design.** 0-2-2. Preq., MEEN 292 and 361. Application of principles of strength of materials to the design of typical machine elements.
- 467: Computer-Aided Design.** 0-3-3. Preq., MEEN 465 or consent of instructor. An introduction to the application of several modern computing techniques and technologies to the mechanical engineering design process. (G)
- 469: Prevention of Mechanical Failure.** 0-3-3. Preq., MEEN 361. Analysis, prediction and prevention of failures in a structure or machine part during the design phase. (G)
- 475: Mechatronics.** 4-2-3. Preq., MEEN 292, MATH 245 or equivalent. A study of the interface between controllers and physical systems; principles of electromechanical design, digital and analog circuitry, actuation, sensing, embedded control, and real-time programming. (G)
- 476: Feedback Control Systems.** 3-2-3. Preq., MEEN 371. The analysis, design and synthesis of mechanical systems employing feedback control. Methods of determining system stability. Typical mechanical control elements and their transfer functions.
- 477: Mechanical Vibrations.** 3-2-3. Preq., MEEN 371. Introduction to free and forced linear vibration of discrete and continuous mechanical systems. Analysis of translational and rotational systems using analytical and numerical methods.
- 478: Engineering Acoustics.** 0-3-3. Preq., MATH 245. Analysis and design of systems for noise control, including vibration isolation, silencers, room acoustic treatment and acoustic barriers. (G)
- 486: Mechanical Engineering Laboratory.** 3-0-1. Preq., ENGL 463, MEEN 353, 361, 382, MEMT 313. Design and performance of laboratory experiments in mechanical engineering.
- 488: Solids Modeling in Engineering Design.** 0-3-3. Preq., Instructor's consent. Engineering design using 3-d graphics, constructive solid geometry, boundary representations, parametric surfaces and data exchange standards. (G)
- 490: Applications of Artificial Intelligence and Expert Systems in Mechanical and Industrial Engineering.** 3-2-3. Preq., permission of instructor. Introduction to artificial intelligence, expert systems and their application in industrial, mechanical and manufacturing engineering systems. (G)
- 492: Mechanical Engineering Design I.** 3-1-2. Preq., MEEN 215, 321, 451, 465, ENGL 463 and INEN 300. Open-ended design problems calling for the integration of thermal sciences, machine design, economics, etc.
- 494: Mechanical Engineering Design III.** 3-0-1. Preq., MEEN 492. A continuation of MEEN 492.
- 496: Computational Techniques in Mechanical Engineering.** 0-3-3. Preq., MEEN 292. The use of the digital computer in achieving numerical solutions to typical problems in the engineering design and analysis of thermal fluid and mechanical systems.
- 497: Finite Element Methods for Engineers.** 0-3-3. Preq., MEEN 334 and 361. Introduction to approximation methods in engineering using finite elements. Physical and mathematical theory, computer applications. (G)
- 499: Technical Enrichment Course.** 3-0-1. (6) Preq., consent of instructor. (Pass/Fail). May be repeated for a maximum of 6 hours of credit. Varying new technologies. Does not count toward graduation in Mechanical Engineering. Contact the department for more information.
- 500: Energy, Sources and Utilization.** 0-3-3. Energy sources, uses and conservation; physical laws governing energy conversion and energy transfer; economic, political and environmental problems related to energy.
- 502: Advanced Machine Design.** 0-3-3. The study of various topics from advanced mechanics as are applicable in the design of machines.
- 521: Machining Analysis.** 3-2-3. The force and power analysis of material removal processes; analytical and finite element modeling and experimentation to determine process variables and relation to part quality.
- 524: Graduate Seminar.** 0-1-1. Surveys, investigations, and discussions of current problems in mechanical engineering.
- 525: Graduate Seminar.** 0-1-1. Surveys, investigations, and discussions of current problems in mechanical engineering.
- 526: Graduate Seminar.** 0-1-1. Surveys, investigations, and discussions of current problems in mechanical engineering.
- 531: Advanced Thermodynamics.** 0-3-3. Fundamental laws of thermodynamics; entropy and entropy production; kinetic theory of gasses; statistical thermodynamics; quantum thermodynamics for various systems.
- 542: Advanced Heat Transfer I.** 0-3-3. Steady and transient conduction heat transfer; analytical solutions; approximate solutions; numerical methods.

- 543: Advanced Heat Transfer II.** 0-3-3. Continuation of MEEN 542. Principles of forced and natural convection in laminar and turbulent flow; thermal radiation.
- 545: Potential Flow.** 0-3-3. Basic principles and analytical methods for the motion of an inviscid, incompressible fluid. Eulerian equations. Conformal transformation. Mapping of flows. Rotation, circulation, and vorticity.
- 546: Viscous Flow I.** 0-3-3. Study of the governing principles and methods in viscous fluid flow. Solutions of the integral and differential equations for laminar flow. Digital computer applications.
- 547: Viscous Flow II.** 0-3-3. Preq., MEEN 546. Study of transition, turbulence, and compressibility in viscous flow. Theory of stability of laminar flows. Fundamentals of turbulent flow.
- 550: Special Problems.** 1-4 semester hours. Advanced problems in mechanical engineering. The problems and projects will be treated by current methods used in professional practice.
- 551: Research and Thesis in Mechanical Engineering.** 3 hours credit (6). Registration in any quarter may be for three semester hours credit or multiples thereof. Maximum credit allowed is six semester hours.
- 552: Heat Exchanger Design.** 0-3-3. A study of the thermal and mechanical design of heat exchangers, regenerators, and radiators.
- 553: Thermal Stresses.** 0-3-3. Thermal stresses in structures; plane stress problems; thermal stresses in plates and shells; thermoelastic instability; thermal fatigue, creep and inelastic thermal stresses at high temperatures.
- 555: Practicum.** 0-3-3 (6). Preq., 12 semester hours of graduate work. Analytical and/or experimental solution of an engineering problem; technical literature survey required; development of engineering research techniques.
- 557: Special Topics: Mechanical Engineering.** 0-3-3 (9). The topic or topics will be selected by the instructor from the various sub-areas of mechanical engineering. May be repeated as topics change.
- 566: Design Optimization.** 0-3-3. Preq., MEEN 467 or consent of instructor. Constrained nonlinear minimization algorithms applied to mechanical engineering design problems.
- 568: Advanced Vibrations.** 0-3-3. Analytical and numerical treatment of nonlinear and multidegree-of-freedom vibration problems in mechanical engineering.
- 569: Robot Manipulators.** 0-3-3. The application of the basic principles of kinematics, dynamics, automatic control, computer programming, and human factors to the development of general purpose, programmable robot manipulators.
- 571: Advanced Engineering Dynamics.** 0-3-3. Fundamentals of Newtonian dynamics principles of work and energy, D'Alembert's principle, Hamilton's principle, LaGrange equation. Central force motion, virial theorem. Rigid body motion and robotics.
- 575: Advanced Mechanical Systems Controls I.** 0-3-3. The analysis and design of controllers for dynamic mechanical systems. System identification and plant controller response matching. Controllers for typical thermal and mechanical systems.
- 589: Computer Animation in Engineering.** 0-3-3. Preq., MEEN 488. Computer generated animation for display of dynamic simulation or analysis results using solids models and color graphics.
- 591: Mechanical Engineering Analysis I.** 0-3-3. Mathematical modeling of engineering systems. Physical interpretation of ordinary and partial differential equations and methods of solution.
- 592: Mechanical Engineering Analysis II.** 0-3-3. A continuation of MEEN 591 with emphasis on approximate techniques for formulating and solving mathematical models of physical systems.
- 593: Advanced Finite Element Methods.** 0-3-3. Development of the finite methods element using the variational formulation. Applications in structures, fluid mechanics and heat transfer.
- 641: Aerothermodynamics.** 0-3-3. Preq., MEEN 543 and MEEN 547. Study of governing principles of hypervelocity flight. Laminar and turbulent flow of a dissociating gas. Shock-wave boundary-layer interaction. Slip flow. Free-molecular flow.
- 650: Special Problems.** 1-4 semester hours. Preq., Consent of department head. Advanced problems in mechanical engineering. Special problems suitable for doctoral-level work.
- 651: Advanced Cryogenics.** 0-3-3. Preq., MEEN 542. Study of mechanical regenerative cryocoolers and nonmechanical refrigeration systems used to achieve and maintain temperatures below 120 K.
- 672: Advanced Mechanical Systems Controls II.** 0-3-3. Preq., MEEN 575, ELEN 510, or consent of instructor. Control systems for complex,

compliant systems such as industrial robots. Adaptive systems and intelligent controllers.

MECHANICAL TECHNOLOGY (METE)

- 215: Thermal Science.** 0-3-3. Preq., MATH 112. Temperature; heat; work; first law of thermodynamics; basic principles of heat transfer.

MECHANICS AND MATERIALS (MEMT)

- 201: Engineering Materials.** 0-2-2. Preq., ENGR 122, PHYS 201. A study of the basic principles which relate the internal structure of materials to their mechanical, physical, and electrical properties.
- 206: Statics and Strength of Materials.** 3-2-3. Preq., PHYS 209. Mechanics of rigid and deformable bodies, force systems, stresses and strains, fundamental concepts of static equilibrium, centroids, moments of inertia, and friction, and basic beam design.
- 211: Intermediate Strength of Materials.** 3-1-2. Preq., ENGR 220. Mechanics of deformable bodies. Axial, shear, torsion and bending. Inelastic and indeterminate problems.
- 312: Dynamics.** 0-2-2. Preq., ENGR 220 and PHYS 201. Kinematics and kinetics of particles and solid bodies in rectilinear, rotational and plane motion, energy methods, linear impulse and momentum.
- 313: Elementary Fluid Mechanics.** 3-2-3. Preq., ENGR 220 and MATH 242. Properties of fluids, fluid statics. Continuity, energy, and impulse-momentum equations. Steady flow in pipes and open channels. Fluid measurements. General fluid mechanics/hydraulics laboratory.
- 411: Advanced Engineering Materials.** 0-3-3. Preq., MEMT 201 and MEEN 361 or consent of instructor. An introduction to modern engineering materials. Examination of newer materials such as high strength steels, polymers and composites.
- 508: Finite Element Analysis.** 0-3-3. Linear and nonlinear finite element analysis of continual and discretized structures; use of finite element computer programs to solve typical structural problems.
- 511: Modern Engineering Materials.** 0-3-3. An introduction to modern engineering materials with an emphasis on light weight or high strength materials such as polymers, composites, and high strength steels.
- 563: Theory of Elasticity.** 0-3-3. General equations of elasticity; plane stress and plane strain; torsion and flexure of bars; Hertz contact stresses.
- 564: Plates and Shells.** 0-3-3. Pure bending of plates; laterally-loaded plates; membrane theory of shells; bending of cylindrical and spherical shells.
- 565: Continuum Mechanics.** 0-3-3. Introductory treatment of the fundamental, unifying concepts of the mechanics of continua.
- 577: Advanced Strength of Materials.** 0-3-3. Energy methods, advanced bending theory, torsion, stress concentrations, failure theory and elastic stability.
- 588: Inelastic Deformation.** 0-3-3. Analytical and numerical modeling of inelastic deformation in metals, polymers and ceramics, including plasticity, creep, viscoelasticity, and viscoplasticity.

MERCHANDISING AND CONSUMER STUDIES (MCS)

- 108: Professional Career Orientation.** 0-2-2. Structured experiences in career assessment and exploration, leadership, and communication in the professional arena. Open to non-majors.
- 118: Pattern Design and Construction.** 6-1-3. Introduction to basic pattern making techniques, fit, and construction. Some emphasis on techniques, commercial patterns, and ready-to-wear construction.
- 146: Internet for Personal and Family Management.** 0-1-1. An introduction to the use of internet for personal and family activities.
- 218: Analysis of Children's Apparel.** 0-1-1. Analysis of apparel for infants and young children.
- 219: Textiles I.** 0-3-3. Study of fiber properties and production of textiles.
- 238: Apparel Selection and Analysis of Fashion.** 0-3-3. Contemporary apparel needs of individuals and families with recognition of cultural, economic, and psychological factors.
- 246: Microcomputers in Personal and Family Management I.** 3-2-3. An introduction to the use of microcomputers for more effective management of personal and family related tasks.
- 256: Individual and Family Management.** 0-3-3. A systems approach to the management of personal and family resources.
- 258: Professional Selling Experience.** 8.5-1-3. Preq., MCS 108 or consent of instructor. Supervised professional selling experience with emphasis on customer satisfaction and service. Field experience with cooperating firms.

- 268: Apparel Design I.** 3-2-3. Preq., MCS 219. Application of principles related to the creation, fabrication and execution of apparel design.
- 276: Environments for Young Children.** 0-1-1. Preq., FCS 201 or consent of instructor. Principles of housing and equipment applied to creating learning environments for infants and young children.
- 308: Buying.** 0-3-3. Preq., MCS 258. Buying function in retail organizations. Includes merchandising concepts essential for buyers.
- 338: Intermediate Apparel Construction.** 6-0-2. Preq., MCS 118 or consent of instructor. Emphasis on evaluation and use of advanced construction techniques including tailoring and couture methods.
- 348: Merchandising and Computer Management.** 1-2-2. Preq., MCS 246 and 308 or consent of instructor. Procedures and task management for the retailer through computer application.
- 356: Families as Consumers.** 0-3-3. Preq., ECON 215. Application of principles of consumerism to family decisions related to time and money use.
- 366: Consumer Issues.** 0-3-3. Issues that arise between sellers/government and consumers including legislation, regulation and safety issues.
- 388: Media Planning and Promotion.** 3-2-3. Preq., MCS 258 and 348. Study and application of principles of product promotion. Emphasis on coordination of customer targeting, communications, media presentation, and special events.
- 416: Interior Space Planning and Furnishings.** 0-3-3. Preq., MCS 219 or consent of instructor. Study of the furnishings, fixtures, and design components for residential and commercial interiors.
- 419: Textiles II.** 0-3-3. Preq., MCS 219 or consent of instructor. Study of textile products in relation to end-use, product quality, technology and trade regulations. (G)
- 426: Housing Policy.** 0-3-3. Social aspects of housing including zoning, government regulations, and purchase considerations. (G)
- 429: Issues in Merchandising.** 0-3-3. Preq., junior or senior standing. Domestic and international issues affecting merchandising and consumer studies. (G)
- 436: Advanced Individual and Family Management.** 4-2-3. Preq., MCS 256, and advanced junior standing. Planning, coordinating, and evaluating all phases of individual and family management.
- 439: Historic Costume I.** 0-3-3. Development of costume from ancient Egypt through the 17th century, with emphasis on social, economic, and aesthetic influences on its design.
- 440: Historic Costume II.** 0-3-3. Development of costume from 18th century until the present, with emphasis on social, economic, and aesthetic influences. (G)
- 446: Microcomputers in Personal and Family Management II.** 0-3-3. Preq., MCS 246. Advanced study in the use of microcomputers in personal and family management.
- 456: Consumer Decision Making.** 0-3-3. Behavior of the consumer with reference to economic decision making and expenditure patterns relevant to current lifestyles. (G)
- 466: Consumer Relations.** 0-3-3. Preq., HEC 327 or JOUR 450 or consent of instructor. Professional strategies and tactics in consumer studies programs. (G)
- 488: Visual Merchandising.** 3-2-3. Preq., MCS 466 or consent of instructor. Promotion of products through visual merchandising techniques including display and store layout and design.
- 498: Field Study Tour in Merchandising and Consumer Studies.** 3-1-3 (6). Structured educational experiences in major industry centers in the United States and abroad. Application required. (G)
- 516: Family and Consumer Economics Issues.** 0-3-3. (12) Analysis of family and consumer in the larger economic and political systems.
- 528: Consumer Motivation and Factors in Apparel.** 0-3-3. Relationship of consumer behavior to fashion; analysis of factors relative to production, distribution, and consumption of apparel and textiles.
- 536: Consumer Needs of Older Population.** 0-3-3. Issues facing consumer affairs professionals working with the older consumer.
- 556: Current Trends in Consumer Decision Making.** 0-3-3. (12) Preq., MCS 456 or consent of instructor. Recent advances and current research in behavior of the consumer with reference to economic decision making and expenditure patterns relevant to current lifestyles.

MICRO SYSTEMS ENGINEERING (MSE)

- 401: Microsystems Principles.** 0-3-3. Fundamentals of microsystems, emphasizing the basic principles, materials, fabrication, measurement, and applications of microsystems.

- 402: Microfabrication Principles.** 0-3-3. Preq., MSE 401. Fundamentals of microfabrication processes for the realization of microelectromechanical and microelectronic devices.
- 403: Microfabrication Applications and Device Fabrication.** 3-2-3. Preq., MSE 402. Microfabrication processes, process integration and applications for the realization of microelectromechanical and microelectronic devices.
- 501: Microsystems Principles.** 0-3-3. Fundamentals of microsystems, emphasizing the basic principles, materials, fabrication, measurement, and applications of microsystems.
- 502: Microfabrication Principles.** 0-3-3. Preq., MSE 501. Fundamentals of microfabrication processes for the realization of microelectromechanical and microelectronic devices.
- 503: Microfabrication Applications and Device Fabrication.** 3-2-3. Preq., MSE 502. Microfabrication processes, process integration and applications for the realization of microelectromechanical and microelectronic devices.
- 511: Vacuum Science & Technology.** 0-3-3. Fundamental and advanced practices of vacuum technology are treated. Ultra high vacuum is included as well as introductory material on thin films and plasma processes.
- 521: Fundamental Lithography Processes.** 0-3-3. A graduate level course in the fundamentals of optical lithography and electron beam lithography.
- 531: Electronic Materials.** 0-3-3. A graduate level course in electronic materials starting from the atomic theory of matter. Applications include the fundamentals of microelectronic and optoelectronic devices.
- 541: Thin Film Deposition & Etching Techniques.** 0-3-3. Fundamentals of deposition and processing of thin films for microstructure and microelectronics. Applications include micromechanical and microelectronic devices.
- 551: Material Analysis & Microstructure.** 0-3-3. A graduate level course in the characteristics of materials based on modern instrumental techniques. Bulk and surface characteristics are included.
- 561: Micro & Nano Scale Measurements.** 0-3-3. A graduate level course in measurements from the millimeter to the atomic scale. Applications include atomic manipulation and nanometer motion control.
- 641: Laser & Ion Beam Processing.** 0-3-3. Direct methods for material processing and microstructure fabrication using laser beams or ion beams are presented. Applications include electronic devices and characterization of materials.

MUSIC APPLIED, CLASSES & RECITALS (MUAP)

- 100: General Recital.** 1-0-0. A weekly, live performance laboratory for all music majors and minors taken concurrently with private lessons. Includes evening recital and concert attendance as required by the respective private lesson studio.
- 101: Class Piano-Major.** 2-0-1(3). Group instruction in the techniques of basic piano skills for the music major. A piano proficiency must be successfully passed within 3 quarters of study.
- 102: Class Voice.** 1-1-1. Group instruction in the techniques of the singing voice.
- 232: French Diction.** 1-1-1. Pronunciation of French art song (melodie).
- 233: Italian Diction.** 1-1-1. Pronunciation of Italian art song.
- 234: German Diction.** 1-1-1. Pronunciation of German art song (Lieder).
- 399: Undergraduate Recital.** 1-0-0. Preq., Recital Committee approval. For all music majors, preparation and performance of a degree recital of not less than 25 minutes of music.
- 499: Undergraduate Recital.** 1-0-0. Preq., Recital Committee approval. For Bachelor of Fine Arts in Music Performance degree candidates, preparation and performance of a degree recital of not less than 50 minutes of music.

MUSIC APPLIED, PRIVATE LESSONS (MUPV)

Music Applied courses refer to private lessons taken in the appropriate studio in an area declared by the student. In order to be eligible to register for 400-level courses a student must pass an upper-division jury. This is usually done in the Spring of the Sophomore year. This rule applies only to music majors. Non-music majors may enroll at the 100 level according to the limitation of the applied instructor's schedule. All students must have the approval of the applied music instructor before registering for private lessons.

Minor Level

These courses are designed for students electing to minor in music, majors studying a secondary instrument, and non-music majors. Students register in

the specific area or instrument as designated by the course number. Students minoring in music must also register for MUAP 100: General Recital concurrently with private study.

- 111: **Applied Piano - Minor.** 1-0-1.
- 121: **Applied Organ - Minor.** 1-0-1.
- 131: **Applied Voice - Minor.** 1-0-1.
- 151: **Applied Violin - Minor.** 1-0-1.
- 152: **Applied Viola - Minor.** 1-0-1.
- 153: **Applied Cello - Minor.** 1-0-1.
- 154: **Applied Bass - Minor.** 1-0-1.
- 155: **Applied Guitar - Minor.** 1-0-1.
- 161: **Applied Flute - Minor.** 1-0-1.
- 162: **Applied Oboe - Minor.** 1-0-1.
- 163: **Applied Bassoon - Minor.** 1-0-1.
- 164: **Applied Clarinet - Minor.** 1-0-1.
- 165: **Applied Saxophone - Minor.** 1-0-1.
- 171: **Applied Trumpet - Minor.** 1-0-1.
- 172: **Applied French Horn - Minor.** 1-0-1.
- 173: **Applied Trombone - Minor.** 1-0-1.
- 174: **Applied Euphonium - Minor.** 1-0-1.
- 175: **Applied Tuba - Minor.** 1-0-1.
- 181: **Applied Percussion - Minor.** 1-0-1.

Lower Division

These courses are designed for the music major studying privately at the lower division level whose declared major is in the specific area designated by the course number. The letter "A" is added to the end of the course number to indicate 1 hour of credit and the letter "B" indicates 2 hours of credit.

- 211: **Applied Piano - Major.** 1-2 semester hours.
- 221: **Applied Organ - Major.** 1-2 semester hours.
- 231: **Applied Voice - Major.** 1-2 semester hours.
- 251: **Applied Violin - Major.** 1-2 semester hours.
- 252: **Applied Viola - Major.** 1-2 semester hours.
- 253: **Applied Cello - Major.** 1-2 semester hours.
- 254: **Applied Bass - Major.** 1-2 semester hours.
- 255: **Applied Guitar - Major.** 1-2 semester hours.
- 261: **Applied Flute - Major.** 1-2 semester hours.
- 262: **Applied Oboe - Major.** 1-2 semester hours.
- 263: **Applied Bassoon - Major.** 1-2 semester hours.
- 264: **Applied Clarinet - Major.** 1-2 semester hours.
- 265: **Applied Saxophone - Major.** 1-2 semester hours.
- 271: **Applied Trumpet - Major.** 1-2 semester hours.
- 272: **Applied French Horn - Major.** 1-2 semester hours.
- 273: **Applied Trombone - Major.** 1-2 semester hours.
- 274: **Applied Euphonium - Major.** 1-2 semester hours.
- 275: **Applied Tuba - Major.** 1-2 semester hours.
- 281: **Applied Percussion - Major.** 1-2 semester hours.

Upper Division

These courses are designed for the music major studying privately at the upper division level whose declared major is in the specific area designated by the course number. Students must have passed the upper division exam to be eligible. The letter "A" is added to the end of the course number to indicate 1 hour of credit and the letter "B" indicates 2 hours of credit.

- 411: **Applied Piano - Major.** 1-2 semester hours.
- 421: **Applied Organ - Major.** 1-2 semester hours.
- 431: **Applied Voice - Major.** 1-2 semester hours.
- 451: **Applied Violin - Major.** 1-2 semester hours.
- 452: **Applied Viola - Major.** 1-2 semester hours.
- 453: **Applied Cello - Major.** 1-2 semester hours.
- 454: **Applied Bass - Major.** 1-2 semester hours.
- 455: **Applied Guitar - Major.** 1-2 semester hours.
- 461: **Applied Flute - Major.** 1-2 semester hours.
- 462: **Applied Oboe - Major.** 1-2 semester hours.
- 463: **Applied Bassoon - Major.** 1-2 semester hours.
- 464: **Applied Clarinet - Major.** 1-2 semester hours.
- 465: **Applied Saxophone - Major.** 1-2 semester hours.
- 471: **Applied Trumpet - Major.** 1-2 semester hours.
- 472: **Applied French Horn - Major.** 1-2 semester hours.
- 473: **Applied Trombone - Major.** 1-2 semester hours.
- 474: **Applied Euphonium - Major.** 1-2 semester hours.
- 475: **Applied Tuba - Major.** 1-2 semester hours.
- 481: **Applied Percussion - Major.** 1-2 semester hours.

MUSIC DIRECTED STUDIES (MUDS)

- 450: **Directed Studies.** 1-4 semester hours (6). Preq., consent of advisor. Selected study in an identified area in Music. Credit depends on the nature of problem and work accomplished. May be repeated for credit.
- 550: **Directed Studies.** 1-4 semester hours (6). Preq., consent of advisor. Selected study in an identified area in Music. Credit depends on the nature of the problem and work accomplished. May be repeated for credit.

MUSIC ENSEMBLE (MUEN)

- Students of Freshman or Sophomore standing sign up for 200 level. Students who have achieved Junior or Senior level standing sign up for 400 level.
- 200/400: **Chamber Ensemble.** 1-0-1 (6). Instruction and performance in small instrumental or vocal ensembles.
 - 231/431: **University Concert Choir.** 4-0-1 (12). Preq., audition. Major Ensemble. Instruction and performance in large vocal ensemble.
 - 232/432: **Chamber Singers.** 2-0-1 (12). Preq., audition. Major Ensemble. Instruction and performance in advanced vocal ensemble.
 - 233/433: **Gospel Choir.** 2-0-1 (6). Instruction and performance in vocal ensemble with emphasis on ethnic, religious material.
 - 234/434: **Opera Workshop.** 1-0-1 (3). A function study in opera performance including vocal, dramatic, and technical aspects of opera production.
 - 251/451: **Chamber Orchestra.** 4-0-1 (6). Preq., audition. Instruction and performance in string ensemble.
 - 260/460: **Musical Stage Orchestra.** 3-1-2 (8). Orchestral experience with literature and techniques of music theatre.
 - 261/461: **Musical Stage Production.** 3-1-2 (8). Practical study of theories, practices and techniques of musical stage production.
 - 271/471: **University Marching Band.** 4-0-1 (4). Preq., audition required. Major Ensemble. Instruction and performance in the college marching band. Includes performance in designated football games, bowl games, pep rallies and other presentations as directed.
 - 272/472: **Fall Wind Ensemble.** 1-0-1 (2). Preq., audition. Open to any major. Instruction and performance in concert band. Includes reading and study of selected works from the major standard band repertoire for participating music majors.
 - 273/473: **Symphonic Wind Ensemble.** 4-0-1 (4). Preq., audition. Major ensemble. Instruction and performance in advanced band ensemble.
 - 274/474: **University Concert Band.** 4-0-1 (4). Preq., audition. Major ensemble. Instruction and performance in band ensemble.
 - 275/475: **University Jazz Ensemble.** 3-0-1 (6). Preq., audition. Performance and instruction in stage band ensemble covering a variety of jazz styles and genres.
 - 281/481: **Percussion Ensemble.** 2-0-1 (6). Preq., audition. Performance and instruction in the various combinations of percussion ensemble.

MUSIC GENERAL (MUGN)

- 112: **Beginning Piano.** 2-0-2 (6). Preq., consent of instructor. Instruction in beginning piano techniques for the non-music major.
- 152: **Beginning Guitar.** 2-0-2 (6). Preq., consent of instructor. Instruction in beginning guitar techniques for the non-music major.
- 290: **Music Appreciation.** 0-3-3. Satisfies General Education Requirement for Fine Arts Appreciation. For non-music majors. Attempts to answer the question "What is Music?" by acquainting students with knowledge and appreciation of music from several cultures and eras.

MUSIC HISTORY AND LITERATURE (MUHS)

- 101: **Music Literature I.** 0-2-1. A broad survey of music literature from the Middle Ages to the Early Baroque. Includes selected music of Native American peoples.
- 102: **Music Literature II.** 0-2-1. A broad survey of music literature from the Baroque through the Classical era.
- 103: **Music Literature III.** 0-2-1. A broad survey of music literature from the Romantic era to the modern era. Includes selected world music.
- 304: **Music History I.** 0-3-3. Preq., MUTH 102 or permission of instructor. Survey of music history and literature from ancient times through mid-eighteenth century. Concentrates on music of Western European traditions from Renaissance through Baroque era.
- 305: **Music History II.** 0-3-3. Preq., MUTH 102 or permission of instructor. Survey of music history and literature from mid-eighteenth century through 1970's. Latter part of course will introduce some musical concepts and traditions of non-western cultures.

- 306: Introduction to Non-Western Music.** 0-2-2. Preq., MUHS 305 or permission of instructor. An introduction to the music and musical life of the world's peoples by sampling and by synthesis.
- 307: Introduction to Jazz History.** 0-2-2. Preq., MUHS 305 or permission of instructor. Cultivate in the music major an understanding of jazz music through a comprehensive study of major artists and styles from 1900 to the present.
- 410: Piano Literature.** 0-3-3. A survey of piano literature from the Classic Period to the present including literature composed for earlier keyboard instruments.
- 430: Vocal Literature.** 0-3-3. A survey of vocal literature covering a wide diversity of composers, styles, and historical periods through discussion and analysis of representative works including assignments in listening, performance, and reading.
- 431: Choral Literature.** 0-2-2. A survey of choral literature covering a diversity of composers, styles, and historical periods through discussion and analysis of representative works.
- 432: Survey of Opera.** 0-3-3. Preq., permission of instructor. Designed to cultivate in students an understanding and enjoyment of opera by surveying selected, significant operatic works through viewing and analysis.
- 433: Survey of American Music Theatre.** 0-3-3. Preq., MUGN 290 or SPTH 290. Designed to increase the understanding and appreciation of the American Music Theatre genre through the study of musical theatre works, composers, lyricists, directors, and performers.

MUSIC PEDAGOGY (MUPD)

- 300: Beginning Conducting.** 1-1-1. Elementary methods, principles and practice of conducting.
- 301: Choral Conducting.** 1-2-2. Preq., MUTH 201 and MUPD 300. Principles of interpretation and score reading with emphasis on choral conducting. Includes laboratory experience with the choral ensembles.
- 302: Instrumental Conducting.** 1-2-2. Preq., MUTH 201 and MUPD 300. Principles of interpretation and score reading with emphasis on instrumental conducting. Includes laboratory experience with the instrumental ensembles.
- 303: Instruments.** 1-1-1. Preq., MUTH 102. Group instruction in the functional knowledge of wind, string, fretted, and percussion instruments for vocal majors.
- 311: Piano for Vocal Education.** 2-0-2. Preq., students must have passed all parts of the piano proficiency exam and have the consent of the instructor. Experiences in improvising, transposing and performing vocal accompaniments at the piano. These skills are required for vocal music education majors.
- 331: Vocal Methods.** 1-1-1. Group instruction in the singing voice including methods and materials of instruction for the music educator. Includes laboratory experiences and observation at the elementary and secondary levels.
- 334: Elementary Teachers Appreciation/Methods.** 0-3-3. Provides an understanding and appreciation of the elements of music.
- 351: String Methods.** 2-0-1. Group instruction in strings including methods and materials of instruction for the music educator. Includes laboratory experiences and observation at the elementary and secondary levels.
- 352: Guitar Methods.** 2-0-1. Group instruction in fretted instruments including methods and materials of instruction for the music educator. Includes laboratory experiences and observation at the elementary and secondary levels.
- 361: Flute Methods.** 2-0-1. Group instruction in flute including methods and materials of instruction for the music educator. Includes laboratory experiences and observation at the elementary and secondary levels.
- 362: Single Reed Methods.** 2-0-1. Group instruction in single reed instruments including methods and materials of instruction for the music educator. Includes laboratory experiences and observations at the elementary and secondary levels.
- 363: Double Reed Methods.** 2-0-1. Group instruction in double reed instruments including methods and materials of instruction for the music educator. Includes laboratory experiences and observation at the elementary and secondary levels.
- 371: High Brass Methods.** 2-0-1. Group instruction in high brass instruments including methods and materials of instruction for the music educator. Includes laboratory experiences and observation at the elementary and secondary levels.
- 372: Low Brass Methods.** 2-0-1. Group instruction in low brass instruments including methods and materials of instruction for the music educator.

Includes laboratory experiences and observation at the elementary and secondary levels.

- 381: Percussion Methods I.** 2-0-1. Group instruction in percussion instruments including methods and materials of instruction for the music educator. Includes laboratory experiences and observation at the elementary and secondary levels.
- 382: Percussion Methods II.** 2-0-1. Preq., MUPD 381. Continuation of MUPD 381.
- 410: Piano Pedagogy I.** 1-1-2. Methods and materials used in teaching piano to beginners. Required by the State Department of Education for teachers wishing to be certified in piano.
- 411: Piano Pedagogy II.** 1-1-2. Preq., MUPD 410. Continuation of MUPD 410. Practice teaching of beginning students in integral to this course.
- 430: Vocal Pedagogy.** 1-1-2 (4). Methods and materials of teaching voice in private studio and/or in the school.
- 464: Elementary Music Methods.** 0-3-3. An overview of the methodologies of Orff, Kodaly, and Dalcroze. Learning to plan, execute and evaluate music programs in the elementary school. Includes observation at the elementary level.
- 465: Secondary Vocal Methods.** 0-3-3. Examines the materials and methods for the teacher and supervisor of vocal music, e.g., program building, contests, festivals, requisitions, grading, materials, scheduling, and rehearsing. Includes observation at the secondary level.
- 466: Secondary Instrumental Methods.** 0-3-3. Examines the materials and methods for the teacher and supervisor of instrumental music, e.g., program building, contests, festivals, requisitions, grading, materials, scheduling, and rehearsing. Includes observation at the secondary level.

MUSIC TECHNOLOGY (MUTC)

- 141: Music Technology.** 1-2 semester hours. Individualized instruction in the techniques of working with various sound sources and resources in the field of music technology.
- 301: Computer Science in Music.** 2-2-3. Study of general computer applications and music related applications including notation, graphics, sound generation, sequencing, audio manipulation, and other related uses.

MUSIC THEORY (MUTH)

- 100: Rudiments of Music Theory.** 0-2-2. Instruction in the fundamentals of music theory including reading, notation, and aural skills.
- 101: Music Theory I.** 2-2-2. Preq., diagnostic exam. Beginning study of fundamentals of music covering the areas of notation, ear-training, sight singing, and functional keyboard.
- 102: Music Theory II.** 2-2-2. Preq., MUTH 101. Continuation of MUTH 101, increasing emphasis on common-practice harmonic vocabulary.
- 103: Music Theory III.** 2-2-2. Preq., MUTH 102. Continuation of MUTH 102.
- 201: Music Theory IV.** 2-2-2. Preq., MUTH 103. Continuation of MUTH 103 with emphasis on the organization and interaction of melodic, harmonic and rhythmic concepts and music forms. Aural training and functional keyboard is intensified in proportion to the depth of course content.
- 202: Music Theory V.** 2-2-2. Preq., MUTH 201. Continuation of MUTH 201.
- 203: Music Theory VI.** 2-2-2. Preq., MUTH 202. Continuation of MUTH 202.
- 301: Music Composition.** 0-3-3. Preq., MUTH 203. A survey of the techniques of 20th century composition with projects consisting of the writing of short compositions illustrating these techniques.
- 302: Form and Analysis.** 0-3-3. Preq., MUTH 203. A study of specific examples of the major forms of composition to show the relative importance of detail to the overall comprehension of a composition.
- 330: Choral Arranging.** 0-2-2. Preq., MUTH 203. A study of writing for the individual voices and the combinations of voices in choral ensembles.
- 370: Instrumental Arranging.** 0-2-2. Preq., MUTH 203. A study of writing for the individual instruments of the band and orchestra, the combinations of instruments in the various sections, and the combination of all the sections.
- 401: Counterpoint.** 0-3-3. Preq., MUTH 203. A study of contrapuntal practice of the 18th and 19th centuries with emphasis on the understanding of counterpoint within a harmonic context.

NURSING (NURS)

- 109: Introduction to Nursing.** 0-2-2. An introduction to the health care system and professional nursing. Basic human needs, the elderly client, and concepts related to death and dying are introduced.