

- LARCH 462 Landscape Architectural Technology III 3(2,2)** Advanced overview of construction materials and methods used in project implementation. Study characteristics, strengths, nominal sizes and uses of materials (asphalt, brick, concrete, stone, wood). Field trips, exercises, and preparation of construction documents develop understanding of how design ideas are realized in built form. *Preq:* LARCH 362.
- LARCH 490 Directed Studies and Projects in Landscape Architecture 1-5(0,3-15)** Comprehensive studies and/or research of special topics not covered in other landscape architecture courses. May be repeated for a maximum of ten credits. *Preq:* Consent of instructor.
- LARCH H491 Honors Research Methods for Landscape Architecture 1-3(1-3,0)** Students investigate various research methodologies in landscape architectural design or related areas and apply to student generated project(s). Students generate a proposal for Landscape Architecture Honors Research. *Preq:* Junior standing; membership in Calhoun Honors College, consent of Department Honors Program Advisor.
- LARCH 493 Professional Office Internship 1-3(0,3-9)** Office experience for advanced students. On-the-job learning requires a minimum of five uninterrupted sequential weeks of employment under the direct supervision of a preapproved registered landscape architect, architect, urban planner, or civil engineer. May be repeated for a maximum of six credits. To be taken Pass/Fail only. *Preq:* LARCH 352, 362, consent of instructor.
- LARCH H494 Landscape Architecture Honors Research 2-3(2-3,0)** Independent, student-generated research on a preapproved topic conducted under the supervision and weekly guidance of a faculty member. Second in a sequence of three required courses for students enrolled in Departmental Honors Program. Written interim report and presentation to faculty and honors students are required before the end of the semester. May be repeated for a maximum of six credits. *Preq:* LARCH H491, membership in Calhoun Honors College.
- LARCH H495 Landscape Architecture Honors Thesis 2-3(2-3,0)** Continuation of independent research, conducted under the supervision and weekly guidance of a faculty member. Third in a sequence of three required courses for students enrolled in Departmental Honors Program. Written thesis is submitted and presented before the end of the semester to qualify for Departmental Honors. *Preq:* LARCH H494.
- LARCH 503 Landscape Architecture Portfolio II 1(0,2)** Final portfolio course. Students' academic and design experiences over the five-year program are put in the final form that best communicates their experiences and achievements. *Preq:* LARCH 103 or consent of instructor.
- LARCH 550 Professional Project Studio 3(0,6)** Comprehensive project with a client. Projects may be linked to the Design Arts Partnership, the Center for Community Growth and Change, or the Department of Planning and Landscape Architecture among other possibilities. *Preq:* LARCH 452 or consent of instructor.
- LARCH 551 Landscape Architecture Design V 3(1,10)** Studio work and adjunct lectures featuring complex problem-solving projects involving regional design analysis and planning, city planning and urban design, complex building relationships and intense site utilization in an urban setting. Studio may be taken in Charleston, Genoa, or Barcelona. *Preq:* LARCH 452.
- LARCH 552 Landscape Architecture Exit Project 6(0,12)** Studio work on student-selected professional level exit project including design-build project or substantive research project. Exit studio synthesizes and builds on skills developed throughout the Landscape Architecture program. Also provides opportunities for students to inquire into areas of interest not otherwise covered. *Preq:* LARCH 452.
- LARCH 562 Landscape Architectural Technology IV 2(0,4)** Studio course for the integration of design and technology. *Preq:* LARCH 462, professional standing. *Coreq:* LARCH 552.
- LARCH 581 Landscape Architectural Professional Practice 3(3,0)** Lecture course dealing with general consideration of landscape architectural office procedures. Study of the professional relationships of the landscape architects to client and contractor including problems of ethics, law, and business. *Preq:* Professional standing or consent of instructor.

LANGUAGE

LANG 300 Introduction to Linguistics and Foreign Language Learning 3(3,0) Introduction to the field of linguistics, including the study of phonetics, phonology, morphology, syntax, and semantics. Discussion of issues pertaining to foreign language acquisition.

LANG 303 Study Abroad Transfer 3-6(3-6,0) Course for credit transfer of any course taken abroad during a department-approved study. Requires a minimum of two contact hours per week for at least 15 weeks or equivalent. Students may take a course outside their concentration. May be repeated for a maximum of six credits. To be taken Pass/Fail only. *Preq:* Consent of department chair.

LANG 340 Cosmopolis: The Myth of the City 3(3,0) Cross-cultural inquiry into the idea of the city through literary, political, and philosophical texts as well as film and architecture. *Preq:* Junior standing or consent of instructor.

LANG 342 Sacred and Profane Bodies 3(3,0) Cross-cultural inquiry into the ambivalence surrounding female sexuality implicit in images of women and, in particular, the division of women into "earthly" and "divine" categories. *Preq:* Junior standing or consent of instructor.

LANG 346 Walking and the Road 3(3,0) Cross-cultural inquiry into the epistemological, political, and aesthetic questions generated by walkers and the roads they travel in literature, philosophy, and film. *Preq:* Junior standing or consent of instructor.

LANG 348 The Child and the Adolescent 3(3,0) Cross-cultural inquiry into important theoretical questions of personal and political identity raised by the figure of the child and the adolescent in literature and film. *Preq:* Junior standing or consent of instructor.

LANG (PO SC) 350 Seminar in International News 3(3,0) Review of current news of significance for the world and for U.S. foreign policy through authentic sources such as foreign newspaper, television/radio broadcasts, and the internet. Student-led discussions in the target language groups (i.e. French, German, Spanish) are supplemented by joint debates in English from global perspectives. May be repeated for a maximum of six credits. *Preq:* FR 202, GER 202, SPAN 202, or consent of department chair.

LANG 356 Faces of Evil 3(3,0) Cross-cultural inquiry into evil as an ineradicable challenge to representation disclosed by notions of the monstrous, the enemy, the infinite, and death in literature, cultural theory, and the arts. *Preq:* Junior standing or consent of instructor.

LANG 371 Language and Culture 3(3,0) Surveys key topics, theories, and methodological approaches in linguistic anthropology. Examines the complex relationships among language, culture, and communicative behavior and provides students with conceptual tools that inform the study of language in its cultural contexts.

LANG 400, 600 Phonetics 3(3,0) Study of basic phonetic concepts used in the study of sounds in language.

LANG 401 China Study Abroad 3(3,0) Six-week intensive summer course on Chinese culture offered in China. Main topics include origin and history of Chinese language, Chinese nationalities, geography, architecture, arts, and social custom. All readings and discussions are in English. May be repeated for a maximum of six credits.

LANG 420, H420 France and the Francophone World 3(3,0) Selected masterpieces of French and Francophone Culture are considered within their historical and cultural context. All readings and instruction are in English. No knowledge of the foreign language is required. May be repeated for a maximum of six credits. *Preq:* Sophomore standing or consent of department chair.

LANG 450 Risk and Danger 3(3,0) Cross-cultural inquiry into the meanings of risk and danger as they are articulated in various literary and philosophical texts and films about gambling, duels, stunts, bullfights, wilderness adventure, and smoking. *Preq:* Junior standing or consent of instructor.

LANG (ENGL) 454 Selected Topics in International Film 3(2,3) Presents subtitled films of specific world cultures and basic film theory and discourse applicable to the selected areas. Taught in English. May be repeated for a maximum of six credits with consent of department chair. *Preq:* ENGL 310 or consent of instructor.

LANG 455 Hispanic Film: Documentary and Feature 3(3,0) Overview of theory and discourse on Hispanic film. Through lectures, discussions, and films, students become acquainted with film as a vehicle for understanding the Hispanic World. Taught in English. Films are in Spanish with English subtitles. *Preq:* Sophomore standing or consent of department chair.

LANG 460 Propaganda and the Totalitarian Recreation of the World 3(3,0) Cross-cultural inquiry into the various languages (philosophical, political, literary, and filmic, among others) that form a crucial weapon in the striving for hegemony over desire that marks the modern totalitarian project. *Preq:* Junior standing or consent of instructor.

LANG 462 Borders 3(3,0) Cross-cultural inquiry into representations of physical and non-physical borders. Provides a theoretical framework in which various forms of borders, limits, and boundaries can be studied through literature and other artistic media. *Preq:* Junior standing or consent of instructor.

LANG (PO SC) 485, 685 Global Affairs and Governments 3(3,0) See PO SC 485.

LANGUAGE AND INTERNATIONAL TRADE

Professors: P. R. Heusinkveld, *Director*, S. C. King, C. K. Nakuma, *Chair*; *Associate Professor:* T. Kishimoto; *Assistant Professors:* M. M. Rojas-Massei, J. Schmidt, G. E. Tissera, Y. Zhang; *Lecturers:* C. S. Edwards, L. J. Ferrell

L&IT 127 Introduction to Language and International Trade 1(1,0) Survey of the nature of international trade and related career opportunities. Information and applications of specific relevance to tourism, agriculture, and textile industries are offered. To be taken Pass/Fail only.

L&IT 400 Language and International Trade Internship 1-3 One-semester, full-time (or equivalent part-time) work assignment which provides the opportunity for students to extend theoretical classroom learning through work experience in an appropriate setting. A final report is required. May be repeated for a maximum of six credits. To be taken Pass/Fail only. *Preq:* FR 316, GER 316, or SPAN 316; 12 credit hours in a Language and International Trade technical option.

L&IT 401 Language and International Trade Practicum 1-3 Foreign language experience such as an approved study abroad program which provides the student with the opportunity to apply theoretical classroom learning to a foreign language experience in an appropriate setting. To be taken Pass/Fail only. *Preq:* FR 316, GER 316, or SPAN 316, six credits in language.

L&IT 402 Language and International Trade Directed Study 3 Directed study of an individual project in language and international trade. To be taken Pass/Fail only.

LATIN

LATIN 101 Elementary Latin 4(4,0) Course for beginners designed principally to teach the reading of the language.

LATIN 102 Elementary Latin 4(4,0) Continuation of LATIN 101.

LATIN 201 Intermediate Latin 3(3,0) Review of the fundamental principles of grammar in conjunction with readings from the Classical period. *Preq:* LATIN 102 or equivalent.

LATIN 202 Intermediate Latin 3(3,0) Continuation of LATIN 201 with the introduction of writings from the late Latin and Medieval periods. *Preq:* LATIN 201 or equivalent.

LAW

Associate Professor: F. L. Edwards; *Assistant Professor:* M. E. Mowrey; *Lecturers:* J. R. Jahn, V. L. S. Ward-Vaughn

LAW 322, H322 Legal Environment of Business 3(3,0) Examination of both state and national regulation of business. Attention is given to the constitution and limitations of power, specific areas in which governments have acted, and the regulations that have been imposed in these areas. *Preq:* Junior standing.

LAW 333 Real Estate Law 3(3,0) The nature of real property and means of acquiring rights therein: conveyance of ownership, creation and execution of deeds, mortgages, etc., landlord and tenant relationships, shared concepts, and government regulation.

LAW 399 Internship in Legal Studies 1-3 Faculty-supervised legal internship to give students learning opportunities that support their classroom experiences. Requires a minimum of six full-time weeks. Course enrollment and internship must occur in the same semester. Simultaneous credit cannot be received for another internship offering. May be repeated for a maximum of three credits. To be taken Pass/Fail only. *Preq:* Junior standing or consent of instructor.

LAW 405, 605 Construction Law 3(3,0) Provides a practical knowledge of legal principles applied to the construction process and legal problems likely to be encountered by practicing construction professionals. Topics include construction contracting, liability, claims and warranties, documentation, and responsibility and authority of contracting parties. *Preq:* LAW 322 or consent of instructor.

LAW 406 Sports Law 3(3,0) Provides awareness of sport-related legal issues. Topics include contracts, torts, arbitration, mediation, criminal liability, intellectual property, gender equity, disabilities, drug testing, and professional and amateur organizations. *Preq:* LAW 322, Senior standing.

LAW 420, 620 International Business Law 3(3,0) Intensive examination of the historical background of modern public and private international law; selected issues of public international law—human rights, law of war, United Nations' system, and international litigation; selected issues of private international law—international sales, international trade, and formation and operation of multinational businesses. *Preq:* LAW 322 or consent of instructor.

LAW 499 Selected Topics 1-3(1-3,0) In-depth examination of timely topics in legal studies. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* Senior standing and consent of instructor.

LEISURE SKILLS

Assistant Professor: M. H. Wynn; *Lecturer:* B. W. Stevens

L S 100 Selected Topics 1(0,3) Presentation of leisure skills not covered in other courses. May be repeated for a maximum of three credits, but only if different topics are covered.

L S 101 Challenge Recreation Activities 1(1,0) Encourages students to broaden their leisure skills and improve self-image through challenge activities. Classroom instruction stresses how to get started safely in flying, scuba, canoeing, skiing, windsurfing, mountaineering, hang-gliding, ballooning, and other challenge activities.

L S 111 Lapidary Arts 1(0,3) Students learn the techniques used to transform raw materials such as gemstones, minerals, gold, and silver into objects of art—primarily jewelry.

L S 125 Budget Travel 1(0,3) Teaches the necessary skills to travel internationally on a budget. Students learn how to get the best airfares, research destinations, and build an itinerary. Packing, security, local transportation, and culture/reverse-culture shock are also discussed.

L S 141 Top Rope Climbing 1(0,3) Basic rock climbing skills, including philosophy, safety, knots, climbing techniques, site and supplies selection, and nature/conservation issues are covered.

L S 145 Camping and Backpacking 1(0,3) Basic camping and backpacking skills including map and compass reading, outdoor cooking, camping hazards and safety, site selections, and trip planning.

L S 147 Alpine Skiing 1(0,3) Basic downhill snow skiing instruction including equipment selection, safety, and maintenance; parallel turns; edging; carved and linked turns; wedeling; and safety and etiquette. There is an additional fee for this course. Taught during Christmas recess. (Contact the Department of Parks, Recreation, and Tourism Management in October.)

L S 149 Snowboarding 1(0,1) Basic snowboarding instruction including equipment selection; safety; conditioning; and skills such as stopping, techniques for turning, and riding lifts. There is an additional fee for this course. Taught during Christmas recess. (Contact the Department of Parks, Recreation, and Tourism Management in October.) May not be taken concurrently with L S 147 or 347.

L S 159 Hunting Traditions 1(0,3) Basic, hands-on instruction in the shooting sports (shotgun, rifle, and archery) and the sport of hunting. Designed to introduce students to the safe and responsible use of firearms and archery equipment and safe hunting practices. Students are required to complete the SC Department of Natural Resources Hunter Education certification.

- L S 164 Whitewater Kayaking 1(0,3)** Flat-water and whitewater skills, techniques, safety, rescue, equipment selection and maintenance, and selection of routes/trips to participate in basic white-water kayaking. *Preq:* Basic swimming skills.
- L S 165 Inland Kayak Touring 1(0,3)** Introductory course which teaches basic skills necessary for safe enjoyment of flatwater (non-tidal waters: lakes, slow moving rivers) kayak touring. Students learn equipment selection, strokes, safety, and rescue techniques. *Preq:* Demonstrated swimming competence.
- L S 167 Canoeing 1(0,3)** Basic instruction in the nomenclature, strokes, and safety techniques in canoeing. *Preq:* Basic swimming skills.
- L S 169 Sailing 1(0,1)** Basic instruction in the nomenclature, safety and rescue techniques, and skills required to skipper sailing craft. *Preq:* Basic swimming skills.
- L S 171 Windsurfing 1(0,3)** Basic windsurfing instruction including rigging, launching, tacking, jibbing, rig and foot steering, safety, maintenance, equipment selection, rules-of-the-road, and racing techniques are covered. Offered Fall Break and first summer session. There is an extra fee for this course. *Preq:* Ability to swim 300 yards and tread water for five minutes.
- L S 175 Fly Fishing 1(0,3)** Introductory course in the techniques of fly-fishing. Students learn casting, fly-tying, and equipment selection.
- L S 176 Beginning Fly Tying 1(0,3)** The art of fly tying. Students learn basic fly tying techniques and gain a knowledge of materials and tools used in fly tying.
- L S 177 Saltwater Fly Tying 1(0,3)** Introduction to tying flies for saltwater applications of fly fishing.
- L S 179 Scuba I 1(0,3)** Teaches basic open water diving techniques and prepares students to complete requirements for the open water diving certification. Certifications are granted by an internationally recognized and accepted certifying agency. *Preq:* Swim test required by certifying agency.
- L S 183 Introduction to Rugby 1(0,3)** Introduces students to the sport of Rugby. Covers history of the game, rules, and skills such as passing, kicking, and decision making.
- L S 185 Bowling 1(0,3)** Basic instructional program on techniques of bowling.
- L S 189 Tennis 1(0,3)** Fundamental course stressing rules, strokes, and strategy, with ample opportunity for practice.
- L S 194 Racquetball 1(0,3)** Basic skills, knowledge of rules, strategy, and basic strokes.
- L S 196 Introduction to Billiards 1(0,3)** Introductory course in the history, rules, and skills necessary to participate in billiards. Students learn different types of games, proper shot techniques, and equipment selection.
- L S 198 Golf 1(0,3)** Fundamental course stressing rules, strategy, and basic strokes.
- L S 200 Traditional Sports 1(0,3)** Introductory course in the history, rules, and skills necessary to participate in traditional sports. Students learn about and participate in basketball, volleyball, football, and softball.
- L S 210 Learn to Dance 1(0,2)** Students develop an understanding of the qualities of dance, recognize the importance of dance as a leisure pursuit, and learn to dance to different types of music. Dances include shag, waltz, cha-cha, foxtrot, as well as current dance trends.
- L S 214 Modern Dance 1(0,3)** Introduction to modern dance techniques with emphasis on developing the style of movement and understanding the dance art form.
- L S 218 Ballroom Dance 1(0,2)** Students develop an understanding of advanced dance methods, learn about dance at social and competitive levels, and increase knowledge of a variety of both smooth and Latin steps. Dances include tango, cha-cha, waltz, foxtrot, and swing.
- L S 220 Shag 1(0,2)** Students develop an understanding of the South Carolina state dance, its history and impact on the state. Students learn more advanced steps in shag, including bellyroll, sugarfoot, slide step, tiptoe up the ladder, pivot, and the thirteen steps.
- L S 221 Intermediate Shag Dance 1(0,2)** Builds on skills learned in L S 220. Students improve their ability to improvise, add style, and add many different moves to their dance vocabulary. *Preq:* L S 220.
- L S 222 Advanced Shag 1(0,2)** Exposes students to a competition level of shag. Students learn to break down a dance routine and to choreograph short routines. *Preq:* L S 221.
- L S 227 Introduction to Swing Dance 1(0,2)** Introduction to vintage swing dance created in the 1920s–1950s including Charleston, Lindy Hop, Jitterbug, and optional acrobatic moves used in performance and competition.
- L S 228 Intermediate Swing Dance 1(0,2)** Builds on skills learned in L S 227 by improving students' ability to improvise, add style, musicality, and many additional moves to add to their dance vocabulary. *Preq:* L S 227.
- L S 229 Advanced Swing Dance 1(0,2)** Focuses on competition level and style of swing dance. Students learn to break down and teach a routine to beginners. Students also learn the skills necessary to create and choreograph a short routine. *Preq:* L S 228 or consent of instructor.
- L S 233 Aerobic Dance 1(0,3)** Instruction in the development of skills for the safe improvement and maintenance of cardiovascular fitness, flexibility, and muscle tone utilizing dance movements and techniques.
- L S 235 Basic Yoga 1(0,3)** Develops flexibility, strength, sensitivity, energy, and a sense of relaxation through the study of basic yoga postures, conscious breathing, and meditation techniques.
- L S 236 Power/Ashtanga Yoga 1(0,3)** Power/Ashtanga Yoga is a comprehensive workout based on the Eastern philosophy of K. Pattabhi. Students learn the eight limbs of this philosophy and the rigorous series of postures that produce a high power, athletic workout with the purpose of detoxifying impurities in the body.
- L S 237 Kripalu Yoga 1(0,3)** Great emphasis is placed on learning breath work techniques to combine directly with the various kripalu yoga postures. The goal is to teach individuals the physiological reactions produced by this type of yoga in developing and restoring health.
- L S 270 Sports Officiating 1(0,3)** Practical study of officiating for various sports. Includes studies and practical application of officiating rules and mechanics. Sports studied include football, basketball, softball, soccer, and introductions to a variety of other team sports.
- L S 275 Red Cross First Aid/CPR 1(0,3)** Gives students the knowledge and skills necessary to prevent, recognize, and provide basic care for infants, children, and adults with injuries and sudden illness.
- L S 347 Advanced Alpine Skiing 1(0,3)** Advanced downhill snow skiing instruction in such techniques as mogul skiing, check turns, free-style, and racing. There is an additional fee for course. Taught over Christmas break. Credit is awarded for spring semester. (Contact Department of Parks, Recreation, and Tourism Management in October.) *Preq:* L S 147 or consent of instructor.

MANAGEMENT

Professors: N. Balakrishnan, R. S. Cantrell, J. S. Davis, D. W. Grigsby, V. Grover, R. L. LaForge, T. L. Leap, *Chair;* M. A. McKnew, J. W. Patterson, P. L. Roth, V. Sridharan, C. S. St. John; *Associate Professors:* L. D. Fredendall, J. Miller, R. L. Purvis, T. L. Robbins, W. H. Stewart, Jr.; *Assistant Professors:* R. M. Henry, R. Klein, M. L. Loughry, J. B. Thatcher; *Lecturers:* T. B. Huneycutt, K. A. Kegley, G. L. Newkirk, S. E. Yoder

MGT 120 Collaborative Management 3(2,2)

Provides a model for successfully working with persons from the marketing, operations, accounting/finance, and engineering functions. Students operate on a cross-functional team and explore concepts and tasks associated with managing effectively for high performance. *Preq:* Pre-Business major, ECON 211, consent of the instructor.

MGT 201, H201 Principles of Management 3(3,0)

Management's role as a factor of economic production. Functions of management, principles of organization, and behavior in organizations.

MGT 218, Management Personal Computer Applications 3(0,6)

Personal computer applications that support managers. Students learn from hands-on work rather than lecture. To be taken Pass/Fail only. *Preq:* CP SC 120 or consent of instructor.

MGT 305 Economics of Transportation 3(3,0)

Topics include history and structure of transportation systems in the United States, the nature of transportation costs and rates, transportation systems as factors in industrial location, transportation policy, and transportation's role in national security. *Preq:* Junior standing.

MGT (ECON) 306 Managerial Economics 3(3,0)

See ECON 306.

MGT 307, H307 Personnel Management 3(3,0)

Principles, concepts, and techniques concerned with effective and efficient utilization of personnel. Emphasizes motivation, leadership, and human behavior related to employer-employee relations. Topics include personnel recruitment, classification, selection, training, development, and performance evaluation. *Preq:* Junior standing; one of the following: MTHSC 203, 301, 302, EX ST 301.

MGT 310, H310 Intermediate Business Statistics 3(3,0)

Quantitative methods of the management scientist with applications to business and industrial problems. Topics include regression analysis, correlation analysis, analysis of variance, sampling, and nonparametric methods. Credit toward a degree will be given for only one of MGT 310 or EX ST 311. *Preq:* EX ST 301, MTHSC 309, or equivalent.

MGT 312, H312 Decision Models for Management 3(3,0)

Exploration of ways in which management science decision models can help in making sound managerial decisions. Problem solving is Excel-based. Topics include linear programming, project scheduling, and simulation.

MGT (E L E) 315 New Venture Creation II 3(3,0)

Second of a two-part series examining entrepreneurship. Using opportunity analysis developed in MKT (E L E) 314, course focuses on designing and managing an organization capable of effectively pursuing the opportunity. Topics include organization strategy and design, start-up capital, operations and sourcing issues, leadership, team building, and management of rapid growth. *Preq:* MKT (E L E) 314.

MGT 317 Logistics Management 3(3,0)

Management of physical distribution and supply systems with emphasis on design concepts, cost determinants, and control. *Preq:* Junior standing.

MGT 318 Management Information Systems 3(3,0)

Introduction to information systems concepts and applications in business. Topics include software, hardware, decision support and knowledge based systems, database, information systems design and implementation, and the management of information systems. *Preq:* MGT 218 or consent of instructor.

MGT 390 Operations Management 3(3,0)

Examines the role of operations management in both manufacturing and service organizations. Discusses the concepts, tools, and techniques for managing the operations function. Topics include operations strategy, design, planning, and control. *Preq:* MTHSC 301 or equivalent.

MGT 400 Management of Organizational Behavior 3(3,0)

Provides management students with a framework for understanding how behavior within business organizations is managed. Particular emphasis is on integrating management theory with recent developments in the behavioral sciences with distinct management applications. Theory, research, and business applications are considered. *Preq:* MGT 201 with a C or better.

MGT 402, H402 Operations Planning and Control 3(3,0)

Managing, planning, and controlling production and service operations emphasizing demand forecasting, aggregate planning, production scheduling, and inventory management. *Preq:* MGT 310, 312, 390.

MGT 403 Special Problems 1-3(1-3,0)

Students plan, develop, and execute a research project related to the field of management and defense studies. May be repeated for a maximum of six credits. *Preq:* Senior standing in Industrial Management or Management, consent of instructor.

MGT 404 Advanced Statistical Quality Control 3(3,0)

Statistical quality control techniques as applied to all areas of quality control: process control, process capability, acceptance sampling, and economic aspects of quality decisions. *Preq:* MGT 310, 390.

MGT 408 Design of Production Systems 3(3,0)

Examines the design of systems for production and delivery of goods and services. Emphasizes the impact of alternative designs on the competitive posture of the firm. Discusses the concepts, tools, and techniques for designing facilities and jobs and systems for continuous performance improvement. *Preq:* MGT 310, 312, 390.

MGT 411 Project Management 3(3,0)

Examination and application of the project management body of knowledge. This consists of theory, tools, and techniques to organize, plan, and control individuals, teams, quality, and operations while conducting a project. *Preq:* EX ST 301 or MTHSC 301 or equivalent.

MGT 412 Supply Management 3(3,0)

Provides an understanding of the key issues in selecting and developing suppliers. Provides a conceptual framework to understand purchasing's function within the firm and its role in supply chain management. *Preq:* MGT 390.

MGT 414 Statistical Analysis 3(3,0)

Application of statistics in management decision making. Emphasis is on the proper design, analysis, and interpretation of planned experiments. Topics include single factor through fractional factorial experiments. *Preq:* MGT 310 or equivalent.

MGT 415, H415 Business Strategy 3(3,0)

Capstone course for seniors. Various methods are used in analyzing complex business problems, requiring students to integrate their knowledge of all areas of business. Student participation and written and oral communications are stressed. *Preq:* FIN 306 or 311; MGT 201; MKT 301; Senior standing.

MGT 416 Management of Human Resources 3(3,0)

Recent developments in the management of human resources with emphasis on results of research into the motivation, development of potential, and full utilization of the human resources. *Preq:* MGT 307 and 400 with a C or better; consent of instructor.

MGT 422 Small Business Management 3(3,0)

Study of management of the small independently owned and operated business. Emphasizes analyzing new business opportunities, planning and establishing a growing concern, and managing the contemporary small business. Field experience in consulting with small businesses enhances students' understanding of the unique opportunities and problems of small business organizations. *Preq:* MKT 301 or consent of instructor.

MGT 423 International Business Management 3(3,0)

Survey of theoretical and institutional complexities of international business operations. Topics include exporting, importing, foreign investment, multinational corporations, and international payment system. *Preq:* Junior standing.

MGT 424 International Transportation and Logistics 3(3,0)

Examination and analysis of international transportation systems and their logistics support systems. Topics include ocean shipping, international air transportation, port management, and EEC and Soviet-block transport systems. International transport legislation and policies are also analyzed. *Preq:* Senior standing or consent of instructor.

MGT 425 Compensation Management 3(3,0)

Examination of compensation employees seek in exchange for their efforts and contributions. Topics include government and union influences; job content analysis, description, and evaluation; developing pay structures; measuring and paying for performance; employee benefits; administration of the compensation plan; executive, managerial, professional, and sales. *Preq:* MGT 307, 400 with a C or better.

MGT 426 Industrial Traffic Management 3(3,0)

Surveys the responsibilities and functions of industrial traffic management in manufacturing and distribution. Emphasizes the role of the industrial traffic manager in optimizing the logistics system of the firm (i.e., the materials management of its inbound supplies and the distribution of its finished products). *Preq:* MGT 305 or 317.

MGT 427 Managing Continuous Improvement 3(3,0)

Examination of issues related to continuous improvement, including a systematic approach to selecting improvement areas, determining how to improve, plan, and manage the improvement process. Topics include selecting performance measurements, using teams to achieve breakthrough change, identifying root causes of problems, and developing and implementing solutions to problems. *Preq:* MGT 390 or consent of instructor.

MGT 430 Senior Seminar in Management 3(3,0)

In-depth study of current business topics; allows senior Management students to relate their academic studies to real-world problems. Senior paper is required. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* Senior standing.

MGT 431 Employee Diversity, Rights, and Responsibilities 3(3,0) Focuses on employee and organizational rights and responsibilities. Topics include various types of discrimination (race, sex, religious, national origin, age, and disability status); drug and alcohol testing; AIDS in the workplace; employee discipline and termination issues; privacy and safety concerns; and union organizing campaigns. *Preq:* MGT 307, 400 with a C or better.

MGT 435 Personnel Interviewing 3(3,0) Helps students understand current interviewing theory, conduct an employment interview, and advise their future employers how to improve interviewing programs. Topics include job analysis, legal issues, types of interviews, and evaluating applicants. *Preq:* MGT 307 and 400 with a C or better.

MGT 436 White-Collar Crime 3(3,0) White-collar crime and corruption are examined from a managerial perspective. Topics include financial crimes, crimes against consumers, environmental crimes, acts of institutional corruption, the impact of organized crime on legitimate businesses, and computer crime. *Preq:* Senior standing, FIN 306.

MGT (I E) 444 International Perspectives in Industrial Management 3-6(3-6,0) Provides an international perspective to industrial management via organized plant visitations to businesses in a foreign country and lectures by and discussions with senior operations managers. Cultural visits and lectures are also organized to provide a holistic perspective to cover cultural and economic environment of the host country. Students are responsible for travel costs. May be repeated for a maximum of six credits. *Preq:* Consent of instructor.

MGT 452 Systems Analysis and Design 3(3,0) Follows the traditional systems development life cycle (SDLC), although alternative methodologies are also discussed. Focuses on earlier phases of the SDLC, from IS planning through specification of structured requirements and on the methods, techniques, and tools used to determine information requirements and their unambiguous documentation. *Preq:* Junior standing.

MGT 454 Systems Implementation 3(3,0) Builds upon skills of programming, database, and systems analysis and design by involving students with the later phases of the systems development life cycle (SDLC). Students design and develop a system using various platforms. Focus is on the logical and physical system design. *Preq:* CP SC 462 or equivalent, MGT 452.

MGT 455 Emerging Information Technology Trends in Business 3(3,0) In-depth study, through case studies, readings, and hands-on experience of emerging information technologies in and across business organizations. Focuses on understanding, effective deployment, and impact of these technologies on business outcomes. *Preq:* Junior standing.

MGT 456 Decision Support Systems 3(3,0) In-depth study, through case studies, readings, and hands-on experience, of decision support systems and related knowledge-based technologies. Focus is on organizational decision making and its data, information, and knowledge-based support systems. *Preq:* Junior standing.

MGT 490 Selected Topics in Industrial Management 3(3,0) In-depth examination of advanced topics in Industrial Management. Topics may vary in keeping with developments in the management profession and interests of faculty. Emphasis is on the application of these topics to the production and operations management environment. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* MGT 402 or 404 or 408.

MARKETING

Professors: L. Carlson, C. R. Duke, S. J. Grove, W. E. Kilbourne, G. M. Pickett, *Chair;* R. M. Reese; *Associate Professors:* M. J. Dorsch, R. Gomes, P. A. Knowles, M. C. LaForge, J. D. Mittelstaedt, J. N. Moore, M. A. Raymond; *Assistant Professors:* C. D. Hopkins, S. A. Jones; *Lecturer:* J. G. Gaubert

MKT 301, H301 Principles of Marketing 3(3,0) Principles and concepts involved in planning, pricing, promoting, and distributing of goods and services. *Preq:* ECON 200 or 211 or 212; 45 credit hours completed.

MKT 302 Consumer Behavior 3(3,0) Examination of selected individual and group behavioral science concepts and their application to the understanding of consumer decision making. *Preq:* MKT 301.

MKT (E L E) 314 New Venture Creation I 3(3,0) First in a two-part series with MGT (E L E) 315 assessing entrepreneurial opportunities. Focuses on creativity, idea generation, market opportunity analysis, strategy, and methods of entry. Opportunity analysis may be developed into a full new venture plan in MGT (E L E) 315. *Preq:* Junior standing.

MKT 321 Sports Marketing 3(3,0) Exploration of the essentials of effective sports marketing. Topics include application of marketing principles in the sports area, licensing issues, sponsorships and endorsements, stadium and arena marketing, broadcasting and media considerations, public policy and sports, and unique marketing challenges for sport specific products (football, basketball, baseball, motorsports, etc.). *Preq:* MKT 301 or consent of instructor.

MKT H390 Junior Honors Research 1(1,0) Students select and complete a research project approved by a faculty advisor, in conjunction with an approved three-credit marketing course (other than MKT 301, H301, or 431). Students are expected to display a command of marketing theory and an ability to apply theory to their research. *Preq:* MKT 301 or H301, membership in Calhoun Honors College, consent of faculty member supervising research.

MKT 399 Marketing Internship 3(0,9) Pre-planned, preapproved, faculty-supervised marketing internships. Credit will only be given for internships of at least ten full-time, consecutive weeks with the same internship provider. Restricted to students with a major or minor in Marketing. To be taken Pass/Fail only. *Preq:* MKT 301 and consent of instructor.

MKT 420 Professional Selling 3(3,0) Current theories about the selling of goods and services to organizational buyers in the context of long-term relationships. Role playing, video-taped presentations, and other techniques are generally employed to enhance interpersonal communication skills. *Preq:* Junior standing, MKT 301.

MKT 423, 623 Promotional Strategy 3(3,0) Emphasizes promotion as the communication function of marketing. Attention is given to communication theory and promotion's relation to mass and interpersonal communication. Factors affecting promotional decision-making process are explored, and promotion as a competitive tool is examined. *Preq:* MKT 301 or consent of instructor.

MKT 424 Sales Management 3(3,0) Comprehensive examination of the planning, implementation, and control of professional sales organizations. *Preq:* MKT 301 or consent of instructor.

MKT 425 Retail Management 3(3,0) Retailing is studied from a decision-making approach. Topics include target market analysis, location analysis, merchandising, human resources, pricing and promotion. *Preq:* MKT 301 or consent of instructor.

MKT 426 Business-to-Business Marketing 3(3,0) Study and analysis of the unique aspects of marketing goods and services to organizational buyers rather than household consumers. Emphasis is on developing strategic responses to market opportunities given competitive behavior. *Preq:* MKT 301 or consent of instructor.

MKT 427, 627 International Marketing 3(3,0) Study of marketing from the international point of view. Emphasis is on the necessary modification of marketing thinking and practice for foreign markets due to individual environmental differences. *Preq:* MKT 301.

MKT 428, 628 Services Marketing 3(3,0) Exploration and study of the nature of service organizations and the principles which guide the marketing of their products. Emphasis is on a marketing mix that is fundamentally different than that found in traditional goods marketing. *Preq:* MKT 301 or consent of instructor.

MKT 429, 629 Public and Nonprofit Marketing 3(3,0) Examines the role and application of marketing in public and nonprofit settings. Focuses on a conceptual understanding of the marketing discipline and marketing processes and shows how basic concepts and principles of marketing are applicable to public and nonprofit organizations. *Preq:* MKT 301 or consent of instructor.

MKT 430, 630 Marketing Product Management 3(3,0) Management of the firm's product or service offerings. Topics include new product screening, evaluation, and development; product line and mix analysis, abandonment decisions, brand manager's role, new product development department, and others. Emphasis is on decision making. *Preq:* MGT 310, MKT 301; or consent of instructor.

MKT 431, 631 Marketing Research 3(3,0) Research used in marketing decision making. Emphasizes methods and techniques used in planning, collection, processing, and utilization of information. Topics include research design, sources of information, questionnaire design, sampling, data collection, and data analysis. *Preq:* MGT 310, MKT 301, MTHSC 301; or consent of instructor.

MKT 433 Sport Marketing Strategy 3(3,0) Provides students with basic knowledge about brand management as it applies to sport. Addresses basic principles and guiding precepts of how sport-based organizations build strong brands. *Preq:* MKT 321 or consent of instructor.

MKT 434 Sport Promotion 3(3,0) Emphasizes the promotional function of sport. Topics include event sponsorship, developing media relationships, endorsements, promotion objective setting and budgeting, media planning and scheduling, and utilizing the tools of promotion within a sport context. Integrated Marketing Communication provides the theoretical and managerial framework for how these factors are utilized optimally. *Preq:* MKT 321, 423.

MKT 435 International Sport Marketing 3(3,0) Provides working knowledge of international sport marketing. Consists of lecture and site visits. Topics include brief history of sport, sport marketing basics, building sport brands, sport strategies, and issues facing the new sporting goods industry. *Preq:* MKT 301.

MKT 445 Macromarketing 3(3,0) Examines the relationship between marketing and society focusing on the social impact of marketing practices. Topics include technology, ethics, materialism, globalization, environmental sustainability, and the political and economic philosophy underlying marketing. Course is multidisciplinary and uses a variety of readings to cover each of the topic areas. *Preq:* MKT 301 and junior standing, or consent of instructor.

MKT 450 Strategic Marketing Management 3(3,0) Application of marketing constructs in the analysis and solution of marketing problems. Emphasizes information systems, data analysis, and critical-thinking skills in solving marketing problems in a wide range of managerial decision areas including, but not limited to, new product development, pricing, advertising, personal selling, channels, and international marketing. *Preq:* MKT 301, six hours of 400-level marketing courses.

MKT H490 Senior Honors Thesis Research 3(3,0) Students, in consultation with a Marketing faculty member, choose a topic for the honors thesis and produce a research proposal which involves an imaginative approach to the subject, a sufficient literature review, a comprehensive introduction to the research topic, and a detailed research plan. *Preq:* MKT H390.

MKT H491 Senior Honors Thesis Writing and Presentation 3(3,0) Students implement their research plans, write up their reports, and present and defend their Senior Honors Theses to an audience of Marketing faculty, Honors students, and invited others. *Preq:* MKT H490.

MKT 495, 695 Selected Topics 3(3,0) In-depth examination of timely topics in marketing. May be repeated for credit, but only if different topics are covered. *Preq:* MKT 301 or consent of instructor.

MKT 499 Independent Study 1-3(1-3,0) Directed readings or independent research in selected marketing areas. Topics must be selected and proposed by student. Proposals must be approved by instructor. May be repeated for a maximum of three credits. *Preq:* MKT 301 and consent of instructor.

MATERIALS SCIENCE AND ENGINEERING

MS&E 450 Materials Science and Engineering Portfolio 2(2,0) Students working in groups present and discuss practical, ethical, safety, and business topics in the polymer and textile industries. Students are required to complete their electronic portfolios. To be taken Pass/Fail only.

MATHEMATICAL SCIENCES

Professors: W. P. Adams, J. R. Brannan, J. V. Brawley, Jr., C. L. Cox, P. M. Dearing, V. J. Ervin, R. E. Fennell, X. Gao, R. E. Jamison, J. P. Jarvis, J. D. Key, M. M. Kostreva, K. B. Kulasekera, R. C. Laskar, R. B. Lund, W. F. Moss III, J. A. Reneke, D. R. Shier, R. L. Taylor, *Chair:* D. D. Warner, M. M. Wiecek; *Associate Professors:* N. J. Calkin, S. L. Ganter, P. C. Kiessler, H. K. Lee, J. K. Peterson, C. B. Russell, M. J. Saltzman, H. F. Senter, C. L. Williams; *Assistant Professors:* D. M. Ambrose, C. M. Gallagher, J. A. Hoffacker, P. D. Hyden, K. L. James, E. W. Jenkins, T. R. Khan, H. R. MacMillan, H. Maharaaj, G. L. Matthews, C. Park, J. R. Yoon; *Research Assistant Professors:* D. P. Diaz, J. B. Von Oehsen; *Senior Lecturers:* S. S. Biggers, M. E. Cawood, P. F. Garner, S. A. Prevost; *Lecturers:* N. J. Conway, J. E. Cottingham, R. E. Davidson, C. A. Davis, K. J. Durham, J. M. Flatt, A. A. Guest, M. L. Hanna, Jr., T. A. Johnson, J. M. LaVare, A. J. Lynn, J. K. Martin, J. I. McKnew, J. R. Newton, T. F. Parrott, M. Reba, M. Rios-Adams, L. J. Shick, D. M. Simms, R. E. Simms, W. B. Staufeneger, A. K. Stoddard, D. C. Szurley, T. C. Teitloff, A. Tsolakis, S. E. Walker, M. K. Zachary; *Visiting Professors:* J. D. Fulton, M. E. Hammett, W. J. Padgett; *Visiting Associate Professor:* D. M. Fairbairn; *Visiting Assistant Professors:* J. B. Lassiter, B. A. Novick, I. V. Viktorova

MTHSC 101 Essential Mathematics for the Informed Society 3(3,0) Topics include logic and computers, probability and statistics, and financial mathematics. Specific topics include Boolean algebra, digital data formats, randomness, graphical representation of data, inference and estimation; interest, annuities, and amortization. Not open to students who have received credit for MTHSC 301, 302, 309, or EX ST 301. *Preq:* Satisfactory score on the Clemson Mathematics Placement Test or consent of department.

MTHSC 102 Introduction to Mathematical Analysis 3(3,0) Intuitive approach to the concepts and applications of calculus. Topics include functions and graphing, differentiation, and integration. Applications from social, biological, and management sciences are presented. Not open to students who have received credit for MTHSC 106. *Preq:* Satisfactory score on the Clemson Mathematics Placement Test or consent of department.

MTHSC 103 Elementary Functions 3(3,1) Gateway course for MTHSC 106. Comprehensive treatment of functions and analytic geometry with applications including polynomial, rational, algebraic, exponential, logarithmic, and trigonometric functions. Not open to students who have received credit for MTHSC 105. *Preq:* MTHSC 104 or satisfactory score on the Clemson Mathematics Placement Test.

MTHSC 104 College Algebra 3(3,1) Basic course to prepare students for subsequent courses in probability, mathematical analysis, elementary statistics, and elementary functions (precalculus). Fundamental concepts of algebra, equations, inequalities, functions, and graphs are studied. Students who have received credit for any other mathematical sciences course will not be allowed to enroll in or receive credit for MTHSC 104.

MTHSC 105 Precalculus 5(5,1) Extensive treatment of topics chosen to prepare students for the study of calculus. Special emphasis is given to polynomial, rational, exponential, logarithmic, and trigonometric functions and their graphs, as well as basic and analytic trigonometry. Students who have received credit for any other mathematical sciences course will not be allowed to enroll in or receive credit for MTHSC 105.

MTHSC 106, H106 Calculus of One Variable I 4(4,0) Topics include analytic geometry, introduction to derivatives, computation and application of derivatives, integrals, exponential and logarithm functions. *Preq:* MTHSC 103 or 105 or satisfactory score on the Clemson Mathematics Placement Test or consent of department.

MTHSC 107 Co-Calculus I 1(0,2) Recitation course to accompany MTHSC 106. Reinforces precalculus and calculus topics covered in MTHSC 106 and provides additional instruction and practice for students. Required of students identified by the Clemson Mathematics Placement Test as being conditionally qualified for placement in calculus with supplemental instruction. To be taken Pass/Fail only. *Preq:* Concurrent enrollment in MTHSC 106.

MTHSC 108, H108 Calculus of One Variable II 4(4,0) Topics include transcendental functions, applications of integration, integration techniques, indeterminate forms, improper integrals, parametric equations, polar coordinates, and infinite series. *Preq:* MTHSC 106.

MTHSC 109 Co-Calculus II 1(0,2) Recitation style course to accompany MTHSC 108. Reinforces precalculus and calculus topics covered in MTHSC 108 and provides additional instruction and practice. Recommendations are made to students based on their scores on a Calculus Basic Skills Quiz, given at the beginning of each semester. *Preq:* Concurrent enrollment in MTHSC 108.

MTHSC 115 Contemporary Mathematics for Elementary School Teachers I 3(3,0) Cooperative learning groups, manipulatives, and concrete models are used to demonstrate logical reasoning, problem-solving strategies, sets and their operations, numeration systems, properties and operations of whole numbers, number theory, prime and composite numbers, divisibility, common factors and multiples. Open to Elementary, Early Childhood, and Special Education majors only. *Preq:* MTHSC 104 or satisfactory score on the Clemson Mathematics Placement Test.

- MTHSC 116 Contemporary Mathematics for Elementary School Teachers II 3(3,0)** Continuation of MTHSC 115. Manipulatives and concrete models are used for properties, operations, and problem solving for integers, elementary fractions, rational numbers, and real numbers. Selected topics in statistics and probability are introduced with a hands-on approach to learning. Restricted to Elementary, Early Childhood, and Special Education majors. *Preq:* MTHSC 115 or consent of instructor.
- MTHSC 117 Mathematics for Elementary School Teachers I 3(2,2)** Problem-solving strategies, logic, algebraic thinking, sets, relations, functions, numeration systems, whole numbers, integers, number theory, fractions, decimals, applications of percent, real numbers with their computational algorithms and properties are explored. Content, according to state standards, is taught with appropriate methodology for teaching K–8. Open to Elementary, Early Childhood, and Special Education majors only. *Preq:* MTHSC 101 or consent of department.
- MTHSC 118 Mathematics for Elementary School Teachers II 3(2,2)** Simple probability and descriptive statistics are reviewed. Two- and three-dimensional geometry including polygons, polyhedra and their properties; congruence, similarity, and constructions; coordinate system; standard measurement, area, surface area, volume; and motion geometry are explored. Content, according to State standards, is taught with appropriate methodology for teaching K–8. *Preq:* MTHSC 117 or consent of department.
- MTHSC 119 Introduction to Discrete Methods 3(3,0)** Topics normally include elementary logic and methods of proof; sets, functions, and relations; graphs and trees; combinatorial circuits and Boolean Algebra. *Preq:* Satisfactory score on the Clemson Mathematics Placement Test or consent of department.
- MTHSC 129 Problem Solving in Discrete Mathematics 3(2,2)** Problem-solving approach to learning mathematics is applied to topics in modern discrete mathematics. Typical selection of topics includes logic and proof, sets, relations, functions, mathematical induction, graphs and trees, counting techniques, recurrence equations. For Bachelor of Science and Bachelor of Arts majors in Mathematical Sciences only. Credit may not be received for both MTHSC 119 and 129. *Preq:* MTHSC 106.
- MTHSC 199 Problem Solving in Mathematics 3(2,2)** Functions and graphs, mathematical modeling, and applications. Applications from management and life and social sciences are presented. Specific topics include linear, quadratic, polynomial, exponential, and logarithmic functions with emphasis on problem solving. Students who have received credit for any other mathematical sciences course will not be allowed to enroll in or receive credit for MTHSC 199. To be taken Pass/Fail only.
- MTHSC 203 Elementary Statistical Inference 3(3,0)** Data-based course in statistical methodology: collecting and summarizing data, the normal distribution, one and two sample inference on means and proportions, simple linear regression, analysis of categorical data. May not be taken for credit by students who have passed MTHSC 301, 302, 309, or EX ST 301. *Preq:* Satisfactory score on the Clemson Mathematics Placement Test or MTHSC 101 or consent of department.
- MTHSC 206, H206 Calculus of Several Variables 4(4,0)** Topics include real valued functions of several variables, multiple integration, differential calculus of functions of several variables, vector field theory. *Preq:* MTHSC 108.
- MTHSC 207 Multivariable Calculus 3(3,0)** Introduction to the calculus of several variables, differential calculus and optimization of several variables, multiple integrals. Topics from the management sciences are used to illustrate the above concepts. May not be taken by students who have passed MTHSC 206. *Preq:* MTHSC 102, or 106 with consent of instructor.
- MTHSC 208, H208 Introduction to Ordinary Differential Equations 4(4,0)** Introduction to the study of differential equations and their application to physical problems. Topics include exact, series, and numerical solutions; solutions by means of Laplace transforms; and solutions of systems of differential equations. *Preq:* MTHSC 206.
- MTHSC 210 Applied Matrix Algebra 3(3,0)** Introduction to the basic principles of matrix algebra with applications to the behavioral and managerial sciences. Major areas of application include linear programming, directed graphs, and game theory. *Preq:* MTHSC 101 and 102 or 106.
- MTHSC 216 Geometry for Elementary School Teachers 3(3,0)** Informal treatment of the basic concepts of geometry. Open to Elementary, Early Childhood, and Special Education majors only. *Preq:* MTHSC 116 or consent of instructor.
- MTHSC 231 Mathematics of Life Insurance 3(3,0)** Introduction to basic mathematics of finance and life insurance. Topics include compound interest, annuities certain, mortality tables, life annuities, net premiums, net level reserves, modified reserves, nonforfeiture values, and dividends.
- MTHSC 250 Introduction to Mathematical Sciences 1(1,0)** Introduction to areas of study, degree options, career choices, and professional development in mathematical sciences. Includes guidelines and requirements for portfolio development and an introduction to ethical issues.
- MTHSC 301, H301 Statistical Methods I 3(3,0)** Principal topics include collecting and summarizing data, probability distributions, inferences about central values and variation, analysis of categorical data, simple linear regression, basic experimental designs, and the analysis of variance. Credit toward a degree will be given for only one of MTHSC 301, 302, 309, EX ST 301. *Preq:* MTHSC 106 or 207 or 210.
- MTHSC 302 Statistics for Science and Engineering 3(3,0)** Methodology for collecting, organizing, and interpreting data. Topics include understanding variability, graphical and numerical summarization of data, introductory probability, normal and related distributions, statistical inference, experimental design, simple linear regression. Statistical microcomputer software is used. Credit toward a degree will be given for only one of EX ST 301, MTHSC 301, 302, 309. *Preq:* MTHSC 206.
- MTHSC 308 College Geometry 3(3,0)** Theorems and concepts more advanced than those of high school geometry. Treatment of the various properties of the triangle, including the notable points, lines, and circles associated with it. *Preq:* MTHSC 106.
- MTHSC 309 Introductory Business Statistics 3(3,0)** Introductory probability and statistics for business students, particularly those who will take MGT 310. Topics include descriptive statistics, probability, expectations, binomial, normal, sampling distributions, one and two sample estimation and testing. Credit toward a degree will be given for only one of EX ST 301, MTHSC 301, 302, 309. *Preq:* MTHSC 106 or 207 or 210.
- MTHSC 311, H311 Linear Algebra 3(3,0)** Introduction to the algebra of matrices, vector spaces, polynomials, and linear transformations. *Preq:* MTHSC 108 or consent of instructor.
- MTHSC 360 Intermediate Mathematical Computing 3(3,0)** Continuing study of mathematical computing using the FORTRAN language. Emphasis is on subroutine computation with applications to problems in science and engineering. *Preq:* CP SC 110 or consent of instructor.
- MTHSC H382 Honors Seminar 1(1,0)** Weekly seminar to prepare students in Departmental Honors Program for independent senior research. At the end of the second semester, each student must have identified a research topic and a faculty advisor. May be repeated for a maximum of two credits. *Preq:* Junior standing in departmental honors program.
- MTHSC 400, H400, 600 Theory of Probability 3(3,0)** Principal topics include combinatorial theory, probability axioms, random variables, expected values; special discrete and continuous distributions, jointly distributed random variables, correlation, conditional expectation, law of large numbers, central limit theorem. *Preq:* MTHSC 206 or consent of instructor.
- MTHSC 403, H403, 603 Introduction to Statistical Theory 3(3,0)** Principal topics include sampling distributions, point and interval estimation, maximum likelihood estimators, method of moments, least squares estimators, tests of hypotheses, likelihood ratio methods, regression and correlation analysis, introduction to analysis of variance. *Preq:* MTHSC 400 or equivalent.
- MTHSC 405, 605 Statistical Theory and Methods II 3(3,0)** Principal topics include simple linear regression, multiple regression and correlation analysis, one-way analysis of variance, multiple comparison, multifactor analysis of variance, experimental design. Computation and interpretation of results are facilitated through use of statistical computer packages. *Preq:* MTHSC 301.

- MTHSC 406, 606 Sampling Theory and Methods 3(3,0)** Probability-based treatment of sampling methodology. Theory and application of estimation techniques are treated using simple and stratified random sampling, cluster sampling, and systematic sampling. *Preq:* MTHSC 302 and 400, or consent of instructor.
- MTHSC 407, 607 Regression and Time-Series Analysis 3(3,0)** Theory and application of the regression and time series. Approaches to empirical model building and data analysis are treated. Computation and interpretation of results are facilitated through the use of interactive statistical packages. *Preq:* MTHSC 302, 311, 400; or consent of instructor.
- MTHSC 408, 608 Topics in Geometry 3(3,0)** Introduction to topics in special geometries which include non-Euclidean space concepts such as projective geometry, finite geometries, and intuitive elementary topology. Brief introduction to vector geometry. *Preq:* MTHSC 206.
- MTHSC 410 Number Theory 3(3,0)** Introduction to theory of integers and related number systems. Topics include historical development, principle of mathematical induction, divisibility, primes, congruences, number-theoretic functions, primitive roots, quadratic residues, and diophantine equations. *Preq:* MTHSC 108 or consent of instructor.
- MTHSC 412, H412, 612 Introduction to Modern Algebra 3(3,0)** Introduction to the concepts of algebra. Topics include the number system and the elementary theory of groups, rings, and fields. *Preq:* MTHSC 311.
- MTHSC 419, H419, 619 Discrete Mathematical Structures I 3(3,0)** Applies theoretical concepts of sets, functions, binary relations, graphs, Boolean algebras, propositional logic, semigroups, groups, homomorphisms, and permutation groups to computer characteristics and design, words over a finite alphabet and concatenation, binary group codes, and other communication or computer problems. *Preq:* MTHSC 311.
- MTHSC 430 Actuarial Science Seminar I 1(1,0)** Problem-solving seminar to prepare students for the Society of Actuaries' Exam P or the Casualty Actuarial Society's Exam I (Probability). *Preq:* MTHSC 400 or consent of instructor.
- MTHSC 431 Theory of Interest 3(3,0)** Comprehensive treatment of the theory of interest including from a calculus-based continuous viewpoint. Topics include simple and compound interest and discount, nominal and effective rates, force of interest, basic and general annuities, yield rates, amortization and sinking funds, and applications to bonds, mortgages, and other securities. *Preq:* MTHSC 206.
- MTHSC 432 Actuarial Science Seminar II 1(1,0)** Problem-solving seminar to prepare students for the examination on the Society of Actuaries' and Casualty Actuarial Society's Course 2 (Interest Theory, Economics and Finance). *Preq:* ECON 211, 212, FIN 306 or 311, MTHSC 431, or consent of instructor.
- MTHSC 434, 634 Advanced Engineering Mathematics 3(3,0)** Fourier series, Laplace and Fourier transform, and numerical methods for solving initial value and boundary-value problems in partial differential equations are developed. Applications to diffusion wave and Dirichlet problems are given. Matrix methods and special functions are utilized. *Preq:* MTHSC 208.
- MTHSC 435, H435, 635 Complex Variables 3(3,0)** Elementary functions; differentiation and integration of analytic functions; Taylor and Laurent series; contour integration and residue theory; conformal mapping; Schwartz-Christoffel transformation. *Preq:* MTHSC 206.
- MTHSC 440, H440, 640 Linear Programming 3(3,0)** Introduction to linear programming covering the simplex algorithm, duality, sensitivity analysis, network models, formulation of models, and the use of simplex codes to solve, interpret, and analyze problems. *Preq:* MTHSC 206, 311, or consent of instructor.
- MTHSC 441, H441, 641 Introduction to Stochastic Models 3(3,0)** Introductory treatment of stochastic processes, finite-state Markov chains, queueing, dynamic programming, Markov decision processes, reliability, decision analysis, and simulation. Both theory and applications are stressed. *Preq:* MTHSC 400.
- MTHSC 450 Introduction to Mathematical Models 3(3,0)** Includes a study of the modeling process and examples of existing models chosen from physical, biological, social, and management sciences, depending on the instructor. Written and oral report is required for at least one of the models studied. May be repeated for a maximum of six credits. *Preq:* MTHSC 302, 360, 440, or consent of instructor.
- MTHSC 453, H453, 653 Advanced Calculus I 3(3,0)** Limits, continuity, and differentiation of functions of one and several variables, the Riemann integral, and vector analysis. *Preq:* MTHSC 206.
- MTHSC 454, H454, 654 Advanced Calculus II 3(3,0)** Continuation of MTHSC 453. Transformations, multiple integrals, line and surface integrals, infinite sequences and series, and improper integrals. *Preq:* MTHSC 453.
- MTHSC 460, 660 Introduction to Numerical Analysis I 3(3,0)** Introduction to the problems of numerical analysis emphasizing computational procedures and application. Topics include sources of error and conditioning, matrix methods, systems of linear equations, nonlinear equations, interpolation and approximation by splines, polynomials, and trigonometric functions. *Preq:* MTHSC 206 or 207 and 360 or equivalent.
- MTHSC 463, H463, 663 Mathematical Analysis I 3(3,0)** Basic properties of the real number system, sequences and limits; continuous functions, uniform continuity and convergence. Integration, differentiation, functions of several real variables, implicit function theory. *Preq:* MTHSC 206.
- MTHSC 481 Seminar in Mathematics 1-3(1-3,0)** Attention is focused on mathematical areas in which nonroutine problems can be posed with comparative ease. Emphasis is on independent study and student use of previously acquired mathematical skills. Open to students by invitation only for a maximum of three credits.
- MTHSC 482, H482 Undergraduate Research 3(3,0)** Independent research conducted under the supervision and guidance of a faculty member. May be repeated for a maximum of six credits.
- MTHSC 491 Independent Study 3(3,0)** Independent study or internship in mathematical sciences under faculty supervision. A written report and oral poster presentation of the results of the independent study or internship are required. May be repeated for a maximum of six credits. *Preq:* Mathematical Sciences major.
- MTHSC 492 Professional Development 1(1,0)** Issues in professional development in the Mathematical Sciences. Individual portfolios are evaluated and critiqued for continued career use.

MECHANICAL ENGINEERING

Professors: D. E. Beasley, S. B. Biggers, G. M. Fadel, R. S. Figliola, J. L. Gaddis, M. Grujicic, I. Haque, *Chair;* C. O. Huey, Jr., J. M. Kennedy, E. H. Law, J. H. Leylek, J. M. Ochterbeck, D. A. Zumbrennen; *Associate Professors:* P. F. Joseph, L. L. Thompson, J. R. Wagner; *Assistant Professors:* D. C. Angstadt, E. M. Austin, Y. Huang, N. Jalili, R. S. Miller, J. R. Saylor, J. D. Summers, C. Tong, J. D. Wood; *Lecturers:* D. C. Moline, J. B. Riestter; *Visiting Assistant Professors:* R. P. Ingel, H. L. Watson

M E 201 Statics and Dynamics for Mechanical Engineers 5(3,4) Vector analysis of the effects of forces, couples, and force-systems on rigid bodies. Conditions of static equilibrium for simple structures including pulleys, trusses, beams, frames. Kinematics and kinetics of general rigid body motion in 2-D. Applications of Newton's laws, energy methods, and impulse momentum methods to simple machine elements. *Preq:* PHYS 122, 124. *Coreq:* E G 208, ENGR 141, MTHSC 206.

M E 202 Foundations of Mechanical Systems 3(3,0) Introduction to basic physical elements of mechanical engineering systems. Problem-solving, design, and resourceful application of mathematics and general principles from students' science courses are emphasized throughout. *Preq:* MTHSC 108, PHYS 122, E M 201 (or concurrent enrollment).

M E 203 Foundations of Thermal and Fluid Systems 3(3,0) Introduction to control volumes, conservation laws of mass, momentum, and energy. Concepts of work and heat are introduced, including rate forms. Properties of pure substances. *Preq:* MTHSC 206, PHYS 221.

M E 205 Computer Analysis in Engineering 2(2,0) Application of undergraduate mathematics and basic engineering principles, emphasizing numerical methods and the use of mathematical software packages in the solution of engineering problems. Problems are drawn from dynamics, vibrations, kinematics, thermodynamics, heat transfer, materials engineering, fluid mechanics, and other engineering fields. *Preq:* ENGR 120, MTHSC 208 (or concurrent enrollment), PHYS 122, Mechanical Engineering major.

M E 221 Mechanical Engineering Laboratory I 1(0,3) Discovery of mechanical engineering principles and phenomena. Introduction to laboratory safety practices, instrumentation, calibration techniques, data analysis, and report writing. *Preq:* M E 202 (or concurrent enrollment), 203 (or concurrent enrollment), PHYS 221.

- M E 222 Mechanical Engineering Laboratory I 2(0,6)** Discovery of mechanical engineering principles and phenomena. Introduction to laboratory safety practices, instrumentation, calibration techniques, data analysis, and report writing. Introduction to basic manufacturing processes. *Preq:* PHYS 122 and 124; 221 (or concurrent enrollment).
- M E H300 Junior Honors Seminar 0** Acquaints students enrolled in Departmental Honors Program with current research activities in the Department of Mechanical Engineering. Faculty provide seminars in which research interests are summarized. These seminars are planned to prepare students in choosing a research topic for the senior thesis. *Preq:* Junior standing in departmental honors program.
- M E 301 Materials for Mechanical Engineering Applications 3(3,0)** Properties and selection of materials of interest to mechanical engineers. Emphasis is on the interrelations between the microstructure, processing, and properties of materials. *Preq:* CH 102, M E 302 (or concurrent enrollment).
- M E 302, H302 Mechanics of Materials 3(3,0)** Relationships between external loads on solid bodies or members and the resulting internal effects and dimension changes, including the derivation of rational formulas for stresses and deformations and the identification and use of important mechanical properties of engineering materials. *Preq:* E M 201, MTHSC 206.
- M E 303 Thermodynamics 3(3,0)** Study of the second law and entropy; applications to fixed mass systems and control volumes; vapor and gas power cycles; mixtures of gases; vapor psychrometrics; combustion and the third law. Thermochemical equilibrium. *Preq:* M E 203.
- M E 304 Heat Transfer 3(3,0)** Steady and transient heat conduction, free and forced convection, radiation, and multi-mode heat transfer. Emphasis is on analytical and numerical solutions to engineering heat transfer problems with a design orientation. *Preq:* M E 203, 308.
- M E 305 Modeling and Analysis of Dynamic Systems 3(3,0)** Presents techniques for developing and analyzing physical and mathematical models of mechanical and electromechanical systems. Transient and frequency response are determined using analytical and numerical methods. Basic feedback systems are introduced. *Preq:* E C E 307, E M 202, M E 202, 205, MTHSC 208.
- M E 306 Fundamentals of Machine Design 3(3,0)** Introduction to failure theory, fatigue analysis, and energy methods for deflection analysis. Integration of these topics with selected portions of mechanics of materials and application of them to the design and analysis of machine elements. *Preq:* M E 302.
- M E 308, H308 Fluid Mechanics 3(3,0)** Behavior of fluids at rest or in motion, including the study of fluid properties. Emphasis is on a rational, analytical approach from which are developed basic principles of broad applicability to all fields of engineering. *Preq:* E M 202, M E 303 (or concurrent enrollment).
- M E 310 Thermodynamics and Heat Transfer 3(3,0)** Introduction to thermodynamics and heat transfer for nonmajors: properties of liquids and gases, first and second law analysis, introduction to cycles for power and refrigeration, heat flow by conduction and radiation, and convective heat flow and heat exchangers. *Preq:* Junior standing in an engineering curriculum.
- M E 312 Manufacturing Processes and Their Application 3(3,0)** Fundamental principles associated with production processes and their application to the manufacture of products from metals, polymers, ceramics, and composites. Emphasizes the physical and quantitative aspects of processing, the selection of processes to create products, and the identification processes used to manufacture existing products. *Preq:* M E 304 (or concurrent enrollment), 306 (or concurrent enrollment), 333 (or concurrent enrollment).
- M E 333 Mechanical Engineering Laboratory II 2(1,3)** Mechanical engineering principles and phenomena are reinforced through student conducted experiments. Presentation of fundamentals of instrumentation, calibration techniques, data analysis, and report writing in the context of laboratory experiments. *Preq:* M E 221, 302 (or concurrent enrollment), 303 (or concurrent enrollment), 308 (or concurrent enrollment), MTHSC 208.
- M E 400 Senior Seminar 1(1,0)** Seminars address the problems encountered by engineering graduates in professional practice. Invited lecturers as well as faculty provide the lectures and demonstrations. *Preq:* All required 300-level E C E, E M, and M E courses or consent of instructor.
- M E 401 Mechanical Engineering Design 3(3,0)** Project-oriented course in mechanical engineering. Emphasis is on the role of analysis, synthesis, and evaluation in design and on written reporting of design solutions. Influence of economics and optimization, concurrent development, integration of design and manufacturing, and system creation are utilized for engineering design decisions. *Preq:* M E 301, 303, 304, 305, 306 (Concurrent enrollment in one of these courses is permitted with departmental approval.)
- M E 402 Internship in Engineering Design 3(1,6)** Creative application of general engineering knowledge in solving an open-ended design problem provided by a sponsor typically external to the University. Progress is evaluated by a faculty jury. Students present results to the jury and sponsor through written reports and oral presentations addressing University written/oral competency goals. *Preq:* M E 401, 404 (or concurrent enrollment).
- M E 403 Control and Integration of Multidomain Dynamic Systems 3(3,0)** Introduction of control theory with sensor, actuator, and dynamic plant integration to develop, model, control, and analyze mathematical models of mechanical, electrical, hydraulic, and pneumatic systems. Transient dynamics are determined using analytical and numerical methods with feedback control systems. Strong emphasis is placed on system design using computer simulation tools. *Preq:* M E 305.
- M E 404 Manufacturing Processes and Their Application 3(3,0)** Fundamental principles associated with production processes and their application to the manufacture of products from metals, polymers, ceramics, and composites. Emphasizes the physical and quantitative aspects of processing, the selection of processes to create products, and the identification of processes used to manufacture existing products. *Preq:* M E 301, 303, 304, 305, 306, 444.
- M E 405 Kinematics and Dynamics of Machinery I 3(3,0)** Graphical, analytical, and numerical techniques are used in the dynamic analysis and synthesis of machines. Emphasis is on the application of these analysis techniques to planar linkages. *Preq:* E M 202, 304, M E 205.
- M E 407, 607 Applied Heat Transfer 3(3,0)** Application oriented extension of M E 304, considering topics in transient conduction, flow of fluids, energy exchange by radiation, and mass transfer. Applications in heat-exchanger design with emphasis on economics and variation of operating conditions from the design point. *Preq:* M E 304, consent of instructor.
- M E 415, H415 Undergraduate Research 1-3** Individual research projects conducted under the direct supervision and guidance of a faculty member. May be repeated for a maximum of six credits. *Preq:* Consent of instructor.
- M E 416, 616 Control of Mechanical Systems 3(3,0)** Physical modeling and feedback principles are presented for control of mechanical systems. Transient response, root locus, and frequency response principles are applied to the control of basic mechanical systems such as electric motors, fluid tanks, or thermal processes. PID control laws are emphasized. *Preq:* M E 305.
- M E 417, 617 Mechatronics System Design 3(3,0)** Mechatronics integrates control, sensors, actuators, and computers to create a variety of electromechanical products. Includes concepts of design, appropriate dynamic system modeling, analysis, sensors, actuating devices, and real time microprocessor interfacing and control. Case studies, simulation, and projects are used to exemplify the system design principles. *Preq:* M E 305 or consent of instructor.
- M E 418 Finite Element Analysis in Mechanical Engineering Design 3(2,3)** Introduction to the finite element method and solid modeling, finite element modeling and analysis using commercial codes; analysis strategies using finite elements; applications to heat transfer, fluid flow, and structures. *Preq:* M E 205, 302, 304, 308, or consent of instructor.
- M E 420, 620 Energy Sources and Their Utilization 3(3,0)** Covers availability and use of energy sources such as fossil fuels, solar (direct and indirect), and nuclear; addresses energy density and constraints to use (technical and economic) for each source. *Preq:* M E 303, 304.
- M E 421, 621 Introduction to Compressible Flow 3(3,0)** Introductory concepts to compressible flow; methods of treating one-dimensional gas dynamics including flow in nozzles and diffusers, normal shocks, moving and oblique shocks, Prandtl-Meyer Flow, Fanno Flow, Rayleigh Flow, and reaction propulsion systems. *Preq:* M E 303, 308.

M E 422, 622 Design of Gas Turbines 3(3,0)

Guiding principles in gas turbine cycles are reviewed. Turbine and compressor design procedures and performance prediction for both axial and radial flow machines are presented. Methods of design of rotary heat-exchangers and retrofitting gas turbine for regenerative operation are presented. Design projects are used to illustrate the procedures. *Preq:* M E 308.

M E 423, 623 Introduction to Aerodynamics 3(3,0)

Basic theories of aerodynamics are presented for the purpose of accurately predicting the aerodynamic forces and moments which act on a vehicle in flight. *Preq:* M E 308.

M E 424 Mechanical Engineering Laboratory IV 1(0,3)

Continuation of M E 323. Mechanical engineering principles and phenomena are reinforced through open-ended, student designed and conducted experiments. Utilization of mature skills in measurement techniques, data analysis, and report writing. *Preq:* M E 301, 303, 304, 305, 306, 404 (or concurrent enrollment), 444.

M E 429, 629 Thermal Environmental Control 3(3,0)

Mechanical vapor compression refrigeration cycles, refrigerants, thermoelectrical cooling systems, cryogenics, thermodynamic properties of air, psychometric charts, heating and cooling coils, solar radiation, heating and cooling loads, insulation systems. *Preq:* M E 303, 308.

M E 430, 630 Mechanics of Composite Materials 3(3,0)

Fundamental relationships for predicting the mechanical and thermal response of multilayered materials and structures are developed. Micromechanical and macromechanical relationships are developed for laminated materials with emphasis on continuous filament composites. The unique nature of composites and the advantages of designing with composites are discussed. *Preq:* M E 302.

M E 431 Applied Fluids Engineering 3(3,0)

Applications-oriented course in industrial fluids engineering, primarily directed toward the analysis and design of piping systems and components for liquid and gas flow. Topics include friction factors, head loss, flow capacities, piping networks, flow measurement, pumps, control valves, and hydraulic and pneumatic components. *Preq:* M E 308, 333.

M E 432, 632 Advanced Strength of Materials 3(3,0)

Topics in strength of materials not covered in M E 302. Three-dimensional stress and strain transformations, theories of failure, shear center, unsymmetrical bending, curved beams, and energy methods. Other topics such as stress concentrations and fatigue concepts are treated as time permits. *Preq:* M E 302.

M E 440 Materials for Aggressive Environments 3(3,0)

Emphasizes the engineering aspects of selecting materials for applications in aggressive environments. Various types of materials degradation are discussed as are methods for wastage prevention, including especially engineering design and materials selection approaches. Structural metallic alloys are emphasized; however, technically important ceramics and polymers are also discussed. *Preq:* M E 301, 306.

M E 444 Mechanical Engineering Laboratory III 2(1,3)

Continuation of M E 322. Mechanical engineering principles and phenomena are reinforced through student-conducted experiments. Presentation of fundamentals of instrumentation, calibration techniques, data analysis, and report writing in the context of laboratory experiments. *Preq:* M E 301 (or concurrent enrollment), 304 (or concurrent enrollment), 305 (or concurrent enrollment), 306 (or concurrent enrollment), M E 333, MTHSC 302 or EX ST 411.

M E 450, 650 Mechanical Vibrations 3(3,0)

Mathematical analysis of physical problems in the vibration of mechanical systems. Topics include linear-free vibrations, forced vibrations, and damping in single degree of freedom systems, transient vibrations, critical speeds and whirling of rotating shafts, dynamic balancing, and multi-degree of freedom systems with lumped parameters. *Preq:* E M 202, M E 302, MTHSC 208.

M E 453, 653 Dynamic Performance of Vehicles 3(3,0)

Introduces techniques for analyzing the dynamic behavior of vehicles. Types of vehicles to be considered are chosen from aircraft, surface ships, automobiles and trucks, railway vehicles, and magnetically levitated vehicles. *Preq:* M E 205, 305, or consent of instructor.

M E 454, 654 Design of Machine Elements 3(3,0)

Design of common machine elements including clutches, brakes, bearings, springs, and gears. Optimization techniques and numerical methods are employed as appropriate. *Preq:* M E 306 or consent of instructor.

M E 455, 655 Design for Computer-Automated Manufacturing 3(3,0)

Concepts of product and process design for automated manufacturing are considered. Topics include product design for automated manufacturing, inspection and assembly, using automation, industrial robots, knowledge-based systems and concepts of flexible product manufacture. *Preq:* M E 301, 306, 404 (or concurrent enrollment), or consent of instructor.

M E (E C E) 456, 656 Fundamentals of Robotics 3(3,0)

Introduction to the fundamental mechanics and control of robots, including their application to advanced automation. Topics include robot geometry, kinematics, dynamics, and control. Planar machine structures are emphasized, including methods using computer analysis. Application considerations include the design and operation of robot systems for manufacturing and telerobotics. *Preq:* M E 305, 416 (or concurrent enrollment), or consent of instructor.

M E 471, 671 Computer-Aided Engineering Analysis and Design 3(3,0)

Students are exposed to geometric and solid modeling, finite elements, optimization, and rapid-prototyping. Students design an artifact, represent it on the computer, analyze it using FEA, then optimize before prototyping it. Emphasizes the use of computer-based tools for engineering design. The World Wide Web is used for reporting. *Preq:* Numerical methods and programming experience or consent of instructor.

M E 493, 693 Selected Topics in Mechanical Engineering 1-6(1-6,0)

Study of topics not found in other courses. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* Consent of instructor.

MICROBIOLOGY

Professors: W. Y. Chen, S. S. Hayasaka, T. A. Hughes, L. L. Larcom, T. E. Schwedler, T. R. Scott; *Assistant Professors:* X. Jiang, H. D. Kurtz; *Lecturers:* J. G. Abercrombie, J. M. Henson, P. A. Mickelsen, T. R. Tzeng

MICRO 101 Microbes and Human Affairs 1(1,0)

Introduces Microbiology majors to University career and library services, evaluation of computer program proficiency, Web page development, Microbiology emphasis areas, and Microbiology faculty. Students initiate their own Web-based student portfolios, which showcase their skills and experiences (e.g., résumés, accomplishments, and work samples) during their undergraduate programs. *Coreq:* BIOL 103 or 110 or consent of course coordinator.

MICRO 205 Introductory Microbiology 4(3,3)

Basic concepts of microbiology, introduced through classroom and laboratory experiences. Emphasis is on practical applications in various areas of importance to man. Recommended for students not majoring in a biological science. Not open to Microbiology majors. *Preq:* CH 101, 102, BIOL 103.

MICRO 305 General Microbiology 4(3,3)

Morphology, physiology, classification, distribution, and cultivation of microorganisms. *Preq:* Introductory biology, CH 101, 102.

MICRO 400, 600 Public Health Microbiology 3(3,0)

Epidemiology of transmissible diseases including pathogenic characteristics of the infectious organism, modes of transmission, mechanism of infection, diagnostic aids, effective treatments, immunizing procedures, and methods of preventing infection. *Preq:* MICRO 305.

MICRO 401, H401, 601 Microbial Diversity and Ecology 4(2,6)

In-depth survey of microbial morphology, ecology, and diversity. Study of the interaction and adaptation of microbes in a wide range of environmental conditions, including consideration of their metabolism, nutrition, growth and the use of microbiological assays. *Preq:* CH 201 or 223, 227, MICRO 305.

MICRO 403, 603 Marine Microbiology 3(2,3)

Discussion of the microbes that inhabit the marine environment, their peculiar physiological traits, and contributions to the ecology of oceans. *Preq:* MICRO 305, organic chemistry.

MICRO 407, H407, 607 Food and Dairy Microbiology 4(3,3)

Physical-chemical factors limiting survival and growth of microorganisms during processing and manufacturing of food and dairy products. Standard methods for enumerating and identifying indicator bacteria, yeasts, molds, and microbes producing food and food-borne illness. Starter cultures, fungal toxins, microbial cell injury and standards for food and dairy products. *Preq:* BIOCH 305 or CH 201 or 223, MICRO 305.

MICRO 410, H410, 610 Soil Microbiology 3(2,3)

Role of microorganisms in the decomposition of organic substances, transformation of nitrogen and mineral substances in the soil; interrelationships between higher plants and microorganisms; importance of microorganisms in soil fertility. *Preq:* MICRO 305.

MICRO 411, H411, 611 Pathogenic Bacteriology 4(3,3) Study of pathogenic bacteria, their morphology, cultural requirements and classification; diagnostic tests, methods of differentiation, and the diseases caused. *Preq:* MICRO 305.

MICRO 412, H412, 612 Bacterial Physiology 4(3,3) Consideration of the cytology, physiology, metabolism, and genetics of bacteria. Includes studies of growth and death, reproduction and mutation, nutrition and metabolic pathways, regulatory mechanisms, and effects of environment. *Preq:* CH 224, MICRO 305, one semester of biochemistry, or consent of instructor.

MICRO 413, H413, 613 Industrial Microbiology 3(2,3) Microbial aspects of large-scale processes for the production of foods, antibiotics, enzymes, fine chemicals, and beverages. Topics include strain selection, culture maintenance, biosynthetic pathways, continuous cultivation and production of single cell protein. *Preq:* MICRO 305.

MICRO (AVS, BIOSC) 414, H414, 614 Basic Immunology 4(3,3) Consideration of the nature, production, and function of basic immune responses in animals. Procedures and mechanisms of antigen-antibody and other immune reactions. *Preq:* MICRO 305, organic chemistry.

MICRO 415, H415, 615 Microbial Genetics 4(3,3) Cytological basis of bacterial, fungal, and viral genetics; molecular aspects; mutations; mechanisms of genetic transfers; episomes and plasmids; and population changes. *Preq:* BIOCH 301, CH 224, MICRO 305, or consent of instructor.

MICRO 416, H416, 616 Introductory Virology 3(3,0) Introduction to the field of virology, including animal, bacterial, and plant viruses. Topics include nomenclature and classification, biochemical and biophysical characteristics, mechanisms of replication, chemotherapy, and techniques for isolation, assay, and purification. *Preq:* BIOCH 301, MICRO 305, or consent of instructor.

MICRO 417, H417, 617 Molecular Mechanisms of Carcinogenesis and Aging 3(3,0) Changes which occur at the cellular and subcellular levels during transformation and aging. Accumulated damage and "intrinsic clock" theories of aging; genetic and epigenetic theories of carcinogenesis; epidemiology of cancer; viral, radiation-induced, and chemical carcinogenesis; the immune system and cancer. *Preq:* BIOCH 301, MICRO 305, or consent of instructor.

MICRO (BIOSC, GEN) 418, 618 Biotechnology I: Nucleic Acids Techniques 4(2,4) See GEN 418.

MICRO 419, 619 Selected Topics in Molecular Medicine 3(3,0) Introduction to various areas of molecular medicine. Examines the latest research and developments in molecular medicine. Designed for students interested in medicine and biomedical research. Graduate students may repeat for a maximum of six credits. *Preq:* BIOCH 301, MICRO 305, or consent of instructor.

MICRO 491 Special Problems in Microbiology 1-3(0,3-9) Research problems in various areas of microbiology which introduce undergraduate students to the planning and execution of research experimentation and the presentation of research findings. May be repeated with advisor's approval.

MICRO H491 Honors Special Problems in Microbiology 3(0,9) Research problems in various areas of microbiology which introduce undergraduate students to the planning and execution of research experimentation and the presentation of research findings. May be repeated for a maximum of six credits with consent of instructor. *Preq:* Membership in Calhoun Honors College, consent of instructor.

MICRO (BIOSC) 493 Senior Seminar 2(2,0) See BIOSC 493.

MILITARY LEADERSHIP

Professor: F. S. Choi, *Chair; Assistant Professors:* D. W. Eaton, H. A. Pennington, W. G. Richards, Jr., G. K. Smith, R. J. Webber; *Instructors:* A. L. Hunter, J. L. McLean

ML 101 Leadership Fundamentals I 2(2,1) Study of leadership focused at the individual level. Students learn effective communicating skills, ethical decision making, small group management, and mental and physical conditioning. Skills are applied in a variety of challenging training events during laboratory, including rappelling, water survival, land navigation, and team athletics.

M L 102 Leadership Fundamentals II 2(2,1) Continued study of leadership focused at the individual and team levels. Topics include problem solving, critical thinking, leadership styles, and group cohesion. Leadership laboratory training includes small tactics and weapons firing.

ML 103 Becoming a Leader 3(3,0) Study of basic leadership, covering leadership theory and skills, organizational systems to support leaders, problem solving, values and ethics, and communication skills. Includes lecture, practical exercises, and guest speakers.

ML 201 Leadership Development I 2(2,1) Study of leadership focused at the team level. Students develop leadership skills through public speaking, managing small groups, and mentoring first-year students. Skills are applied in a variety of challenging training events during leadership laboratory, including rappelling, water survival, land navigation, and team-building exercises.

M L 202 Leadership Development II 2(2,1) Continued study of leadership at the team and small group levels. Focuses on moral leadership, officership, and the Army as a profession. Leadership laboratory training includes small unit tactics, airmobile operations, and weapons firing. Students lead teams throughout the semester.

M L 210 Leaders' Training Course 4(2,6) Five-week leadership camp conducted on an Army post. Students' pay and expenses are provided by the U.S. Army. Environment is rigorous and focused on leadership development. No military obligation is incurred. Completion of this course qualifies students for entry into the Army ROTC Advanced Course.

M L 211 Cadet Field Leadership Training 1-6 Eight-week program of instruction conducted by the U.S. Military Academy to develop leadership skills of sophomore students. Seven weeks of the course are held at West Point with one week at Fort Knox, KY, for Mounted Maneuver Training. To be taken Pass/Fail only. *Preq:* M L 202.

M L 301 Advanced Leadership I 3(2,2) Study of leadership focused on decision making, planning, communicating, and executing. Addresses motivational techniques, the role of a leader, and performance assessment. Provides students with leadership management tools and methodology. Students are responsible for training, developing, and mentoring Basic Course students. Students apply learned techniques in leadership laboratory. *Preq:* M L 202 or 210.

ML 302 Advanced Leadership II 3(2,2) Continuation of leadership study focusing on collective skills training, tactics, and small group instruction. Synthesizes various components of training, leadership, and team-building learned during the Basic Course and M L 301. Final step in students' progression prior to the Leader's Development and Assessment Course. *Preq:* M L 301.

M L 401 Organizational Leadership I 3(2,2) Culmination of leadership study in preparation for commissioning as Army officers. Students continue exercising leadership and management skills as senior cadet leaders. Leadership instruction focuses on coordinating activities with staffs, communicating effectively, counseling and mentoring subordinates, training management and ethics. *Preq:* M L 302, Leader's Development and Assessment Course.

M L 402 Organizational Leadership II 3(2,2) Continuation of M L 401. Focuses on the continued study of moral, ethical, and legal issues faced by leaders. Includes instruction in administrative and logistical management. Requires students to apply their knowledge individually and collectively to solve problems and improve the organization. *Preq:* M L 401.

M L 451 Organizational Leadership III 3(2,3) Transitional leadership development and training for completion cadets and others designed to enhance practical experiences in managing organizational training programs, develop leadership skills by serving in cadet staff positions, develop small group decision making and conflict management skills, and reinforce physical fitness and lifestyle skills required of leaders. May be repeated for a maximum of six credits. *Preq:* M L 302.

MUSIC

Professors: R. E. Goodstein, *Chair;* L. U. Harder, D. R. Rash; *Associate Professors:* P. L. Buyer, N. M. Hosler, A. R. Levin, L. L. Li-Bleuel; *Assistant Professors:* L. Dzuris, M. J. Spede, B. A. Whisler; *Lecturers:* M. Anderson, E. J. Austin, H. D. Bannister, Jr., I. Bracchitta, T. Broussard, S. R. Cullen, J. B. Fankhauser, T. Haden, R. M. Houze, L. Kibler, H. C. Parker, M. G. Rowell, S. M. Sawyer, H. R. Spires, D. E. Stevenson, W. H. Thomas

MUSIC 101 Beginning Class Piano I 1(0,2) Thorough introduction to basic keyboard skills including solo and ensemble repertoire, technique, applied keyboard theory, and performance. Applied music fee is assessed. *Preq:* Consent of instructor.

MUSIC 102 Beginning Class Piano II 1(0,2) Continued work on keyboard skills, applied keyboard theory, solo and ensemble repertoire, and performance. Applied music fee is assessed. *Preq:* MUSIC 101 or consent of instructor.

- MUSIC 105 Music Fundamentals 3(3,0)** Covers the rudiments of music theory and aural skills. Includes notation, scales, key signatures, intervals, and chord construction, as well as sight singing and ear training.
- MUSIC 111 Beginning Class Guitar I 1(0,2)** Introduction to basic guitar skills, including finger-style technique, strumming, and song accompaniment. Students develop skills and appreciation of the discipline through teacher-led drills, ensemble playing, and the exploration of guitar history, style, and the impact of various players and composers on the medium. Applied music fee is assessed. *Preq:* Consent of instructor.
- MUSIC 112 Beginning Class Guitar II 1(0,2)** Continued work on guitar skills, including finger-style, strumming, pick playing, ensemble playing, and soloing. Also includes music theory for guitarists such as keys, scales, and chord building, as well as discussions of the impact of various players and composers on the medium. Applied music fee is assessed. *Preq:* MUSIC 111 or consent of instructor.
- MUSIC 121 Beginning Class Voice 1(0,2)** Introduction to basic vocal skills, including breathing, tone production, diction, intonation, and interpretation. Includes solo and ensemble repertoire. In-class group and individual performances are required. Applied music fee is assessed. *Preq:* Consent of instructor.
- MUSIC 131 Beginning Instrumental Class 1(0,2)** Introduction to basic instrumental skills in a class setting, including proper playing position, tone production, intonation, and ensemble playing. Includes brief history and usage of the given instruments. Different instrumental groups are taught as separate course sections. May be repeated for a maximum of six credits, but only on other instruments. Applied music fee is assessed. *Preq:* Consent of instructor.
- MUSIC 151 Applied Music 1(0,1)** Individual study in performance medium (piano, voice, strings, woodwinds, brass, percussion, guitar, organ, or carillon). One 30-minute lesson each week, for which a minimum of four hours practice is required. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. *Preq:* Consent of instructor, based upon a qualifying audition.
- MUSIC 152 Applied Music 1(0,1)** Continuation of MUSIC 151. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. *Preq:* MUSIC 151.
- MUSIC 153 Applied Music for Majors 1(0,1)** Individual study in vocal or instrumental performance (voice, woodwinds, brass, strings, percussion or keyboards). One 45-minute lesson each week. Jury required. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. *Preq:* Performing Arts major (Music Concentration) and consent of instructor, based upon qualifying audition.
- MUSIC 154 Applied Music for Majors 1(0,1)** Continuation of MUSIC 153. Jury and performance on a recital are required. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. *Preq:* MUSIC 153, consent of instructor.
- MUSIC 180 Introduction to Music Technology 3(2,3)** Introduction to music notation, sequencing, digital audio, sound reinforcement, analog and digital recording, and other current music technologies. *Preq:* Performing Arts major or consent of instructor.
- MUSIC 205 Music Theory I 3(3,0)** Beginning analytical techniques in both the classical and popular genres, including aspects of harmony, melody, and rhythm. *Preq:* MUSIC 105, satisfactory score on departmental placement exam, or consent of instructor. *Coreq:* MUSIC 207.
- MUSIC 206 Music Theory II 3(3,0)** Continuation of MUSIC 205, with added emphasis on modulation and formal structures. *Preq:* MUSIC 205. *Coreq:* MUSIC 208.
- MUSIC 207 Aural Skills I 1(0,2)** Beginning studies in sight-singing and dictation (melodic, harmonic, and rhythmic). *Coreq:* MUSIC 205.
- MUSIC 208 Aural Skills II 1(0,2)** Continuation of MUSIC 207 with music of greater complexity and the use of C clefs. *Coreq:* MUSIC 206.
- MUSIC 210, H210 Music Appreciation: Music in the Western World 3(3,0)** Deepens students' appreciation of their musical heritage through study of the elements of the musical language and its development in Western culture.
- MUSIC 251 Applied Music 1(0,1)** Continuation of MUSIC 152. Applied music fee is assessed. *Preq:* MUSIC 152, consent of instructor.
- MUSIC 252 Applied Music 1(0,1)** Continuation of MUSIC 251. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. *Preq:* MUSIC 251, consent of instructor.
- MUSIC 253 Applied Music for Majors 1(0,1)** Continuation of MUSIC 154. May be repeated for credit on other performance media with departmental approval. Jury is required. Applied music fee is assessed. *Preq:* MUSIC 154, consent of instructor.
- MUSIC 254 Applied Music for Majors 1(0,1)** Continuation of MUSIC 253. May be repeated on other performance media with departmental approval. Jury and performance on a recital are required. Applied music fee is assessed. *Preq:* MUSIC 253, consent of instructor.
- MUSIC 279 Music Practicum 1(0,3)** Practical work in music on productions designed for public presentation. Emphasis is placed on sound support, amplification, and mixing. May be repeated for a maximum of four credits. *Preq:* Consent of instructor.
- MUSIC 280 Sound Reinforcement 3(2,2)** Theory and practice of using audio equipment for amplifying sound in venues ranging from conference rooms to concert halls and sports arenas. *Preq:* Performing Arts major or consent of instructor.
- MUSIC 285 Acoustics of Music 3(3,0)** Study of the relationship between the laws of physics and the production of music from an audio engineering perspective. Topics include mechanical and acoustical laws, harmonic analysis, musical scales, sound production in instruments, and the physiology of hearing. *Preq:* Performing Arts major.
- MUSIC 310 Survey of Music History 3(3,0)** Comprehensive survey of the Western art music tradition from the Middle Ages to the present. *Preq:* MUSIC 206, Performing Arts major; or consent of instructor.
- MUSIC 311 History of American Music 3(3,0)** Music in America from 1620 to the present. Indigenous and borrowed influences are examined.
- MUSIC 312 History of Jazz 3(3,0)** Comprehensive survey of jazz elements and styles. A historical perspective from Dixieland to bebop to jazz/rock is included.
- MUSIC 313 History of Rock and Roll 3(3,0)** Comprehensive survey of rock elements, styles, and artists. Emphasis is on the evolution of rock and roll including a broad examination of musical influences. Course content examines how rock and roll both reflected and influenced social issues.
- MUSIC 314 World Music 3(3,0)** Introduction to ethnomusicology and music of the world's peoples. Emphasis is placed on music through culture.
- MUSIC 317 History of Country Music 3(3,0)** Chronological study of country music origins, styles, and artists. Emphasizes the evolution of country music from a cultural expression of the South to a commercial art form of worldwide appeal.
- MUSIC 321 Principles of Piano Performance I 3(3,0)** In-depth study of the principles of piano performance focusing on how to interpret a musical score, develop technical skills and practice techniques, and use the body correctly at the keyboard. *Preq:* By audition.
- MUSIC 322 Principles of Piano Performance II 3(3,0)** Continuation of MUSIC 321. *Preq:* MUSIC 321 or consent of instructor.
- MUSIC 323 Piano Accompanying I 1(0,3)¹** Group study in piano accompanying. Focuses on sight-reading and choral, vocal, and instrumental accompanying. Students take group lessons and accompany choral groups and/or applied music students. *Preq:* Consent of instructor.
- MUSIC 325 CU Carillonneurs 1(0,2)¹** Group study in playing the 47-bell University carillon. One two-hour meeting each week for which a minimum of two hours of individual practice is required. Participation in a recital is required. *Preq:* Musical keyboard experience, consent of instructor.
- MUSIC 330 Small Ensemble 1(0,3)¹** Ensembles: devoted to the musical training of instrumental, vocal ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time. Enrollment in simultaneous sections is allowed. *Preq:* Consent of director.

- MUSIC 331 Pep Band 1(0,3)¹** Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given in addition to the minimum rehearsal time. Simultaneous enrollment in multiple sections is allowed. *Preq:* Consent of director.
- MUSIC 332 Woodwind Quintet 1(0,3)¹** Ensembles: advanced study of woodwind chamber music media. One one-hour class meeting each week, for which a minimum of two hours of ensemble practice is required. *Preq:* By audition only; concurrent enrollment in MUSIC 362.
- MUSIC 333 String Quartet 1(0,3)¹** Ensembles: advanced study of string quartet repertoire. Two 90-minute meetings each week for which a minimum of two hours of practice is required. *Preq:* By audition only. *Coreq:* MUSIC 369, Applied Music.
- MUSIC 334 Flute Choir 1(0,3)¹** Ensembles: study of flute ensemble literature. One 60-minute meeting each week for which a minimum of two hours of practice is required. *Preq:* By audition only.
- MUSIC 336 Percussion Ensemble 1(0,2)¹** Ensembles: study and performance of percussion ensemble literature. One two-hour class meeting each week, for which a minimum of two hours of individual practice is required. *Coreq:* MUSIC 331, 362, 363, 364, or 369.
- MUSIC 337 Steel Drum Band 1(0,2)¹** Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given in addition to the minimum rehearsal time. Rehearsals also include discussions of steel band history and performance practice. *Preq:* Consent of director.
- MUSIC 341 Men's Breakout Ensemble 1(0,2)¹** Small ensembles: study of male a cappella/popular music on an advanced level. *Coreq:* MUSIC 370 or 372 or consent of instructor.
- MUSIC 342 Women's Breakout Ensemble 1(0,2)¹** Small ensembles: study of women's a cappella/popular vocal music on an advanced level. Enrollment is limited with priority given to students who are enrolled in a large choral ensemble. *Coreq:* MUSIC 370 or 371 or consent of instructor.
- MUSIC 343 Men's Small Ensemble 1(0,2)¹** Small ensembles: study of male a cappella/popular, barbershop, and nostalgic music on an advanced level. *Coreq:* MUSIC 370 or 372 or consent of instructor.
- MUSIC 344 Vocal Jazz Ensemble 1(0,3)¹** Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time. *Coreq:* MUSIC 370, 371, 372 or consent of instructor.
- MUSIC 351 Applied Music 1(0,1)** Continuation of MUSIC 252. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. *Preq:* MUSIC 252, consent of instructor.
- MUSIC 352 Applied Music 1(0,1)** Continuation of MUSIC 351. Students are required to perform an appropriate solo in a student recital. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. *Preq:* MUSIC 351, consent of instructor.
- MUSIC 353 Applied Music for Majors 1(0,1)** Continuation of MUSIC 254. May be repeated on other performance media with departmental approval. Jury is required. Applied music fee is assessed. *Preq:* MUSIC 254, consent of instructor.
- MUSIC 354 Applied Music for Majors 1(0,1)** Continuation of MUSIC 353. May be repeated on other performance media with departmental approval. Juried half-recital performance is required. Applied music fee is assessed. *Preq:* MUSIC 353, consent of instructor.
- MUSIC 361 Marching Band 1(0,3)¹** Ensembles: devoted to musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time. Offered fall semester only. *Preq:* Consent of director.
- MUSIC 362 Symphonic Band 1(0,3)¹** Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time. *Preq:* Consent of director.
- MUSIC 363 Jazz Ensemble 1(0,3)¹** Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time. *Preq:* Consent of director.
- MUSIC 364 Concert Band 1(0,2)¹** Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time. *Preq:* Consent of director.
- MUSIC 369 Symphony Orchestra 1(0,3)¹** Mid-sized, college-community orchestra devoted to performing works from standard repertoire. Weekly evening rehearsals with one or more performances per semester. *Preq:* Consent of director.
- MUSIC 370 Clemson University Singers 1(0,3)¹** Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time. *Preq:* Consent of director.
- MUSIC 371 Women's Glee 1(0,3)¹** Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given in addition to the minimum rehearsal time. *Preq:* Consent of director.
- MUSIC 372 Men's Glee 1(0,3)¹** Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given in addition to the minimum rehearsal time. *Preq:* Consent of director.
- MUSIC 373 University Chorus 1(0,3)¹** Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time. *Preq:* Consent of director.
- MUSIC 380 Audio Engineering I 3(2,2)** Intermediate-level course in music technology focusing on digital hard-disk recording and acoustical considerations in audio engineering. *Preq:* MUSIC 180 or consent of instructor.
- MUSIC 398 Special Topics in Music 3(3,0)** Consideration of select areas of study in music not addressed by other music courses. May be repeated once for credit. *Preq:* Consent of instructor.
- MUSIC 400, 600 Music in the Elementary Classroom 3(3,0)** Familiarizes teachers in the elementary classroom with traditional, Kodaly, Orff, and Kindermusik approaches in correlating music with language arts, mathematics, and social studies.
- MUSIC 405 Instrumental and Vocal Arranging 3(2,3)** Advanced study of the properties of instruments and voices and their combination in various small and large ensembles. Emphasis is placed on applying this knowledge to the creation of instrumental and vocal arrangements. *Preq:* MUSIC 180, 205, or consent of instructor.
- MUSIC 415 Music History to 1750 3(3,0)** Development of Western music from antiquity to 1750, emphasizing representative literature from various styles and periods. *Preq:* MUSIC 210, 310, or consent of instructor.
- MUSIC 416 Music History Since 1750 3(3,0)** Continuation of MUSIC 415. Music from 1750 to the present. *Preq:* MUSIC 210, 310, or consent of instructor.
- MUSIC 430 Conducting 3(3,0)** Study of choral and instrumental conducting. Emphasis is on manual conducting techniques, attitudes, philosophies, and responsibilities necessary for the preparation, planning, and execution of artistic conducting. *Preq:* MUSIC 205 or consent of instructor.
- MUSIC 451 Applied Music 1(0,1)** Continuation of MUSIC 352, guiding students in interpretation of advanced solo and ensemble literature. Students are required to perform an appropriate solo in a student recital. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. *Preq:* MUSIC 352 and consent of instructor.
- MUSIC 452 Applied Music 1(0,1)** Continuation of MUSIC 451. Students are required to perform an appropriate solo in a student recital. Applied music fee is assessed. *Preq:* MUSIC 451 and consent of instructor.
- MUSIC 453 Applied Music for Majors 1(0,1)** Continuation of MUSIC 354. May be repeated on other performance media with departmental approval. Jury is required. Applied music fee is assessed. *Preq:* MUSIC 354, consent of instructor.
- MUSIC 454 Applied Music for Majors 1(0,1)** Continuation of MUSIC 453. May be repeated on other performance media with departmental approval. Juried full recital performance is required. Applied music fee is assessed. *Preq:* MUSIC 453, consent of instructor.

MUSIC 480, 680 Audio Engineering II 3(2,2)
Advanced course in music technology focused on music production integrating digital audio and virtual instruments. *Preq:* MUSIC 380 or consent of instructor.

MUSIC 485 Production Workshop 3(2,2)
Project-based course focused on music production. Students produce an audio CD that includes recorded audio tracks and/or newly-created sequenced material with creative and appropriate packaging. *Preq:* MUSIC 480.

MUSIC 499, 699 Independent Studies 1-3(1-3,0)
Tutorial work for students with special interests in music study outside the scope of existing courses. May be repeated for a maximum of six credits. *Preq:* Consent of department chair.

¹This course may be repeated for credit with a maximum of 16 hours of ensemble credit allowable toward a degree.

NONPROFIT LEADERSHIP

NPL 300 Foundations in Nonprofit Leadership 2(2,0)
Students develop an understanding of historical and philosophical aspects of nonprofit organizations, as well as special skills needed to develop boards, recruit volunteers, raise funds, and manage day-to-day operations. Career development opportunities are also explored.

NPL 390 Practicum I 1(0,3)
Under agency supervision, students spend 60 hours observing and implementing activities, events, and programs in a nonprofit, faith-based, grassroots, or organization approved by instructor. To be taken Pass/Fail only. *Preq:* Enrollment in Nonprofit Leadership minor, consent of instructor.

NPL 490 Practicum II 2(0,6)
Under agency supervision, students spend 100 hours planning, organizing, and implementing activities, events, and programs in a nonprofit, faith-based, grassroots, or organization approved by instructor. *Preq:* Enrollment in Nonprofit Leadership minor, consent of instructor.

NURSING

Professors: R. H. Pruitt, *Director*; B. J. Holaday, E. J. Lee, B. N. Logan, P. A. Smart; *Associate Professors:* B. J. Holder, C. W. Lee, N. K. Meehan, V. G. Parker, S. W. Thompson, J. L. Timms, M. A. Wetsel, D. F. Willoughby; *Assistant Professors:* C. L. Belcher, J. B. Craig, J. A. Eggert, L. M. Gibson, C. C. Harmon, L. A. Howe, A. E. Johnson; *Lecturers:* S. Abbott, R. Amerson, P. A. Botchway, J. S. Gillespie, E. N. Hatfield, P. E. Payne, K. J. Smith, E. O. Swanson

NURS 140 Computer Applications in Health Care 3(3,0)
Introduction to the application of computers in the delivery of health care. Covers existing health care applications and forecasts future needs. Multiple computer systems are discussed. Nursing majors will be given enrollment priority.

NURS 300 Seminar in Health Care Topics 1-4 (1-4,0-9)
Individualized in-depth study in a selected health care area; may have a clinical component and/or special projects. Open to non-Nursing majors. May be repeated for a maximum of six credits. *Preq:* Consent of instructor.

NURS 303 Nursing of Adults 7(3,12)
Incorporates theoretical and empirical knowledge from physical and social sciences. Uses critical thinking to provide holistic, safe, individualized nursing care to adults, including health promotion, maintenance, restoration, and health teaching. *Preq:* NURS 304, 310, 312, 340. *Preq or Coreq:* NURS 320.

NURS 304 Pathophysiology for Health Care Professionals 3(3,0)
Focuses on disease mechanisms and recognition of the manifestations of these mechanisms in body systems. Discussion also includes pharmacologic and mechanical interventions commonly associated with specific disease processes and application to patient-care situations. *Preq:* BIOSC 223.

NURS 305 Psychosocial Nursing 3(3,0)
Lifespan approach to examine psychosocial, developmental, family, and cultural factors that influence individuals from diverse populations and their families in the promotion, maintenance, and restoration of health. The use of the nursing process, critical thinking, therapeutic communication, and psychosocial nursing interventions is explored. *Preq:* Junior standing in Nursing.

NURS 307 Family Nursing in the Community 5(4,2)
Bridge course for RN students focusing on nursing care of families including childbearing clients, infants, children, adolescents, adults, and older adults in the context of the community. Emphasis is on strategies to assist individuals in achieving or maintaining wellness in the family, home, and community environment. *Preq or Coreq:* NURS 313.

NURS 310 Health Assessment 3(2,3)
Introduces concepts of health, wellness, and illness. Focuses on physical, psychosocial, and cultural assessment for the well adult client with variations across the lifespan. Includes interviewing techniques. *Preq:* All required non-nursing courses and electives.

NURS 311 Introduction to Community Nursing 2(2,0)
Focuses on health promotion and illness prevention activities across the lifespan for individuals and families in the community. Major emphasis is on nursing's role in the acquisition and maintenance of health as well as the identification and modification of health risk factors. *Preq:* NURS 310, 312, 320. *Preq or Coreq:* NURS 304, 340.

NURS 312 Therapeutic Nursing Interventions 4(2,6)
Focuses on therapeutic nursing interventions, including selected psychomotor skills, communication skills, and teaching/learning. *Preq:* All required non-nursing courses and electives.

NURS 313 Health Assessment Through the Lifespan 4(3,2)
Expands on RNs' knowledge of health assessment. Focuses on physical and psychosocial assessment for the well client throughout the lifespan. Interviewing techniques are included. *Preq:* Admission to RN/BS program.

NURS 317 Development of the Nursing Profession 3(3,0)
Explores the evolution of nursing as a profession, the social and technological factors and challenges, struggles, and accomplishments of past nursing leaders. Includes strategies for effecting change based on experiences of the past.

NURS 318 Multidisciplinary Approach to End-of-Life Care 3(3,0)
Integrates principles of care to increase comfort at the end of life, presented within a framework which encompasses the physical, psychosocial, and spiritual dimensions of an individual. Coursework also includes ethical and legal issues related to advance directives, reimbursement, and regulatory topics. *Preq:* PSYCH 201, SOC 201, or consent of instructor.

NURS 320, H320 Professionalism in Nursing 2(2,0)
Application of critical thinking skills in the professional nursing roles in multidisciplinary approaches to health care. Analysis of the historical development of modern nursing. Examination of issues of nursing care to diverse populations within context of ethical and professional standards. *Preq:* All required non-nursing courses and electives or consent of instructor.

NURS 323 Gerontology Nursing 2(2,0)
Introduction of theories of aging. Focuses on complex health care issues of aging and chronic care including promotion, maintenance, and restoration of health of the elderly. Scientific concepts address physiological, psychological, and sociological issues of aging and chronic illness. *Preq:* NURS 310, 312, 320, PSYCH 201, SOC 201. *Preq or Coreq:* NURS 304, 340.

NURS 330, H330 Research in Nursing 3(3,0)
Introduction to conceptual frameworks, models, and theories related to nursing. Analysis of reported research in nursing and related disciplines. Ethical, moral, and legal issues are discussed in relation to nursing research. *Preq:* NURS 310, 312, 320 or admission to RN/BS program.

NURS 333 Health Care Genetics 3(3,0)
Focuses on the new genetics and the implications for health care professionals. Discussion includes applications of the evolving genetics technology and services to changing life stages. Issues of ethics relevant to various genetic disorders is also addressed. *Preq:* BIOSC 223.

NURS 340 Pharmacotherapeutic Nursing Interventions 3(3,0)
Focuses on the integration of nursing process with pharmacotherapeutics, administration, monitoring, and related client education. Includes major drug classifications, indications for use, side effects, interactions, routes of administration, usual dosages and contraindications. *Preq:* All required non-nursing courses and electives.

NURS (PHIL) 350 Technology and Philosophy in Nursing 3(3,0)
Analyzes influence of increasing application of scientific technology to health care delivery and concomitant ethical issues.

NURS 401 Mental Health Nursing 5(3,4)
Application of theories and the nursing process to identify, implement, and evaluate nursing interventions for the care of clients with psychiatric disorders. *Preq:* All required 300-level nursing courses.

NURS 403 Complex Nursing of Adults 5(3,4)
Focuses on the biological, psychological, philosophical, and sociocultural influences on complex health problems related to acute and traumatic conditions. Emphasizes the concepts of circulation, oxygenation, homeostasis, and compensation in acutely ill adults. *Preq:* NURS 401, 411, 412.

NURS 405, H405 Leadership and Management in Nursing 3(2,2) Focuses on the role of the professional nurse in managing nursing care. Theories and research related to leadership, power, management, organizations, regulation, and ethics are discussed. Directed laboratory experiences are provided. *Preq:* NURS 401, 411, 412, or admission to RN/BS program.

NURS 406 Issues in Professionalism 3(3,0) Analysis of the development of professional nursing. Consideration of educational issues, legal and economic issues, health policy, leadership, cultural variations, and the influence of values in ethical decisions and nursing practice. *Preq:* Admission to RN/BS program.

NURS 408 Senior Nursing Practicum 3(1,4) Impact of selected health issues and problems on the practice of nursing is considered. Licensure preparation, maintaining currency in the field, and other relevant topics facing the professional nurse are presented. Under preceptor supervision, students observe, organize, and implement entry level nursing practice. To be taken Pass/Fail only. *Preq:* NURS 401, 411, 412. *Coreq:* NURS 403, 415.

NURS 411 Nursing Care of Children 5(3,4) Focuses on child health problems and health maintenance. Emphasizes biological, pathophysiological, psychological, and sociocultural concepts related to nursing care of children with acute, critical, and chronic illnesses. Includes strategies for alleviation of illness, restoration of wellness, promotion and maintenance of health, growth, and development. *Preq:* All required 300-level Nursing courses.

NURS 412 Nursing Care of Women and Their Families 5(3,4) Emphasizes biological, psychological, and sociocultural concepts; identification of appropriate nursing strategies to enhance individual capacity to achieve or maintain wellness in the family, home, community, and hospital environment. *Preq:* All required 300-level Nursing courses.

NURS 415 Community Health Nursing 4(2,4) Consideration of health promotion activities for family and community groups with emphasis on community assessment, screening, and health teaching/counseling. Practice activities are related to health promotion in population groups and nursing care of homebound clients. Laboratory settings include homes, schools, industries, and other community organizations. *Preq:* NURS 401, 411, 412, or admission to RN/BS program.

NURS H420 Senior Honors I 2(2,0) Students develop a proposal for a major thesis, directed study project, or research project under the guidance of a faculty preceptor. *Preq:* Senior Honors standing, NURS H330.

NURS H428 Senior Honors II 2(2,0) Students implement a proposal for a major directed study project or research thesis under the guidance of a faculty preceptor. *Preq:* Senior Honors standing, NURS H405, H420.

NURS 485 Nurse Extern Practicum 6(0,18) Practicum consisting of preceptor-supervised and faculty-led nursing clinical experiences in a regional health care facility. *Preq:* Completion of at least one adult health and one pathophysiology course or consent of instructor.

NURS 499 Independent Study 1-4(1-4,0-9) In-depth study in an area of special interest in Nursing. Students develop specific objectives with a faculty member with expertise in the area of interest. May be repeated for a maximum of six credits. *Preq:* Consent of instructor.

NUTRITION

See also courses listed under Animal and Veterinary Sciences, Biochemistry, and Food Science.

Professors: J. A. Bertrand, A. B. Bodine II, K. L. Cason, T. C. Jenkins, M. E. Kunkel, D. V. Maurice; *Associate Professor:* V. J. Haley-Zitlin; *Assistant Professor:* M. D. Condrasky; *Senior Lecturer:* R. M. Haliene

NUTR 203 Principles of Human Nutrition 3(3,0) Principles of nutrition including functions, digestion, and requirements of nutrients; factors affecting food choices and dietary adequacy; and roles of nutrition in physical fitness and health maintenance. Credit toward a degree will be given for only one of NUTR 203, 205, 451.

NUTR 205 Nutrition for Nursing Professionals 3(3,0) Investigation of targeted general and clinical nutrition topics, including principles of nutrition, life-cycle nutrition, relationship of diet to health and disease, and the role of nursing professionals and nutrition. Credit toward a degree will be given for only one of NUTR 203, 205, 451. *Preq:* Nursing major, BIOSC 222. *Coreq:* BIOSC 223.

NUTR 210 Nutrition and Physical Activity 3(3,0) Topics include role of carbohydrates, fats, and proteins on energy utilization during exercise; altering body composition and improving fitness with diet and physical activity; importance of fluid intake on performance; effectiveness of dietary supplements and ergogenic aids; and choosing a diet appropriate for individual physical activity levels. *Preq:* BIOL 102 or equivalent.

NUTR 401, H401, 601 Fundamentals of Nutrition 3(3,0) Biochemical and physiological fundamentals of nutrition applicable to man and domestic animals. Considers digestive processes and absorption and metabolism of carbohydrates, lipids, proteins, water, minerals, and vitamins. Discusses energy metabolism and comparative anatomy and physiology of digestive systems. Offered fall semester only. *Preq:* BIOCH 305, CH 223, or consent of instructor.

NUTR 420 Selected Topics in Nutrition 1-3(1-3,0) Comprehensive study of special topics in nutrition not covered in detail or contained in other courses. Current developments in each area are stressed. May be repeated for a maximum of three credits, but only if different topics are covered. *Preq:* Senior standing or consent of instructor.

NUTR 421 Special Problems in Nutrition 1-4(0,3-12) Independent research investigation in nutrition. Special emphasis is on developing a research proposal, conducting the research, and reporting the findings. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* Senior standing or consent of instructor.

NUTR 424, 624 Medical Nutrition Therapy I 4(3,3) Principles of nutritional assessment, education, and counseling skills; development of medical nutrition therapy for individuals with obesity and eating disorders, gastrointestinal disorders, metabolic and renal disorders. *Preq:* BIOSC 223, NUTR 451, or consent of instructor.

NUTR 425, H425, 625 Medical Nutrition Therapy II 4(3,1) Development of medical nutrition therapy for individuals with various disease states including cardiovascular, hepatic, musculoskeletal, and neoplastic disorders. Also considers sociocultural and ethnic aspects of food consumption and alternative nutrition therapies. *Preq:* BIOSC 223, NUTR 424, or consent of instructor.

NUTR 426, 626 Community Nutrition 3(3,0) Study of fundamentals of nutrition care delivery in community programs beginning with assessment and problem identification and continuing through the development, implementation, and evaluation of nutrition intervention programs. *Preq:* NUTR 451 or equivalent or consent of instructor.

NUTR 451, H451, 651 Human Nutrition 3(3,0) Essentials of nutrition and principle nutritional deficiency conditions. Factors affecting adequacy of dietary intake, methods of determining nutritional status, development of nutrition standards, and recent advances in human nutrition. Credit toward a degree will be given for only one of NUTR 203, 205, 451. *Preq:* BIOCH 305/306 or equivalent or consent of instructor.

NUTR 455, 655 Nutrition and Metabolism 3(3,0) Concepts of metabolism fundamental to understanding normal and therapeutic nutrition are examined. Bioenergetics as well as metabolism of carbohydrates, lipids, amino acids, vitamins, and minerals as they relate to nutrition are discussed. *Preq:* NUTR 451 and BIOCH 305 or 423 or 406 or consent of instructor.

PACKAGING SCIENCE

Professors: E. H. Hoyle, R. L. Thomas, *Chair; Associate Professors:* D. K. Cooksey, D. O. Darby, R. M. Kimmel, W. S. Whiteside; *Assistant Professor:* H. P. Batt; *Lecturers:* G. S. Batt, D. M. Kimmel, R. T. Moore; *Adjunct Professor:* R. C. Cooksey, T. W. Downes; *Adjunct Associate Professors:* H. J. Park, J. J. Song; *Adjunct Lecturers:* L. R. Byrne, R. J. Giangiorgi

PKGSC 101 Packaging Orientation 1(1,0) Overview of the various principles and practices in packaging science, historical development, packaging as a career.

PKGSC 102 Introduction to Packaging Science 2(2,0) Considers functions of a package; materials, processes, and technology used in package development; and the relationship of packaging to the corporation, consumer, and society as a whole. *Preq:* PKGSC 101 or consent of instructor.

PKGSC 103 Packaging Science E-Portfolio 1(1,0) Packaging Science majors initiate professional electronic portfolios that showcase their skills and experiences and lead to career E-portfolios. Students demonstrate proficiency in using important software tools; are introduced to Packaging Science faculty, emphasis areas, and targeted library services; and discuss academic integrity. *Preq:* PKGSC 101. *Coreq:* PKGSC 102 or consent of instructor.