Vocational Education
See Work, Community, and Family Education.

Water Resources Science (WRS)

Regents’ Professor: Evile Gorham (ecology, evolution, and behavior)
Professor: Patrick L. Brezonik (civil and mineral engineering), director of graduate studies; Anne E. Hershey (biology¹), associate director of graduate studies; Dean E. Abrahamson (Humphrey Institute of Public Affairs); E. Calvin Alexander, Jr. (geology and geophysics); James L. Anderson (soil, water, and climate); Roger E. A. Arndt (civil engineering); Franklin H. Barnwell (ecology, evolution, and behavior); Paul R. Bloom (soil, water, and climate); Kenneth N. Brooks (forest resources); Dwight A. Brown (geography); Robert M. Carlson (chemistry¹); H. H. Cheng (soil, water, and climate); Yosef Cohen (fisheries and wildlife); Dianne Dordal (materials processing engineering¹); Daryl F. Dwyer (civil engineering); K. William Easter (applied economics); Cesar Farel (civil engineering); Efi Foufoula-Georgiou (civil engineering); Luther P. Gerlach (anthropology); Philip J. Gersmehl (geography); Sagar M. Goyal (veterinary diagnostic science); Hans M. Gregersen (forest resources); David F. Grigal (soil, water, and climate); John S. Gulliver (civil engineering); Satish C. Gupta (soil, water, and climate); Richard S. Hanson (microbiology); Roger LeB. Hooke (geology and geophysics); Thomas C. Johnson (geology¹); Kerry R. Kelts (geology and geophysics); Andrew R. Klemer (biology¹); Richard W. Lichty (economics¹); Walter J. Maier (civil engineering); Michael E. McDonald (chemical engineering¹); Donald C. McNaught (ecology, evolution, and behavior); Robert O. Megard (ecology, evolution, and behavior); John F. Moncrief (soil, water, and climate); Howard D. Mooers (geology¹); David J. Mulla (soil, water, and climate); John L. Nieber (biosystems and agricultural engineering); Gary N. Parker (civil engineering); James A. Perry (forest resources); Hans-Olaf Pfannkuch (geology and geophysics); C. Ford Runde (applied economics); Mark W. Seeley (soil, water, and climate); Michael J. Semmens (civil engineering); Richard H. Skaggs (geography); Charles C. S. Song (civil engineering); Heinz G. Stefan (civil engineering); Otto D. L. Strack (civil engineering); Michael Sydor (physics¹); G. David Tilman (ecology, evolution, and behavior); Graham A. Tobin (geography¹); Elon S. Verry (forest resources); Melbourne C. Whiteside (biology¹)

Associate Professor: Sandra O. Archibald (public affairs); Randal J. Barnes (civil engineering); David D. Biesboer (plant biology); Iris D. Charvat (plant biology); Charles J. Clanton (biosystems and agricultural engineering); Florence K. Gleason (plant biology); Randall E. Hicks (biology¹); Ralph W. Holzenthal (entomology); Edward A. Nater (soil, water, and climate); Raymond M. Newman (fisheries and wildlife); Christopher Paola (geology and geophysics); Robert W. Sterner (ecology, evolution, and behavior); Deborah L. Swackhamer (environmental and occupational health); Steven J. Taff (applied economics); Yaakov Tsur (applied economics); Bruce N. Wilson (biosystems and agricultural engineering)

Adjunct Associate Professor: Bruce C. Vondracek (fisheries and wildlife)
Assistant Professor: James C. Bell (soil, water, and climate); Erik Thorson Brown (Large Lakes Observatory¹); Susan M. Galatowitsch (horticultural science); Katherine Klink (geography); Mark A. Person (geology and geophysics); Clive F. Reece (soil, water, and climate)

Adjunct Assistant Professor: Paul D. Capel (civil engineering)
Research Associate: Richard P. Axler (Natural Resources Research Institute¹); Carol A. Johnston (Natural Resources Research Institute¹); Carl Richards (Natural Resources Research Institute¹)

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—M.S. (Plan A and Plan B) and Ph.D.

Curriculum—This University-wide program provides comprehensive training in water resources science, with integration across scientific disciplines. A structured interdisciplinary graduate curriculum is offered. The program includes a set of core courses plus electives in areas of specialization at the M.S. and Ph.D. levels, including limnology, aquatic biology, hydrologic sciences, watershed management, and water engineering. Approximately 80 courses offered within 15 other graduate programs are available to students majoring in water resources science.

Prerequisites for Admission—The graduate program in water resources science is flexible enough to accommodate students from a variety of backgrounds. Normally students have a bachelor’s degree in physical or biological science or engineering. Recommended academic preparation includes one year (or two quarters) each of calculus, physics, and chemistry and one biology course. Further preparation may be expected from students wishing to specialize in certain areas of the program.

¹ University of Minnesota, Duluth

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GRADUATE PROGRAMS

Special Application Requirements—Applicants must submit three letters of recommendation to the director of graduate studies. These letters should be from professors qualified to estimate applicants’ class rank and evaluate their ability to complete a program of graduate study or from persons who can assess their professional potential. These letters also may be used in applying for financial aid. Applicants must also submit a résumé of their academic history and professional experience and a statement of purpose, including the proposed area of emphasis. Applicants are strongly encouraged to submit results of the Graduate Record Examination (GRE). Those who have not taken the GRE are at a disadvantage in competing for financial aid. Students may be admitted any quarter but are strongly encouraged to begin fall quarter and to submit their application by January 15 in the year they expect to begin their studies.

Master’s Degree Requirements—Coursework consists of a core of 22-24 credits, electives in a focus area, and at least 8 credits in one or more related fields. The core provides a broad background in hydrologic, chemical, and biological processes in aquatic systems; water quality management; and the legal, policy, and institutional aspects of water management. The Plan A (thesis) option is primarily for students who have had some undergraduate water-related coursework and have met some of the core requirements. This option also requires 16 thesis credits and the successful completion and defense of a thesis. The Plan B option requires a minimum of 40 course credits and up to 4 credits of independent study for a Plan B project that involves field, laboratory, or computer work and the analysis, synthesis, and/or interpretation of data.

Doctoral Degree Requirements—Students must complete the equivalent of the M.S. coursework (core courses and electives), additional focus in at least one emphasis area, and an appropriate supporting program or minor. Areas of specialization for the Ph.D. are similar to those for the M.S. Coursework is tailored to the needs and interests of students, consistent with program objectives and goals. The Ph.D. requires a minimum of 60 course credits, including at least 18 credits in a supporting program or minor.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A 2-credit seminar on water resources management, a 4-credit course on water resources and institutions (water policy, law, management, and economics), one core course (3-4 credits), and elective course(s) are required. Completion of 13 credits is required for the master’s degree and 21 credits for the doctoral degree. At least 11 credits for the doctoral degree must be selected from one of the categories listed under Curriculum above. The minor program must be approved by the water resources science director of graduate studies.

For Further Information, Applications, and List of Courses—Contact the Director of Graduate Studies, Water Resources Science, Water Resources Research Center, University of Minnesota, 1518 Cleveland Avenue North, Suite 302, St. Paul, MN 55108 (612/624-9282; fax 612/625-1263; e-mail wrs@forestry.tc.umn.edu) or the Director of Graduate Studies, Water Resources Science, Department of Biology, 321 Life Sciences, University of Minnesota, Duluth, MN 55812 (218/726-8200; fax 218/726-8142).

WRS 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

WRS 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

WRS 8888. Thesis Credits: Doctoral. (36 cr required)

WRS 5010. Introduction to Field Research in Water Resources. (3 cr; prereq admission to WRS program or #) Field research techniques and opportunities during two-week summer excursion to regional sites. Data acquisition in large/small lakes, streams, and wetlands for biota and chemical/physical water quality; surface and groundwater hydrologic measurements and sampling.


WRS 8100. Interdisciplinary Seminar in Water Resources. (2 cr; prereq admission to WRS program) Topic varies yearly.
Wildlife Conservation (FW)

Professor: Yosef Cohen; Gary E. Duke; Donald B. Siniff; Anthony M. Starfield; John R. Tester
Adjunct Professor: L. David Mech
Associate Professor: James R. Kitts, director of graduate studies; David E. Andersen; James A. Cooper; Francesca Cuthbert; Peter A. Jordan; J. L. David Smith
Adjunct Associate Professor: Alfred H. Berner; David L. Garshelis; Richard O. Kimmel; Ronald L. Tilson; A. Richard Weisbrod
Adjunct Assistant Professor: Glenn D. Del Giudice
Senior Research Associate: John Pastor

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—M.S. (Plan A and Plan B) and Ph.D.

Curriculum—This program is administered within the Department of Fisheries and Wildlife. The wildlife conservation graduate program is an applied program emphasizing resource-management applications. For the M.S. degree, emphasis is on wildlife biology and related areas in ecology, animal behavior, and physiology as these relate to resource management and conservation problem-solving. For many students, the M.S. is a terminal degree leading to employment with government resource-management agencies. For the Ph.D. program, emphasis is on basic biology and ecology with concentrated work in independent, original research generally relating basic science to management/conservation challenges.

Prerequisites for Admission—For the M.S. program, a bachelor’s degree with a biological sciences background is required, preferably with emphasis on terrestrial or wetland vertebrates and with a natural-resource management orientation. A strong background in physical sciences and mathematics is expected; familiarity with statistics and computer use is desirable. For the Ph.D. program, a master’s degree in wildlife science or a closely related field is normally required.

Special Application Requirements—Three letters of recommendation are required from persons able to evaluate the applicant’s scholarship and professional experience. Also required are scores from the Graduate Record Examination (GRE) General Test. Applicants taking the examination should list the wildlife management major field code (0115). Applications are accepted at any time; however, because the faculty reviews most applications in late January for admission the following fall, applications should be sent before January 1.

Master’s Degree Requirements—Plan A is recommended; Plan B is available under special circumstances. Students must become familiar with factors underlying wildlife population and habitat ecology, techniques in management, and the functioning of management agencies. Academic work includes graduate-level courses in animal ecology, wildlife management, and statistics. The Plan A thesis should involve at least one field season but no more than two. Plan B students undertake one to three projects involving field, laboratory, or planning work. An oral preliminary examination is required as well as a final seminar and oral defense of the thesis or Plan B papers.

Doctoral Degree Requirements—Programs include basic wildlife biology and development of analytical skills, and one or more additional areas of specialization. In addition to the final oral examination, students must give a public oral presentation describing the dissertation.

Language Requirements—For the M.S. degree, none. For the Ph.D. degree, a foreign language is required only when the advisory committee determines that a language is needed to support the student’s research objectives. Symbolic language (computer programming) is recommended for all students.

Minor Requirements for Students Majoring in Other Fields—Programs are designed according to individual student needs, while insuring a comprehensive exposure to wildlife ecology and management.

For Further Information and Applications—Contact Karen Kanda, College of Natural Resources, University of Minnesota, 115 Green Hall, 1530 N. Cleveland Avenue, St. Paul, MN 55108 (612/624-2748; e-mail kkanda@forestry.umn.edu).
**FW 8666. Doctoral Pre-Thesis Credits.** (max 18 cr per qtr; doctoral student who has not passed oral prelims)

**FW 8777. Thesis Credits: Master’s.** (16 cr required; Plan A only)

**FW 8888. Thesis Credits: Doctoral.** (36 cr required)

**5129. Mammalogy.** (5 cr, §EEB 5129; prereq Biol 1106 or 3011 or #) Birney
Recent families and orders of mammals of the world and genera and species of mammals of North America; emphasis on morphology, evolution, and zoogeographic history.

**FW 5278. Special Lectures in Wildlife.** (Cr ar; offered when feasible)

**FW 5565. Fisheries and Wildlife Ecology and Management: Field Trip.** (1 cr) Ten-day field trip to Wyoming and points en route during spring break. Big game, waterfowl, and endangered species.

**FW 5570. Avian Conservation.** (4 cr; prereq EEB 5134 or grad student or #; offered alt yrs) Andersen, Cooper, Cuthbert
Current problems in avian conservation and management, with equal emphasis on non-game, wetland, and game birds.

**FW 5600. Fisheries and Wildlife Techniques.** (4 cr; prereq Biol 5041 or EEB 3001 or #; offered at Itasca) Field techniques and skills; planning and implementing field projects; data collection and analysis using microcomputers; written reports and field journal.

**FW 5603. Wildlife Habitats and Management.** (3 cr; prereq 3052 or 3054 or grad student in biol or natural resources or #; NRES 1020 or computer competency) Ordan
Environmental interactions of wildlife at population and community levels; environmental threats from human activities; habitat-management practices; population management objectives, policies, and regulations.

**FW 5620. Geographical Information Systems (GIS) for Fisheries, Wildlife, and Biological Conservation.** (4 cr; prereq Biol 5041) Cohen
Hands-on experience with GIS as tool for understanding, analysis, and management of ecological systems. ARC-INFO as applied to problems in fisheries, wildlife, and biological conservation.

**FW 5701f, 5702w. Senior Project.** (1, 2 cr; prereq FW sr or grad student or #) Cooper
Problem-solving training. Management problem identification and analysis design, information and data gathering and analysis, and oral and written problem reporting. Problem selection influenced by guest speakers, resource agency contacts, and group discussions; topic is contemporary fisheries and wildlife management issue.

**FW 8100. Seminar.** (Cr ar)
Lectures by and discussions with faculty members, visiting scholars, and graduate students on current topics.

**FW 8200. Seminar.** (Cr ar)
Oral and written reports and discussion by students on selected topics from current literature in wildlife biology and management. Lectures by and discussions with faculty members and visiting specialists.

**FW 8377. Research in Wildlife Biology.** (Cr ar; prereq wildlife conserv grad student)

**FW 8452. Conservation Biology: Genetic and Demographic Issues.** (3 cr; prereq intro genetics course or #) Kapuscinski, Smith
Seminar on current conservation biology issues: genetic, demographic, and environmental analysis and management of populations; ecosystem conservation; case studies of species conservation strategies.

**FW 8576. Wildlife Management: Large Mammals.** (4 cr; prereq fisheries or wildlife conserv or ecol conserv biol grad student or #; offered alt yrs) Jordan
Comprehensive survey of ecology of ungulates and large carnivores, emphasizing North American species, with special reference to harvest, protection, and other management objectives.

**FW 8579. Ecosystem Analysis and Simulations: A Numerical Approach.** (5 cr; prereq 1 qtr calculus, 1 qtr statistics; offered alt yrs) Cohen
Systems analysis methods (e.g., state-space models, transfer functions) and numerical simulations in ecology and fisheries/wildlife management. Presentation of data in time and frequency domains, interpretation of results.

**NRES 5575. Wetlands Conservation.** (4 cr; prereq Biol 5041, EEB 3001 or EEB 3101 or #) Cooper
Freshwater wetland classification, biota, current/historic status, value, and conservation strategies and the ecological principles used in wetland management. Meets concurrently with NRES 3575 plus one additional hour per week.

See Ecology (EEB) for other relevant courses.

**Work, Community, and Family Education**

*Professor: Charles R. Hopkins, chair; George Copa; Richard A. Krueger; Judith J. Lambrecht; Gary N. McLean; Curtis D. Norenberg; Edgar Persons; Roland Peterson; David J. Pucel; Richard Swanson; Ruth Thomas

*Associate Professor: Gary W. Leske, director of graduate studies; James M. Brown; Theodore Lewis; Jerry McClelland; Rosemarie J. Park; Jane Plihal; Marilyn M. Rossmann; James R. Stone III; Barbara A. Warren

*Assistant Professor: James C. Kielsmeier; Shari L. Peterson; Nancy J. Rohde

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1. Unless otherwise indicated, all faculty for work, community, and family education also hold a graduate faculty appointment in education.

2. Holds graduate faculty appointment in work, community, and family education only.
Lecturer: Jeanette R. Daines; Sherry A. Schwartz
Other: Robert D. Shumer; Antony J. Warner

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.


Curriculum—The M.A. degree allows specialization in the following areas: adult education; agricultural education; business and marketing education; comprehensive work, community, and family education; extension education; family education; human resource development; industrial education; international vocational education and training; vocational education administration; and vocational special needs.

Two doctoral degrees are offered with specializations in adult education, agricultural education, business and marketing education, extension education, family education, human resource development, industrial education, international vocational education and training, and comprehensive work, community, and family education. The Ed.D. in work, community, and family education is designed for professionals who primarily synthesize and apply knowledge to problems of practice. The Ph.D. in education with emphasis in work, community, and family education is designed for professionals who are involved in research and generation of knowledge for the field.

Prerequisites for Admission—Prospective master’s degree students generally have completed an undergraduate degree or extensive coursework in the specialization area. Others, however, may be admitted if they complete appropriate background preparation. Prospective doctoral degree students should have academic background and experience in at least one specialization area.

Special Application Requirements—Scores from the Miller Analogies Test or the Graduate Record Examination (GRE) are required for master’s degree program applicants with a bachelor’s degree from a U.S. institution. Master’s degree applicants should designate the specific specialization to which they seek admission. Scores from the GRE are required for doctoral degree program applicants with bachelor’s degrees from a U.S. institution. Doctoral degree applicants should designate either the Ph.D. or the Ed.D. program and the specialization they want to pursue. Students are admitted each quarter.

Master’s Degree Requirements—Each specialization has its own degree requirements. Students should consult the director of graduate studies for the appropriate planning document. A final oral examination is required.

Doctoral Degree Requirements—For the Ed.D. in work, community, and family education, the following is required: a minimum of 88 credits plus a 36-credit field study (thesis credits); at least 18 credits in the general aspects of work, community, and family education; at least 42 credits in the specialization/subspecialization, including a 6-credit internship; and at least 11 credits in research, including at least one statistics course.

Examinations focus on the general aspects of work, community, and family education; specialization/subspecialization; and research. For more information about the doctoral degrees, see the departmental degree handbooks.

Language Requirement—None.

Minor, Supporting, or Related Field Requirements for Students Majoring in Other Fields—Any work, community, and family education specialization (except the emphasis in the major field of education) may be used as a minor or supporting field for the doctoral degree, or as a related field for the master’s degree. For students who choose one of these specializations as part of a doctoral supporting program (which consists of at least 18 credits total), a minimum of 12 credits in the chosen specialization is required. For students who choose a work, community, and family education specialization as a related field for the master’s degree, a minimum of 8 credits in the chosen specialization is required.
For Further Information and Applications— Contact Gary Leske, Director of Graduate Studies, Department of Work, Community, and Family Education, University of Minnesota, R-350 VoTech Building, 1954 Buford Avenue, St. Paul, MN 55108 (612/624-1221; fax 612/625-8140; e-mail votech@tc.umn.edu).

Educ 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

WCFE 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; §VoEd 8666; doctoral student who has not passed oral prelims)

Educ 8777. Thesis Credits: Master's. (16 cr required; Plan A only with emphasis in VoEd)

Educ 8888. Thesis Credits: Doctoral. (36 cr required; PhD only)

Section 2. Work, Community, and Family Education

AdEd 5103. Adult Education Workshop. (1-12 cr [max 12 cr]; §Educ 5103; prereq practicing adult educator or #)
Topics appropriate to activities and interests of the participants.

Literature, objectives, history, philosophy, research, institutions, issues, and trends.

AdEd 5110. The Status and Role of Women in American Society. (4 cr, §Educ 5110; offered alt yrs) Park
The role of women in American history; perceptions of women in literature and art; attention to women in social studies curricula; human sexuality; male and female character-nature and/or nurture; choices of family and career.

AdEd 5201. Introduction to the Undereducated Adult. (3 cr, §Educ 5201) Park
Issues in literacy education, characteristics, problems, individual differences of the undereducated adult learner; traditional and innovative approaches for working with adults in literacy programs.

AdEd 5202. Adult Literacy: Diagnosis and Prescription. (3 cr, §Educ 5202; prereq 5201 or #) Park
Application of diagnostic information, instruments, and techniques to learning difficulties of adults in reading and mathematics programs.

AdEd 5203. Adult Literacy: Methods and Materials. (3 cr, §Educ 5203; prereq 5202 or Elem 5331 or #) Park
Teaching literacy skills to adults: basic theories, approaches, overview of methods and materials for implementation.

AdEd 5204. Literacy in Work Settings. (3 cr, §VoEd/WCFE 5204) Park
Overview of concepts in integrating literacy instruction into vocational training programs and work settings; diagnosis and methods of assessing needs of vocational students and workers on a job; techniques for building needs into training programs.

AdEd 5205. Field Experience in Adult Education. (4-8 cr [max 8 cr]; §Educ 5205; prereq #) Supervised fieldwork practice and seminars; presentations on and evaluations of adult education practices.

AdEd 5301. Designing the Adult Education Program. (3 cr, §Educ 5301) Rohde
Designing and implementing educational programs for adults: concepts, theories, determining needs, educational objectives, learning experiences, and evaluating outcomes.

AdEd 5401. Adult Learning and Development Through the Life Span. (3 cr, §Educ 5401) S Peterson
Physiological, social, and cultural bases of adult behavior; motivation, socialization, personality change as applied to education of adults.

AdEd 5411. Strategies for Teaching Adults. (3 cr, §Educ 5411) Park
Identification, classification and analysis of techniques used in teaching adults.

AdEd 5421. Distance Education. (3 cr) Rohde
Theories, history, delivery systems, and present practice. Emphasizes practice in United States, but explores topics from international perspective.

Multidisciplinary introduction to aging and the aging process.

AdEd 5450. Critical Pedagogy. (3 cr, §FE 5450, §VoEd/WCFE 5450) McClelland
Critical pedagogy in schools and adult education; application to education for family, work, and community.

AdEd 5501. Continuing Education and the Professions. (3 cr, §Educ 5501) Rohde
Review of literature; analysis of philosophies, issues, and trends; emphasis on integrating personal growth, professional needs, and statutory requirements in continuing education programs.

AdEd 8100. Research in Adult Education. (3 cr, §Educ 8100; prereq #, coursework in experimental design) Williams
Review and analysis of current research and research procedures in adult education.

AdEd 8302. Problems: Adult Education. (1-9 cr, §Educ 8302; prereq #) Individual research in area of adult education.
**Agricultural Education (AgEd)**

**AgEd 5010. Rural Leadership Development.** (3 cr) R Peterson
Understanding role, function, and unique features of leaders in rural communities; importance of personal involvement to these roles; personal leadership and vision development for individuals and rural community groups.

**AgEd 5023. Methods for Change in Developing Countries.** (3 cr, §WCFE 5023) Persons
Strategies, programs, projects, and methodologies for individual and community economic and social change.

**AgEd 5028. Teaching Methods in Agricultural Education.** (5 cr) R Peterson
Methods in teaching agriculture in public schools; use of media, principles of learning, problem solving, test construction, classroom management and specific practice in problem-solving teaching techniques; use of competency-based individualized instruction as medium for course presentation and model for teaching methods.

**AgEd 5032. High School Curriculum in Agriculture.** (3 cr; prereq 10 cr educ) R Peterson
Philosophy, organization, and administration of instruction in agriculture departments in secondary schools.

**AgEd 5034. Procedures in Teaching Agriculture.** (3 cr) R Peterson
New developments in methodology; assessment of innovations and procedures; consideration of various levels of instruction.

**AgEd 5041. Workshop: Agricultural Education Technology.** (1-6 cr [max 12 cr])
New understandings, techniques, and materials in animal science, plant science, horticulture, soil science, agricultural mechanics, forestry, natural resources, youth organization, visual aids, and occupational exploration.

**AgEd 5042. Agricultural Mechanics.** (1-3 cr [max 12 cr])
Technical and managerial information, techniques, and materials. Facilitates participant’s instructional planning, resource development, and instruction.

**AgEd 5043. Farm Management.** (1-3 cr [max 12 cr]) Persons
Application of agricultural economics theory, principles, techniques, and materials. Facilitates participants’ instructional planning, resource development, and instruction. Topics vary with each offering.

**AgEd 5049. Agricultural Education for Adults.** (3 cr) Persons
Organization and implementation of systematic education programs for beginning and established farmers; organization of local programs to meet needs of production agriculture in areas of enterprises, agricultural mechanics, and management; development of continuing programs.

**AgEd 5051. Enterprise Analysis.** (3 cr) Persons
Analyzing the farm business as a basis for identifying problems; planning learning experiences to improve farm management at the high school, young farmer, and adult levels.

**AgEd 5052. Farm Business Management Education.** (3 cr; prereq 5049 or #) Persons
Administration, organization, and operation of farm business management education programs for adults; development and use of curriculum materials based on farm business record data.

**AgEd 5055. Methods in Farming Systems Research and Extension.** (3 cr)
Methodology for integrating research and extension programs designed to identify and solve farm family system problems using interdisciplinary and holistic approaches.

**AgEd 5061. Program Planning and Evaluation.** (3 cr) Persons
Developing a program of agricultural education in a community school, integration with total school program, administrative relationships, techniques and uses of program evaluation in planning.

**AgEd 5071. Supervised Occupational Experiences in Agriculture.** (3 cr) Leske
Organization and administration of an occupational experience program in agriculture for high schools and area schools.

**AgEd 5072. Practicum: Agricultural Business and Industry.** (1-3 cr [max 9 cr]; prereq 5071 or #)
Leske, Norenberg
Observation, study, and experience in agricultural business and industry; application to educational problems in agriculture.

**AgEd 5078. FFA Organization and Management.** (2 cr) Leske
Development of FFA (vocational agribusiness education student organization) knowledge, organization and integration of activities into curriculum, management of chapter operations.

**AgEd 5080. Organization and Management.** (3 cr; prereq #) Leske
Administrative structure and function of subcollegiate programs.

**AgEd 5081. Current Issues for the Beginning Agriculture Teacher.** (1-3 cr [max 3 cr]; prereq #) R Peterson
Teaching methods, organizing learning resource materials, managing classroom and laboratory learning activities, curriculum planning and organization, managing discipline situations, school and community relationships for the beginning teacher.

**AgEd 5082. Current Issues in Agricultural Education.** (1-3 cr [max 9 cr]; prereq #) Leske, Persons, R Peterson
Emphasizes study and clarification of current issues, strategies of response, implications of response actions, and related leadership roles.
AgEd 5087. Mentorship for Beginning Agriculture Teachers. (2 cr per qtr; prereq postbac student, less than 2 yrs tchg exper in agriculture, 15081, # registration required in 3 consecutive qtrs) R Peterson
Year-long program of professional development during induction year of teaching agriculture in public schools. Problem solving, issues and concerns of new teachers, and making a smooth transition into teaching profession.

AgEd 5090. Independent Study. (1-3 cr)
Topics may be chosen to permit study of areas within education or to supplement areas of inquiry not provided in the regular course structure.

AgEd 5128. Methods of Teaching. (3 cr; prereq non-agricultural educ major and/or #) R Peterson
Methods of teaching agriculture or related subjects; developing competencies in planning, organizing, implementing, and evaluating instruction, with practice in instructional techniques.

AgEd 5244. Topics in Program Planning for Extension Education. (1-6 cr [max 9 cr])
Extension education programming in relation to situation and needs analysis; coordination of content, people, methodology; specific aspects in development of program models; managing resources.

AgEd 5245. Topics in Administering Extension Education. (1-6 cr [max 9 cr])
Issues and current literature; focus on personnel hiring and supervision, financial management, leadership styles, long-range planning; application of theory to administrative practice.

AgEd 5246. Topics in Teaching and Delivering Extension Education. (1-6 cr [max 9 cr])
Teaching techniques related to concepts of use of media, telecommunications, computers, group process methods, and experiential learning in extension education settings.

AgEd 5247. Topics in Evaluating Extension Education. (1-6 cr [max 9 cr]) Krueger
Overall evaluation design: choosing quantitative vs. qualitative evaluation methods; developing skills and conceptual frameworks to apply theory to extension settings.

AgEd 8001. Research in Agricultural Education. (Cr ar; prereq 15 cr educ)
Selecting problems, preparing bibliographies, analyzing and interpreting data, and preparing manuscripts.

AgEd 8020. Seminar: Agricultural Education. (Cr ar) Peterson

AgEd 8091. Field Problems. (3 cr)
Making investigations, gathering data, and formulating plans regarding agricultural education.

AgEd 8303. Seminar: Graduate Studies Review. (1-3 cr)
Review of graduate studies in agricultural education being planned or recently completed.

Business and Industry Education (BIE)

BIE 5002. Teaching Promotion Display. (3 cr, §BME 5252)
Identifying materials and methods for teaching visual merchandising, sales promotion, advertising, public relations, and promotion planning.

BIE 5010. Introduction to Microcomputer Applications in Business and Industry Education. (3 cr, §BME 5310)
Instructional uses of microcomputers; representative business and industry education applications, including word processing, databases, spreadsheets, and graphics.

BIE 5015. Advanced Word Processing Practicum. (3 cr, §BME 5160)
Completion of projects using advanced editing and printing capabilities.

BIE 5020. Spreadsheet Analysis Using Microcomputers in Business and Industry Education. (3 cr, prereq 5010 or equiv)
Using spreadsheet software; instructional applications in business.

BIE 5025. Teaching Microcomputer Graphics in Business and Industry. (3 cr, §BME 5335; prereq 5010 or equiv)
Representative microcomputer-based business graphics software packages; use for making instructional presentations; using simulated projects to teach applications in business and industry classrooms.

BIE 5030. Database Microcomputer Applications. (3 cr; prereq 5010 or equiv)
Using database software; instructional applications in business.

BIE 5035. Teaching Desktop Publishing. (3 cr, §BME 5363; prereq 5010 or equiv)
Strategies for teaching skill development in page layout and design, text and graphic creation, file merging, printing, equipment and software requirements.

BIE 5040. Integrated Microcomputer Applications in Business and Industry Education. (3 cr, §BME 5365; prereq 5010 or 5015 or 5020 or 5025 or 5030 or equiv) Lambrecht
Advanced business and industry computer applications integrating business word processing, spreadsheets, business graphics, and database software.

BIE 5080. Special Topics in Technical Updating. (1-6 cr)
Technological and procedural changes in business and industry content. Topics vary with each offering.

BIE 5113. Special Topics in Manufacturing. (1-6 cr, §Ind 5133)
Topic not covered by available courses.

BIE 5123. Special Topics in Communications. (1-6 cr, §Ind 5123)
Topic not covered by available courses.
BIE 5133. Special Topics in Power and Energy. (1-6 cr, §Ind 5143)
Topic not covered by available courses.

BIE 5143. Special Topics in Transportation. (1-6 cr, §Ind 5153)
Topic not covered by available courses.

BIE 5150. Technical Development: Specialized. (1-12 cr [max 18 cr], §Ind 5200; prereq #)
Integration of specialized technical instruction in advanced and emerging areas into courses in industrial education.

BIE 5253. Supervisory Training. (3 cr, §HRD 5253; prereq VoEd/WCFE 5340) S Peterson, Rossmann
Problems, practices, programs, issues, and methodologies related to preparing trainers of supervisors.

BIE 5261. Sales Training. (3 cr, §HRD 5261)
Strategies and techniques for developing effective sales people.

BIE 5262. Customer Service Training. (3 cr, §BME 5262, §HRD 5262)
Strategies of successful organizations; training practices to develop customer-oriented personnel.

BIE 5300. Organizational Needs Assessment. (3 cr, §HRD 5300) Swanson
Organizational performance problems, problem causes, and recommendations of training solutions, and other intervention to improve performance in business, industry, and schools.

BIE 5301. Student and Trainee Evaluation Systems. (3 cr, §HRD 5301, §Ind 5301) Pucel, Swanson
Test development, performance, and learning evaluation; affective evaluation, learning progress reporting systems.

BIE 5303. Instructional Aids. (3 cr, §Ind 5303; prereq educ major or grad student) Norenberg
Planning, construction, use.

BIE 5320. Vocational Guidance. (3 cr, §Ind 5320)
Self-assessment, use of occupational and labor market information, job-seeking skills, work and work satisfaction. For industrial teachers and trainers in school and industrial settings.

BIE 5325. Foundations of Industrial Education. (3 cr, §Ind 5325) Pucel, Lewis
History, objectives, development, and current practices of the field.

BIE 5344. Facilities and Management. (3 cr, §Ind 5344; prereq 1300 or 5630 or #)
Planning, evaluation, and management of industrial education shop and laboratory facilities.

BIE 5365. Curriculum Development in Technology Education. (4 cr, §Ind 5516) Lewis

BIE 5366. Management Development Practices. (4 cr, §HRD 5366; prereq principles of mgmt or supervision course or #) McLean
Problems, practices, programs, and methodologies relating to development of managers, including needs assessment, delivery modes, and evaluation; site visits and critiques.

BIE 5400. Introduction to Business and Marketing Education. (4 cr, §BME 5300) Hopkins, Lambrecht
Conceptual models useful in design and delivery of programs in secondary and postsecondary schools, adult education settings, and business and industry.

BIE 5440. Business Observation and Seminar. (3-9 cr, §BME 5361)
Current operating practices and career opportunities in business and industry combining planned experience in work environments and related seminars.

BIE 5452. Methods of Teaching Business Concepts. (4 cr) Hopkins, Lambrecht
Recent research and developments in teaching concepts related to economics, business organization and management, business law, entrepreneurship, marketing, international business, information systems, accounting, risk management, and personal finance.

BIE 5453. Consumer Education: Curriculum, Methods, and Materials. (3-4 cr, §BME 5153; prereq FE 5153)
Objectives, content, curriculum organization, teaching methods, materials, and evaluation methods for elementary, secondary, postsecondary, and adult levels.

BIE 5457. Methods of Teaching for Business Employment. (4 cr) Lambrecht
Recent research and developments in teaching to prepare people for administrative support positions, accounting and information processing, sales and marketing, computer operations, and other occupations in which desktop publishing is a major employment responsibility.

BIE 5462. Research and Methods in Teaching Accounting and Data Processing. (4 cr, §BME 5162) Lambrecht
Application of current research findings to teaching methodology and to curriculum and materials development; computerized accounting applications.

BIE 5463. Teaching Keyboarding and Word Processing. (3 cr) McLean
Effective teaching strategies, expected learner outcomes, evaluation methods, criteria for selecting hardware and software, managing and organizing computer labs.
BIE 5485. Business and Industry Education Workshop. (1-6 cr, §Ind 5306; prereq tchg exper, #) Areas of concentration vary with each offering.

BIE 5490. Special Topics in Instruction. (1-6 cr, §BME 5370) Planning and providing content, evaluating instruction. Topics vary with each offering.

BIE 5495. Special Topics in Curriculum. (1-6 cr, §BME 5380) Content development and evaluation of curriculum and curriculum materials. Topics vary with each offering.

BIE 5500. Occupational Experience. (1-5 cr [max 15 cr]; prereq #) Observation and employment in business and industry focused on developing technical or occupational competencies.

BIE 5510. Internship: Business and Industry Education. (1-12 cr [max 12 cr], §BME 8600) Practical experience in a business or industry professional educator or supervisory role, culminating in an integrating paper.

BIE 5501. Special Topics. (1-6 cr, §HEEd 5001; S-N optional) Topics not covered by available courses.

BIE 5502. Thinking, Learning, and Teaching in Work, Family, and Community. (3 cr, §VoEd/WCFE 5002) Thomas Theory and practice relevant to stimulating and supporting thinking and learning within and for the contexts of work, family, and community.

BIE 5503. Internship: Community/Work Settings. (3-12 cr [max 12 cr], max 6 cr for MEd and MA programs; prereq #) Planned work experience focusing on educational competencies in these settings; students assume defined responsibilities of position.

BIE 5513. Consumer Education: Curriculum, Methods, and Materials. (3 or 4 cr, §BME 5153, §HEEd 5153) Objectives, content, curriculum organization, teaching methods, materials, and evaluation methods for elementary, secondary, postsecondary, and adult levels.

BIE 5605. Critical Issues. (3 cr, §Ind 5305; prereq educ major or grad student) Hopkins, Pucel Identification, analysis, and discussion of major current problems in the field.

BIE 5630. Course Development. (3 cr, §HRD 5630) Pucel Content identification, stating objectives, sequencing, lesson planning, and selection of methods and media for instruction.

BIE 5660. Instructional Methods. (3 cr, §HRD 5660) Lewis Implementation of instructional strategies and methods.

BIE 5700. Field-Based Projects. (1-6 cr [max 12 cr], §BME 5600; prereq adviser approval or #) Curricular, instructional, developmental, or evaluative problems and projects applicable to local school or business and industry situations.

BIE 5752. Technical Skills Training. (4 cr, §HRD 5752) Lewis Systems and process analysis and troubleshooting of work behavior; methods of design and development of training materials.

BIE 5900. Directed Study. (1-6 cr [max 12 cr], §Ind 5901; prereq adviser approval or #) In-depth individual learning, or supplementation of areas not covered in regular course structure.

BIE 8900. Research Problems: Business and Industry. (4-9 cr [max 9 cr]; prereq adviser approval) Individual research or conferences.

Family Education (FE)

FE 5001. Special Topics. (1-6 cr, §HEEd 5001; S-N optional) Topics not covered by available courses.

FE 5002. Thinking, Learning, and Teaching in Work, Family, and Community. (3 cr, §VoEd/WCFE 5002) Thomas Theory and practice relevant to stimulating and supporting thinking and learning within and for the contexts of work, family, and community.

FE 5003. Internship: Community/Work Settings. (3-12 cr [max 12 cr], max 6 cr for MEd and MA programs; prereq #) Planned work experience focusing on educational competencies in these settings; students assume defined responsibilities of position.

FE 5153. Consumer Education: Curriculum, Methods, and Materials. (3 or 4 cr, §BME 5153, §HEEd 5153) Objectives, content, curriculum organization, teaching methods, materials, and evaluation methods for elementary, secondary, postsecondary, and adult levels.

FE 5300. Family Education Curriculum. (3 cr, §HEEd 5300) Thomas Research and theory, developing programs for all ages and evaluating materials.

FE 5310. Methods in Teaching Family Education. (3 cr, §HEEd 5310) McClelland Theory and relevant research; application to educational objectives, strategies, student needs, and program evaluation.

FE 5315. Evaluation in Family Education. (3 cr, §HEEd 5315) Plihal Collecting and interpreting evidence related to individual and program performance.

FE 5320. Adult Education in Family Education. (3 cr, §HEEd 5320) Plihal Planning a community program; teaching procedures; special problems.

FE 5321. International Perspectives in Family Education. (3 cr, §HEEd 5321; offered alt yrs) Examination of family education around world; commonalities and differences in purpose, problems, history, methods of delivery, and context.

FE 5404. Introduction to Early Childhood Family Education Programs. (1 cr, §HEEd 5404) Rossmann History, philosophy, and implementation of programs.

FE 5405. Child Development and Parent Education. (4 cr, §HEEd 5405) McClelland Objectives, content, curriculum organization, teaching methods, materials, and evaluation approaches for teaching youth and adults about social, cultural, psychological, economic, and technical aspects of child development, parenting, and parent-child interaction.
FE 5406. Special Topics in Parent and Family Education. (1-6 cr, §HEEd 5406; S-N optional) Issues and current literature.

FE 5407. Family Education. (3 cr) Rossmann Objectives, content, curriculum, methods, materials, and evaluation for teaching diverse groups about family life.

FE 5408. Work-Family Relationships. (3 cr) Rossmann Examination of interactions between work and family with educational applications for youth and adults.

FE 5409. Group Methods for Parent and Family Education. (2 cr, §HEEd 5409) Rossmann Development of skills for leading parent and family education groups.

FE 5410. Food and Nutrition Education. (1-4 cr [max 12 cr], §HEEd 5410; offered when feasible) FE 5411. Challenges in Sexuality Education. (4 cr) Rossmann Preparation to develop, deliver, and evaluate sexuality education. Strategies to help children and adults acquire information, form positive values, develop interpersonal skills, and exercise personal responsibility in sexual dimension of individual and family life.

FE 5416. Parent Education: Advanced. (3 cr, §HEEd 5416; prereq 5405 or #) Thomas Evolving perspectives; emphasis on psychodynamic, conceptual-change approaches and reflective and dialogic approaches for working with parents in understanding beliefs and examining origins and consequences of beliefs; issues related to diversity and to self-awareness; ethics of professionals.

FE 5450. Critical Pedagogy. (3 cr, §AdEd 5450, §VoEd/WMCE 5450) Mcclelland Critical pedagogy in schools and adult education; application to education for family, work, and community.

FE 5500. Proseminar: Family Education. (2 cr, §HEEd 550) Relation of processes and standards of rational thought to professional competence and goals of a graduate program.

FE 5510. History, Philosophy, and Professional Practice of Family Education. (3 cr; prereq postbac student in FE or #) Thomas Critical analysis of family education and the teaching of it; practical problems encountered by families; development of personal orientation to becoming a family education teacher.


FE 5600. Practicum: Adult Education. (1-9 cr, §HEEd 5600; prereq 5320 or AdEd 5411 or #) Individual field assignments under supervision.

FE 5900. Independent Study in Family Education. (1-3 cr [max 12 cr], §HEEd 5900; prereq #) Self-directed study with faculty advice in areas not covered by regular courses.

FE 8520. Seminar: History and Philosophy of Family Education. (2 cr, §HEEd 8520) Data sources used to trace meaning of family education as field of study; relation of developments in field to intellectual forces in society; conceptual foundations.

FE 8900. Problems: Family Education. (1-9 cr, §HEEd 8900) Independent study of current educational problems.

Human Resource Development (HRD)

HRD 5104. Survey: Human Resource Development and Adult Education. (4 cr, §AdEd 5104) S Peterson, Stone, Swanson General concepts in the field; literature, objectives, history, philosophy, research, institutions, issues, and trends.

HRD 5253. Supervisory Training. (3 cr, §BIE 5253; prereq VoEd/WMCE 5340) S Peterson, Rossmann Problems, programs, issues, and methodologies related to preparing trainers of supervisors.

HRD 5261. Sales Training. (3 cr, §BIE 5261) Strategies and techniques for developing effective sales people.

HRD 5262. Customer Service Training. (3 cr, §BIE 5262) Strategies of successful organizations; training practices to develop customer-oriented personnel.

HRD 5300. Organizational Needs Assessment. (3 cr, §BIE 5300) Swanson Organizational performance problems and their causes; training solutions and other interventions to improve performance in business, industry, and schools.

HRD 5301. Student and Trainee Evaluation Systems. (3 cr, §BIE 5301, §Ind 5301) Pucel, Swanson Test development, performance, and learning evaluation; affective evaluation, learning progress reporting systems.

HRD 5366. Management Development Practices. (4 cr, §BIE 5366; prereq principles of mgmt or supervision course or #) McLean Problems, practices, programs, and methodologies relating to development of managers, including needs assessment, delivery modes, and evaluation; site visits and critiques.

HRD 5630. Course Development. (3 cr, §BIE 5630) Identifying content, stating objectives, sequencing, lesson planning, and selecting methods and media for instruction.
HRD 5660. Instructional Methods. (3 cr, §BIE 5660, §Ind 5360) Lewis
Implementing of instructional strategies and methods.

HRD 5750. Personnel Training and Development. (3-4 cr) Lewis, Swanson
Acquiring skills in analysis, design, development, implementation, and evaluation.

HRD 5751. Motivational Training Practices. (3 cr)
Assessing need for, planning, developing, delivering, and appraising results of motivational training and development that involve motivational theory, principles, and practices.

HRD 5752. Technical Skills Training. (4 cr, §BIE 5752) Lewis
Analyzing technical skills training practices in business and industry. Systems and process analysis and troubleshooting of work behavior; design methods and developing training materials.

HRD 5760. Organization Development. (3-4 cr) McLean, Pucel
Introduction to major concepts, skills, and techniques.

HRD 5761. Team Building in Organizations. (3 cr) McLean
Introduction to theories of and techniques for building effective work teams. Developing skills in facilitating team-building activities.

HRD 5762. Management of Conflict. (3 cr, §VoEd 5762)
Types, sources, and diagnosis of conflict styles; skills and strategies for managing interpersonal, intergroup, and intragroup conflict.

HRD 5770. Human Resource Development: Special Topics. (1-4 cr) McLean, Swanson
Developments relating to problems, practices, programs, and methodologies in training and development; content varies with each offering.

HRD 5780. Internship: Human Resource Development. (Cr ar [max 15 cr]; prereq 5750) Brown, McLean, Swanson
Students apply and contract for training or organization development positions; contracts describe specific training and development responsibilities to be fulfilled during internship.

HRD 5781. International Field Study in Human Resource Development. (4 cr) McLean, Swanson
Training, organization development, career development, and quality improvement theories and practices in selected nation.

HRD 5790. Strategic Planning in Human Resource Development. (3-4 cr; prereq 5750 or 5760) S Peterson, Swanson
Human capital as component of organizational strategic planning; analyzing and articulating practices.

HRD 5792. Managing Human Resource Development. (3 cr; prereq 5750, 5760 or #)
Managing and leading human resource development activities in industry, business, and government to meet organizational objectives. Mission, staffing, resources, systems, process management, and reporting.

HRD 5793. International Human Resource Development. (4 cr) McLean
Problems, practices, programs, theories, and methodologies in human resource development as practiced internationally and in cross-cultural settings.

HRD 5794. Consulting in Human Resource Development. (3 cr; prereq 5750 or 5760 or #) McLean
Analyzing marketing, subject matter expertise, organization, business principles, and communication skills as elements of consulting in business and industry human resource development.

Quality management and productivity improvement strategies from training and organization development perspective. Organization development interventions to implement three selected quality management strategies. Not a statistical process control course.

HRD 5798. Current Issues in Human Resource Development. (4 cr, §VoEd 5798; prereq 5750, 5760 or #) Lewis, Swanson
Issues confronting practitioners in training and organization development; conflicting viewpoints and resolution options.

HRD 5808. Diversity Issues and Practices. (3 cr, §VoEd/WCFE 5808) Brown
Collaborative diversity-related issues among educators and human resource development personnel. Nature of diverse populations, their unique learning/training needs, and effective diversity-related practices.

HRD 8750. Advanced Theories in Human Resource Development. (4 cr; prereq 5750, 5760 or #) Swanson
Critique of organizations as adaptive systems; role of human resource development in mediating among the organizational, process, and individual levels of performance.

Work, Community, and Family Education (WCFE)

WCFE 5002. Thinking, Learning, and Teaching in Work, Family, and Community. (3 cr, §FIC 5002, §VoEd 5002) Thomas
Theory and practice.

WCFE 5010. Technology and Public Ethics. (3 cr, §VoEd 5010, §WCFE 3010) Lewis
Nature of technology. Values and ethical issues relating to technology. Ways in which citizens can influence technological decisions in their communities.
WCFE 5021. Education Through Extension Methods. (3 cr, §AgEd 5021; prereq grad student or #) Norenberg
Methods and techniques of formal and nonformal education used by Extension Service and other organizations.

WCFE 5023. Methods for Change in Developing Countries. (3 cr, §AgEd 5023) Devising strategies, programs, projects, and methodologies for individual and community economic and social change.

WCFE 5024. Extension History and Philosophy. (3 cr, §AgEd 5024) Origin, philosophy, historical development, objectives, and organizational structure of the Extension Service.

WCFE 5025. Extension Program Development. (3 cr, §AgEd 5025) Planning, implementing, and evaluating program development process.

WCFE 5026. Administering Non-Formal Education Programs. (3 cr, §AgEd 5026; prereq #) Administering Extension Service and other non-formal education agencies or programs at local, area, and state levels.

WCFE 5027. Practicum: Extension Experiences. (2-9 cr [max 9 cr], §AgEd 5027; S-N optional) Observing and participating in activities of Extension Service staff at county and state levels; staffing, program planning and development, and educational and administrative functions.

WCFE 5101. Special Topics in Curriculum. (1-6 cr [max 9 cr], §VoEd 5101) Topics vary, but course covers development and evaluation of curricula.

WCFE 5102. Special Topics in Administration. (1-6 cr [max 9 cr], §VoEd 5102) Topics vary, but course covers leadership and management of education programs.

WCFE 5200. Program Evaluation. (3 cr, §VoEd 5200) Krueger
Designing and conducting program evaluations.

WCFE 5204. Literacy in Work Settings. (3 cr, §AdEd 5204, §VoEd 5204) Park
Overview of concepts involved in integrating literacy instruction into vocational training programs and work settings; diagnosis and methods of assessing needs of vocational students and workers on a job; techniques for building needs into training programs.

WCFE 5274. Two-Year Postsecondary Institutions. (3 cr, §EdPA 5274, §VoEd 5274)
Present status, development, functions, organization, curriculum, trends in postsecondary but nonbaccalaureate institutions.

WCFE 5284. Leadership Skills. (1 cr; §VoEd 5284) Applying leadership and management theory to education programs for youth and adults in school, industry, business, and community settings.

WCFE 5286. Marketing of Education and Training Programs. (3 cr, §VoEd 5286) Stone Application of comprehensive marketing model to design and delivery of education and training programs for institutions, programs, and specific course offerings. Market research, market segmentation, product positioning, alternative marketing mix strategies, and marketing planning.

WCFE 5300. Philosophy and Practice of Vocational Education. (3 cr, §VoEd 5300) Brown, Hopkins, Peterson Purposes, recipients, practices, legislation and funding, and socioeconomic contexts.

WCFE 5310. Advising Vocational Student Organizations. (2 cr, §VoEd 5310) Leske Value and purposes of vocational student organizations in curriculum. Tasks of adviser in designing, operating, and sustaining activities to enhance student leadership, personal development, and school-to-work transition.

WCFE 5330. Coordination Techniques in Cooperative Education. (3-4 cr, §AgEd 5071, §BME 5352, §HEEd 5106, §Ind 5310, §VoEd 5330) Brown, Leske, Stone Responsibilities of instructor-coordinator; guidance, selection, placement, supervision, and evaluation of students; articulation of related instruction; training sponsor identification, orientation, development, and evaluation; purposes and management of program.

WCFE 5340. Principles of Supervisory Management. (3 cr, §VoEd 5340) Rossmann For persons in education, business, industry, or service organizations.

WCFE 5400. Education for Work. (3 cr, §VoEd 5400; prereq 5300 or #) Copa, Leske, Stone Contextual bases underlying education for work; implications for practice.

WCFE 5410. Experiential Learning: Theory and Practice. (3 cr, §VoEd 5410) Analyzing students’ own learning process; how experience is used in educational settings; shared decision making and group dynamics.

WCFE 5420. Youth in the World. (3 cr, §VoEd 5420, §YoSt 5100; prereq 5410 or #) Understanding youth, using “everyday life” experiences as levels of reality; range of ideas, social institutions, and organizations that reflect the ways societies and cultures understand and influence youth.

WCFE 5430. Organizational Approaches to Youth Development. (3 cr, §EdPA 5340, §VoEd 5430; prereq 5410 or #) Defining youth development within framework of formal and informal organizations; organizational systems responsible for youth development in the community; policy issues surrounding these systems.
GRADUATE PROGRAMS

WCFE 5440. Issues: Youth Development. (3 cr, §VoEd 5440; prereq 5410 or #)
Healthy development of adolescents in relation to the family, community, and workplace; collaborative use of community resources to address these issues.

WCFE 5450. Critical Pedagogy. (3 cr, §AdEd 5450, §FE 5450, §VoEd 5450) McClelland
Critical pedagogy in schools and adult education; application to education for family, work, and community.

WCFE 5451. Microcomputer Instructional Utility Software. (2 cr, §VoEd 5451; prereq microcomputer coursework or exper)
Software for preparing tests, worksheets, learner reports and records, instructional inventory records, and classroom group presentations for vocational educators.

WCFE 5452. Authoring Instruction Using Microcomputers. (3 cr, §VoEd 5452; prereq 5450 or equiv or #)
Designing and preparing instructional materials using an authoring language.

WCFE 5490. Seminar in Youth Development. (1-6 cr, §VoEd 5490)
Concepts of healthy youth development used by youth workers as a framework for discussing personal experience, portfolio development, and other facets of their program work.

WCFE 5500. Introduction to Vocational Education Administration. (3 cr, §VoEd 5500)
Basic concepts of structure, financing, program planning and evaluation, law and liability, personnel policies, and the management of vocational education programs.

WCFE 5600. Planning Vocational Education. (3 cr, §VoEd 5600; offered when feasible) Copa

WCFE 5700. Teaching Entrepreneurship: Small Business Management. (3 cr, §VoEd 5700)
Persons
Organization, curriculum modification, and implementation of education programs.

WCFE 5800. Educating Persons With Special Learning Needs. (3 cr, §VoEd 5800) Brown
Identifying instructional procedures for students with disabilities and disadvantaging conditions in regular classroom/lab settings.

WCFE 5801. Educating Persons With Learning Disabilities. (1 cr, §VoEd 5801)
Educational traits of students with learning disabilities; instructional strategies for meeting their educational needs.

WCFE 5802. Educating Disadvantaged Vocational Students. (1 cr, §VoEd 5802)
Educational traits of disadvantaged vocational students; instructional strategies for meeting their educational needs.

WCFE 5804. Work Evaluation of Persons With Special Learning Needs. (3 cr, §VoEd 5804)
Overview of techniques, systems, and organizations that evaluate such students entering vocational education programs.

WCFE 5805. Occupational Analysis for Persons With Special Learning Needs. (3 cr, §VoEd 5805)
Overview of techniques, issues, and practices for analyzing and describing jobs and job settings into which vocational special needs learners may be placed or for which vocational training or vocational assessment systems may be developed.

Overview of interagency planning issues and practices for educational and human service organizations. Transition of students from school to work and community living, infant and preschool services, and use of locally based planning teams to achieve enhanced service coordination.

WCFE 5808. Diversity Issues and Practices. (3 cr, §HRD 5808, §VoEd 5808) Brown
Collaborative diversity-related issues among educators and human resource development personnel. Nature of diverse populations, their unique learning/training needs, and effective diversity-related practices.

WCFE 5900. Using Work, Community, and Family Education Research. (3 cr, §VoEd 5900; prereq grad program admission or #) Leske, Stone
Role of education research in professional practice, significant problems of practice for research, alternative research modes, and synthesizing and applying research results.

WCFE 5920. Independent Study. (1-6 cr, §VoEd 5920; prereq ∆)

WCFE 8100. Colloquium. (1-18 cr, §VoEd 8100)
Selected topics.

WCFE 8140. History and Philosophy of Education for Work, Community, and Family. (3 cr, §VoEd 8120; A-F only for PhD and EdD students in WCFE) Thomas
Philosophical views of and historical influences on research and practice in education for work, community, and family.

WCFE 8150. Comparative Systems in Education for Work, Community, and Family. (3 cr, §VoEd 8110; A-F only for PhD and EdD students in WCFE) Copa, Lewis, McClelland
Comparison of systems in education for work, community, and family within United States and between United States and other countries.
WCFE 8160. Critical Issues in Education for Work, Community, and Family. (3 cr, §VoEd 8130; prereq 8140, 8150 or #; A–F only for PhD and EdD students in WCFE) Hopkins, Lewis, Stone

WCFE 8810. Internship. (1-15 cr [max 15 cr], §VoEd 8810; prereq ∆) Student applies for position in professional practice; individual arrangements describe specific responsibilities during internship period.

WCFE 8910. Positivistic Research. (3 cr, §VoEd 8910; prereq 5900 or equiv or #) Brown, Lambrecht, Lewis Assumptions of, procedures for, and considerations in planning and conducting positivistic research.

WCFE 8920. Interpretive and Critical Science Research. (3 cr, §VoEd 8920) Copa, Pilhal Assumptions of, procedures for, and considerations in planning and conducting interpretive and critical science research.

WCFE 8990. Research Seminar. (1 cr per qtr [max 9 cr]; prereq 8910 or 8920 or ∆; only 2 cr apply to doct prog research core req) Developing, reporting, and evaluating research. Participants make and react to presentations.

Zoology (Zool)

Professor: Elmer C. Birney, director of graduate studies: Franklin H. Barnwell; Kendall W. Corbin; James W. Curtsinger; Robert P. Elde; Stanley L. Erlandsen; William S. Herman; Robert G. McKinnell; Frank D. McKinney; Craig Packer; Richard E. Phillips; Anne E. Pusey; Philip J. Regal; William D. Schmid; Akhouri A. Sinha; Donald B. Siniff; Bert E. Stromberg

Associate Professor: John H. Beatty; Stuart F. Goldstein; Jay T. Hatch; Ralph W. Holzenthal; Scott M. Lanyon; Peter W. Sorensen; Robert M. Zink

Assistant Professor: Susan J. Weller

Please read the General Information section of this bulletin for Graduate School requirements that apply to all major fields.

Degrees Offered—M.S. (Plan A and Plan B) and Ph.D.

Curriculum—Emphases in areas of vertebrate and invertebrate zoology are available in the master’s and doctoral programs.

Prerequisites for Admission—At least 15 credits of biological science, chemistry through organic, one year of physics, and mathematics through calculus are required for both programs. Deficiencies in the above work must be made up during the first year of graduate work.

Special Application Requirements—A statement of purpose, scores from the General (Aptitude) Test and the Subject (Advanced) Test in biology of the Graduate Record Examination, and three letters of recommendation should be sent to the director of graduate studies. The application deadline is January 7 for entry in the following fall quarter; fall quarter entry is preferred.

Master’s Degree Requirements—Requirements for the major are flexible, but breadth in coursework is encouraged. Requirements for the major as well as the minor or supporting program are determined in consultation with the adviser and the director of graduate studies. The final examination is oral.

Doctoral Degree Requirements—The program is planned in consultation with the adviser and the director of graduate studies. Competence in statistics and computer science is required and field experience is strongly recommended for all Ph.D. students.

Language Requirements—For the master’s degree, none. For the doctoral degree, one foreign language is required.

For Further Information and Applications—Contact the Zoology Graduate Program, University of Minnesota, 100 Ecology Building, 1987 Upper Buford Circle, St. Paul, MN 55108 (612/624-6770; fax 612/624-6777; e-mail ecbirney@biosci.umn.edu).

Zool 8666. Doctoral Pre-Thesis Credits. (max 18 cr per qtr; doctoral student who has not passed oral prelims)

Zool 8777. Thesis Credits: Master’s. (16 cr required; Plan A only)

Zool 8888. Thesis Credits: Doctoral. (36 cr required)

For course descriptions, see Ecology and Molecular, Cellular, Developmental Biology and Genetics.