

Agricultural Sciences

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COLLEGE OF AGRICULTURAL SCIENCES

Graduate Faculty:

AbuGhazaleh, Amer A., Professor, Ph.D., South Dakota State University, 2002; 2004.

Akamani, Kofi, Assistant Professor, Ph.D., University of Idaho, 2011; 2015.

Altman, Ira J., Associate Professor and *Chair*, Ph.D., University of Missouri, 2005; 2006.

Apgar, Gary A., Associate Professor, Ph.D., Virginia Polytechnic Institute and State University, 1994; 1998.

Arthur, Robert, Professor, *Emeritus*, Ph.D., University of Missouri, 1970; 1977.

Ashraf, Hea-Ran L., Professor, *Emerita*, Ph.D., Iowa State University, 1979; 1980.

Asirvatham, Jebaraj, Assistant Professor, Ph.D., University of Illinois, 2011; 2015.

Atkinson, Rebecca L., Associate Professor, Ph.D., University of Wyoming, 2006; 2006.

Banz, William J., Professor and *Chair*, Ph.D., University of Tennessee, 1995; 1995.

Beaulieu, Jeffrey R., Associate Professor, *Emeritus*, Ph.D., Iowa State University, 1984; 1983.

Beck, Roger J., Associate Professor, *Emeritus*, Ph.D., Pennsylvania State University, 1977; 1984.

Bond, Jason P., Professor, Ph.D., Louisiana State University, 1999; 2000.

Carver, Andrew, Professor, Ph.D., Purdue University, 1998; 1998.

Chong, She-Kong, Professor, *Emeritus*, Ph.D., University of Hawaii, 1979; 1979.

Choudhary, Ruplal, Associate Professor, Ph.D., Oklahoma State University, 2009; 2009.

Cook, Rachel, Assistant Professor, University of North Carolina, 2012.

Davis, Jeremy, Associate Professor, Ph.D., Iowa State, 2008; 2008.

Diesburg, Kenneth L., Assistant Professor, *Emeritus*, Ph.D., Iowa State University, 1987; 1989.

Eberle, Phillip R., Associate Professor, *Emeritus*, Ph.D., Iowa State University, 1983; 1983.

Endres, Jeannette M., Professor, *Emerita*, Ph.D., St. Louis University, 1972; 1980.

Fakhoury, Ahmad M., Associate Professor, Ph.D., Purdue University, 2001; 2003.

Gastal, Eduardo L., Associate Professor, Ph.D., University of Wisconsin-Madison, 1999, 2009.

Groninger, John W., Professor, Ph.D., Virginia Polytechnic Institute and State University, 1995; 1997.

Harris, Kim S., Associate Professor, *Emeritus*, Ph.D., University of Illinois, 1985; 1984.

Hausler, Carl L., Associate Professor, *Emeritus*, Ph.D., Purdue University, 1970; 1970.

Henry, Paul H., Associate Professor, Ph.D., North Carolina State University, 1991; 1992.

Holzmueller, Eric J., Associate Professor, Ph.D., University of Florida, 2006; 2007.

Jones, Karen L., Professor and *Chair*, Ph.D., Texas A&M, 1999; 1999. Animal biotechnology.

Kammlade, W. G., Jr., Associate Professor, *Emeritus*, Ph.D., University of Illinois, 1951; 1954.

Kantartzi, Stella, Associate Professor, Ph.D., Aristotle University of Thessaloniki, 2006; 2008. Soybean breeding and genetics.

King, Sheryl S., Professor, *Emerita*, Ph.D., University of California, Davis, 1983; 1983.

Klubek, Brian P., Professor, *Emeritus*, Utah State University, 1977; 1978.

Kraft, Steven E., Professor, *Emeritus*, Ph.D., Cornell University, 1976; 1980.

Kroening, Gilbert H., Professor, *Emeritus*, Ph.D., Cornell University, 1965; 1969.

Latour, Mickey, Professor and *Dean*, Ph.D. Mississippi State University.

Legacy, James, Professor, *Emeritus*, Ph.D., Cornell University, 1976; 1977.

Lightfoot, David A., Professor, Ph.D., University of Leeds, 1984; 1991.

Long, Sara, Professor, *Emerita*, Ph.D., Southern Illinois University Carbondale, 1991; 1991.

McGuire, James M., Professor, *Emeritus*, Ph.D., North Carolina State University, 1961; 1993.

Meksem, Khalid, Professor, Ph.D., University of Cologne, Germany, 1995; 2000.

Midden, Karen L., Professor and *Associate Dean*, M.L.A., University of Georgia, 1983; 1988. Landscape design.

Minish, Gary L., Professor, *Emeritus*, Ph.D., Michigan State University, 1966; 2004.

Moon, Wanki, Professor, Ph.D., University of Florida, 1995; 2000.

Nielsen, Clayton, Professor, Ph.D., Southern Illinois University Carbondale, 2001; 2009.

Olsen, Farrel J., Professor, *Emeritus*, Ph.D., Rutgers University, 1961; 1971.

Park, Logan, Associate Professor, Ph.D., Virginia Polytechnic Institute and State University, 2009; 2009.

Pense, Seburn L., Associate Professor, Ph.D., Oklahoma State University, 2002; 2003.

Prece, John E., Professor, *Emeritus* Ph.D., University of Minnesota, 1980; 1980.

Rendleman, C. Matthew, Associate Professor, Ph.D., Purdue University, 1989; 1994.

Ruffner, Charles M., Professor, Ph.D., Pennsylvania State University, 1999. 1999.

Sanders, Dwight R., Professor, Ph.D., University of Illinois, 1999; 2000.

Schmidt, Michael, Associate Professor, *Emeritus*, Ph.D., Southern Illinois University Carbondale, 1994; 1979.

Schoonover, Jon E., Associate Professor, Ph.D., Auburn University, 2005; 2006.

Secchi, Silvia, Associate Professor, Ph.D., Iowa State, 2000; 2008.

Shoup, W. David, Professor, *Emeritus*, Ph.D., Purdue University, 1980; 1999.

Smith, Sylvia F., Associate Professor, Ph.D., University of Tennessee, 2007; 2007.

Stucky, Donald J., Professor, *Emeritus*, Ph.D., Purdue University, 1963; 1970.

Taylor, Bradley H., Associate Professor, Ph.D., Ohio State University, 1982; 1982.

Tweedy, James A., Professor, *Emeritus*, Ph.D., Michigan State University, 1966; 1966.

Varsa, Edward C., Professor, *Emeritus*, Ph.D., Michigan State University, 1970; 1970.

Venable, Erin R., Assistant Professor, Ph.D., University of Missouri-Columbia, 2010.

Walters, S. Alan, Professor, Ph.D., North Carolina State University, 1997, 1998.

Watson, Dennis, Associate Professor, Ph.D., Michigan State University, 1987; 2002.

Welch, Patricia, Professor, *Emerita*, Ph.D., Southern Illinois University, 1982; 1982.

Williard, Karl W. J., Professor, Ph.D., Pennsylvania State University, 1999; 1999.

Wolff, Robert L., Professor, *Emeritus*, Ph.D., Louisiana State University, 1971; 1972.

Young, Anthony W., Professor, *Emeritus*, Ph.D., University of Kentucky, 1969; 1980.

Zacsek, James J., Professor and *Chair*, Ph.D., Pennsylvania State University, 1994; 1997.

Doctor of Philosophy in Agricultural Sciences

The College of Agricultural Sciences offers a graduate program leading to the Doctor of Philosophy degree. This degree is designed to provide students with an interdisciplinary doctoral education in the physical, biological and social sciences that enhances, regulates and sustains agriculture, food and forestry producers, industries and agencies. This degree will prepare Ph.D. graduates to teach and conduct research and outreach at universities and community colleges, and for careers in the corporate, private and government sectors.

Admission

All applications to the program must include a Graduate School On-Line Application available at gradschool.siu.edu, a statement of interest, college transcripts, three letters of recommendation, GRE scores including verbal and quantitative, and may include a financial assistance form. In addition, this Program requires a non-refundable \$65 application fee. Criteria for admission include: an official transcript, letters of recommendation, grade point average (must meet the SIU Graduate School minimum 3.25 GPA in graduate work), and GRE scores. The Graduate Committee of the College must approve admission to the Ph.D. in Agricultural Sciences program. Ph.D. students will be selected on a national and international competitive basis.

Students may be admitted to the doctoral program with a Bachelor's, a Master of Science or a Master of Arts degree in Agriculture, a discipline within the SIUC College of Agricultural Sciences, or a closely related field (such as Biology, Botany, Natural Science, Rural Sociology, Economics, or Environmental Science). Upon nomination of the master's committee and upon approval by the College of Agricultural Sciences doctoral program committee, exceptional M.S. students may be allowed accelerated entry to the Ph.D.

Students admitted under direct or accelerated entry to the Ph.D. program are subject to all existing requirements for the doctoral degree; the admission/advisory committee for the student may add extra requirements based on the student's background.

Doctor of Philosophy Degree Program

Each doctoral student in the College of Agricultural Sciences must successfully complete a common core of research methodology courses, including a two semester sequence of graduate level statistics courses for four to five credit hours each, followed by a three to four credit hour graduate level experimental design course. Students also will be required to take a three-credit course in Research and Teaching Communications, two semesters of graduate seminar, and 24 hours of dissertation credits. There will be an additional minimum of 20 hours of structured courses appropriate for each student's area of emphasis. The student's graduate advisory committee must approve these courses. Emphasis areas include: Agricultural Economics, Agricultural Systems Technology, Agricultural Education, Animal Science, Crop Science and Environmental Management, Food and Nutrition, Forestry, and Horticulture.

All Ph.D. students in the program will be required to teach or assist in teaching at least two courses within the College of Agricultural Sciences while in the program. This requirement is regardless of the form of stipend of the student, i.e. if a student is on a research assistantship throughout their tenure in the program, they will still be required to teach or assist in teaching courses.

There is no minimal credit-hour requirement beyond the core, the area of emphasis, and the Graduate School's residency and dissertation requirements. A student in consultation with their major professor will prepare a program of study, including courses in the student's area of emphasis, by the end of the second semester of residency. This plan of study, when approved by the student's advisory committee, will be filed with the Director of Graduate Studies for the College.

Ph.D. Candidacy

By the end of the second semester in residence, students must have chosen an area of emphasis and formed a graduate advisory committee to approve their coursework and oversee their dissertation research. The graduate advisory committee will consist of at least five graduate faculty members, with the majority from within the College of Agricultural Sciences and no more than three members from one department. The committee chair will be the student's major professor and must be a member of the College of Agricultural Sciences faculty.

To be admitted to candidacy, the student must have completed the Graduate School's 24 credit hours residency requirement within four calendar years, plus the core and emphasis area coursework that was approved by their graduate advisory committee. This should take the student three to four semesters, depending on whether they had any graduate-level research methodology courses during their Master's degree. At this time, they will take both written and oral preliminary examinations designed and administered by the student's graduate advisory committee. These exams will each have two parts. One will focus on the student's knowledge of the research methodology core and the second part will focus on the student's

chosen area of emphasis. If the preliminary examinations are not passed, a student must wait a minimum of three months for the second and final attempt to pass the exam.

After passing the written and oral preliminary exams and with an approved dissertation proposal, the student will be admitted to candidacy. The Graduate School requires that Ph.D. students fulfill all degree requirements within five years of admission to candidacy or they may have to retake their preliminary exams.

Dissertation and Dissertation Examination

By the beginning of the fifth semester of residence, the students will present to their graduate committee a dissertation research proposal. The student's committee must approve the proposal by the end of their fifth semester of residence. At this time, students must present their dissertation proposal verbally in the form of a graduate seminar. All faculty members in the College of Agricultural Sciences, the student's graduate advisory committee, all other graduate students in the College, and appropriate individuals from industry groups in southern Illinois will be invited to these seminars. Following the seminar, the student will meet with their graduate advisory committee and will be asked to defend the substance and methods of the proposed research.

The student's graduate advisory committee will monitor the student's progress on the dissertation. When the dissertation is completed to the satisfaction of the graduate advisory committee, the committee will administer a final oral exam that will focus on defense of the dissertation. When the dissertation and final oral exam are successfully completed, the student will be recommended to the Graduate School for the doctoral degree.

Courses (AGSC)

AGSC 550-3 Research and Teaching Communications. This course is designed to teach graduate students how to communicate successfully their proposed and completed research and to teach college-level courses in the Agricultural Sciences.

AGSC 581-1-4 (1,1,1) Seminar. Oral presentations by individual graduate students. Each Ph.D. student in Agricultural Sciences is required to present their proposed dissertation research project as a seminar and the findings of their dissertation as a seminar. All Agricultural Science Ph.D. students must register for at least two credits of seminar.

AGSC 582A-1-3 Colloquium in Agricultural Science-Biological Sciences. Recent developments in Agricultural Sciences will be discussed in a classroom setting.

AGSC 582B-1-3 Colloquium in Agricultural Science-Social Sciences. Recent developments in Agricultural Sciences will be discussed in a classroom setting.

AGSC 582C-1-3 Colloquium in Agricultural Science-Physical Sciences. Recent developments in Agricultural Sciences will be discussed in a classroom setting.

AGSC 590-1-4 Graduate Readings in Agricultural Science. Journal articles, chapters and books relevant to a Ph.D. student's research will be read and discussed with their major professor.

AGSC 591-1-4 Individual Research in Agricultural Science. Directed research in approved specialized topic areas in Agricultural Sciences.

AGSC 592-1-4 Special Problems in Agricultural Science. Directed study of specialized areas of Agricultural Science, depending on the program of the student.

AGSC 595-1 to 6 Instruction in Agricultural Sciences. Acquaints the student with different teaching environments and styles. Students will be expected to participate in instruction of agricultural sciences courses. Special approved needed by the instructor.

AGSC 600-1-36 (1 to 12 per semester) Dissertation. This course is to be taken during the research and writing of the dissertation. A minimum of 24 hours must be earned for the Doctor of Philosophy degree.

AGSC 601-1 Continuing Enrollment. For those Doctoral students who have not finished their degree programs and who are in the process of working on their dissertation. The student must have completed a minimum of 24 hours of dissertation research before being eligible to register for this course. Concurrent enrollment in any course is not permitted.

The following is a list of structured courses from which Ph.D. students in Agricultural Sciences may select in each of the emphasis areas. Students will not be limited to these courses, however, the majority of the courses that they may take are included.

Common Among Disciplines

QUAN 506-4	Inferential Statistics
QUAN 507-4	Multiple Regression
QUAN 508-4	Experimental Design in Educational Research
PSAS 560A,B-5	Field Plot Technique
ZOOL 557-4	Biostatistics
ZOOL 558-4	Advanced Biostatistics

Agribusiness Economics

ABE 401-3	Agricultural Law
ABE 402-1 to 6	Problems in Agribusiness Economics
ABE 440-3	Natural and Environmental Resource Economics and Policy
ABE 444-3	Agricultural Development
ABE 450-3	Advanced Farm Management
ABE 451-3	Appraisal of Rural Property
ABE 453-3	Agribusiness Planning Techniques
ABE 460-3	Agricultural Price Analysis and Forecasting
ABE 461-3	Agriculture Business Management
ABE 462-3	Advanced Agricultural Marketing
ABE 463-3	Managerial Strategies for Agribusiness
ABE	
ABE 581-1 to 4	Seminar in Agribusiness Economics
ABE 585-1 to 6	Practicum/Internship
BA 505-3	Brand Management
BA 510-3	Managerial Accounting & Control Concepts
BA 514-3	Ethics of Business
BA 530-3	Financial Management
BA 531-3	Advanced Financial Management
BA 532-3	Financial Institutions and Markets
BA 533-3	Investment Concepts
BA 540-3	Managerial and Organizational Behavior
BA 541-3	Analytic Methods for Supply Chain Management
BA 544-3	Advanced Production Planning and Inventory Management

BA 545D-3	Advances in Strategic Management	PSAS 473-3	Agricultural Automation
BA 550-3	Marketing Management	PSAS 476-3	Agricultural Safety and Health
BA 551-3	Product Strategy and Management	PSAS 483-3	Agricultural Processing Systems
BA 558-3	Promotional Strategy and Management	PSAS 497-3	Agricultural Operations Management
BA 560-3	Management of Information Systems	PSAS 560A,B-5	Field Plot Technique
BA 561-3	Database Design and Applications	PSAS 572-3	Current Research in Agricultural Systems
BA 562-3	Information Systems and Design	PSAS 575-3	Introduction to Agricultural Systems
BA 564-3	Advanced Topics in E-Commerce and Marketing		
BA 580-2-3	International Dimensions of Business and Management	<u>Forestry</u>	
BA 581-3	Global Marketing	FOR 401-3	Fundamentals of Environmental Education
BA 582-3	International Finance	FOR 402-3	Wildland Hydrology
BA 583-3	Global Operations Management	FOR 403-3	Agroforestry
BA 584-3	Global Business Strategies	FOR 405-3	Forest Management for Wildlife
ECON 429-3	International Trade and Finance	FOR 409-3	International Forest Resources
ECON 431-3	Public Finance II		Decision-Making
ECON 440-3	Price, Output and Allocation Theories	FOR 411-3	Forest Resources Economics
ECON 441-3	Contemporary Macroeconomic Theory	FOR 412-2	Tree Improvement
ECON 463-3	Introduction to Applied Econometrics	FOR 414-3	Information Management
ECON 474-3	Economic Strategies for Business	FOR 416-4	Forest Resource Management
ECON 520A,B-6	Economic Development Theory and Policy	FOR 417-2	Forest Land-Use Planning
ECON 530-3	Foreign Trade	FOR 418-2	Marketing of Forest Products
ECON 531-3	International Finance	FOR 420-3	Park and Wildlands Management
ECON 534-3	Economics of Taxation	FOR 421-3	Recreation Land-Use Planning
ECON 540A-3	Microeconomic Theory I	FOR 422C-6	Park and Wildlands Management Camp
ECON 540B-3	Microeconomic Theory II	FOR 423-3	Environmental Interpretation
ECON 540C-3	Microeconomic Theory III	FOR 428-2	Urban Forestry
ECON 541A-3	Macroeconomic Theory I	FOR 429-2	Watershed Management Field Laboratory
ECON 541B-3	Macroeconomic Theory II	FOR 430-3	Wildland Watershed Management
ECON 541C-3	Macroeconomic Theory III	FOR 431-3	Regional Silviculture
ECON 545-3	Resource Economics	FOR 451-3	Natural Resources Inventory
ECON 567A-3	Econometrics I	FOR 452-3	Forest Soils
ECON 567B-3	Econometrics II	FOR 452L-2	Forest Soils Laboratory
ECON 567C-3	Econometrics III	FOR 453-2	Environmental Impact Assessment in Forestry
ECON 580A-3	Performance Measurement	FOR 454A-D-2-8	Forest Ecology Field Studies
GEOG 401-3	Geographic Information Systems	FOR 460-2	Forest Industries
GEOG 406-3	Introduction to Remote Sensing	FOR 470-2	Wilderness Management, Policy, and Ethics
GEOG 408-3	Advanced Remote Sensing	FOR 480-3	Natural Resource Conflict Management
GEOG 420-3	Advanced Geographic Information Systems (GIS) Studies	FOR 500-2	Principles of Research
GEOG 422-3	Environmental and Energy Economics	FOR 502-3	Advanced Watershed Hydrology and Management
GEOG 424-4	Sustainable Development	FOR 504-2	Tree Physiology Concepts and Applications
GEOG 426-3	US Environmental Policy	FOR 508-2	Historical Ecology
GEOG 428-3	Spatial Decision Support Systems	FOR 510-2	Advanced Silviculture: Landscape Rehabilitation
GEOG 429-3	Geography of Local Organic Food	FOR 511-2	Advanced Forest Resources Economics
GEOG 430-3	Environmental Systems Analysis	FOR 512-2	Tree Selection and Breeding
GEOG 431-3	Climatology	FOR 516-2	Advanced Forest Management
GEOG 433-3	Field Methods in Geography	FOR 520-2	Advanced Park Planning
GEOG 434-3	Water Resources Hydrology	FOR 521-2	Recreation Behavior in Wildlands Environments
GEOG 435-3	Energy Planning	FOR 523-2	Advanced Resource Interpretation
GEOG 436-3	Natural Hazards	FOR 530-2	Forest Site Evaluation
GEOG 439-3	Global Climate Change	FOR 531-2	Disturbance Ecology
GEOG 458-3	Applied GIS	FOR 585-3	Human Dimensions of Natural Resource Management
GEOG 471-3	Environmental Impact Analysis	SOC 514-4	Qualitative Methodology
		SOC 544-3	Sociology of Gender
<u>Agricultural Operations and Systems</u>		SOC 555-3	Social Movements and Collective Action
PSAS 461-3	Programming for Agricultural Systems	POLS 446-3	Museum Administration
PSAS 472-3	Precision Agriculture	POLS 549-3	Administration of Nonprofit Organizations

PSYC 529-3 Advanced Applied Multivariate Statistics
 PSYC 563-3 Research in Attitude and Persuasion
 REC 500-3 Modern Concepts of Leisure

Human and Animal Systems

ANS 409-4 Equine Science
 ANS 415-4 Advanced Animal Nutrition
 ANS 419-3 Stable Management
 ANS 421-2 International Animal Production
 ANS 430-4 Dairy Cattle Management
 ANS 431-4 Reproductive Physiology
 ANS 433-3-7 Introduction to Agricultural Biotechnology
 ANS 434-2 Physiology of Lactation
 ANS 455-2 Animal Nutrient Management
 ANS 465-4 Swine Management
 ANS 485-4 Beef Cattle Management
 ANS 500-3 Research Methods in Agricultural Sciences
 ANS 506-3 Instrumentation Methods in Agricultural Science
 ANS 515-3 Energy and Protein Utilization
 ANS 516-3 Minerals and Vitamins
 ANS 531A-2 Advanced Animal Physiology
 ANS 531B-2 Developmental Physiology
 ANS 531C-2 Endocrine Physiology
 HND 410-3 Nutrition Education
 HND 420-3 Recent Developments in Nutrition
 HND 425-3 Biochemical Aspects in Nutrition
 HND 470-4 Medical Nutrition Therapy
 HND 475-3 Nutrition Through the Life Cycle
 HND 480-3 Community Nutrition
 HND 485-3 Advanced Nutrition
 HTA 445-3 Sustainable Tourism Planning and Development
 HTA 460-4 Food Service Management
 HTA 461-3 Service Organization and Management
 HTA 465-3 Convention Management and Services

Plant Systems

PSAS 401-2 Agricultural Plant Pathology
 PSAS 403A-2 Field Crop Diseases
 PSAS 403B-2 Horticultural Crop Diseases
 PSAS 403C-1 Turfgrass Diseases
 PSAS 405-3 Plant Breeding
 PSAS 408-3 World Crop Production Problems
 PSAS 409-3 Crop Physiology
 PSAS 419-3 Plant Molecular Biology
 PSAS 420-4 Crop Pest Control
 PSAS 422-3 Turfgrass Science and Professional Management
 PSAS 432-4 Garden Center and Nursery Management
 PSAS 424-4 Floriculture
 PSAS 425-4 Environmental Physiology of Plants
 (same as PLB 425, CSEM 425)
 PSAS 426-4 Genomic and Bioinformatics
 PSAS 428-3 Advanced Landscape Design I
 PSAS 429-3 Advanced Landscape Design II
 PSAS 430-4 Plant Propagation
 PSAS 432-4 Garden Center and Nursery Management
 PSAS 433-4 Introduction to Agricultural Biotechnology
 (same as PLB 433)
 PSAS 434-3 Woody Plant Maintenance

PSAS 436-4 Fruit Production
 PSAS 437-4 Vegetable Production
 PSAS 441-3 Soil Morphology and Classification
 PSAS 442-3 Soil Physics
 PSAS 443-3 Soil Management
 PSAS 445-3 Irrigation Principles and Practices
 PSAS 446-3 Soil and Water Conservation
 PSAS 447-3 Fertilizers and Soil Fertility
 PSAS 448-2 Soil Fertility Evaluation
 PSAS 454-4 Soil Microbiology
 PSAS 455-3 Biology of Plant-Microbe Interactions
 PSAS 468-3 Weeds – Their Control
 PSAS 470-2 Post Harvest Handling of Horticultural Commodities
 PSAS 475-4 Golf Course Green Installation and Maintenance
 PSAS 518-3 Principles of Herbicide Action
 PSAS 520-3 Growth and Development of Plants
 PSAS 524-3 Gene Regulatory Networks
 (same as PLB 524)
 PSAS 560A,B-5 Field Plot Technique
 PSAS 582A,B,C-6 Colloquium in Plant and Soil Science
 PLB 400-4 Plant Anatomy
 PLB 415-5 Morphology of Vascular Plants
 PLB 475-3 Advanced Cell Biology
 MBMB 421-3 Biotechnology
 MBMB 425-3 Biochemistry and Physiology of Microorganisms Lecture
 MBMB 451A/B-3/3 Biochemistry
 MBMB 453-3 Immunology Lecture
 MBMB 460-3 Bacterial and Viral Genetics
 MBMB 480C-4 Molecular Biology of Microorganisms Laboratory
 GEOL 470-3 Hydrogeology
 GEOL 474-3 Geomorphology
 GEOG 434-3 Water Resources Hydrology