

# COURSES OF INSTRUCTION

This list includes for each course the catalog number, title, credit hours, class and laboratory hours per week, description, and prerequisites. Courses numbered 600 and above are graduate courses.

## Cross-Listed Courses

A cross-listed course is one that can be taken for credit under different departmental titles. For example, students can take SOC (R S) 471 *Demography* as either R S 471 or SOC 471. The student should select the desired departmental title in conference with an advisor. The departmental title may be changed only during the period allowed by the University calendar for adding a course.

## COURSE ABBREVIATIONS

Accounting.....	ACCT
Aerospace Studies.....	A S
Agricultural Education.....	AG ED
Agricultural Mechanization.....	AG M
Agriculture.....	AGRIC
Agriculture, Forestry and Life Sciences.....	AFLS
American Sign Language.....	A S L
Animal and Veterinary Sciences.....	AVS
Animal Physiology.....	AN PH
Anthropology.....	ANTH
Applied Economics.....	AP EC
Arabic.....	ARAB
Architecture.....	ARCH
Art.....	ART
Art and Architectural History.....	A A H
Astronomy.....	ASTR
Athletic Leadership.....	A L
Automotive Engineering.....	AU E
Biochemistry.....	BIOCH
Bioengineering.....	BIO E
Biological Sciences.....	BIO SC
Biology.....	BIOL
Biomolecular Engineering.....	BMOLE
Biosystems Engineering.....	B E
Biosystems Technology.....	B T
Business.....	BUS
Business Administration.....	M B A
Career and Technology Education.....	CTE
Ceramic and Materials Engineering.....	C M E
Chemical Engineering.....	CH E
Chemistry.....	CH
Chinese.....	CHIN
City and Regional Planning.....	C R P
Civil Engineering.....	C E
Clemson University.....	C U
College of Architecture, Arts and Humanities.....	CAAH
College of Engineering and Science.....	CES
Communication Studies.....	COMM
Community and Rural Development.....	C R D
Computer Science.....	CP SC
Construction Science and Management.....	C S M
Crop and Soil Environmental Science.....	CSENV
Dance.....	DANCE
Design Studies.....	DSIGN
Early Childhood Education.....	ED EC
East Asian Studies.....	E A S

Economics.....	ECON
Education.....	ED
Educational Counseling.....	ED C
Educational Foundations.....	ED F
Educational Leadership.....	ED L
Electrical and Computer Engineering.....	E C E
Elementary Education.....	ED EL
Engineering.....	ENGR
Engineering Graphics.....	E G
Engineering Mechanics.....	E M
English.....	ENGL
Entomology.....	ENT
Environmental and Natural Resources.....	E N R
Environmental Design and Planning.....	EDP
Environmental Engineering and Science.....	EE&S
Environmental Science and Policy.....	EN SP
Environmental Toxicology.....	ENTOX
Executive Leadership and Entrepreneurship.....	E L E
Experimental Statistics.....	EX ST
Finance.....	FIN
Food Science.....	FD SC
Food Technology.....	FD TH
Forestry.....	FOR
Forestry and Natural Resources.....	F N R
French.....	FR
Genetics.....	GEN
Geography.....	GEOG
Geology.....	GEO
German.....	GER
Graduate Studies.....	G S
Graphic Communications.....	G C
Great Works.....	G W
Health.....	HLTH
Health, Education and Human Development.....	HEHD
Historic Preservation.....	H P
History.....	HIST
Honors.....	HON
Horticulture.....	HORT
Human Resource Development.....	H R D
Humanities.....	HUM
Industrial Engineering.....	I E
Integrated Pest Management.....	I P M
International Studies.....	I S
Italian.....	ITAL
Japanese.....	JAPN
Landscape Architecture.....	LARCH
Language.....	LANG
Language and International Health.....	L&IH
Language and International Trade.....	L&IT
Latin.....	LATIN
Law.....	LAW
Leisure Skills.....	L S
Library.....	LIB
Management.....	MGT
Marketing.....	MKT
Materials Science and Engineering.....	MS&E
Mathematical Sciences.....	MTHSC
Mechanical Engineering.....	M E
Microbiology.....	MICRO
Military Leadership.....	M L
Music.....	MUSIC
Nonprofit Leadership.....	NPL
Nursing.....	NURS
Nutrition.....	NUTR
Packaging Science.....	PKGSC
Pan African Studies.....	P A S
Parks, Recreation and Tourism Management.....	PRTM

Performing Arts.....	P A
Philosophy.....	PHIL
Physical Science.....	PH SC
Physics.....	PHYS
Plant and Environmental Sciences.....	PES
Plant Pathology.....	PL PA
Plant Physiology.....	PL PH
Policy Studies.....	PO ST
Political Science.....	PO SC
Polymer and Fiber Chemistry.....	PFC
Portuguese.....	PORT
Psychology.....	PSYCH
Public Administration.....	P ADM
Reading.....	READ
Real Estate Development.....	RED
Religion.....	REL
Rhetorics, Communication and Information Design.....	RCID
Rural Sociology.....	R S
Russian.....	RUSS
Science and Technology in Society.....	S T S
Secondary Education.....	EDSEC
Sociology.....	SOC
Soils and Sustainable Crop Systems.....	SSCS
Spanish.....	SPAN
Special Education.....	ED SP
Textiles.....	TEXT
Theatre.....	THEA
Vocational-Technical Education.....	VT ED
Wildlife and Fisheries Biology.....	W F B
Women's Studies.....	W S

## ACCOUNTING

*Professors:* L. S. Cash, T. L. Dickens, D. M. Guffey, J. J. McMillan, R. E. Welton Jr., *Director*; A. J. Winters; *Associate Professors:* L. S. Clark, R. B. Dull, F. A. Kennedy, L. F. Schleifer; *Assistant Professors:* C. W. Hollingsworth, L. A. Owens-Jackson, J. D. Stanley; *Lecturers:* J. R. Madray, M. A. Prater

**ACCT 201, H201 Financial Accounting Concepts 3(3,0)** Introduction to accounting principles with emphasis on the use of financial data and analysis of financial statements.

**ACCT 202, H202 Managerial Accounting Concepts 3(3,0)** Introduction to managerial accounting with emphasis on using accounting information to make decisions.

**ACCT 204 Accounting Procedures 1(1,2)** Lectures, demonstrations, and hands-on experience with accounting systems and analysis required to complete the accounting cycle and prepare financial statements. Intended for students who plan to enroll in ACCT 303 or 311.

**ACCT 299 Creative Inquiry—Accounting 1-4(1-4,0)** In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. To be taken Pass/Fail only.

**ACCT 303, H303 Cost Accounting 3(3,0)** Application of cost analysis to manufacturing and distributing problems; analysis of behavior characteristics of business costs and a study of principles involved in standard cost systems; lectures and problems. *Req:* ACCT 201 and 204 with a C or better.

- ACCT 307 Managerial Accounting 3(3,0)** Emphasizes internal use of accounting data by the manager in establishing plans and objectives, controlling operations, and making decisions involved with management of an enterprise. May not be taken for credit by Accounting majors. *Preq:* ACCT 202.
- ACCT 311, H311 Intermediate Financial Accounting I 3(3,0)** In-depth treatment of traditional financial accounting topics of standards setting, financial statement form and content, and accounting and reporting of current assets. Emphasizes basic theory, valuation, and measurement, as well as presentation and analysis of accounting information. *Preq:* ACCT 201 and 204 with a C or better.
- ACCT 312, H312 Intermediate Financial Accounting II 3(3,0)** Continuation of ACCT 311. In-depth treatment of accounting and reporting for noncurrent assets, current and noncurrent liabilities, and equity. Emphasizes basic theory, valuation, and measurement issues, as well as presentation and analysis of accounting information. *Preq:* ACCT 311 with a C or better.
- ACCT 313, H313 Intermediate Financial Accounting III 3(3,0)** Continuation of ACCT 312. In-depth treatment of selected accounting topics, such as investments, cash flows, tax allocation, post-retirement benefits, leases, and error corrections. Emphasizes basic theory, valuation, and measurement, as well as presentation and analysis of accounting information. *Preq:* ACCT 312 with a C or better.
- ACCT 322 Accounting Information Systems 3(3,0)** Study of computer-based accounting systems with attention to systems design, application, internal control, auditing the system, and system security. *Preq:* CP SC 220.
- ACCT 340 Internal Auditing Theory 3(3,0)** Introduces students to internal auditing and covers internal auditing standards, ethics, concepts, audit techniques, and reporting practices. Enrollment priority will be given to students who have completed 60, but not more than 100, credits. *Preq:* ACCT 311 with a C or better.
- ACCT 391 Public Accounting Certificate Program I 0** Professional interaction in public accounting. Tracks interaction requirements of the Public Accounting Certificate Program. To be taken Pass/Fail only. *Preq:* Junior standing.
- ACCT 393 Managerial Accounting Certificate Program I 0** Professional interaction in managerial accounting. Tracks interaction requirements for the Managerial Accounting Certificate Program. To be taken Pass/Fail only. *Preq:* Junior Standing.
- ACCT 395 Internal Auditing Certificate Program I 0** Professional interaction in internal auditing. Tracks interaction requirements of the Internal Auditing Certificate Program. To be taken Pass/Fail only.
- ACCT 399 Internship in Accounting 1-3(1-3,0)** Faculty-supervised accounting internship designed 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 and consent of instructor.
- ACCT 404, H404, 604 Individual Taxation 3(3,0)** Interpretation of Federal income tax laws, regulations, and court decisions with practice in application of these laws to the returns of individuals, partnerships, and corporations. *Preq:* ACCT 311 with a C or better.
- ACCT 406 Business Taxation 3(3,0)** Introduction to the importance of taxation in business decision making. Emphasizes the interrelationship of taxes, the choice of business form, and various business transactions; exposes students to the breadth of business decisions which are affected by the Federal Income Tax. *Preq:* ACCT 311 with a C or better.
- ACCT 408 Retirement and Estate Planning 3(3,0)** Provides students with an understanding of the tax consequences of personal financial, retirement, and estate planning. Subjects include the basic concepts of retirement, gift, income shifting, and estate planning. *Preq:* ACCT 404 with a C or better.
- ACCT 410, 610 Budgeting and Executive Control 3(3,0)** Study and application of selected techniques used in the planning and control functions of business organizations. *Preq:* ACCT 303 with a C or better.
- ACCT 415 Auditing 3(3,0)** Study of professional and practical auditing theory. Includes a review of internal controls, audit procedures, and development of audit programs for various types of businesses. Considers auditors' professional and ethical standards. *Preq:* ACCT 311 and 322 with a C or better.
- ACCT 445 Internal Auditing Practice 3(3,0)** Expands students' knowledge of internal auditing practice, including operation audits, organization audits, quality-control audits, and organization theory. *Preq:* ACCT 340 with a C or better.
- ACCT 491 Public Accounting Certificate Program II 0** Public accounting service. Tracks service requirement of the Public Accounting Certificate Program. To be taken Pass/Fail only. *Preq:* Senior standing.
- ACCT 493 Managerial Accounting Certificate Program II 0** Managerial accounting service. Tracks service requirement of the Managerial Accounting Certificate Program. To be taken Pass/Fail only. *Preq:* Senior standing.
- ACCT 495 Internal Auditing Certificate Program II 0** Internal auditing service. Tracks service requirement of the Internal Auditing Certificate Program. To be taken Pass/Fail only.
- AEROSPACE STUDIES**  
*Professor:* M. R. Mendonca, *Chair*; *Assistant Professors:* M. F. Brabham, T. R. Butler, M. Giebner
- A S 109 Air Force Today I 2(1,2)** Deals with Air Force in the contemporary world through a study of the total force structure: strategic offensive and defensive, general purpose, and aerospace support. Leadership laboratory activities include drill fundamentals, customs, and courtesies of the service.
- A S 110 Air Force Today II 2(1,2)** Continuation of A S 109. Leadership laboratory includes drill, ceremonies, and an introduction to Air Force career opportunities.
- A S 209 Development of Air Power I 2(1,2)** Study of the development of air power from balloons and dirigibles through the peaceful employment of U.S. air power in relief missions and civic action programs in the late 1960s and also the air war in Southeast Asia. Leadership laboratory provides experience in guiding, directing, and controlling an Air Force unit.
- A S 210 Development of Air Power II 2(1,2)** Continuation of A S 209.
- A S 308 Air Force Leadership and Management 3(3,0)** Motivational and behavioral processes, leadership, communication, and group dynamics are covered to provide a foundation for development of the leader's professional skills using Air Force examples and methods.
- A S 309 Air Force Leadership and Management I 4(3,2)** Emphasizes the individual as a manager. Individual motivational and behavioral processes, leadership, communication, and group dynamics are covered to provide a foundation for the development of the Air Force officer's professional skills. Students prepare individual and group presentations, write reports, participate in group discussions, seminars, and conferences.
- A S 310 Air Force Leadership and Management II 4(3,2)** Continuation of A S 309. Uses the basic managerial processes involving decision making, utilization of analytical aids in planning, organizing, and controlling environment. Actual case studies are used to enhance learning and communication processes.
- A S 409 National Security Policy I 4(3,2)** Analysis of the role and function of the military officer in a democratic society and the relationships involved in civil-military interactions. Students prepare individual and group presentations, write reports, and participate in group discussions.
- A S 410 National Security Policy II 4(3,2)** Continuation of A S 409. Examines the environmental context in which U.S. defense policy is formulated and implemented. Emphasizes initial commissioned service and military justice. Students prepare individual and group presentations for the class, write reports, and participate in group discussions, seminars, and conferences.

## AGRICULTURAL EDUCATION

*Professors:* T. R. Dobbins, D. R. King, C. D. White Sr.;  
*Associate Professor:* P. M. Fravel

- AG ED 100 Orientation and Field Experience 1(0,2)** Supervised observations and explanations of vocational agriculture teaching while serving as teacher aides. One full week of field experience in representative high schools is required.
- AG ED 102 Agricultural Education Freshman Seminar 1(2,0)** Introduces students to the South Carolina agriculture education structure and provides opportunities to prepare oral presentations on selected agricultural education organizations. Assists students in understanding the value of professional organizations to agriculture education in the state and nation. *Preq:* Agricultural Education major.

- AG ED 103 Multiculturalism in Agricultural Education 3(3,0)** Studies the influence of various groups and their contributions to agriculture. Includes the roles of women, African-, Hispanic-, Asian-, Native-, and European-Americans.
- AG ED 200 Agricultural Applications of Educational Technology 3(2,2)** Overview of microcomputer hardware and software encompassing word processing, spreadsheet, utility, Web development, and graphic communications in an agricultural context.
- AG ED 201 Introduction to Agricultural Education 3(2,3)** Principles of education, development of agricultural education, and an introduction to the formulation of instructional programs for the teaching of agricultural courses.
- AG ED 202 Agricultural Education Sophomore Seminar 1(2,0)** Instruction on how to establish a comprehensive student record-keeping system. Includes integration of that data into the FFA Awards program. Allows students hands-on experience with the total FFA Awards program on the state and national level. *Prq:* AG ED 102.
- AG ED 203 Teaching Agriscience 3(2,3)** Integrates biological and technological concepts appropriate for teaching introductory middle or secondary school-level courses in agricultural science. Topics emphasize disciplines, theories, and applications in modern agricultural production. Experiences include teaching techniques, materials, resources, and the design and implementation of new activities to facilitate teaching agriscience. *Prq:* BIOL 104/106.
- AG ED 204 Applied Agriculture Calculations 3(3,0)** Demonstrates basic mathematical applications in crop and livestock production and agribusiness and financial management. These applications aid students in understanding the mathematical applications needed in the agriculture field.
- AG ED 302 Agricultural Education Junior Seminar 1(2,0)** Allows students the opportunity to prepare and deliver information on Career Development Events (CDE) and to understand fully the CDE concepts. Students receive much needed hands-on experience at the state and national levels. *Prq:* AG ED 202.
- AG ED 303 Mechanical Technology for Agriculture Education 3(2,3)** Study of technical content and new technology utilized in agriculture mechanics. Integrates agriculture mechanics topics such as electrical wiring and controls, green industry maintenance, irrigation systems, and agriculture construction. Offers a delivery of mechanics instruction in the classroom and laboratory setting.
- AG ED 355 Team and Organizational Leadership in the Food and Fiber System 3(3,0)** Principles and practices in planning, developing, conducting, and evaluating leadership programs for agricultural groups. Focuses on helping students better understand themselves and others; improving group communications; becoming effective leaders and members of groups; improving leadership and personal development skills; assessing leadership situations, determining and administering appropriate leadership strategies.
- AG ED 400 Supervised Field Experience II 1(0,3)** Special emphasis is placed on enhancing existing knowledge and experiences of the students. Primary focus is on becoming acquainted with the student teaching center well in advance of the customary twelve-week directed teaching experience.
- AG ED 401, 601 Instructional Methods in Agricultural Education 3(2,3)** Appropriate methods of teaching vocational agriculture in high schools. Includes procedures for organizing teaching programs, teaching high school students, and directing FFA activities.
- AG ED 402 Agricultural Education Senior Seminar 1(2,0)** Provides an opportunity to prepare and deliver information on continuing adult education. Assists students in fully understanding the adult education component of the total Secondary Agriculture Education Program. *Prq:* AG ED 302.
- AG ED 403, 603 Principles of Adult/Extension Education 3(3,0)** Overview of adult/extension education and adult learning. Selection of adult education providers is reviewed with emphasis on extension. *Prq:* Junior standing or consent of instructor.
- AG ED 404 Biotechnology in Agricultural Education 3(2,3)** Multidisciplinary introduction to theories and applications of biotechnology in agriculture and high school agricultural education. Topics include common techniques used in modern biotechnology, examples of their applications, and social considerations that impact the use of biotechnology in agricultural research and development. Laboratories illustrate principles covered in lecture. *Prq:* BIOL 104/106.
- AG ED 406 Directed Teaching 12(0,36)** Guided participation in the professional responsibilities of a teacher of vocational agriculture, including intensive study of the problems encountered and competencies developed. Twelve weeks of directed teaching in selected schools are required. *Prq:* AG ED 400, 401.
- AG ED 407 Internship in Extension and Leadership Education 6-12(0,18-36)** Internship placements may include county extension offices and other appropriate extension units. Six weeks of supervised experience must be completed for six hours of credit. Twelve weeks of supervised experience must be completed for 12 hours of credit. May be repeated for a maximum of 12 credits. *Prq:* AG ED 400, 401, Senior standing, and consent of instructor.
- AG ED 409, 609 Agriscience Institute: Applications of Agriscience to the Secondary Curriculum 3(2,2)** Designed for pre-service and in-service agricultural educators or secondary-level counselors. Surveys current developments in agriscience with an emphasis on modern practices, current job opportunities, and meeting state and national science and math education standards through agricultural instruction. Students construct lesson plans and career planning modules for high school. *Prq:* AG ED 102.
- AG ED 412 Senior Agriculture Leadership Seminar 1(1,0)** Emphasizes leadership techniques and policies that affect agriculture. Students conduct research and make presentations on issues which influence agriculture policy. *Prq:* AP EC 202, 302.
- AG ED 415, 615 Leadership of Volunteers 3(3,0)** Provides an overview of volunteer management. Examines the knowledge, skills, and abilities required of professional managers to involve volunteers effectively in the work of organizations.
- AG ED 416, 616 Ethics and Issues in Agriculture and the Food and Fiber System 3(3,0)** Explores ethical theories, concepts of critical thinking, and major ethical issues in American agriculture. The major social, political, economic, and ethical issues that arise in connection to the "food and fiber system" are examined and potential solutions considered.
- AG ED 423, 623 Curriculum 2(2,0)** Curriculum goals and related planning for career and continuing education programs.
- AG ED 425, 625 Teaching Agricultural Mechanics 2(1,3)** Instruction in organizing course content, conducting and managing an agricultural mechanics laboratory, shop safety, microteaching demonstrations of psychomotor skills, and methods of teaching manipulative abilities.
- AG ED 428, 628 Special Studies in Agricultural Education 1-3(1-3,0)** Students study, individually or collectively, selected topics and/or problems in agricultural education to meet the particular needs of the clientele enrolled. May be repeated for a maximum of six credits.
- AG ED 440, 640 Program Development in Adult/Extension Education 3(3,0)** Principles, theory, and practice in planning and conducting educational programs in adult/extension settings. *Prq:* Junior standing or consent of instructor.
- AG ED 450 Modern Topics and Issues 3(3,0)** Students select a major area of concern to teachers of agriculture and county agents for intensive study at least one semester prior to offering the course. Team teaching with faculty from other departments in the College of Agriculture, Forestry and Life Sciences is utilized when feasible. *Prq:* Senior standing or relevant experience.
- AG ED (CTE, ED F) 480, 680 Digital Technology in the 21st Century Classroom 3(2,2)** See ED F 480.
- AG ED (CTE, ED F) 482, 682 Advanced Educational Applications of Microcomputers 3(2,2)** See ED F 482.

## AGRICULTURAL MECHANIZATION

*Professors:* J. P. Chastain, Y.J. Han, *Interim Chair*; J. C. Hayes, A. Khalilian; *Associate Professors:* H. J. Farahani, T. O. Owino; *Assistant Professors:* A. T. Chow, D. R. Hitchcock, A. Jayakaran, C. V. Privette, C. B. Sawyer; *Lecturer:* K.R. Kirk

**AG M 101 Introduction to Agricultural Mechanization and Business 1(0,3)** Introduces the Agricultural Mechanization and Business program. Gives an overview of the curriculum and explains the opportunities for extracurricular activities. Covers long-term interaction between the department and alumni.

**AG M 205 Principles of Fabrication 3(2,3)** Principles, techniques, and methods in the selection, proper use, and maintenance of hand and power tools. Principal topics include welding, tool fitting, metalworking, woodworking, finishing and preserving, and heat treatment.

- AG M 206 Machinery Management 3(2,3)** Teaches agriculture students to apply physical principles and sound reasoning to the mechanization of modern agricultural production and processing enterprises. Stresses planning efficient operational systems and wise selection of equipment, based on function and economic suitability. *Preq:* MTHSC 105, PHYS 207 or consent of instructor.
- AG M 221 Surveying: Earthwork and Area Measurements 3(2,3)** Fundamentals of surveying relative to earthwork and land area measurements, including linear measurements, leveling, angular measurements, and computations. Levels and total stations are used with an introduction to GPS. *Preq:* MTHSC 102 or 106 or consent of instructor.
- AG M 301 Soil and Water Conservation 3(3,0)** Soil and water management is studied by applying principles of mathematics, fluid flow, hydrology, and soil characteristics as related to soil-water-vegetation complexes in runoff, erosion control, channel design, water conservation, drainage, irrigation, stormwater best management practices and stream restoration.
- AG M 303 Calculations for Mechanized Agriculture 3(2,3)** Enhances students' ability to analyze and solve a wide range of problems requiring engineering technology. Laboratory periods introduce students to microcomputer hardware. Basic programming and typical applications to agricultural mechanization problems are included. *Preq:* PHYS 200, 207, or consent of instructor.
- AG M 371 Agricultural Mechanization Practicum 1-3** Preplanned internship with an approved employer involved in agricultural technical or business endeavors. A minimum 130 hours of supervised responsibility are required per credit hour. A work journal, written/oral reports, company consent and evaluation must be on file. May be repeated for a maximum of six credits. To be taken Pass/Fail only. *Preq:* Sophomore standing and consent of department.
- AG M 402, 602 Landscape Drainage and Irrigation 3(2,3)** Uses basic soil-water-plant relationships to determine the need for and methods of irrigation and drainage. Topics include irrigation methods, drainage needs and drainage methods.
- AG M 405, 605 Agricultural Structures and Environmental Control 3(2,3)** Technical considerations of buildings used for agriculture emphasizing structural materials, structural adequacy, environmental control, and indoor air quality. *Preq:* AG M 221, 303, PHYS 200.
- AG M 406, 606 Mechanical and Hydraulic Systems 3(2,3)** Study of power transmission systems for agricultural production emphasizing mobile equipment. Characteristics, requirements, and design of both V-belt drive and roller-chain drives are presented. Emphasizes hydraulic power transmission systems, including pumps, actuators, control devices, and hydraulic circuitry. *Preq:* AG M 206, PHYS 200 or 207, or consent of instructor.
- AG M 410, 610 Precision Agriculture Technology 3(2,3)** Includes principles and hands-on application of technologies supporting precision agriculture. Topics include global positioning system (GPS), geographic information system software, variable rate technologies, collection of spatial data, automated guidance of equipment, spatial data mapping and analysis, remote sensing, and economic considerations. *Preq:* Junior standing.
- AG M 452, 652 Mobile Power 3(2,3)** Study of tractors, emphasizing internal combustion engines and support systems necessary for their proper functioning. Also considers application of power, maintenance, adjustment, and general repair. *Preq:* PHYS 200, 207, or consent of instructor.
- AG M 460, 660 Electrical Systems 3(2,3)** Students in agriculture and related curricula study electric and other utilities on the farm and in the home. Emphasizes selection, installation, and maintenance of wiring systems, lighting systems, motors, controls, water systems, and waste disposal systems. *Preq:* Junior standing.
- AG M 472 Capstone 3(2,3)** Covers professional conduct, ethics, oral and written communication, and financial matters. Each student completes a comprehensive project on a technical subject. The results are given in a written report and oral presentation. Students use digital portfolio technology to assess their education.
- AG M 473 Special Topics in Agricultural Mechanization 1-3(1-3,0)** Comprehensive study and application of new technologies and methods not covered in existing courses. Emphasizes independent study using innovative approaches to problem solving. May be repeated for a maximum of six credits. *Preq:* Consent of instructor.

## AGRICULTURE

*Professors:* L. L. Bauer, D. E. Linvill, V. L. Quisenberry;  
*Associate Professor:* W. C. Stringer

**AGRIC 104, H104 Introduction to Plant Sciences 3(3,0)** Fundamental course in plant sciences, including agronomic and horticultural crops of the major agricultural areas of the world and emphasizing the crops of South Carolina.

**AGRIC (EN SP) 315, H315 Environment and Agriculture 3(3,0)** Survey of the interrelationships of the environment and current agriculture and agricultural practices to include both the environmental impacts of agriculture and the role of agriculture in conservation and improving the environment. *Preq:* Sophomore standing and two semesters of biology or chemistry.

**AGRIC 355 Team and Organizational Leadership in Food and Fiber System 3(3,0)** Principles and practices in planning, developing, conducting, and evaluating leadership programs for agricultural groups. Focuses on helping students better understand themselves and others, improving group communications; becoming effective leaders and members of groups; improving leadership and personal development skills, assessing leadership situations, determining and administering appropriate leadership strategies.

**AGRIC 412 Senior Agriculture Leadership Seminar 1(1,0)** Emphasizes leadership techniques and policies that affect agriculture. Students conduct research and make presentations on issues which influence agricultural policy. *Preq:* AP EC 202, 302.

**AGRIC 416 Ethics and Issues in Agriculture and the Food and Fiber System 3(3,0)** Explores ethical theories, concepts of critical thinking, and major ethical issues in American agriculture. Examines the major social, political, economic, and ethical issues that arise in connection to the food and fiber system and considers potential solutions.

**AGRIC 440, 640 Microclimatology 3(3,0)** Study of energy balance in earth's atmosphere and soil: solar and thermal radiation, air and soil temperature, humidity, evaporation and the hydrologic cycle, wind fields. Examines weather variables to describe microclimates and the energy balance of plants, animals, and insects; modification of microclimates; and rural and urban climates. *Preq:* PHYS 240 or equivalent or consent of instructor; second semester Junior standing.

**AGRIC H491 Senior Honors Research 3(1,6)** Senior division honors research in an agricultural sciences curriculum. In consultation with and under the direction of a professor, students select a research topic, conduct experiments, record data, and make oral presentations of results to the College Honors Program Committee. Open to approved Honors Program students only.

**AGRIC H492 Senior Honors Research 3(1,6)** Continuation of AGRIC H491. Senior division honors research in an agricultural sciences curriculum. Upon termination of the research project, students submit formal written reports and make final oral presentations of results to the College Honors Program Committee. Professor-student discussions of additional topics are arranged.

## AGRICULTURE, FORESTRY AND LIFE SCIENCES

**AFLS 191 Directed Research 1-3(0,3-9)** Research projects, supervised by faculty in the College of Agriculture, Forestry and Life Sciences introducing research methods. Restricted to outstanding high school students, selected using Governor's School for Science and Mathematics ranking criteria. May be repeated for a maximum of six credits. *Preq:* Entering high school junior or senior status and consent of faculty research supervisor and department in which research is conducted.

## AMERICAN SIGN LANGUAGE

*Associate Professor:* W. A. Brant; *Lecturer:* T. Bateson

**A S L 101 American Sign Language I 4(3,1)** Introduction to the basics of American Sign Language, its history, and culture. Visual-gestural communication techniques are used.

**A S L 102 American Sign Language I 4(3,1)** Continuation of A S L 101 and culture to develop further communicative competencies. Proficiency oriented with the use of visual-gestural communication skills. *Preq:* A S L 101 or consent of instructor.

**A S L 201 American Sign Language II 3(3,0)** Continuation of A S L 102. Covers additional vocabulary, sentences, and grammar structures. Main focus is on conversational and receptive skills as well as a better understanding of Deaf culture. *Preq:* A S L 102 or consent of instructor.

**A S L 202 American Sign Language II 3(3,0)** Continuation of A S L 201, concentrating on intermediate conversational and discourse skills using American Sign Language, more complex American Sign Language grammar, reading comprehension, and composition of short stories, narratives, and dialogues with an emphasis on topics related to the Deaf community. Class is conducted totally in American Sign Language using visual-gestural communicative techniques. *Preq:* A S L 201 or consent of instructor.

- A S L 297 Creative Inquiry—American Sign Language 1-4(1-4,0)** In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Arrangements with faculty members must be established prior to registration.
- A S L 301 Advanced American Sign Language I 3(3,0)** Focuses on American Sign Language fluency, vocabulary development, grammatical structures of American Sign Language, use of classifiers, conversational skills, translating written texts into American Sign Language, and vice versa. Emphasis is on making formal presentations in American Sign Language. *Prq:* A S L 202 or consent of instructor.
- A S L 302 Advanced American Sign Language II 3(3,0)** Continuation of A S L 301. Focuses on American Sign Language fluency, vocabulary development, grammatical structures of American Sign Language, use of classifiers, conversational skills, translating written texts into American Sign Language, and vice versa. Emphasis is on making formal presentations in American Sign Language. *Prq:* A S L 301 or consent of instructor.
- A S L 304 Internship in American Sign Language 3(0,4)** Minimum 60 contact hours in an environment exclusively using American Sign Language. Frequent opportunities to converse with native signers in classroom settings, dormitory settings, meals, excursions, sporting events, cultural events, and meetings. *Prq:* A S L 202 or consent of instructor.
- A S L 305 Deaf Studies in the United States 3(3,0)** In-depth look into language, culture, and daily lives of approximately one million people who use American Sign Language as their primary language. Traces the roots of American Sign Language from pre-revolutionary times to current science and knowledge and how it applies to professional fields. *Prq:* A S L 202 or consent of instructor.
- A S L 349 Advanced Applications in American Sign Language 3(3,0)** Study of select signs in American Sign Language emphasizing culturally appropriate signs in education, psychology/mental health, legal/legislation, health/medicine, religion, drugs/alcohol, and technology. May be repeated for a maximum of six credits. *Prq:* A S L 202 or consent of instructor.
- A S L 397 Creative Inquiry—American Sign Language 1-4(1-4,0)** Students focus on a special research area under the guidance of a faculty member. After acquiring the requisite background, students formulate hypotheses for a group project, develop a critical framework, and initiate research on a specific topic.
- A S L 401 Discourse in American Sign Language I 3(3,0)** Designed for advanced-level students in American Sign Language. Primary goal is to further develop students' understanding and knowledge of American Sign Language by incorporating in-depth analysis of American Sign Language's historical development, linguistic structures, syntax, grammar, and pragmatics. *Prq:* A S L 302 or consent of instructor.
- A S L 402 Discourse in American Sign Language II 3(3,0)** Continuation of American Sign Language 401. Primary goal is to further develop students' understanding and knowledge of American Sign Language by incorporating analysis of time concepts, variations due to region and ethnicity, pluralization, classifiers, locatives, temporal aspects, and pronoun usage in American Sign Language. *Prq:* A S L 401 or consent of instructor.
- A S L 460 Deaf Literature and Folklore 3(3,0)** Designed for advanced-level students in American Sign Language. Primary goal is to further develop students' knowledge and understanding of Deaf literature, folklore, and the community at large. Includes introductions to deaf authors, literary works, plays, poetry, painting, and sculpture. *Prq:* A S L 302 or consent of instructor.
- A S L 497 Creative Inquiry—American Sign Language 1-4(1-4,0)** Continuation of research initiated in A S L 397. Students complete their projects and disseminate their research results. *Prq:* A S L 397 or consent of instructor.
- A S L 498 Independent Study 1-3(1-3,0)** Supervised research and study on topics related to the origins and growth of American Sign Language and the Deaf Community in the United States (1800–present). May be repeated for a maximum of six credits. *Prq:* A S L 202 or consent of instructor.
- ## ANIMAL AND VETERINARY SCIENCES
- Professors:* M. M. Beck, *Chair*; G. P. Birrenkott Jr., A. B. Bodine II, S. K. Duckett, A. K. Greene, T. C. Jenkins, D. V. Maurice, T. R. Scott, P. A. Skewes; *Associate Professors:* S. E. Ellis, M. A. Hall; *Assistant Professors:* J. R. Gibbons, C. J. Mortensen, S. L. Pratt, K. L. Vernon; *Instructors:* B. G. Bolt, J. L. Fain, L. M. Morgan
- AVS 100 Orientation to Animal and Veterinary Sciences 1(2,0)** Study of the role of animal agriculture in the world today emphasizing supply and demand of end products and careers available in the animal industry.
- AVS 101 Dairy Foods 1(1,0)** Study of production aspects of dairy foods from the farmer to the consumer, including such products as ice cream, yogurt, and various cheeses. Considers the use of these foods for nutrition and pleasure.
- AVS 150 Introduction to Animal Science 3(3,0)** Survey of animal industries and their role in society. Examines the relationship between man and animals in both a current and historical context.
- AVS 151 Introduction to Animal Science Laboratory 1(0,2)** Examines the basic principles in the handling of livestock and techniques of farm animal production as well as orientation to animal production units. *Coreq:* AVS 150.
- AVS 200 Beef Cattle Techniques 2(1,2)** Examines basic principles in the techniques and management associated with production of both beef cattle and sheep. Students may take only one techniques course per semester. *Coreq:* AVS 150, 151.
- AVS 201 Poultry Techniques 2(1,2)** Basic principles of the production of poultry are discussed and demonstrated. Students receive hands-on experience in the production and processing of poultry. Students may take only one techniques course per semester. *Prq:* AVS 151.
- AVS 203 Dairy Science Techniques 2(1,2)** Introduction to dairy production and processing. Laboratories include hands-on opportunities for management of dairy cattle, quality control of milk, and processing of milk and dairy products. Students may take only one techniques course per semester. *Prq:* AVS 151.
- AVS 204 Horse Care Techniques 2(1,2)** Basic principles of equine behavior, handling, and management are discussed and demonstrated. Students receive hands-on experience with various management techniques, including handling and all aspects of health care. Students may take only one techniques course per semester.
- AVS 205 Horsemanship I 2(0,4)** Designed for beginner to intermediate riders. The mechanics of safety, longeing, basic position, cues, and rider's aids for both western and English disciplines are covered. *Prq:* AVS 151.
- AVS 206 Swine Techniques 2(1,2)** Examines the basic principles in the techniques and management associated with production of swine. Students may take only one techniques course per semester. *Prq:* AVS 150, 151.
- AVS 207 Horsemanship II 2(0,4)** Designed for intermediate to advanced riders to enhance basic horsemanship and develop specific skills for advanced maneuvers in both western and English disciplines. Students concentrate on individual work and establish finesse and subtlety of aids. Training and artificial aids are discussed and/or implemented in riding sessions. *Prq:* AVS 205 and consent of instructor.
- AVS 208 Techniques of Teaching Horsemanship 3(2,2)** Discusses teaching techniques and theory and handling of large mounted groups. Trains beginner through advanced levels. *Prq:* AVS 205.
- AVS 209 Livestock Exhibition Techniques 2(1,2)** Students learn techniques associated with exhibition and evaluation of beef, dairy, equine, poultry, and swine.
- AVS 301 Anatomy and Physiology of Domestic Animals 4(3,3)** Study of physiology and associated anatomy of the body systems, including nervous, skeletal, muscular, respiratory, digestive, circulatory, urinary, reproductive, and endocrine systems. Designed primarily for students in Animal and Veterinary Sciences. *Prq:* BIOL 104/106 or 111.
- AVS 302 Livestock Selection and Evaluation I 2(1,2)** Selection and evaluation of the meat species of livestock with application of theory applied in multiple field exercises.
- AVS 303 Livestock Selection and Evaluation II 2(1,2)** Selection and evaluation of the meat species of livestock with application of theory applied in multiple field exercises. *Prq:* AVS 302.
- AVS 305 Meat Grading and Selection 2(1,2)** Classification, grading, and selection of beef, lamb, and pork carcasses and wholesale cuts and factors influencing quality and value are studied. Students are eligible to compete in intercollegiate meat-judging contests.
- AVS 309 Principles of Equine Evaluation 2(0,4)** Discusses the selection and evaluation of equines for various disciplines. Emphasizes current industry standards with regard to "form to function." Students place classes of four horses and develop oral reasons to defend their placing. Opportunities for competitive horse judging teams are available.

- AVS 310 Animal Health 3(3,0)** Discusses basic principles of animal health. Emphasizes disease prevention in beef cattle, dairy cattle, goats, horses, poultry, and swine. The most common and important diseases and zoonosis of farm animals are explained. *Preq:* AVS 150.
- AVS 311 Dairy Cattle Selection 2(1,2)** Dairy selection and evaluation methods are studied, including evaluation according to the Purebred Dairy Cattle Association scorecard, linear evaluation, pedigrees, and Dairy Herd Improvement Association records. Emphasizes presentation of oral reasons.
- AVS 312 Forages and Grazing Systems 3(2,2)** Familiarizes students with the interaction of forage plants and grazing animals. Includes practical application of theory to management issues as it relates to the relationship between plants and animals. *Preq:* AVS 150, BIOL 103/105 or 111.
- AVS 315 Animal Welfare 3(3,0)** Discussion of past, present, and future human/animal interaction. Topics include wild animals, domestication, animal welfare organizations, animal rights organizations, welfare assessment, animal agriculture, animal research, and other current topics. *Preq:* Junior standing.
- AVS 323 Poultry and Poultry Products Evaluation 2(0,4)** Selection of layers, broilers, and turkeys. Grading of poultry products according to USDA grade standards is also studied. Students are eligible to compete in intercollegiate poultry judging contests. May be repeated for a maximum of four credits.
- AVS 330 Animal Pathology 3(3,0)** Acquaints students with animal pathology, including cell injury, inflammation, neoplasia, immunologic disease, and pathology of various organ systems. *Preq:* AVS 301.
- AVS 360 Internship 1-12(0,3-36)** Off-campus, preplanned, reviewed, approved, and supervised educational experience in an area related to animal and veterinary sciences. Based on a multifaceted work experience in a highly structured professional environment. Students submit periodic written reports and a final written and oral report. To be taken Pass/Fail only. *Preq:* Junior standing in Animal and Veterinary Sciences and consent of instructor.
- AVS 370, H370 Principles of Animal Nutrition 3(3,0)** Familiarizes students with nutrients and feeds used in livestock and specialty animal production. Methods of evaluating common feed-stuffs are covered along with a survey of the functioning of the various digestive systems. Practical aspect to feeding each species is covered. *Preq:* AVS 150, CH 102.
- AVS 375, H375 Applied Animal Nutrition 3(2,2)** Students learn procedures for formulating diets that meet nutrient requirements of livestock and poultry, utilizing traditional mathematical approaches and computerized formulation. Computerized least-cost formulation of diets is covered along with familiarization with feeding systems and approaches. *Preq:* AVS 370.
- AVS 385 Equine Behavior and Training 2(0,6)** Introduces students to the initial processes in gentling and riding young horses. Students work with two- and three-year-old horses to desensitize them to stimuli in preparation for riding. Students do groundwork and put the initial rides on the horses. *Preq:* AVS 205 or 207.
- AVS 386 Advanced Equine Behavior and Training 2(0,6)** Students train young horses advanced skills in western or English disciplines. Students actively prepare horses for show or sale and participate in a show or marketing/sale of their assigned horse. Develops students' negotiation and communication skills, industry insight, and industry-specific jargon. May be repeated for a maximum of four credits. *Preq:* AVS 385.
- AVS 390 Practicum 1-3(0,3-9)** On-campus, preplanned, supervised learning experience in an area related to animal and veterinary sciences. Gives experience not covered in other classwork. May be repeated for a maximum of four credits. To be taken Pass/Fail only. *Preq:* Consent of instructor supervising practicum.
- AVS 401, H401, 601 Beef Production 4(3,2)** Discusses breeding, feeding, reproduction, and management of beef cattle. Emphasizes production systems integrating disciplines of animal agriculture into management plans and alternatives. Practical applications of beef production and management practices are also presented. *Preq:* AVS 370.
- AVS 405 Advanced Selection and Evaluation 2(0,4)** Special and advanced training in selection and evaluation of breeding, performance, and market animals or their products. Species used are beef and dairy cattle, sheep, swine, and horses. *Preq:* AVS 302 or 303 or 305 or FD SC 304; 309 or 311 and consent of instructor.
- AVS 406 Seminars and Related Topics 2(3,0)** Students conduct in-depth library research on current topics related to animal science and give formal presentations using multimedia technology. Students also prepare scientific posters, learn interviewing skills, prepare résumés, and observe professional speakers. *Preq:* Senior standing.
- AVS 409 Selected Topics 1-3(1-3,0)** Topics of interest to students at the undergraduate, graduate, and professional levels. Provides experience with problems not covered in other courses or on thesis research. May be repeated for a maximum of six credits, but only if different topics are covered.
- AVS 410, 610 Domestic Animal Behavior 3(3,0)** Provides knowledge and understanding of behavior related to perception, learning, sociality, reproduction, feeding, and health for application in production, training, and design of environments for optimum health and welfare of domestic animals. *Preq:* AVS 150, 151 and Junior standing.
- AVS 411, 611 Animal Growth and Development 3(3,0)** Integration of the nutritional, physiological, and genetic basis for animal growth and development with application to livestock and poultry production. Includes the cellular and molecular mechanisms controlling these processes and emphasizes the genes that regulate animal products (meat, eggs, wool, and milk). *Preq:* AVS 301.
- AVS 412, H412, 612 Advanced Equine Management 4(3,2)** Further discussion of special considerations of the equine regarding housing, manure management, nutrition, reproduction, transportation, and behavior. Students gain insight into how horses differ from other livestock species and their unique requirements for the above systems. *Preq:* AVS 370.
- AVS 413, 613 Animal Products 3(2,3)** Introduction to the safe and humane production of red meat, poultry, and dairy products. Includes HACCP principles and production of value-added animal products.
- AVS (BIOSC, MICRO) 414, H414, 614 Basic Immunology 4(3,3)** See MICRO 414.
- AVS 415, 615 Contemporary Issues in Animal Science 3(3,0)** Provides knowledge, understanding, and critical analytical skills on current issues in animal agriculture in diverse regional, national, and global social-cultural and political environments as they impact animals and man. *Preq:* Junior standing in Animal and Veterinary Sciences.
- AVS 416, 616 Equine Exercise Physiology 4(3,2)** Integration of muscle, bone, cartilage, cardiovascular, and respiratory systems as related to the equine athlete. Encompasses biomechanics, kinetics, and kinesiology related concepts specific to the horse. Further discussion of diseases related to specific systems is covered. *Preq:* AVS 301.
- AVS 417, 617 Animal Agribusiness Development 2(1,2)** Team-based development of a business relating to the animal industries. Students develop the business from the initial idea through operations. Focuses on the development of the business plan, including financials, personnel management, and resources needed. *Preq:* ACCT 201 and AP EC 202 or consent of instructor.
- AVS 418, 618 Muscle Biology and Lean Meats 3(2,2)** Biology of animal muscle, connective, fat, and bone tissue with laboratory emphasis on low-fat sausages and restructured, value-added meat products. *Preq:* AVS 202.
- AVS 420, 620 Poultry Science On-line 3(3,0)** On-line course covering the physiology, nutrition, health, reproduction, genetics, breeding, housing, and management of commercial poultry species, including the processing of meat and egg products.
- AVS 422 Special Problems 1-3(0,3-9)** Laboratory, library, or field study of problems related to animal and veterinary sciences, emphasizing development and testing of hypothesis and reporting of results. May be repeated for a maximum of four credits. *Preq:* Junior standing and consent of instructor supervising study.
- AVS 441 Animal and Veterinary Sciences Teaching Experience 1-3(1-3,0)** Formal teaching experience related to animal and veterinary sciences supervised by a faculty member. May involve classroom instruction, educational material development, and/or student evaluation and assessment. Students submit periodic written reports and a final written and oral report. May be repeated for a maximum of four credits. To be taken Pass/Fail only. *Preq:* Consent of instructor.

**AVS 442 Animal and Veterinary Sciences Extension Experience 1-3(1-3,0)** Formal experience in extension education. Students are involved in development, implementation, or assessment of adult or youth educational programs related to animal and veterinary sciences, under supervision of extension professionals. Students submit periodic written reports and a final written and oral report. May be repeated for a maximum of four credits. To be taken Pass/Fail only. *Preq:* Consent of instructor.

**AVS 443 AVS International Experience 1-3(1-3,0)** Preplanned and approved international education/cultural experience supervised by an Animal and Veterinary Sciences faculty member. Periodic reports or record keeping are required. Final report and oral presentation are required at the end of the experience. May be repeated for a maximum of four credits. To be taken Pass/Fail only. *Preq:* Consent of instructor.

**AVS 444 AVS Animal Agribusiness Travel Experience 2(1,2)** Classroom and travel course to expose students to animal production operations, agribusiness, and industry leaders across various geographical areas. Travel is conducted during spring break and includes visits to farms, universities, and agribusinesses. Additional fee is required. To be taken Pass/Fail only. *Preq:* Junior standing in Animal and Veterinary Sciences, consent of instructor.

**AVS 450 Sustainable Livestock Production Systems 4(3,2)** Critical analysis of sustainable livestock production systems and associated factors. Principles of decision making, business analysis, management practices, resource assessment and allocation are covered in a variety of sustainable livestock production schemes.

**AVS 453, H453, 653 Animal Reproduction 3(2,2)** Reproductive physiology and endocrinology of mammals with emphasis on farm animals and frequent reference to reproduction in laboratory animals and humans. *Preq:* AVS 150, 301.

**AVS 455, 655 Animal Reproductive Management 2(1,3)** Physiology and endocrinology of pregnant and nonpregnant cows are discussed. Emphasizes methods of artificial insemination, pregnancy detection, and computer record keeping to achieve a high level of reproductive efficiency in cattle. *Preq:* AVS 150, 301; AVS 453 (or concurrent enrollment).

**AVS 465, 665 Animal Physiology I 3(3,0)** Advanced study of the physiological systems of domestic animals as these systems relate to the integrated functions of the body. Exposes students to advanced physiological concepts and current literature perspectives on a variety of body systems and processes. *Preq:* Introductory physiology and biochemistry.

**AVS 467, 667 Animal Physiology II 3(3,0)** Advanced course extending coverage of major and current topics in animal physiology across species not previously covered in AVS 465. Major topics include digestive physiology in nonruminant and ruminant species, reproductive physiology, muscle physiology, and general aspects of avian physiology. *Preq:* Introductory course in physiology and biochemistry.

**AVS 470, H470, 670 Animal Genetics 3(3,0)** Fundamental principles relating to the breeding and improvement of livestock, including variation, heredity, selection, linebreeding, inbreeding, crossbreeding, and other related subjects. *Preq:* AVS 150.

**AVS (BIOSC) 480, 680 Vertebrate Endocrinology 3(3,0)** See BIOSC 480.

**AVS 491 Animal and Veterinary Sciences Undergraduate Research Experience 1-3(1-3,0)** Formal laboratory, library, or field study of problems related to animal and veterinary sciences, emphasizing hypothesis development, testing, and reporting results. Projects are preplanned, reviewed, and approved. Students submit periodic written reports and final written and oral reports. May be repeated for a maximum of four credits. *Preq:* Consent of instructor.

## ANTHROPOLOGY

*Professor:* J. M. Coggeshall; *Associate Professors:* E. L. Williams, Y. Zhang; *Assistant Professors:* M. A. Vogel, K. E. Weisensee; *Adjunct Assistant Professor:* L. G. Rapaport

**ANTH 201 Introduction to Anthropology 3(3,0)** Offers a four-field overview: primates and human biological origins; the development of agriculture and complex societies in the archaeological record; contemporary human societies cross-culturally; and the relationship between languages and cultures. An anthropological perspective on contemporary human problems is also presented.

**ANTH 301 Cultural Anthropology 3(3,0)** Explores human cultural diversity and current global issues. Examines food production and economic distribution, political organization, marriage and family, and religious systems in contemporary cultures. *Preq:* ANTH 201 or consent of instructor.

**ANTH 320 North American Indian Cultures 3(3,0)** Discusses the prehistory of Native peoples, their cultural diversity at European contact, and the history and impact of that contact. Also examines contemporary issues facing Native Americans. *Preq:* ANTH 201 or consent of instructor.

**ANTH 331 Archaeology 3(3,0)** Overview of anthropological archaeology emphasizing the scientific analyses, methodologies and theoretical approaches used by anthropological archaeologists to study the human past. Students learn about the origins and development of complex society and explore individual case studies.

**ANTH 332 World Archaeology 3(3,0)** Global survey of the earliest complex societies focusing on the origins of "pristine states" from the perspective of anthropological archaeology. Following a brief overview of archaeological methods and approaches, students learn about the origins of complex societies of Mesopotamia, the Indus Valley, Egypt, China, Mesoamerica, and the Andes.

**ANTH (BIOSC) 351 Biological Anthropology 3(3,0)** Study of humans as biological organisms. Examines human evolution, primate social behavior, human physiological variations and disease resistance, and human skeletal anatomy and forensics.

**ANTH (BIOSC) 353 Forensic Anthropology 3(3,0)** Introduction to forensic anthropology, the science that utilizes methods from skeletal biology and archaeology as tools in human identification in a medico-legal context. *Preq:* Junior standing or consent of instructor.

**ANTH (LANG) 371 Language and Culture 3(3,0)** See LANG 371.

**ANTH 403, 603 Qualitative Methods 3(3,0)** Methods and techniques of qualitative field research, including participant observation, ethnographic interviewing, data analysis, and report writing. *Preq:* ANTH 201 or consent of instructor.

**ANTH (JAPN) 417 Japanese Culture and Society 3(3,0)** See JAPN 417.

**ANTH (CHIN) 418 Chinese Culture and Society 3(3,0)** See CHIN 418.

**ANTH (W S) 423 Women in the Developing World 3(3,0)** Comparative anthropological study of women and their status in developing countries around the world. A survey of women's daily lives in a global context, emphasizing education, economics, and the environment. Case studies include microfinance, literacy, reproductive rights and practices, and the impact of religious fundamentalism on women. *Preq:* Sophomore standing.

**ANTH 451 Biological Variation in Human Populations 3(3,0)** Provides an in-depth discussion of the most influential topics in human skeletal biology. Course explores the history and ethical dilemmas of the field, and examines how biological anthropologists use skeletons to reconstruct patterns of diet, disease, demography and physical activity in human populations. *Preq:* ANTH 201 or consent of instructor.

**ANTH (BIOSC) 466, 666 Evolution of Human Behavior 3(3,0)** See BIOSC 466.

**ANTH 495 Field Studies 1-6(1-2,2-12)** Group field project in settings selected by the instructor to provide students with a variety of exposures to various cultural contexts. Archaeological digs are included. Project progress and student interpretations of findings are monitored by periodic group meetings and shared experiences. May be repeated for a maximum of six credits. *Preq:* ANTH 301 or equivalent and consent of instructor.

**ANTH 496 Creative Inquiry—Cultural Anthropology 1-3(1-3,0)** Investigates topics in cultural anthropology selected by faculty and students. Goals, research, and outcomes vary from semester to semester and project to project. May be repeated for a maximum of 12 credits. *Preq:* ANTH 201.

**ANTH 498 Independent Study 1-3(1-3,0)** Individual readings or projects in anthropological areas not covered in other courses. May be repeated for a maximum of six credits with advisor's approval. *Preq:* ANTH 201.

## APPLIED ECONOMICS

*Professors:* C. E. Curtis Jr., M. Espey, D. W. Hughes, W. M. Smathers Jr., W. M. Ward; *Associate Professors:* T. D. Davis, R. D. Lamie, S. R. Templeton, D. B. Willis; *Assistant Professors:* K. A. Boys, C. E. Carpio, O. Isengildina-Massa, J. D. Kropp, K. L. Robinson; *Research Assistant Professor:* T. Boonsaeng

- AP EC 102 South Carolina and the Global Economy 3(3,0)** Explores important aspects of globalization. Includes the role of market-based systems, trade, financial flows, and immigration. Emphasizes the world-wide economic integration of the United States, generally, and South Carolina in particular.
- AP EC 202 Agricultural Economics 3(3,0)** Analytical survey of the various subdivisions of agricultural economics, including farm organization, enterprise, land economics, marketing, farm prices, governmental farm policies, and the relation of agriculture to the national and international economy.
- AP EC 205 Agriculture and Society 3(3,0)** Introduction to the development of world society focusing on food production, from early hunting and gathering to modern biotechnology. Covers factors driving societal growth with a global perspective. Explores systematic impacts of growth in technical capacity to produce agricultural products on farm and community organization, industrialization, and the global economy.
- AP EC 257 Natural Resources, Environment, and Economics 3(3,0)** Economic principles applied to resource allocation problems related to environmental and natural resource issues.
- AP EC 302 Economics of Farm Management 3(3,0)** Economic principles underlying the organization and operation of agricultural firms and related business enterprises. Particular emphasis is placed on management aspects of the farm as a production unit. *Preq:* AP EC 202 or ECON 211.
- AP EC 308 Quantitative Applied Economics 3(3,0)** Basic quantitative relationships in applied economics are examined and interpreted. Emphasizes the mathematical aspects of applied economics. Microcomputer software is utilized for problem solving.
- AP EC 309, H309 Economics of Agricultural Marketing 3(3,0)** General course in marketing agricultural commodities with particular emphasis upon food products. Analyzes efficiency criteria, consumer behavior, market organizations and institutions, and marketing functions. *Preq:* AP EC 202.
- AP EC 313 Principles of Real Estate Appraisal 3(3,0)** Introduction to basic principles and procedures of real estate appraisal. Topics include the real estate market, principles of valuation, legal concepts, and the application of the comparable sales, cost, and income approaches to real estate valuation. *Preq:* FIN 307 or consent of instructor.
- AP EC 319 Agribusiness Management 3(3,0)** Study of the principles used in making management decisions and the application of these principles in agribusiness. Emphasizes the application of economics to the solution of problems facing managers of agricultural supply and marketing firms. *Preq:* AP EC 302 or 309.
- AP EC 351 Principles of Advertising 3(3,0)** Introduction to the various functions of advertising; research and audience analysis; various media formats; planning, research, and production necessary to create an advertising campaign; social effects, economic effects, and ethical considerations of advertising.
- AP EC 352 Public Finance 3(3,0)** Principles of financing government, sources of public revenue, objects of public expenditures, problems of fiscal administration, and the application of fiscal policies in stabilizing the national economy. *Preq:* Junior standing.
- AP EC (C R D) 357 Natural Resources Economics 3(3,0)** See C R D 357.
- AP EC (C R D, HLTH) 361 Introduction to Health Care Economics 3(3,0)** See C R D 361.
- AP EC 402, 602 Production Economics 3(3,0)** Economic analysis of agricultural production involving the concept of the farm as a firm; principles for decision making; the quantitative nature and use of production and cost functions and the interrelations and applications of these principles to resource allocation in farms and among areas. *Preq:* AP EC 308, ECON 314.
- AP EC 403, 603 Land Economics 3(3,0)** Study of the characteristics of land and of the physical, legal, social, and economic principles and problems relating to the control and use of land resources. *Preq:* AP EC 202 or ECON 200.
- AP EC 409, 609 Commodity Futures Markets 3(3,0)** Introduction to the economic theory, organization, and operating principles of agricultural commodity futures markets in the United States. Emphasizes speculating, hedging, and investing in agricultural commodity futures contracts from the standpoint of the agribusiness entrepreneur. *Preq:* AP EC 202 or ECON 211.
- AP EC (C R D) 411, 611 Regional Impact Analysis 3(3,0)** See C R D 411.
- AP EC (C R D) 412, 612 Regional Economic Development Theory and Policy 3(3,0)** See C R D 412.
- AP EC 413, 613 Advanced Real Estate Appraisal 3(3,0)** Topics include highest and best use analysis, data collection, and analyses. Stresses advanced appraisal procedures for income, cost, and comparable sales approach to real estate valuation. Covers eminent domain, the appraisal of property in transition, and specialized property. *Preq:* AP EC 313, FIN 307, or consent of instructor.
- AP EC 420, 620 World Agricultural Trade 3(3,0)** Review of practical considerations of agricultural trade and trade policy analysis. Considers the role of international institutions. Special emphasis is placed on concepts of agricultural trade, analysis of trade policies of major trading partners/competitors, and export/import marketing of products. Offered spring semester only. *Preq:* AP EC 309, ECON 412, or consent of instructor.
- AP EC 421, 621 Globalization 3(3,0)** Utilizes basic principles of international economics (comparative advantage, free trade versus protectionism, exchange rate determination, etc.) to analyze the contemporary problems and issues of the world economy. Emphasizes application of economic principles to current globalization trends. *Preq:* ECON 310 or 412 or 413 or consent of instructor.
- AP EC (CSENV) 426, 626 Cropping Systems Analysis 3(2,2)** See CSENV 426.
- AP EC 433, 633 Agricultural Law and Related Environmental Issues 3(3,0)** Introduction to agricultural and agriculture-related environmental legal issues. Topics include a review of laws, agencies, programs, court structure, torts, taxation, biotechnology, land and water use, regulated industry, and environment liabilities as they relate to agriculture and natural resources. *Preq:* LAW 322 or consent of instructor.
- AP EC 452, H452, 652 Agricultural Policy 3(3,0)** Review of public agricultural policy programs in the United States and a critical examination of current and proposed government policies and programs affecting the agricultural sector of the economy. Includes economic considerations as related to past and current farm price and income problems. *Preq:* AP EC 302, 309.
- AP EC 456, H456, 656 Prices 3(3,0)** Review of the basic theory of price under competitive conditions and various modifications; nature, measurement, and causes of daily, seasonal, and cyclical price fluctuations; geographical price relationships; nature, function, and behavior of futures markets; government price programs. *Preq:* AP EC 308, ECON 314, EX ST 462.
- AP EC 457, 657 Natural Resource Use, Technology, and Policy 3(3,0)** Focuses on economic analyses of actual, efficient, and sustainable uses of natural resources, impacts of technologies that affect these uses, and policies that affect development and use of such technologies. Resource-technology-policy combinations may vary, but an example is crude oil, hybrid automotive engines, and fuel economy standards. *Preq:* MTHSC 102; and C R D (AP EC) 357 or ECON 314.
- AP EC 458, 658 Economics of Risk Management 3(3,0)** Focuses on cost-benefit analysis of risks, incorporation of economic considerations into risk assessments, and microeconomic analysis of activities, insurance, and policies that reduce, mitigate, or increase these risks. Possible topics include climate change, wildland fire, erosion, pests and invasive species, pestilence, food contamination, and hurricanes. *Preq:* MTHSC 102 and C R D (AP EC) 357 or ECON 314.
- AP EC 460, 660 Agricultural Finance 3(3,0)** Study of the principles and technique of financing in the agricultural sector. Topics include the capital situation in agriculture, concepts of farm financial management, use of credit, capital markets, lending agencies, and estate planning. *Preq:* ACCT 201, AP EC 202.
- AP EC (W F B) 475, 675 Economics of Wildlife Management and Policy 3(3,0)** Integrated approach to the study of the economics of wildlife. Topics include determination of market and nonmarket value, single and multiple species management, enterprise cost and returns, marketing wildlife, leasing methods, complementarity and competitiveness with agricultural and forestry enterprises, and timber and crop damage cost estimates and control. *Preq:* AP EC 202, ECON 200, FOR 304, W F B 306, or consent of instructor.
- AP EC 490 Selected Topics 1-15(0,2-30)** Study of topics in applied economics. Topics may include classroom and/or field experience not normally covered in other classes. May be repeated for credit, but only if different topics are covered. *Preq:* Junior standing or consent of instructor.

**AP EC (C R D) 491 Internship, Agribusiness, and Community and Rural Development 1-6(0,2-12)** See C R D 491.

**AP EC (C R D) 494 Creative Inquiry—Community and Rural Development 1-3(1-3,0)** See C R D 494.

## ARABIC

**ARAB 101 Elementary Arabic I 4(3,1)** Introductory course for beginners emphasizing acquisition of the Arabic alphabet and writing, basic grammar, vocabulary, speaking and listening skills, and developing strategies for the successful long-term acquisition of Arabic.

**ARAB 102 Elementary Arabic II 4(3,1)** Continuation of ARAB 101 consisting of three hours a week of classroom instruction and one hour a week in the language laboratory. *Preq:* ARAB 101.

**ARAB 201 Intermediate Arabic I 3(3,1)** Continuation of ARAB 102, emphasizing grammar, vocabulary, writing, reading, and acquisition of intermediate language skills. *Preq:* ARAB 102.

**ARAB 202 Intermediate Arabic II 3(3,1)** Continuation of ARAB 201, emphasizing grammar, vocabulary, writing, reading, and acquisition of advanced intermediate language skills. *Preq:* ARAB 201.

## ARCHITECTURE

*Professors:* D. J. Allison, J. F. Barker, *President*; J. R. Caban, *Interim Chair*; E. T. Cavanagh, L. G. Craig, R. J. Hogan, *Associate Chair*; Y. Kishimoto, R. J. Miller (*Charleston*), S. F. Verderber; *Associate Professors:* D. G. Battisto, K. E. Green, H. C. Harritos, D. A. Hecker, N. J. Hurt, R. T. Silance; *Assistant Professors:* V. Y. Blouin, U. Heine, R. T. Huff (*Charleston*), P. L. Laurence, B. F. Sill, M. L. Skinner; *Lecturers:* R. A. Bruhns, P. A. Hedegor (*Charleston*), A. H. Jacques, A. K. Jennings (*Charleston*), D. M. Lee, M. T. Maher (*Charleston*), C. B. Mills, L. M. Mitchell, G. A. Nicholson (*Charleston*), D. A. Pastre (*Charleston*)

**ARCH 101 Introduction to Architecture 3(3,0)** Introduction to the discipline and profession of architecture. Lectures and discussion cover a broad range of architectural issues throughout history. Emphasizes the relationship between architecture and other disciplines as well as across cultures. Includes the development of individual digital portfolio.

**ARCH 151 Architecture Communication 5(2,6)** Introduction to principles and elementary vocabulary of architectural design. Collaborative studio which offers instruction in the specific skills of formal design composition, visual communication, oral presentation, and computer literacy. *Preq:* ARCH 101.

**ARCH 152 Collaborative Studio II 3(1,6)** Continuation of ARCH 151. Introduction to an elemental vocabulary of architecture within basic spatial design problems, emphasizing visual communications skills, oral presentations of work, and analysis and discussion of design issues through critical readings of canonical texts and buildings. *Preq:* ARCH 151.

**ARCH 201 Introduction to Architecture 3(3,0)** Examines basic concepts of architectural design using historic and contemporary examples. Principles of design, programmatic concerns, design documents, and construction are discussed in the context of the practice of architecture.

**ARCH 251 Architecture Foundations I 6(3,6)** Architectural analysis and design problems with a focus on understanding the context of architecture. Specific investigation of buildings as part of the cityscape and the landscape. Instruction on visual communications skills, computer modeling, and oral presentation techniques support the design discussions. *Preq:* ARCH 151.

**ARCH 252 Architecture Foundations II 6(3,6)** Continuation of ARCH 251. Architectural design problems with a focus on structural and construction principles and their relationship to contextual situations. Instruction in oral communication skills and computer graphics support the design discussions. *Preq:* ARCH 251.

**ARCH 351 Studio Clemson 6(1,11)** Addresses architectural problems with varied scales, programs, and locations. Emphasizes the relationship between architecture and context. Projects include analysis, conceptual development, and architectonic resolutions. Continued development of graphic and oral communication skills. Design problems vary every semester according to current issues. May be repeated for a maximum of 18 credits. *Preq:* ARCH 252.

**ARCH 352 Studio Charleston 6(1,11)** Addresses architectural problems with varied scales and programs in the context of Charleston, South Carolina. Emphasizes the relationship between architecture and context. Projects include analysis, conceptual development, and architectonic resolutions. Continued development of graphic and oral communication skills. Design problems vary every semester according to current issues. May be repeated for a maximum of 12 credits. *Preq:* ARCH 252.

**ARCH 353 Studio Genoa 6(1,11)** Addresses architectural problems with varied scales and programs in the context of Genoa, Italy, and historic Europe. Emphasizes the relationship between architecture and context. Projects include analysis, conceptual development, and architectonic resolutions. Design problems vary every semester according to current issues. Continued development of graphic and oral communication skills. May be repeated for a maximum of 12 credits. *Preq:* ARCH 252.

**ARCH 354 Studio Barcelona 6(1,11)** Addresses architectural problems with varied scales and programs in the context of Barcelona, Spain. Emphasizes the relationship between architecture and context. Projects include analysis, conceptual development, and architectonic resolutions. Continued development of graphic and oral communication skills. Design problems vary every semester according to current issues. May be repeated for a maximum of 12 credits. *Preq:* ARCH 252.

**ARCH 355 Studio South 6(1,11)** Addresses architectural problems with varied scales and programs in the context of the South. Emphasizes the relationship between architecture, community, and context. Projects include analysis, conceptual development, and architectonic resolutions. Continued development of graphic and oral communication skills. Design problems vary every semester according to current issues. May be repeated for a maximum of twelve credits. *Preq:* ARCH 252.

**ARCH 401 Architectural Portfolio 3(3,0)** Continues portfolio development for Architecture students, including professional portfolio, academic portfolio, and digital portfolio. *Preq:* ARCH 101. *Coreq:* ARCH 452, 453; Graduating Senior standing.

**ARCH 403 The Modern Architectural Movement 3(3,0)** Seminar in the analysis and criticism of architectural and town building works. Course sequence includes historic and contemporary examples, literary searches, field trips, essays, and oral reports. *Preq:* Senior standing or consent of instructor.

**ARCH 404 Current Directions in Architecture 3(3,0)** Critical analysis of the development and current directions of modern movements in architecture. *Preq:* Senior standing or consent of instructor.

**ARCH 405, 605 American Architectural Styles 1650–1950 3(3,0)** Survey of American architectural styles and of the architects responsible for them, from the Colonial period to our recent past. Considerable emphasis is placed on identifying those architectural elements which serve as clues in determining a building's architectural style.

**ARCH 412, 612 Architectural History Research 3(3,0)** Directed investigations related to the art and architectural history of Europe. May be repeated for a maximum of six credits. *Preq:* Junior standing or consent of instructor.

**ARCH 414, 614 Design Seminar 3(3,0)** Exploration of topical issues in architecture, art, construction, and planning. May be repeated for a maximum of six credits. *Preq:* Junior standing or consent of instructor.

**ARCH 416, 616 Field Studies in Architecture and Related Arts 3(0,9)** Documentation and analysis of architectural structures observed during European travels in graphic and written form. May be repeated for a maximum of six credits. *Preq:* Junior standing or consent of instructor.

**ARCH 421 Architectural Seminar 3(3,0)** Lectures and seminars dealing with pertinent topics related to environmental and technological considerations in architecture and the building industry. *Preq:* Senior standing or consent of instructor.

**ARCH 422 New Directions Seminar 3(3,0)** Exploration into careers which relate directly (i.e., construction law) or indirectly (i.e., public relations) to the making of our built environment.

**ARCH 424, 624 Product Design 3(0,9)** Furniture and product system design with emphasis on ergonomics and the relationship of form and materials. *Preq:* Senior standing and consent of instructor.

**ARCH 425, 625 Energy in Architecture 3(3,0)** Climate design methodology and its influence on building energy patterns and architectural form. *Preq:* Senior standing and consent of instructor.

- ARCH 426, 626 Architectural Color Graphics 3(3,0)** Architectural color graphics by computer. Theories of color classification and interaction; application of color theories to art and architecture. *Preq:* Consent of instructor.
- ARCH 427, 627 Advanced Color Graphics 3(3,0)** Theories of color classification and interaction; three-dimensional color modeling by computer; advanced application of color theories to art and architecture. *Preq:* ARCH 426 or consent of instructor.
- ARCH 428, 628 Computer-Aided Design 3(2,3)** Introduction to the concepts, skills, and applications of computer-aided design as they relate to the practice of architecture. *Preq:* Senior standing or consent of instructor.
- ARCH 429, 629 Architectural Graphics 3(3,0)** Provides students with an understanding of the concepts, skills, techniques, and strategies of visual presentation/graphics as they relate to the design professions—architects/landscape architects. *Preq:* Junior standing or consent of instructor.
- ARCH 430, 630 Theories and Philosophies of Technology and Architecture 3(3,0)** Theoretical and practical examination of technology and architecture from pre-modern and modern viewpoints to study its nonneutral role in shaping and reflecting knowledge, beliefs, and actions within a cultural context.
- ARCH 431, 631 Virtual Reality in Architecture 3(3,0)** Introduction and exploration of the theories and concepts of virtual reality and their use in modeling three dimensional spaces. Instruction in computer modeling, lighting, and texture mapping is offered. Projects focus on the creation and presentation of a virtual environment. *Preq:* Junior standing or consent of instructor.
- ARCH 440, 640 New York Field Study 3(3,0)** Study of architecture, art, planning, and urban design of New York. Two weeks of residence are required with scheduled field trips to relevant sites in all five boroughs, with counseling to determine research interests. Guidance is provided to resources in the city. A final report is required. Offered Maymester only.
- ARCH 451 Architecture Studio III 6(1,11)** Continuation of ARCH 352. Advanced architectural issues of program and theory, synthesis of ideas, and self-criticism. *Preq:* ARCH 352.
- ARCH 452 Synthesis Studio 6(1,11)** Integrates acquired skills, abilities, and interests from previous architecture studios. Projects emphasize the accumulation of architectural experiences and knowledge. *Coreq:* ARCH 401, 453; Graduating Senior status.
- ARCH 453 Writing Architecture 3(3,0)** Advanced writing course for architecture majors. Emphasizes synthesis of the architectural education and development of architectural projects through writing. *Preq:* Graduating Senior status. *Coreq:* ARCH 401, 452.
- ARCH 471 Architectural History of Place 3(3,0)** Survey of urban design and architectural history using examples viewed in a particular locale. Emphasizes an overview survey of design movements identifying specific design elements and understanding how they are used in shaping place. Course is offered only during the summer at study abroad locations. *Preq:* ARCH 101 or consent of instructor. *Coreq:* ARCH 472 and DSIGN 370 or consent of instructor.
- ARCH 472 Architectural Field Studies 3(1,6)** Students develop diagramming and writing skills and use them to document and analyze existing works of urban design and architecture observed during field trips. Course is only offered during the summer at study abroad locations. *Preq:* ARCH 101 or consent of instructor. *Coreq:* ARCH 471 and DSIGN 370 or consent of instructor.
- ARCH 477, 677 Introduction of Craft 1-3(0,2-6)** Architectural craft lab offered under different material specializations, all of which introduce students to design as informed by craft through a hands-on lab. Basic craft operations and material properties are introduced for the subject material (wood, steel, etc.) May be repeated for a maximum of six credits. *Preq:* Consent of instructor.
- ARCH 485, 685 History and Theory of Architecture + Health 3(3,0)** Introduces relationships between health and architectural settings for health. Examines connections between cultural context, medical thought, health-care delivery, and health facility design within different time periods. Introduces contemporary theories on the relationships between human beings, their health and well-being, and the design of the physical environment. *Preq:* Consent of instructor.
- ARCH 488, 688 Architectural Programming and Predesign 3(3,0)** Introduces the theory, mechanics, and practice of architectural programming and post-occupancy evaluation. Presents programming as a means to create architectural settings sensitive to the needs of their inhabitants. Emphasizes collaborative methodologies that involve identifying relevant goals, facts, issues, needs, and concepts. Students develop an architectural program. *Preq:* Consent of instructor.
- ARCH 489 Internship 1-6** Practicum in professional practice. Paid work/study in a variety of related disciplines provides students with hands-on experience in design and fabrication fields relevant to the environmental design professions. Consists of two parts: a professional component, managed by an approved sponsor, and an academic component, taught by the instructor. May be repeated for a maximum of 18 credits. *Preq:* Consent of instructor and acceptance by sponsor.
- ARCH 490, H490 Directed Studies 1-5** Comprehensive studies and research of special topics not covered in other courses. Emphasis is on field studies, research activities, and current developments in architecture. May be repeated for a maximum of ten credits. *Preq:* Consent of department chair.
- ARCH 499, H499 Selected Topics in Architecture 1-3(1-3,0)** Study of selected topics in architecture. May be repeated for a maximum of nine credits, but only if different topics are covered. *Preq:* Junior standing or consent of instructor.
- ARCH 557 Architecture Studio 6(0,18)** City planning design and the development of complex building solutions.
- ART**
- Professors:* S. A. Cross, D. M. Detrich, W. W. Lew, M. V. Vatalaro, *Chair*; *Associate Professors:* A. V. Feeser, J. B. LeBlanc, H. J. Jensen; *Assistant Professors:* D. Donar, C. N. Hung, T. McDonald, A. Wrangle; *Lecturers:* S. Grier, L. House, J. R. Manson, A. Plotek, D. C. Woodward-Detrich
- ART 103 Visual Arts Studio 3(0,6)** Studio projects in basic visual elements and principles. The development of creative design process, visual organization, and design skills are introduced as a foundation for further study in visual arts.
- ART 105 Foundation Drawing I 3(0,6)** Introduction to drawing. Presents exploration of observational drawing practices with an emphasis on structural investigations of form and application of spatial systems. Basic materials and approaches associated with drawing are studied and applied. *Preq:* Visual Arts major or consent of instructor.
- ART 106 Foundation Drawing II 3(0,6)** Further exploration of introductory drawing. Emphasizes use of tone and color. Students work primarily with representational categories, developing comprehension of complex forms and spaces in relation to the 2-D planes. Includes use of rigorous observational drawing practices in conjunction with thematic efforts. *Preq:* ART 105 or 151 or consent of instructor.
- ART 151 Foundations in Visual Art I 3(0,6)** Intensive introduction to the fundamentals of visual art. Studio projects, lectures, and discussions introduce topics and projects relative to foundation-level art students. Explores historical and contemporary applications of the elements and principles of design. *Preq:* Visual Arts major.
- ART 152 Foundations in Visual Art II 3(0,6)** Intensive introduction to the fundamentals of visual art. Studio projects, lectures, and discussions introduce topics and projects relative to foundation-level art students. Explores historical and contemporary applications of the elements and principles of design. *Preq:* Visual Arts major.
- ART 153 Orientation to Visual Arts I 1(1,0)** Introduction to the visual arts profession focusing on issues related to various career opportunities, creativity, problem-solving methodologies, and current thinking in contemporary art. *Preq:* Visual Arts major.
- ART 205 Beginning Life Drawing 3(0,6)** Primary emphasis is on drawing from the live model. Students' drawing skills and fundamental understanding of the structure and form of the human figure are reviewed through studio practice, augmented by lectures, discussions, demonstrations, and critiques. Addresses historical and contemporary use of the human figure in visual arts. *Preq:* ART 106, 151, 152; or consent of instructor.

- ART 207 Beginning Painting 3(0,6)** Introduction to basic materials, methods, and techniques of painting. Primary medium used is acrylic, and other painting media may also be introduced. Emphasizes basic skills in painting plus individual creative development. *Prq:* ART 151, 153, 205 (Visual Arts majors); ART 103 (non-Art Majors); ARCH 152 (Architecture majors); LARCH 152 (Landscape Architecture majors); or consent of instructor.
- ART 209 Beginning Sculpture 3(0,6)** Studio course investigating the meaning of sculpture through traditional and nontraditional approaches. Establishes a working knowledge of material and process in several media. Personal expression is encouraged and enhanced by employment of problem-solving techniques. Static, temporal, installation, and site specific sculpture is explored. *Prq:* ART 151, 152, 153, 154, 205 (Visual Arts majors); ART 103 (non-Art majors); ARCH 152 (Architecture majors); LARCH 152 (Landscape Architecture majors); or consent of instructor.
- ART 211 Beginning Printmaking 3(0,6)** Studio course introducing basic techniques of relief printing, intaglio, lithography, silkscreen, and papermaking. Each semester concentrates on two or three of these techniques. Coursework integrates print-making processes and creativity. *Prq:* ART 151, 152, 153, 154, 205 (Visual Arts majors); ART 103 (non-Art majors); ARCH 152 (Architecture majors); LARCH 152 (Landscape Architecture majors); or consent of instructor.
- ART 213 Beginning Photography 3(0,6)** Introduction to the use of photography as an art medium. Lectures and studio work cover the utilization of the camera, processing, and printing in black and white, with emphasis on perception and creative expression. *Prq:* ART 151, 152, 153, 154, 205 (Visual Arts majors); ART 103 (non-Art majors); ARCH 152 (Architecture majors); LARCH 152 (Landscape Architecture majors); or consent of instructor.
- ART 215 Beginning Graphic Design 3(0,6)** Introduction to fundamental techniques, concepts, and principles of visual communication. Through a series of projects and studio work, students explore techniques of communication through the use of type design, typography, photography, illustration, symbolism, and product design. Individual creative development is stressed. *Prq:* ART 151, 152, 153, 154, 205 (Visual Arts majors); ART 103 (non-Art majors); ARCH 152 (Architecture majors); LARCH 152 (Landscape Architecture majors); or consent of instructor.
- ART 217 Beginning Ceramics 3(0,6)** Basic studio course introducing ceramic arts through its various processes and techniques. Hand building methods as well as throwing on the potter's wheel are developed. Weekly projects emphasize imagination, self-expression, and skill development. Ceramic history is introduced through slide lectures. *Prq:* ART 151, 152, 153, 154, 205 (Visual Arts majors); ART 103 (non-Art majors); ARCH 152 (Architecture majors); LARCH 152 (Landscape Architecture majors); or consent of instructor.
- ART 221 Beginning New Media 3(0,6)** Explores new media art practices and ideas. Digital tools and processes are explored relative to drawing, painting, printing, bookmaking, and photography. Introduces new media as a context of new collective, interactive, and social modes of art production. *Prq:* ART 106, 151, 152, or consent of instructor.
- ART 223 Woodworking Studio 3(0,6)** Introduces woodworking explorations in sculpture and furniture design emphasizing technical understanding and creative application of woodworking processes and methodologies. Students experiment with wood as a vehicle for personal expression and thematic development and conduct research on the historical impact of woodworking in the visual arts. *Prq:* ART 151, ART 152 or ARCH 152, or LARCH 152, or consent of instructor.
- ART 305 Intermediate Drawing 3(0,6)** Presents drawing problems and processes directed toward the production of thematically driven projects. Exploration of diverse drawing media. Emphasizes further development of drawing skills, relationships of materials/techniques to subject matter, and the study of contemporary issues in drawing. *Prq:* ART 205 or consent of instructor.
- ART 307 Painting 3(0,6)** Continuation of ART 209 with increased emphasis on personal expression and growth in technical competence. Some study of painting history is included in studio activity. *Prq:* ART 207 or consent of instructor.
- ART 308 Painting Research I 1-3(0,2-6)** Continuation of ART 307. Technical and conceptual research in painting to further develop self-expression. Special projects are developed in consultation with instructor. May be repeated for a maximum of five credits. *Prq:* ART 307 or consent of instructor.
- ART 309 Sculpture 3(0,6)** Continuation of ART 209 with increased emphasis on personal expression and content of work. Further exploration of materials and processes, including an introduction to foundry casting and advanced welding techniques. Individual investigation into current and historical aspects of sculpture is required. *Prq:* ART 209 or consent of instructor.
- ART 310 Sculpture Research I 1-3(0,2-6)** Continuation of ART 309. Technical and conceptual research in sculpture to further develop self-expression. Special projects are developed in consultation with instructor. May be repeated for a maximum of five credits. *Prq:* ART 309 or consent of instructor.
- ART 311 Printmaking 3(0,6)** Continuation of processes in beginning printmaking emphasizing expanding the range and depth of technique. The relationship of technique and process to creative idea development is emphasized. *Prq:* ART 211 or consent of instructor.
- ART 312 Printmaking Research I 1-3(0,2-6)** Continuation of ART 311. Technical and conceptual research in printmaking to develop self-expression. Special projects are constructed in consultation with instructor. May be repeated for a maximum of five credits. *Prq:* ART 311 or consent of instructor.
- ART 313 Photography 3(0,6)** Continuation of ART 213. Advanced techniques and more diverse types of film and paper are used in making images of personal and expressive nature. The design and construction of a view camera, printing in color, and multiple imagery may also be included. *Prq:* ART 213 or consent of instructor.
- ART 314 Photography Research I 1-3(0,2-6)** Continuation of ART 313. Technical and conceptual research to develop personal and expressive work in photography. Projects are chosen in consultation with instructor. May be repeated for a maximum of five credits. *Prq:* ART 313 or consent of instructor.
- ART 315 Graphic Design 3(0,6)** Continuation of concepts and techniques introduced in ART 215 with emphasis on more applied projects. Individual creative solutions are emphasized. *Prq:* ART 215 or consent of instructor.
- ART 317 Ceramic Arts 3(0,6)** Continuation of skill development leading to more challenging projects and independent efforts. Further exposure to ceramic history and ceramic technology is presented. *Prq:* ART 217 or consent of instructor.
- ART 318 Ceramics Research I 1-3(0,2-6)** Continuation of ART 317. Technical and conceptual research in ceramics for the purpose of self-expression. Projects are constructed in consultation with instructor. May be repeated for a maximum of five credits. *Prq:* ART 317 or consent of instructor.
- ART 321 New Media Art II 3(0,6)** Intermediate-level course that introduces students to time-based art practices such as video art, installation, and performance art forms. Through regularly scheduled studio projects, readings, and screenings, students develop video, installation, and motion graphic techniques, and receive a historical overview of time-based art practices. *Prq:* ART 221 or consent of instructor.
- ART 323 Digital Sculpture 3(0,6)** Studio course covering digital processes applied to making sculpture. Explores digital media as a resource for creative development, creating digital renderings of sculptures, and the fabrication of models and sculptures using CNC technology. *Prq:* ART 209 and 321 or consent of instructor.
- ART 405, 605 Advanced Drawing 3(0,6)** Advanced level studies of drawing which explore the synthesis of refined drawing skills and philosophies of art. Students' understanding of drawing as a form of art is developed through studio practice augmented by critiques, demonstrations, lectures, field trips, and independent research. *Prq:* ART 305 or consent of instructor.
- ART 407, 607 Advanced Painting 3(0,6)** Advanced studio course in painting. Students select painting media and develop a strong direction based on prior painting experience. Includes study of contemporary painters and directions. *Prq:* ART 307 or consent of instructor.
- ART 409, 609 Advanced Sculpture 3(0,6)** Intensive independent studio concentration to further develop personal direction and content. Emphasizes continued investigation of sculptural context, materials and processes, and relative historical research. *Prq:* ART 309 or consent of instructor.
- ART 411, 611 Advanced Printmaking 3(0,6)** Culmination of process, techniques, and individual development. Students are expected to have mastered process and technique for the benefit of the image produced. Creativity and self-expression are highly emphasized as students select a process for concentrated study. *Prq:* ART 311 or consent of instructor.

- ART 413, 613 Advanced Photography 3(0,6)** Continuation of ART 313. Advanced problems in photography. *Preq:* ART 313 or consent of instructor.
- ART 415 Advanced Graphic Design 3(0,6)** Continuation of ART 315. Personal expression through communication techniques is further explored. Individual projects are emphasized. *Preq:* ART 315 or consent of instructor.
- ART 416 Advanced Media Art: Interactive Objects and Environments 3(0,6)** Students apply advanced media art production skills to create objects and environments that respond to user input or interaction. Tools used may include, but are not limited to, microcontrollers, sensors, RFID systems and electronic circuits, as well as traditional input devices. *Preq:* ART 321.
- ART 417, 617 Advanced Ceramic Arts 3(0,6)** Students are directed toward further development of ideas and skills. Glaze calculation and firing processes are incorporated to allow for a dynamic integration of form and ideas. *Preq:* ART 317 or consent of instructor.
- ART 420, 620 Selected Topics in Art 1-3(0,6-9)** Intense course in studio art. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* Senior standing or consent of instructor.
- ART 421 Two-Dimensional Digital Animation 3(0,6)** Exposes students to the principles of animation with traditional techniques, while incorporating the latest 2-D digital tools. Students also develop interactive animations and showcase their work via the Internet. *Preq:* ART 321 or consent of instructor.
- ART 471 Bachelor of Fine Arts Senior Studio I 3(0,6)** Individual studio project directed by an instructor and determined by the student in consultation with the instructor. Focuses on a particular studio area, concept, or theme. May be repeated for a maximum of six credits. *Preq:* Senior standing and completion of 300/400 sequence in the chosen studio area, minimum grade-point ratio of 3.0 in focus studio area, participation in senior studio interview. *Coreq:* ART 473.
- ART 472 Bachelor of Fine Arts Senior Studio II 5(0,15)** Individual studio project directed by an instructor and determined by the student in consultation with the instructor. Usually focuses upon a particular studio area, concept, or theme. *Preq:* ART 471 with a B or better.
- ART 473 Senior Seminar in Professional Career Preparation 2(2,0)** Seminar and practical guide to prepare students for entry into the professional art world. Focuses on issues concerning visual artists in the early years of their professional activities. Presents career options and practical information for the graduating senior, including portfolio development. *Coreq:* ART 471.
- ART 489 Art and Art History Internship 1-3(0,2-6)** Internship with an approved sponsoring art institution in support of professional development and best art practices. May be repeated for a maximum of six credits. *Preq:* Junior standing in Visual Arts, consent of instructor and acceptance by sponsor.
- ART 490, H490, 690 Directed Studies 1-5(0,2-10)** Study of areas in the visual arts not included in other courses or additional advanced work. Must be arranged with a specific instructor prior to registration. May be repeated for a maximum of 18 credits. *Preq:* Consent of instructor.
- ## ART AND ARCHITECTURAL HISTORY
- Professor:* W. W. Lew; *Associate Professors:* A. V. Feeser, J. B. LeBlanc; *Assistant Professor:* K. Kourelis
- A A H 101, H101 Survey of Art and Architectural History I 3(3,0)** Comprehensive survey of art and architectural history of Western heritage as well as significant coverage of Asian, African, Native American, and South American art. The arts are studied within the contexts of history, geography, politics, religion, and culture. Survey includes Ancient through Gothic.
- A A H 102, H102 Survey of Art and Architectural History II 3(3,0)** Survey of Renaissance, Baroque, and Neoclassical art and architecture. Introduction to the Modern Movement in Europe and America. *Preq:* A A H 101.
- A A H 203, H203 History and Theory of Architecture I 3(3,0)** First in a two-semester sequence of special topics and issues in the history of architecture. Emphasizes architectural theory and practice in the past and present. Includes analysis of differing approaches to history: chronological, typological, thematic, phenomenological. *Preq:* A A H 102.
- A A H 204, H204 History and Theory of Architecture II 3(3,0)** Second of a two-semester sequence on special topics and issues in the history of architecture. Emphasizes typologies of the house, governmental buildings, and sacred architecture. Includes study of new directions in architectural historiography. *Preq:* A A H 203.
- A A H 205, H205 History and Theory of Art I 3(3,0)** First of a two-semester sequence on special topics and issues in the history of art. Emphasizes stylistic developments and specific art movements. Analyzes art within the larger context of social, political, and religious history. Examines art techniques and theory as they have developed. *Preq:* A A H 102.
- A A H 206, H206 History and Theory of Art II 3(3,0)** Second of a two-semester sequence on special topics and issues in the history of art. Continued emphasis on stylistic developments and art movements, with specific attention directed toward post-Renaissance art. Analyzes the influence of past history on modern. *Preq:* A A H 205.
- A A H 210, H210 Introduction to Art and Architecture 3(3,0)** One-semester lecture survey that introduces the nonmajor to an overview of art and architecture from different time periods and cultures. Students are encouraged to appreciate the contribution to art made by the great masters and to discern different styles, art techniques, and creative traditions.
- A A H 305 Contemporary Art History 3(3,0)** Study of contemporary art from World War II to the present, exploring forces that have shaped various movements and directions. *Preq:* A A H 206.
- A A H H330 Honors Colloquium 3** Undergraduate honors colloquium emphasizing interdisciplinary interpretations. Focuses on an integration of art, architecture, landscape, and city planning. *Preq:* A A H 204 or 206 or consent of instructor.
- A A H 395 Special Topics in Visual Studies Abroad I 3(3,0)** On-site exposure to art and architecture in foreign countries, coupled with lectures and study problems. Different countries may be selected for study at faculty discretion. May be taught as a compact course during the academic year with a short stay in a foreign country or during summer with extended foreign experience. May not be taken Pass/Fail. *Preq:* A A H 204 or 206 or consent of instructor.
- A A H 411, 611 Directed Research in Art History II 3(3,0)** Comprehensive studies and research of special topics not covered in other courses. Emphasis is on field studies, research activities, and current developments in art history.
- A A H 412, 612 Directed Research in Art History II 3(3,0)** Continuation of A A H 411.
- A A H 423, 623 Studies in the Art and Architecture of the Renaissance I 3(3,0)** Consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15<sup>th</sup>-18<sup>th</sup> centuries), with a study in depth of selected examples from the period. *Preq:* A A H 204 or 206 or consent of instructor.
- A A H 424, 624 Studies in the Art and Architecture of the Renaissance II 3(3,0)** Consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15<sup>th</sup>-18<sup>th</sup> centuries), with a study in depth of selected examples from the period. *Preq:* A A H 423.
- A A H 430, 630 Twentieth Century Art I 3(3,0)** Acquaints students with the major artists' monuments and issues of the Modern period in art. Through lecture/discussions and the reading of primary sources, course places the major modern movements in the context of the period (1860s-1945). *Preq:* Consent of instructor.
- A A H 432, 632 Twentieth Century Art II 3(3,0)** Overview of trends in art and architecture since World War II. Specific artists, artworks, and movements are presented in a socio/historic context with specific emphasis on the transition from a late-modernist to a post-modern perspective. *Preq:* Consent of instructor.
- A A H (PHIL) 433, 633 Issues in Contemporary Art and Philosophy 3(3,0)** See PHIL 433.
- ## ASTRONOMY
- Professors:* D. H. Hartmann, M. D. Leising, B. S. Meyer; *Associate Professors:* P. J. Flower, J. R. King; *Assistant Professor:* S. Brittain
- ASTR 101 Solar System Astronomy 3(3,0)** Descriptive survey of the universe, with emphasis on basic physical concepts and the objects in our solar system. Related topics of current interest are included. For nonscience majors.
- ASTR 102 Stellar Astronomy 3(3,0)** Descriptive survey of the universe, with emphasis on basic physical concepts and galactic and extragalactic objects. Related topics of current interest are included. For nonscience majors. May not be taken by students who have completed ASTR 302.

**ASTR 103 Solar System Astronomy Laboratory 1(0,2)** Optional laboratory to accompany ASTR 101. Demonstrations, laboratory exercises, and planetarium visits supplement the lecture course. *Coreq:* ASTR 101.

**ASTR 104 Stellar Astronomy Laboratory 1(0,2)** Optional laboratory to accompany ASTR 102. Demonstrations, laboratory exercises, and planetarium visits supplement the lecture course. *Coreq:* ASTR 102.

**ASTR 105 Physics of the Universe 3(3,0)** Basic physics principles of Newtonian mechanics, special and general relativity, quantum mechanics, atomic structure, thermal physics, optics, and radiation physics are qualitatively and quantitatively presented. These principles are then applied to demonstrate their usefulness in understanding fundamental astrophysical objects and processes in the cosmos. *Preq:* MTHSC 105 or equivalent.

**ASTR (GEOL) 220 Planetary Science 3(3,0)** See GEOL 220.

**ASTR 302 Stellar Astrophysics 3(3,0)** Study of the basic physical concepts necessary for understanding the sun, other stars, and their evolution. Topics include star formation, stellar structure and evolution, binary stars, and observational techniques. *Preq:* PHYS 221 or consent of instructor.

**ASTR 303 Galactic Astrophysics 3(3,0)** Study of basic physical concepts necessary for understanding the structure of the galaxy, the motions of the stars within it, the nature of the interstellar matter, other galaxies, the large-scale structure of the universe, and the origin of the solar system. *Preq:* PHYS 221 or consent of instructor.

**ASTR 475 Selected Topics in Astrophysics 1-3(0-3, 0-9)** Comprehensive study of an area of astrophysics. Topics may include nucleosynthesis and stellar evolution, extragalactic distance scale, structure and evolution of galaxies, and large-scale structure of the universe. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* ASTR 302 or consent of instructor.

## ATHLETIC LEADERSHIP

*Lecturer:* D. J. Cadorette

**A L 349 Principles of Coaching 3(3,0)** Investigation into the scientific basis of the coaching profession, middle and high school levels. Topics include developing a coaching philosophy, sport psychology, sport pedagogy, sport physiology, athletic administration, and risk management. Current issues regarding sportsmanship, gender equity compliance, and cultural diversity are researched and synthesized. *Preq:* Athletic Leadership minor or consent of Athletic Leadership coordinator.

**A L 350 Scientific Basis of Coaching I: Exercise Physiology 3(3,0)** Increases understanding of basic scientific information concerning athletic performance by using the conceptual approach. Focuses primarily on an in-depth investigation into the physiological principles that can enhance athletic performance. Includes phases of physical training as well as comprehensive evaluative techniques. *Preq:* A L 349 or consent of Athletic Leadership coordinator.

**A L 352 Scientific Basis of Coaching II: Kinesiology 3(3,0)** Increases understanding of basic scientific information concerning athletic movement by utilizing the conceptual approach. Deals with the basic laws of human motion necessary in evaluation of athletic movement, utilizing joint structure and anatomic landmarks as a basis for motion. *Preq:* A L 349.

**A L 353 Theory of Prevention and Treatment of Athletic Injuries 3(2,3)** Increases understanding of principles involved in the prevention and treatment of athletic injuries. Deals with basic anatomy, first aid, and diagnostic techniques necessary for the understanding of basic athletic training procedures. *Preq:* A L 349 or consent of Athletic Leadership coordinator.

**A L 361 Administration and Organization of Athletic Programs 3(3,0)** Study of modern techniques and practices used in administering athletic programs. Emphasizes areas such as practice and game organization, purchase and care of equipment, budget and finances, public relations, and legal liability in athletic programs. *Preq:* A L 349 or consent of Athletic Leadership coordinator.

**A L 362 Psychology of Coaching 3(3,0)** Study of psychological techniques utilized to promote maximum athletic performance. Emphasizes motivation, coaching philosophy, athletic personality, mental preparation, and goal-oriented behavior. *Preq:* A L 349 or consent of Athletic Leadership coordinator.

**A L 371 Coaching Baseball 1(0,3)** Increases understanding of basic technical and practical information concerning the coaching of baseball by utilizing the conceptual approach. Students study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Also covers total program development as it pertains to specific levels of competition. *Preq:* A L 349 or consent of Athletic Leadership coordinator.

**A L 372 Coaching Basketball 1(0,3)** Increases understanding of basic technical and practical information concerning the coaching of basketball by utilizing the conceptual approach. Students study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Also covers total program development as it pertains to specific levels of competition. *Preq:* A L 349 or consent of Athletic Leadership coordinator.

**A L 373 Coaching Cross Country 1(0,3)** Increases understanding of technical and practical information concerning the coaching of cross country by utilizing the conceptual approach. Students study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Also covers total program development as it pertains to specific levels of competition. *Preq:* A L 349 or consent of Athletic Leadership coordinator.

**A L 374 Coaching Football 1(0,3)** Increases understanding of basic technical and practical information concerning the coaching of football by utilizing the conceptual approach. Students study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Also covers total program development as it pertains to specific levels of competition. *Preq:* A L 349 or consent of Athletic Leadership coordinator.

**A L 375 Coaching Soccer 1(0,3)** Increases understanding of basic technical and practical information concerning the coaching of soccer by utilizing the conceptual approach. Students study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Also covers total program development as it pertains to specific levels of competition. *Preq:* A L 349 or consent of Athletic Leadership coordinator.

**A L 376 Coaching Strength and Conditioning 1(0,3)** Increases understanding of basic technical and practical information concerning the coaching of strength and conditioning by utilizing the conceptual approach. Students study basic principles of coaching, training programs, and equipment appraisal as a means to improve athletic performance. Also covers total program development as it pertains to specific levels of competition. *Preq:* A L 349 or consent of Athletic Leadership coordinator.

**A L 377 Coaching Track and Field 1(0,3)** Increases understanding of basic technical and practical information concerning the coaching of track and field by utilizing the conceptual approach. Students study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Also covers total program development as it pertains to specific levels of competition. *Preq:* A L 349 or consent of Athletic Leadership coordinator.

**A L 400 Athletic Leadership Internship 0** Athletic coaching and administration internship for a minimum of 60 hours. To be taken concurrently with any other Clemson University course. To be taken Pass/Fail only. *Preq:* Current CPR certification and consent of Athletic Leadership coordinator.

**A L 453, 653 Athletic Injuries: Prevention, Assessment and Rehabilitation 3(3,0)** Gives students an understanding of prevention, treatment, and rehabilitation procedures of injured athletes. *Preq:* A L 349.

## BIOCHEMISTRY

*Professors:* A. G. Abbott, W. R. Marcotte, K. Murphy, *Chair;* *Associate Professors:* W. Cao, J. Frugoli, H. Luo, J. Morris, K. S. Smith; *Assistant Professors:* C. F. Chen, L. Clark, F. A. Feltus, H. Kurtz, A. Lawton-Rauh, H. Liang, B. Moore, M. Sehorn, L. J. Wang; *Lecturers:* C. Ingram-Smith, M. T. Morris

**BIOCH 103 Careers in Biochemistry and Genetics 1(1,0)** Introduces students to biochemistry and genetics career paths, professional organizations, ethical issues, and requirements for advanced study. Also gives students training in design of a professional portfolio. Credit toward a degree will be given for only one of BIOCH 103, GEN 103. *Preq:* Freshman or Sophomore standing in Biochemistry or Genetics or consent of instructor.

- BIOCH 301, H301 Molecular Biochemistry 3(3,0)** Introduces the nature, production, and replication of biological structure at the molecular level and its relation to function. *Preq:* CH 223.
- BIOCH 302 Molecular Biochemistry Laboratory 2(0,4)** Laboratory to accompany BIOCH 301. Introduction to fundamental laboratory techniques in biochemistry and molecular biology and a demonstration of some of the fundamental principles of molecular biology discussed in BIOCH 301. *Preq:* CH 223. *Coreq:* BIOCH 301.
- BIOCH 305 Essential Elements of Biochemistry 3(3,0)** Introduction to structure, synthesis, metabolism and function of biomolecules in living organisms. *Preq:* CH 201 or equivalent and BIOL 103 or 110; or consent of instructor.
- BIOCH 306 Essential Elements of Biochemistry Laboratory 1(0,3)** Introduces students to fundamental techniques associated with tissue extraction and analysis of biomolecules. Students learn both principles and practical applications. *Preq or Coreq:* BIOCH 305.
- BIOCH 406, 606 Physiological Chemistry 3(3,0)** Studies chemical basis of the mammalian physiological processes of muscle contraction, nerve function, respiration, kidney function, and blood homeostasis. Discusses composition of specialized tissue such as muscle, nerve, blood, and bone and regulation of water, electrolytes, and acid-base balance. *Preq:* BIOCH 305 or organic chemistry.
- BIOCH 423, 623 Principles of Biochemistry 3(3,0)** Study of the chemistry of amino acids, monosaccharides, fatty acids, purines, pyrimidines, and associated compounds leads to an understanding of their properties and the relationship between structure and function that makes them important in biological processes. The use of modern techniques is stressed. *Preq:* CH 224 or equivalent.
- BIOCH 431, H431, 631 Physical Approach to Biochemistry 3(3,0)** Study of chemical and physical properties of amino acids, lipids, nucleic acids, sugars, and their biopolymers. Physical and mathematical analyses are correlated with biological structure and function. *Preq:* BIOCH 301 with a C or better or consent of instructor. *Coreq:* Physical chemistry.
- BIOCH 432, H432, 632 Biochemistry of Metabolism 3(3,0)** Study of the central pathway of carbohydrate, lipid, and nucleotide metabolism. Emphasizes bioenergetics, limiting reactions, and the regulation and integration of the metabolic pathways. *Preq:* BIOCH 423 or 431 or consent of instructor.
- BIOCH 433, 633 General Biochemistry Laboratory I 2(0,4)** Experiments to illustrate current methods used in biochemical research. *Preq:* Concurrent enrollment in BIOCH 423 or 431.
- BIOCH 434, 634 General Biochemistry Laboratory II 2(0,4)** Continuation of BIOCH 433. *Preq:* Concurrent enrollment in BIOCH 432.
- BIOCH 436, H436, 636 Molecular Biology: Genes to Proteins 3(3,0)** Examines how nucleic acids and proteins are synthesized in prokaryotic and eukaryotic cells. Designed for students interested in biochemistry, cell biology, molecular biology, and cell physiology. *Preq:* BIOCH 301 and GEN 302, or consent of instructor.
- BIOCH (GEN) 440, H440, 640 Bioinformatics 3(3,0)** See GEN 440.
- BIOCH 443, 643 Biochemical Basis of Disease 3(3,0)** Topics in heritable human metabolic disorders, including clinical features and newborn screening, genetic testing, the biochemical basis, and treatment. *Preq:* BIOCH 301, GEN 302, or consent of instructor.
- BIOCH 490 Selected Topics in Biochemistry 1-4(0-4,0-9)** Comprehensive study of selected topics not covered in other courses. May be repeated for a maximum of eight credits, but only if different topics are covered. *Preq:* Junior standing or consent of instructor.
- BIOCH 491, H491 Directed Research in Biochemistry 1-8(0,3-24)** Orientation in biochemical research (i.e., experimental planning, execution, and reporting). May be repeated for a maximum of eight credits.
- BIOCH 493, H493 Senior Seminar 2(2,0)** Analysis and discussion of papers from the primary literature in the life sciences particularly in biochemistry. Students find pertinent articles in the primary literature and present and analyze the selected reading.

## BIOENGINEERING

*Professors:* K. J. L. Burg, R. L. Dooley, R. Figliola, A. Guiseppi-Elie, M. LaBerge, *Chair*; R. A. Latour Jr., N. R. Vyavahare, G. Zhang; *Associate Professors:* R. W. Blob, B. Z. Gao, S. W. Harcum, A. Ramamurthi, C. K. Webb, X. Wen; *Assistant Professors:* F. Alexis, L. Benson, D. Dean, J. DesJardins, J. Nagatomi, D. Simionescu, A. Vertegel, H. Yao, N. Zhang

**BIO E 101 Biology for Bioengineers 1(1,0)** Provides basic introduction to fundamental principles of molecular and cellular biology. *Preq:* CH 101.

**BIO E 201 Introduction to Biomedical Engineering 3(3,0)** Provides engineering, biological, and physical science students with an overview of the replacement of human body parts and the problems related to artificial devices. *Preq:* BIO E 101 or BIOL 103 or 110; CH 102; or consent of instructor.

**BIO E 302 Biomaterials 3(2,3)** Study of metallic, ceramic, and polymer materials used for surgical and dental implants; materials selection, implant design, physical and mechanical testing; corrosion and wear in the body. In addition, physical and mechanical properties of tissue as related to microstructure are studied. *Preq:* BIO E 201, C M E 210, CH 201, or consent of instructor.

**BIO E 320 Biomechanics 3(3,0)** Study of relation between biological and mechanical functions of musculoskeletal tissues such as bone, ligaments, muscles, cartilage, etc.; mechanics of human joints; analysis of implants and implant failure. *Preq:* E M 201, MTHSC 208.

**BIO E 321 Biofluid Mechanics 3(3,0)** Introduces mechanics of biological fluids (e.g., blood, synovial fluid and physiological solutions) with an emphasis on the formation of biological problems within the context of (1) kinematics, (2) the concept of stress, (3) linear momentum balance, (4) constitutive relations and (5) boundary conditions. *Preq:* BIO E 320.

**BIO E 370 Bioinstrumentation and Bioimaging 3(2,3)** Introduction of fundamental topics in bioinstrumentation and bioimaging focused on the acquisition and monitoring of vital signals. Basic principles for the selection and appropriate use of instruments for solving bioengineering and medical problems such as microscopy, magnetic resonance imaging, and ultrasounds, among others, are addressed. *Preq:* E C E 202 or 307; and MTHSC 208; or consent of instructor.

**BIO E 400 Senior Seminar 1(1,0)** Addresses problems to be encountered by bioengineering graduates in professional practice. Invited lecturers and faculty provide lectures and demonstrations. Pertinent information on job interview skills, career placement and guidance, professional registration, professional ethics in bioengineering, entrepreneurship and patents, and business management are provided. To be taken Pass/Fail only. *Preq:* Senior standing in Bioengineering.

**BIO E 401 Bioengineering Design Theory 3(3,0)** Introduces principles of engineering design and applies them to the design of medical devices. Covers materials selection, fabrication processes, performance standards, cost analysis, and design optimization. Students defend a design project proposal in written and oral form before a faculty jury. *Preq:* BIO E 302 or consent of instructor.

**BIO E 402 Biocompatibility 3(2,3)** Guides students through the theory and practice of determining compatibility of biomaterials and medical devices as required by the FDA. Hands-on experiments emphasize host-implant interactions such as toxicity towards tissues using specific techniques, including cell culture, implantation of biomaterials in experimental animals and histopathology. *Preq:* BIO E 302 and BIOSC 461 or consent of instructor.

**BIO E 403 Applied Biomedical Design 3(1,6)** Creative application of bioengineering and design principles to solving clinically relevant design problems. Team-based development, construction and evaluation of design prototypes in accordance with design theory. Students present results to faculty jury and external collaborators through written reports and oral presentations. *Preq:* BIO E 401, or consent of instructor.

**BIO E 412, 612 Orthopaedic Engineering and Pathology 3(3,0)** Interdisciplinary study of clinical orthopaedic cases (bone growth, bone remodeling, osteoarthritis, implant fixation and joint replacements); biomechanical, biomaterials, tribology and clinical diagnosis of failed implants (total joint replacements, fracture fixation and spinal instrumentation); basic concepts of orthopaedic pathology for engineers. *Preq:* BIO E 302, 320, BIOSC 315.

**BIO E (C M E) 415, H415, 615 Research Principles and Concepts 1(1,0)** Introduces seniors and graduate students to principles and practices of scientific research. Topics include developing scientific concepts, developing projects, pursuing research, collaborating in multidisciplinary teams, patenting and publishing technical and scientific information, and reviewing professional and ethical standards of performance. To be taken Pass/Fail only.

**BIO E 420 Sports Engineering 3(3,0)** Study of engineering principles involved in sports: body systems in human motion, analysis of gait, basic performance patterns in athletic movements, performance improvements, design of sports equipment. *Preq:* BIO E 302 and 320 or consent of instructor.

- BIO E 423, 623 Cardiovascular Engineering and Pathology 3(3,0)** Medical and bioengineering aspects of artificial cardiovascular and vascular devices; physiology and pathological aspects of patients with need for such devices; diagnostic techniques and surgical management of diseases and pathology; design aspects of current devices and selection; state of the art in experiments and human clinical trials. *Preq:* BIO E 302, 320, 370, BIOSC 315.
- BIO E 440, 640 Biotechnology for Bioengineers 3(3,0)** Explores the principles necessary to use microorganisms, tissue culture, and enzymes in bioengineering applications, including molecular techniques, fermentation, process scale-up, purification processes, and FDA regulations. Emphasizes production of biopharmaceuticals derived from recombinant systems, including uses in medical systems. *Preq:* BIOCH 305 or consent of instructor.
- BIO E 448 Tissue Engineering 3(2,3)** Explores the application of engineering principles toward the development of biologically based substitutes that restore, maintain, or improve tissue function. Topics include biodegradable scaffolds, wound healing and tissue repair, cell-matrix interactions, immunology and biocompatibility, stem cells. *Preq:* BIO E 302, BIOSC 315 and 461, or consent of instructor.
- BIO E 450, H450 Special Topics in Bioengineering 1-4(1-4,0)** Comprehensive study of a topic of current interest in the field of biomedical engineering under the direct supervision and guidance of a faculty member. May be repeated for a maximum of six credits, but only if different topics are covered. *Preq:* Consent of instructor.
- BIO E 451 Creative Inquiry—Bioengineering 1-3(1-3,0)** Disciplinary and multidisciplinary team research projects with the goal of developing the students' skills in literature research, engineering design, and data analysis. May be repeated for a maximum of six credits. *Preq:* Consent of instructor.
- BIO E 460 International Special Research Topics in Bioengineering 3(0,9)** Comprehensive study and research exposure relating to bioengineering research topics at an international institution through the Bioengineering study abroad program. Students are exposed to laboratory and research methods while under the direct supervision and guidance of approved international mentors. *Preq:* Consent of instructor.
- BIO E 461 International Study in Bioengineering 3(3,0)** Introduction to selected bioengineering topics through participation in international study abroad summer programs. Offers an international study experience to undergraduates through lectures, guest speakers, tours, and/or laboratory exposure on a selected bioengineering topic chosen annually by the department. *Preq:* Consent of instructor.
- BIO E 471, 671 Biomedical Imaging in Biophotonics 3(3,0)** Biophotonics is an interdisciplinary subject of applying photonics to study biological samples from individual cells to the entire body. Introduces fundamental and frontier topics in optical imaging aspects of biophotonics for senior-level undergraduates and graduate students to gain the ability to solve bioimaging-related biomedical problems. *Preq:* MTHSC 208; PHYS 221; E C E 320; or consent of instructor.
- BIO E 476 Biosurface Engineering 3(2,3)** Study of how surface design influences the interactions of biomolecules with biomaterials and how this in turn influences implant biocompatibility. Laboratory addresses both the theory and application of various analytical instruments commonly used in bioengineering to characterize biomaterials surfaces and investigate biomolecule-surface interactions. *Preq:* Senior standing in Bioengineering, BIOCH 305.
- BIO E 482, 682 Biomaterial Implantology 3(2,3)** Provides training in the planning and conduct of experimental surgery, including laws and regulations; institutional requirements; selection of animal models; ethical considerations of animal research; preparation of animals for surgery; general and special surgical techniques; aseptic surgical techniques; and basic and applied instrumentation. *Preq:* Junior standing in Bioengineering.
- BIO E 490 Internship 1(0,3)** Observation and assignment in a medical school, dental school, hospital, regulatory agency, or industrial department. May be repeated for a maximum of two credits. *Preq:* Senior standing in Bioengineering, consent of department chair.
- BIO E 491, H491 Mentored Research in Bioengineering 1-6(0,3-18)** Mentored research training for undergraduate students working with a faculty advisor, including literature review, experimental design, research documentation, and presentation of results. May be repeated for a maximum of six credits. Honors students must take six credits under a single advisor and write an honors thesis. *Preq:* Consent of instructor.

## BIOLOGICAL SCIENCES

*Professors:* P.H. Adler, R.E. Ballard, W. Chen, G.W. Eidson, V. S. Gallicchio, S. J. Klaine, M. B. Ptacek, C. D. Rice, B. J. Speziale, T. P. Spira, L. A. Temesvari, Y. Wei, A. P. Wheeler, *Chair*; *Associate Professors:* L. J. Bain, W. S. Baldwin, R. W. Blob, J. J. Hains, A. S. Mount, S. A. Sparace, D. W. Tonkyn, M. W. Turnbull, P. van den Hurk, X. Yu; *Assistant Professors:* D. G. Bielenberg, S. C. Chapman, M. J. Childress, S. J. DeWalt, Y. Dong, N. R. Espinoza, T. E. Higham, J. L. Kerrigan, P. B. Marko, A. L. Moran, K. S. Paul, L. G. Rapaport; *Senior Lecturers:* J. R. Cummings, T. L. McNutt-Scott; *Lecturers:* K. L. Ickes, R. C. Hardwick, P. D. McMillan, H. P. Walker; *Adjunct Instructor:* J. M. Denton

**BIO SC 101 Frontiers in Biology I 1(1,0)** Introduces Biological Sciences majors to University career and library services, evaluation of computer program proficiency, Web page development, Biological Sciences emphasis areas, and Biological Sciences 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 103/105 or 110 or consent of course coordinator.

**BIO SC 102 Frontiers in Biology II 1(1,0)** Introduces Biological Sciences majors to recent advances in organismal and evolutionary biology. Topics include ecology, evolution, behavior, and organismal biology. *Preq:* BIOL 103/105 or 110 or consent of course coordinator.

**BIO SC 200 Biology in the News 3(3,0)** For non-science majors. Students examine current topics of biology appearing in newspapers and other current media. Uses a problem-based learning approach, with students working as teams and individually on areas of interest identified by the class. *Preq:* ENGL 103, General Education Natural Science Requirement.

**BIO SC 203 Environment, Energy, and Society 3(3,0)** Examines power and energy production, the resultant environmental effects, and the relationship between this technology and society. Introduces historical and contemporary sources of energy and power; the economic, social, and political forces important for types and patterns of development; and the resultant impacts to ecosystems and the environment.

**BIO SC 205 Plant Form and Function 3(3,0)** Introductory course for students majoring in plant sciences. Integrates lecture and laboratory and emphasizes fundamental structures and functions of higher plants. *Preq:* BIOL 103/105 or consent of instructor.

**BIO SC 206 Plant Form and Function Laboratory 1(0,3)** Laboratory for BIOSC 205. *Preq or Coreq:* BIOSC 205 or consent of instructor.

**BIO SC 210 Introduction to Toxicology 3(3,0)** Acquaints students with the field of toxicology, integrates the science of toxicology with regulatory policy, and demonstrates its impact on our daily lives. *Preq:* BIOL 103/105, 110, or consent of instructor.

**BIO SC 222 Human Anatomy and Physiology I 4(3,2)** Basic introductory course in integrated human anatomy and physiology covering cells and tissues; integumentary, skeletal, muscular, and nervous systems; sensory organs. Physiology is stressed. Structured primarily for Nursing and other health-related curricula. *Preq:* BIOL 103/105 or 110; CH 101 and 102, or 105 and 106.

**BIO SC 223 Human Anatomy and Physiology II 4(3,2)** Continuation of BIOSC 222 covering endocrine, reproductive, cardiovascular, lymphatic, respiratory, urinary, and digestive systems; fluid and electrolyte balance. Physiology is stressed. *Preq:* BIOSC 222 or consent of instructor.

**BIO SC (ENT) 301 Insect Biology and Diversity 4(3,3)** See ENT 301.

**BIO SC 302, H302 Invertebrate Biology 3(3,0)** In-depth survey and comparison of free-living invertebrate animals emphasizing functional anatomy, development, and evolutionary relationships. *Preq:* Introductory two-semester biology sequence with laboratory. *Coreq:* BIOSC 306.

**BIO SC 303, H303 Vertebrate Biology 3(3,0)** Comprehensive survey of vertebrate animals, including their taxonomy, morphology, evolution, and selected aspects of the natural history and behavior. *Preq:* Introductory two-semester biology sequence with laboratory.

**BIO SC 304, H304 Biology of Plants 3(3,0)** Survey of the major groups of plants, their biology, diversity, and evolution. *Preq:* BIOL 104/106 or 111 or BIOSC 205. *Coreq:* BIOSC 308.

- BIOSC 305, H305 Biology of Algae and Fungi 3(3,0)** Introduction to the biology of the major groups of algae and fungi. Emphasizes how select representatives of the algae and fungi are adapted to their environment through structural, physiological, and life-cycle modifications. *Preq:* BIOL 104/106 or 111 or BIOSC 205.
- BIOSC 306 Invertebrate Biology Laboratory 1(0,3)** Survey and comparison of the biology of living invertebrates, examples of which are drawn primarily from the southeastern coast of the United States. *Preq:* Introductory two-semester biology sequence with laboratory. *Coreq:* BIOSC 302.
- BIOSC 307 Vertebrate Biology Laboratory 1(0,3)** Comparative and phylogenetic study of the gross morphology of vertebrates. *Preq or Coreq:* BIOSC 303.
- BIOSC 308 Biology of Plants Practicum 1(0,3)** Laboratory exercises that explore the major groups of plants, their biology, diversity, and evolution. *Preq or Coreq:* BIOSC 304.
- BIOSC 309 Algae/Fungi Practicum 1(0,3)** Practice in the manipulation and examination of selected algae and fungi, with emphasis on culture techniques and examination of the structure and adaptations of the algae and fungi to different environments. *Preq or Coreq:* BIOSC 305.
- BIOSC (W F B) 313 Conservation Biology 3(3,0)** See W F B 313.
- BIOSC 315 Functional Human Anatomy 4(3,3)** Introduction to the anatomical structures associated with all organ systems found in the human body at both the gross and microscopic level. Basic physiology is integrated to assist with understanding the function of the anatomical systems. *Preq:* BIOL 103/105 or 110 or consent of instructor.
- BIOSC 316 Human Physiology 4(3,3)** Study of the functional processes associated with the various organ systems in the human body. Students develop a basic understanding of the important and fundamental concepts in human physiology and how organ systems maintain homeostasis. *Preq:* One year of introductory biology and introductory chemistry or consent of the instructor.
- BIOSC 320 Field Botany 4(2,4)** Introductory study of the taxonomy, ecology, and evolution of plants in their natural environment with an emphasis on identification and characteristics of representative species and plant communities in the Carolinas. Includes one or two required Saturday field trips. *Preq:* BIOL 104/106, 111, or BIOSC 205, or consent of instructor.
- BIOSC 335 Evolutionary Biology 3(3,0)** Introduction to basic concepts and underlying principles of modern evolutionary biology. Topics include a historical overview of evolutionary theories, elementary population genetics, principles of adaptation, speciation, systematics and phylogenetic inference, fossil record, biogeography, molecular evolution, and human evolution. *Preq:* GEN 302 or equivalent.
- BIOSC (PL PH) 340 Plant Medicine and Magic 3(3,0)** See PL PH 340.
- BIOSC (ANTH) 351 Biological Anthropology 3(3,0)** See ANTH 351.
- BIOSC (ANTH) 353 Forensic Anthropology 3(3,0)** See ANTH 353.
- BIOSC 394, H394 Selected Topics in Creative Inquiry I 3(1,6)** Disciplinary and multidisciplinary group research projects develop the student's ability to discover, analyze, and evaluate data. Students are required to document their research activities in their portfolios. May be repeated for a maximum of six credits. Honors students must take at least six credits over a two-semester period with the same research advisor and write an honors thesis. These credits may include BIOSC 394, BIOSC 494 or both. *Preq:* Consent of instructor.
- BIOSC (ENT) 400, H400, 600 Insect Morphology 4(3,3)** See ENT 400.
- BIOSC 401, H401, 601 Plant Physiology 3(3,0)** Relations and processes pertaining to maintenance, growth, and reproduction of plants, including absorption of matter and energy, water relations of the plant, utilization of reserve products and liberation of energy. *Preq:* BIOL 104/106 or 111 or BIOSC 205 and CH 102. *Coreq:* BIOSC 402.
- BIOSC 402, 602 Plant Physiology Laboratory 1(0,3)** Laboratory exercises and experiments designed to indicate the relations and processes which pertain to maintenance, growth, and reproduction of plants, including absorption of matter and energy, water relations of the plant, utilization of reserve products, and liberation of energy. *Coreq:* BIOSC 401.
- BIOSC (GEN) 405, H405, 605 Molecular Genetics of Eukaryotes 3(3,0)** See GEN 405.
- BIOSC 406, H406, 606 Introductory Plant Taxonomy 3(3,0)** Introduction to the basic principles and concepts of plant systematics with emphasis on the plants of South Carolina. *Preq:* BIOL 104/106 or 111 or BIOSC 205. *Coreq:* BIOSC 407.
- BIOSC 407, 607 Plant Taxonomy Laboratory 1(0,3)** Introduction to basic techniques of plant taxonomy with laboratory and field emphasis on the flora of South Carolina. *Coreq:* BIOSC 406.
- BIOSC 408, H408, 608 Comparative Vertebrate Morphology 3(3,0)** Phylogeny and diversity of vertebrates and study of their comparative morphology, leading to an understanding of the relationships and functioning of living organisms. *Preq:* BIOL 104/106 or 111. *Coreq:* BIOSC 409.
- BIOSC 409, H409, 609 Comparative Vertebrate Morphology Laboratory 2(0,5)** Comparative anatomy of representative vertebrates; methods used in preparing specimens for study and display. *Coreq:* BIOSC 408.
- BIOSC 410, 610 Limnology 3(3,0)** Detailed introduction to the physical, chemical, and biological interrelationships that characterize inland water environments. A fundamental approach to the interactions of components of the environment is developed at a theoretical level. *Preq:* Junior standing in a life science or consent of instructor.
- BIOSC 411, H411, 611 Limnological Analyses 2(1,2)** Examines a broad range of topics covered with both standing and running fresh waters. About one-third of the laboratory exercises address the major physical components of lakes and streams. The remainder provides rationale and methods for quantitative analyses of biota, as well as some integrated analyses of whole ecosystems. *Preq or Coreq:* BIOSC 410 or 443.
- BIOSC (EN R) 413, 613 Restoration Ecology 3(3,0)** See E N R 413.
- BIOSC (AVS, MICRO) 414, H414, 614 Basic Immunology 4(3,3)** See MICRO 414.
- BIOSC (ENT) 415, 615 Insect Taxonomy 3(1,6)** See ENT 415.
- BIOSC (GEN) 416, 616 Recombinant DNA 3(3,0)** See GEN 416.
- BIOSC 417, 617 Marine Biology 3(3,0)** Survey of the organisms that live in the sea and their adaptations to the marine environment. Emphasizes characteristics of marine habitats, organisms, and the ecosystems. *Preq:* BIOL 104/106, 111, or consent of instructor.
- BIOSC (GEN, MICRO) 418, 618 Biotechnology I: Nucleic Acids Techniques 4(2,4)** See GEN 418.
- BIOSC 420, H420, 620 Neurobiology 3(3,0)** Broad background in neurobiology. Topics include neuroanatomical structure-function; conduction in the neuron; neurite growth and development; neuromuscular junction; chemistry, physiology, and pharmacology of specific neurotransmitters and receptors; visual process; axoplasmic transport; hypothalamic-pituitary regulation; theories of behavior; theories of learning and memory. *Preq:* BIOCH 301 or 305 or consent of instructor.
- BIOSC (PL PA) 425, 625 Introductory Mycology 3(3,0)** Introduction to the biology of all the groups of fungi and some related organisms, with considerations of the taxonomy, morphology, development, physiology, and ecology of representative forms. *Preq:* BIOL 104/106 or 111 or BIOSC 205. *Coreq:* BIOSC (PL PA) 426.
- BIOSC (PL PA) 426, 626 Mycology Practicum 2(1,3)** Application of the principles of mycological techniques, microscopic study of fungi. Examples from all major groups of fungi are included. *Coreq:* BIOSC (PL PA) 425.
- BIOSC 428, 628 Quantitative Biology 4(3,3)** Applies quantitative methods to a wide range of biological problems. Main focus is on building modeling skills using population, physiological, genetic, and evolutionary problems. Also includes a review of statistical principles and introduces basic bioinformatics techniques. *Preq:* BIOL 103/104, 111, or equivalent; and MTHSC 108 or equivalent.
- BIOSC 432, H432, 632 Animal Histology 3(3,0)** Structural and functional study of the basic tissues of animals and tissue makeup of organs. Emphasizes light microscopy level with selected tissue studied at the electron microscope level. *Preq:* BIOSC 303 or consent of instructor. *Coreq:* BIOSC 433.
- BIOSC 433, H433, 633 Animal Histology Laboratory 2(1,2)** Microscopic examination of basic animal tissue types and the tissue makeup of organs which comprise systems. *Coreq:* BIOSC 432.
- BIOSC 434 Biological Chemistry Laboratory Techniques 2(1,3)** Theory and application of some of the routine tools and techniques used in biological chemistry. Lectures introduce laboratory theory and provide additional laboratory instructions; discuss results; and conduct student evaluations. Laboratory periods are used to conduct each activity. *Preq:* BIOCH 305 or equivalent, or consent of instructor.
- BIOSC (ENT) 436, 636 Insect Behavior 3(2,3)** See ENT 436.

- BIOSC 440, H440, 640 Developmental Animal Biology 3(3,0)** Events and mechanisms responsible for the development of multicellular animals. Gametogenesis, fertilization, embryonic development, cellular differentiation, morphogenesis, larval forms and metamorphosis, asexual reproduction, regeneration, malignancy, and aging are analyzed in terms of fundamental concepts and control processes. *Preq:* BIOCH 301 or 305 or consent of instructor. *Coreq:* BIOSC 450.
- BIOSC 441, H441, 641 Ecology 3(3,0)** Study of basic ecological principles underlying the relationships between organisms and their biotic and abiotic environments. Includes physiological, population, and community ecology, with applications of each to human ecological concerns. *Preq:* BIOL 104/106, 111, BIOSC 205, or consent of instructor.
- BIOSC 442, H442, 642 Biogeography 3(3,0)** Study of patterns of distribution of plants and animals in space and time. *Preq:* BIOSC 302 or 303 and 304 or 305 or consent of instructor.
- BIOSC 443, 643 Freshwater Ecology 3(3,0)** Study of basic ecological principles and concepts as they apply to freshwater environments: rivers and streams, wetlands, lakes and ponds, and reservoirs. *Preq:* Junior standing in a life science or consent of instructor.
- BIOSC 444, 644 Freshwater Ecology Laboratory 2(1,2)** Laboratory-based course providing a synthesis of major components of freshwater ecosystems. Activities are hypothesis driven and relate to each other to form an overall synthesis of the field. Hands-on experience allows engagement in creative inquiry. *Preq or Coreq:* BIOSC 443 or equivalent or consent of instructor.
- BIOSC 445, H445, 645 Ecology Laboratory 2(1,2)** Modern and classical approaches to the study of ecological problems discussed in BIOSC 441. Students are introduced to field, laboratory and computer-based analyses of plant and animal populations and communities. *Preq or Coreq:* BIOSC 441.
- BIOSC 446, H446, 646 Plant Ecology 3(3,0)** Ecology of plants in relation to their biotic and abiotic environments. Individual organisms, populations, and communities are considered with an emphasis on seed plants in terrestrial environments. *Preq:* BIOL 104/106, 111, BIOSC 205, or consent of instructor.
- BIOSC 447, H447, 647 Plant Ecology Laboratory 2(1,2)** Experimental and observational approach to addressing principles discussed in BIOSC 446. Students are introduced to field and laboratory methods involving individual organisms, populations, and communities. *Preq or Coreq:* BIOSC 446 or consent of instructor.
- BIOSC 450, H450, 650 Developmental Biology Laboratory 2(1,2)** Examines a broad range of topics concerned with the development of multicellular animals such as gametogenesis, fertilization, embryonic development, cell differentiation, morphogenesis, larval metamorphosis, and regeneration. Laboratory exercises provide the rationale and methods for the descriptive and experimental analysis of development in representative invertebrates and vertebrates. *Preq or Coreq:* BIOSC 440 or equivalent.
- BIOSC 452, 652 Plant Anatomy and Morphology 3(3,0)** Study of the anatomy, reproduction, and phylogenetic relationships of vascular plants. *Preq:* BIOL 104/106, 111, BIOSC 205, or consent of instructor.
- BIOSC 453, 653 Plant Anatomy and Morphology Laboratory 2(1,2)** Laboratory focusing on the anatomy, reproduction, and phylogenetic relationships of vascular plants. *Coreq:* BIOSC 452.
- BIOSC 454, 654 Plant Virology 4(3,3)** Study of plant viruses: their morphology, biochemistry, purification, and transmission; symptoms resulting from virus infection; virus vector relationships. Serological and nucleic acid hybridization procedures. Diagnosis of viral diseases and the identification of causal agents. Replication of plant viruses, the interaction between viral host and plant genome. Control of plant viral diseases. *Preq:* BIOCH 301, MICRO 305, or consent of instructor.
- BIOSC (ENT) 455, H455, 655 Medical and Veterinary Entomology 3(2,3)** See ENT 455.
- BIOSC (MICRO) 456, H456, 656 Medical and Veterinary Parasitology 3(3,0)** Introduction to parasitism in the animal kingdom. Emphasizes basic and applied principles related to economically and medically important diseases. Classical and experimental approaches to the study of parasitism are examined in reference to protozoa, helminths, and arthropods. *Preq:* BIOL 104/106 or 111. *Coreq:* BIOSC 457.
- BIOSC (MICRO) 457, H457, 657 Medical and Veterinary Parasitology Laboratory 2(1,2)** Laboratory to reinforce material presented in BIOSC 456. Introduces students to both live and preserved human/animal parasites. Also introduces techniques used in collection, preservation, and examination of animal parasites. *Coreq:* BIOSC 456.
- BIOSC 458, H458, 658 Cell Physiology 3(3,0)** Study of the chemical and physical principles of cell function emphasizing bioenergetics and membrane phenomena. *Preq:* BIOCH 301 or 305 or consent of instructor.
- BIOSC 459, H459, 659 Systems Physiology 3(3,0)** Physiological systems of vertebrates and their homeostatic controls. Describes the function of the major physiological systems in terms of anatomical structure and chemical and physical principles. *Preq:* One year each of biology, chemistry, and physics or consent of instructor.
- BIOSC 460, 660 Systems Physiology Laboratory 2(1,2)** Modern and classical experimental methods are used to demonstrate fundamental physiological principles discussed in BIOSC 459. Students are introduced to computer-aided data acquisition and computer simulations of physiological function. *Preq or Coreq:* BIOSC 459.
- BIOSC 461, H461, 661 Cell Biology 3(3,0)** In-depth analysis of how and where intracellular and extracellular molecules control general and specific cellular functions such as gene expression, secretion, motility, signaling, cell-cycle control and differentiation. Taught and graded at a level where students are expected to infer from and integrate cellular events. *Preq:* BIOCH 301 or consent of instructor.
- BIOSC 462, 662 Cell Biology Laboratory 2(1,2)** Laboratory to accompany BIOSC 461. Focuses on molecular and microscopic analysis of eukaryotic cells. *Coreq:* BIOSC 461.
- BIOSC 464, 664 Mammalogy 4(3,3)** Origin, evolution, distribution, structure, and function of mammals, with laboratory emphasis on the mammals of the Southeast. Field trips and live trapping of mammals are required. *Preq:* BIOSC 303 or consent of instructor.
- BIOSC (GEN, HORT) 465, 665 Plant Molecular Biology 3(3,0)** See HORT 465.
- BIOSC (ANTH) 466, 666 Evolution of Human Behavior 3(3,0)** Familiarizes students with the evolutionary basis of human behavior. Examines topics such as altruism, cooperation, mating systems, parental investment, and social systems using diverse examples, from hunter-gatherer to technological societies. *Preq:* ANTH 351, BIOSC 335, 470, or PSYCH 201; or consent of instructor.
- BIOSC 467 Principles of Hematology 3(3,0)** Basic hematological principles as they relate to normal blood cell production, as well as in abnormal conditions that result in diseases of the hematological system. Clinical practice, ethics and controversies in hematology are discussed. *Preq:* BIOSC 461 and 462.
- BIOSC 468, 668 Herpetology 3(2,3)** Systematics, life history, distribution, ecology, and current literature of amphibians and reptiles. Laboratory study of morphology and identification of world families and U.S. genera, as well as all southeastern species. Field trips are required. *Preq:* BIOSC 303 or consent of instructor.
- BIOSC (ENT, W F B) 469, H469, 669 Aquatic Insects 3(1,6)** See ENT 469.
- BIOSC 470, H470, 670 Behavioral Ecology 3(3,0)** Historical and modern developments in animal behavior emphasizing the evolutionary and ecological determinants of behavior. A synthesis of ethology and comparative psychology. *Preq:* BIOSC 302 or 303 or consent of instructor.
- BIOSC 471, 671 Behavioral Ecology Laboratory 2(1,2)** Laboratory exercises that explore the behavior of animals. Emphasizes behavioral observation and analysis and presentation of findings in a report format. Includes a semester-long independent research project. *Preq or Coreq:* BIOSC 470 or consent of instructor.
- BIOSC 472, 672 Ornithology 4(3,3)** Biology of birds: their origin and diversification, adaptations, phylogeny, classification, structure and function, behavior, ecology, and biogeography. Field identification is emphasized, and field trips are required. *Preq:* BIOSC 303 or consent of instructor.
- BIOSC 473, 673 History of Modern Biology 3(3,0)** Examines the intellectual and social factors defining the study of life from the scientific revolution of the 1600s to the modern biological sciences. Investigates the historical origins of biological disciplines and explores the differing cultures, methodologies, and philosophical commitments of these communities. *Preq:* Introductory course in biology or consent of instructor.