## NC State Graduate Catalog (2009-2010)

The Graduate Catalog contains Graduate School requirements and pertinent information for individual graduate programs, a current list of graduate faculty, and a selection of other resources for new students. The Catalog is informational only and is subject to change. Official policies and procedures are in the <u>Graduate School Administrative Handbook</u> and on the <u>NC State Policies, Rules and Regulations</u> website.

North Carolina State University The Graduate School Application and Admission Graduate Programs Registration Tuition and Fees Financial Support Fields of Graduate Instruction Course Descriptions Graduate Faculty NC State Policies Other Resources Catalog Archives (PDF)

This catalog is intended for informational purposes only, and it is subject to change. Please see the online Administrative Handbook at <u>http://www.ncsu.edu/grad/handbook/</u> for changes in policies, rules, regulations, and procedures.

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## North Carolina State University

<u>North Carolina State University</u> (NC State) is a national center for research, teaching and extension, and its graduate education has stood for quality for more than a century. As a land-grant state university, it shares the distinctive characteristics of these institutions nationally -- broad academic offerings, extensive public service, national and international activities, and large-scale extension and research programs.

NC State is one of 16 constituent institutions of the multi-campus <u>University of North Carolina system</u>. The UNC Board of Governors is the policy-making body legally charged with "the general determination, control, supervision, management, and governance of all affairs, of the constituent institutions."

NC State is a member of the <u>National Association of State Universities and Land-Grant Colleges</u>. It is also a member of the <u>American Council on Education</u>, the <u>College Entrance Examination Board</u>, the <u>Council of Graduate Schools</u>, the National Commission on Accrediting and the <u>Southern Association of Colleges and Schools</u>.

NC State University is accredited by the <u>Commission on Colleges of the Southern Association of</u> <u>Colleges and Schools</u> to award associate's, baccalaureate, Master's, and doctoral degrees. Contact the Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 or call 404-679-4500 for questions about the accreditation of NC State University.

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## **The Graduate School**

Graduate instruction was first offered at North Carolina State University in 1893, and the first doctoral degree was conferred in 1926. In the ensuing years, the Graduate School has grown steadily and now provides instruction and facilities for advanced study and research in the fields of agriculture and life sciences, design, education, engineering, natural resources, humanities and social sciences, management, physical and mathematical sciences, textiles and veterinary medicine.

<u>The Graduate School</u> is currently composed of more than 2,400 graduate faculty members. Educated at major universities throughout the world and established both in advanced teaching and research, these scholars guide the University's more than 7,000 Master's and doctoral students from all areas of the U.S. and many other countries. The faculty and students have available exceptional facilities, including libraries, laboratories, modern equipment and special research areas.

Additionally, a cooperative agreement exists among the Graduate Schools of the <u>University of North</u> <u>Carolina at Chapel Hill</u>, the <u>University of North Carolina at Greensboro</u>, <u>Duke University</u>, and <u>North</u> <u>Carolina State University</u> which increases the educational and research possibilities associated with each institution.

## **Application and Admissions**

The criteria used for admissions decisions vary according to programs and schools/colleges, reflect an evaluation of the applicant's potential for graduate work, and consider the ability of a program to accommodate additional students. Commonly, departmental admissions committees consider requests for admission and forward their recommendations to the Graduate School. However, Graduate School regulations govern the criteria for the classification of graduate student status.

Application Application Deadlines English Proficiency Requirements Admission Immunization and Medical History Transcript Requirements

Admission to Degree Programs <u>Full Graduate Status</u> <u>Provisional Admission</u> <u>Graduate Unclassified Status</u> <u>Admission for International Students</u> <u>Post-Baccalaureate Studies (PBS)</u> <u>Distance Education</u> <u>Evening Degree Programs</u> <u>Alternative Teacher Education Programs</u>

#### Application

All applicants must submit the online <u>NC State University Graduate School Application Form</u>. Application is made for a specific degree program and date of enrollment (see <u>Admissions</u>).

Applications for admission require the following:

- Non-refundable application processing fee of \$65.00 (US) for U.S. citizens and Permanent Residents or \$75.00 (US) for Non-Resident Aliens (Internationals);
- One official transcript from all colleges and universities previously attended; (NOTE: Applicants currently attending, or who have previously attended NC State, are not required to provide an NC State transcript.)
- Three recommendations from people who know the prospective student's academic record and potential for graduate study;
- On-line North Carolina Residency Form if claiming NC residence for tuition purposes;
- A list of courses in progress if enrolled as a Post-Baccalaureate Studies (PBS) student at NC State;
- GRE or other standardized test scores, statements of purpose, portfolios or other work samples, depending on requirements of particular program; and
- TOEFL scores, where applicable.

## **English Proficiency Requirements for International Students**

In order to be eligible for admission to the Graduate School all international applicants, regardless of citizenship, must demonstrate proficiency in English at a level necessary to be successful in a graduate program at NC State. This requirement can be met for most applicants in one of the following ways; however, some programs may require additional evidence of English proficiency:

1. Provide <u>Test of English as a Foreign Language</u> (TOEFL) with a total score of **at least 80** on the Internet-based Test (iBT). Minimum test scores for each section:

Listening	18 points
Reading	18 points
Writing	18 points
Speaking	18 points for admissiion to the Graduate School
	23 pionts for TA appointment where TA has direct verbal interactins with students
	26 pints for TA appointment where TA presents lectures in the class or laboratory

- 2. The maximum total score for the iBT is 120 with each section worth 30 points.
- 3. Provide <u>International English Language Testing System</u> (IELTS) scores with an overall band score of *at least 6.5*. Minimum test scores for each section are listed below:

Listening	6.5	
Reading	6.5	
Writing 6.5		
Speaking	6.5 for admission to the Graduate School	
speaking	7.0 for TA appointment	

- 4. be a citizen of a <u>country where English is an official language</u> and the language of instruction in higher education; or
- 5. have successfully completed at least one year of full-time study in a degree program at a fouryear US College or university.
- 6. TOEFL or IELTS test date must be *no older* than two years (24 months) prior to the beginning of the requested entry term.

**NOTE:** The current computer- and paper-based versions of the TOEFL test will be given until the iBT version is implemented in a particular location. Computer-based TOEFL scores must be 213 or higher (with at least 17 on three sections and no section score below 13). The paper-based test requires a

score of 550 or higher (with scores of 50 on at least two of the three sections and no section score below 45).

#### Admission

The procedures followed in evaluating an applicant's potential for success in graduate work and the criteria used for admissions decisions vary according to programs and colleges and reflect an evaluation of the applicant's potential to engage in graduate work and the capability of the individual programs to accommodate additional students. Most programs consider applications as they arrive, while others accumulate applications and make recommendations on admission at certain times during the year. Generally, requests for admission are considered by program admissions committees that forward the program recommendations to the Dean of the Graduate School.

Students are admitted to full or provisional status in a specific degree program. Admission is granted for a specific semester or summer term. Any change in the admission date must be requested in writing and approved by the program and Graduate School. Once the requirements for that degree program have been completed, no further registration as a graduate student will be permitted unless admission to a new graduate classification has been formally approved. Students with special objectives may request admission in the "Graduate-Unclassified Status" or register in the "Post-Baccalaureate Studies" program through the <u>Division of Lifelong Education</u>.

#### Immunization and Medical History

All graduate students admitted to a degree program are required by State law to submit a <u>report of</u> <u>medical history and immunization</u> documentation prior to initial registration. This report must document immunization against tetanus/diphtheria, measles, German measles, polio, and for international students, show results of a tuberculin skin test. Graduate students who have recently completed their undergraduate work at NC State must update their medical history. <u>Student Health</u> <u>Services</u> must receive the required reports at least 30 days before registration. If the student does not meet this requirement, dismissal from school is mandatory under the law.

#### **Transcript Requirements**

The University requires that official copies of transcripts of all prior course work be on file in the student's permanent record at NC State. Students are required to provide the Graduate School with official copies of their latest transcript(s) from all universities attended (official translation required for non-English transcripts), including statements of all degrees awarded, no later than the last day of classes of the first semester they are enrolled.

#### Admission to Degree Programs

#### **Full Graduate Status**

To be considered for admission in full graduate standing, an applicant must have a Bachelor's degree from an accredited college or university as determined by a regional or general accrediting agency and must have at least a "B" (3.00/4.00) average in the undergraduate major or in the latest graduate degree program.

Exceptions on standard accreditation may be granted for applications with international degrees, including applicants with three-year degrees from institutions in Europe participating in the <u>Bologna</u> <u>Process</u>.

#### **Provisional Status**

Students with Bachelor's degrees from accredited institutions whose scholastic records are below the standards for admission to full graduate standing may be admitted provisionally when unavoidable, extenuating circumstances affected their undergraduate averages or when progressive improvement in their undergraduate work warrants provisional admission. Students admitted provisionally under these circumstances can attain full graduate standing after completion of nine or more graduate credit hours with a minimum GPA of 3.00. Courses taken for S/U grade cannot be used as part of the minimum.

Provisional admission may be granted to applicants with Bachelor's degrees from accredited institutions who lack undergraduate work considered essential for graduate study in a major field. Applicants with Bachelor's degrees from non-accredited institutions may be granted provisional admission when their academic records warrant this status.

Full graduate standing is granted when the deficiencies responsible for the provisional status are corrected through additional course work (without graduate credit), provided the student has maintained a satisfactory academic record (3.00 GPA) on all course work taken in a graduate classification. A change from provisional status to full graduate standing is effected only upon the recommendation of the department in which the student is seeking the degree.

A graduate student is not eligible for appointment to an assistantship or fellowship while on provisional status.

#### **Graduate-Unclassifed Status**

The Graduate-Unclassified status is a temporary classification and students admitted to this status are not candidates for degrees. They may take courses for graduate credit but may not apply more than 12 credits earned while in this status to any program leading to an advanced degree at this institution. Unclassified graduate students are expected to meet the same admissions requirements that apply to graduate students in full standing. Any individual having an interest in applying for admission as a Graduate-Unclassified Student should correspond with the Graduate Dean describing his or her particular interests and objectives prior to making application.

#### **Admission for International Students**

International graduate students are admitted to either full-time study in a specific graduate program or into the Graduate-Unclassified category as an international visitor. In addition to admission requirements listed elsewhere for graduate admission, applicants who are not U.S. citizens must complete and submit a Visa Clearance Form and/or a Certificate of Financial Responsibility before a final admission decision can be made. Criteria for international visitors are as follows:

- 1. International student visitors must state their educational objectives at NC State and the time expected to accomplish those objectives (normally one semester or one academic year). The educational objective may not be to seek a graduate degree at NC State.
- 2. They are expected to meet the same minimum academic admission requirements that apply to graduate students in full standing.
- 3. They are expected to meet the same TOEFL requirements that apply to international students who are admitted to Master's and doctoral programs if they plan to take courses. If they plan to register for research only, they are not required to take the TOEFL.
- 4. They must be recommended by the DGP of the program in which they plan to take courses or do research. Special admission status may apply for a period not to exceed one year.
- 5. They may hold a research assistantship but may not hold a teaching assistantship (provided their nonimmigrant status allows on-campus employment).
- 6. They will not be eligible for the Graduate Student Support Plan.
- 7. Those in F-1 or J-1 status must maintain full-time enrollment and all other requirements based on their particular nonimmigrant status.

## Post-Baccalaurate Studies (PBS)

The <u>Post-Baccalaureate Studies</u> (PBS) classification is designed for U. S. citizens or permanent residents who wish to undertake academic work beyond the Bachelor's degree but who are not currently admitted to a degree program. This classification is not open to international students with the exception of the spouse of a regularly enrolled NC State student. In special cases where students are sponsored by an agency of the U.S. government for specialized, non-degree study, approval may be given by the Graduate School for registration in the PBS classification. The following rules apply to students who wish to register for PBS.

Please note that the following are university minimum requirements. Some departments may have more restrictive requirements.

- 1. All must have Bachelor's degrees from accredited institutions of higher education. Registration is through the Division of Continuing Studies.
- 2. All classes taken for credit by PBS students will be graded in the usual manner that applies for the particular course (A+ through F or S/U). All courses taken at NC State will appear on the student's transcript.
- 3. If the student is admitted as a graduate student, a maximum of twelve (12) hours may apply toward the minimum university requirement of the Master's degree (i.e., 30 credit hours) for which the student is enrolled, including hours approved for graduate credit while classified as a senior or unclassified graduate. The first twelve (12) hours of course work taken at the graduate level in the PBS category will be accepted toward degree requirements unless a request for some other combination of twelve (12) hours is made by the student's advisory committee and approved by the Graduate Dean. PBS credits cannot be transferred into a doctoral program.
- 4. If a student's graduate degree is terminated, he/she cannot use courses taken in PBS status after termination for credit toward the same graduate degree program.
- 5. The grade point average (GPA) of a graduate student who has credits in the PBS category will be based on all courses taken at the 400-800 level. However, no course taken six (6) years prior to

graduation from a program can be used to meet the requirements for a later graduate degree at NC State.

- 6. Registration is limited to a maximum of two courses per semester. Individuals who are employed full-time should limit their PBS registrations to one course per semester.
- 7. The PBS classification carries with it no implication that the student will be admitted to the Graduate School in any degree classification.
- 8. All course work accepted for degree credit must be approved by the student's advisory committee as being germane to the program. Requests for degree credit for courses completed in the PBS classification are considered after admission to a graduate degree program when the student's Plan of Graduate Work is filed with the Graduate School.
- 9. PBS students are expected to familiarize themselves with Graduate School and departmental policies and to seek further advice or clarification as needed.

## **Distance Education**

Distance learning offers you the opportunity to participate in a different learning environment by allowing students to have instruction off campus. Valuable learning time is gained by providing an educational environment that increases accessibility and flexibility for learners.

NC State's distance learning includes some Internet-based courses, but also offers study through the use of videotape, cable TV, interactive TV, satellite, and independent study programs. In addition, <u>Distance Education</u> courses require more writing than in a traditional classroom setting via electronic participation. On-line discussions and e-mail communications allow regular involvement by all students, not just a few.

## **Distance Education Programs**

NC State offers credit courses on a vast number of subjects, with more than 100 individual distance education courses to choose from in the humanities, engineering, social sciences, textiles, physical sciences, and more.

Degree programs require admission to the university. Since each program sets its own admission requirements, students should contact the program of their interest for details. A full listing of programs is available on the Distance Education website.

Professional development courses are also available through Distance Education; all are for-credit offerings designed to meet the professional development needs of specific audiences. No admission to the university is required.

Other options include non-credit and continuing education programs such as short courses, computer training, or customized programs for businesses and other groups. No admission to the university is required to enroll in these programs.

#### **Evening Degree Programs**

Some graduate degree programs offer late afternoon and evening courses for students who are unable to attend classes during the day. These students may also have the option of earning their degree through <u>Distance Education</u>. For further information about these programs, students should contact the specific department.

#### **Alternative Teacher Education Programs**

<u>Alternative teacher education programs</u> are for people with a desire to teach in elementary, middle, or high schools but do not have an undergraduate degree in education. Please note that all alternative licensure programs at NCSU require a minimum GPA of 2.50 and a four-year degree from an accredited college or university. There are two types of alternative licensure: licensure only and lateral entry.

Licensure only programs are for people who want to complete their teaching license ("A"-level) before entering the classroom. These programs include education coursework, content-specific coursework, and student teaching.

Lateral entry programs are for people who want to work on their coursework while teaching full-time. Lateral entry programs include education coursework, content-specific coursework, and a one-hour practicum in place of student teaching. Participants in lateral entry programs will receive a lateral entry license when they are hired in a teaching position and then will be recommended for a clear ("A"-level) license upon completion of the lateral entry program. There are two types of lateral entry programs offered at NCSU. The traditional lateral entry program can be completed over the course of three years. The NC TEACH program is an intensive one-year program in which participants enter as a cohort and are provided with an extensive support network to aid their transition into the classroom.

## **Graduate Programs**

The Graduate School offers programs of study leading to both Master's and doctoral degrees. Graduate education is the final stage in the development of intellectual independence. It is different from undergraduate education in that the student is encouraged to establish premises, to hypothesize and to defend both the procedure and the conclusions of independent investigation. Emphasis is placed upon the student's scholarly development through formal course work, seminars, research and independent investigation.

Each student's program is planned with an advisory committee of graduate faculty members to provide the opportunity for gaining advanced knowledge in the particular field of study. It is the responsibility of *ALL* graduate students to know and understand their degree requirements. Students are responsible for the fulfillment of those requirements.

#### **Master's Degree Programs**

Master of Science and Master of Arts Degrees Master's Degree in Designated Field Option B Master's Degree Transfer Credits Advisor and Advisory Committee Plan of Work Language Requirements Minor Co-Major Comprehensive Examinations Thesis Time Limit Summary of Master's Procedures

#### **Doctoral Degree Programs**

Doctor of Philosophy and Doctor of Education Degrees Residence Credits Advisor and Advisory Committee Plan of Work External Minor Co-Major Candidacy Comprehensive Examinations Dissertation Time Limit Summary of Doctoral Procedures

## Master of Science and Master of Arts

All Master of Science and Master of Arts degree programs are planned with the objective of making possible a reasonable, comprehensive mastery of the subject matter in a chosen field. In most cases, the Master of Science and Master of Arts programs provide training and experience in research in order to familiarize the student with the methods, ideals and goals of independent investigation. In these cases, representative of most Master of Science and Master of Arts programs do not require a thesis.

## Requirements

- 1. A minimum of 30 semester hours of graduate work in the degree program, unless the specific program requires more hours. (See also <u>Credit Hour Requirements for Master's Degrees</u> in the Graduate Handbook.)
- 2. A reading knowledge of a foreign language (in a few programs)
- 3. A comprehensive written examination (in some programs)
- 4. A thesis (in most programs)
- 5. A comprehensive oral examination (except Option B programs)

## Time Limit

Requirements for **ALL** Master's degrees must be completed within six (6) calendar years. For further information about the time limit for degrees, please see <u>Administrative Handbook Section 3.4</u>.

## Master's Degree in a Designated Field

A number of departments and programs offer Master's degrees in designated fields. These are professional degrees and do not require a thesis.

## Requirements

- 1. A minimum of 30 semester hours of graduate work in the degree program (unless the specific program requires more hours).
- 2. A comprehensive written examination (in some programs)
- 3. A comprehensive oral examination (except Option B programs)

## **Option B Master's Degree**

The <u>Option B Master's degree</u> requires that students adhere to the general guidelines for a Master of Arts or Master of Science degree with the following exceptions:

- 1. A comprehensive oral exam is not required
- 2. A thesis is not required
- 3. Departmental research credit hours will not be included as part of the course work
- 4. Individual departments define other requirements for their Option B program, such as additional course work or final projects

- 5. Option B Master's degree programs may not carry an officially designated minor
- 6. Students have a single assigned advisor rather than an advisory committee.

## **Transfer Credits**

## Transfer of graduate credits earned at other universities

A course that was completed at another college or university may be considered for transfer to a Master's program provided that the course is classified as a graduate course; it was completed while the student was in a graduate or post-baccalaureate classification; the grade in the course is "B" (3.00 on a 4.00 scale) or better; the college or university is accredited by one of the following six U.S. regional accrediting agencies: the Southern Association of Colleges and Schools, the Middle States Association of Colleges and Schools, the New England Association of Colleges and Schools, the North Central Association of Colleges and Schools, the Northwest Association of Colleges and Schools, or the Western Association of Colleges and Schools.

## Transfer of graduate credits earned while enrolled in an undergraduate program at NC State University

A course that was completed while the student was enrolled as an undergraduate at NC State University may be considered for transfer to a Master's program, provided that it is at the 400-level or higher, that the grade is "B" (3.00 on a 4.00 scale) or better, that it was not counted to fulfill undergraduate requirements, and that it is recommended by the Director of Graduate Programs at the time of the student's enrollment in the Graduate School. Students admitted to the Accelerated Bachelor's/Master's program may use up to 12 hours of graduate credit to satisfy requirements for both the bachelor's and the Master's degrees. No graduate credit will be allowed for a course completed in an undergraduate classification at another institution.

# Transfer of graduate credits earned while enrolled in a previous graduate degree program at NC State University

A graduate course that was completed while the student was enrolled in a previous graduate program at NC State University may be considered for transfer to a Master's program, provided that it is at the 500-level or higher and that the grade is "B" (3.00 on a 4.00 scale) or better.

## Transfer of Post-Baccalaureate Studies (PBS) graduate credits earned at NC State University

A graduate course that was completed while the student was enrolled in PBS status at NC State University may be considered for transfer to a Master's program provided that it is at the 500-level or higher and that the grade is "B" (3.00 on a 4.00 scale) or better. All PBS credits that are used to satisfy requirements of a specific Master's degree must be earned before the student is admitted to that degree program.

#### **Master's Advisor and Advisory Committee**

All students in graduate programs must have a graduate advisor who is a member of the Graduate Faculty in the student's major program and is appointed by the Dean of the Graduate School upon recommendation of the DGP. In the case of Master's programs requiring theses and/or final oral examinations, the graduate advisor serves as chair or co-chair of the committee.

The primary function of the committee is to advise the student in all aspects of the educational program and to monitor and evaluate that student's progress toward the degree. The committee should provide an intellectually stimulating foundation for the student's professional and scholarly development and should be sensitive to any difficulties in the student's progress, research performance or methodology requiring attention. The committee certifies whether the student has met NC State's standards for a graduate degree. Advising and guiding the student on how best to qualify for the requirements of a degree is a key part of this responsibility.

In all Master's programs except those designated "Option B," the committee will consist of at least three NC State Graduate Faculty members, one of whom is designated as chair and one of whom represents the minor if one has been declared. Those Master's programs designated "Option B" require that the student choose only a major advisor or co-advisors but no committee.

#### **Plan of Work**

The Graduate School does not require that all Master's students submit a <u>Plan of Work</u> (POW). However, Master's students are encouraged to complete a POW in consultation with their advisor as soon as possible after the completion of one half of their course work. The Graduate School reserves the right to request a POW under some circumstances. In this capacity, the POW serves as a contract between the student and his or her graduate program, reducing the possibility of any later misunderstanding as to fulfilling degree requirements.

Whether submitted optionally or as part of the degree requirement, the POW should include both a list of the course work to be undertaken (in all programs) and the thesis or dissertation topic (except in non-thesis programs); be developed by the student and his/her advisory committee; be approved by the committee and the DGP or Department Head prior to submission to the Graduate School for final approval; be submitted (optional) prior to completion of one-half the total Master's program, or (mandatory) upon completion of 12 hours of a doctoral program.

#### Language Requirement

#### **Requirements for Master of Arts and Master of Science Students**

A reading knowledge of one modern foreign language (Germanic, Romance or Slavic) is required by some programs for the Master of Science and Master of Arts degrees. Other programs may designate that the language requirement be filled from among those languages in which the Department of Foreign Languages and Literatures conducts testing. Students should contact the major program for specific language requirements.

## Master's Degrees in Designated Fields

There is no language requirement in the professional Master's degree programs (Master's degrees in designated fields) with the exception of the Master's of International Studies, which requires knowledge of one foreign language at a level of conversational proficiency.

## Minor

The Graduate School does not require a minor, though individual programs may require one. If a program does not require a minor, the graduate student has the option of choosing one, except in an Option B Master's program. The minor work will usually be from a single discipline or field that in the judgment of the advisory committee provides relevant support to the major field. However, the committee has the alternative of developing an interdisciplinary minor if it best serves the needs of the student. When a student does select a minor, the advisory committee must include a representative of the minor field. The minor credits on the Plan of Graduate Work must be approved by the graduate advisory committee member representing the minor, and, in some cases, the DGP from the minor program.

## **Co-Major**

Students may co-major at the Master's level in programs with identical degrees, although the degrees do not necessarily have to have identical requirements, e.g., two master of science programs, one with a thesis requirement and one without. Students must obtain the approval of both graduate programs as well as appropriate representation on the advisory committee, and must meet all requirements of both programs. Students who co-major are not required to declare a minor. Co-majors must meet all requirements for majors in both programs. One degree is awarded and the co-major is noted on the transcript.

## **Master's Comprehensive Examination**

## Written Examination

Written examinations covering the subject matter of the major and the minor may be required. Information concerning written examination schedules should be obtained from the student's program.

## **Oral Examination**

Candidates for Master's degrees, except those in Option B programs, must pass a <u>comprehensive oral</u> <u>examination</u> to demonstrate to the advisory committee that he/she possesses a reasonable mastery of the subject matter of the major and minor fields and that this knowledge can be used with promptness and accuracy. This exam takes the form of a traditional defense of the thesis in those programs requiring theses. In programs that require a thesis, the thesis must be submitted in complete form, except for such revisions which may be necessary as a result of the final oral exam, to all members of the advisory committee at least two (2) weeks prior to the exam. Failure of a student to pass the oral examination terminates the student's graduate work at NC State unless the graduate advisory committee unanimously requests that the Graduate School permit a re-examination. Only one re-examination will be given.

Oral examinations where one or more of the participants are located remotely from the others may occasionally become necessary, but they should never be normal practice. If such circumstances arise, please see <u>Section 3.6</u> of the Administrative Handbook for rules requesting and conducting a remote exam.

## Thesis

Candidates for the Master of Arts or Master of Science degrees in programs requiring a thesis must undertake an original investigation into a subject, which has been approved by the student's advisory committee and DGP, and prepare a thesis. Information on form and organization of the thesis, in addition to other regulations, is presented in the University's on-line <u>Thesis and Dissertation Guide</u>.

## Time Limit

All requirements for the Master's degree must be completed within six calendar years, beginning with the date the student commences courses carrying graduate credit applicable to the degree program, unless a more restrictive time limit has been established by the academic college/school or program. The term limit remains at six (6) years even if a student was on approved leave of absence during the six-year period. For further information about the time limit for degrees, please see <u>Administrative</u> <u>Handbook Section 3.4</u>.

## **Summary of Master's Procedures**

## **All Master's Students**

- 1. Application materials and required fees received
- 2. Application materials reviewed by graduate program
- 3. Graduate program forwards recommendation regarding applicant's admissibility to the Dean of the Graduate School
- 4. The Dean of the Graduate School reviews the recommendation and the student is notified of the action taken on the request for admission
- 5. Outstanding transcripts, if any, showing any or all post-secondary coursework attempted and degree(s) conferred since application should be submitted by student to the Graduate School, prior to matriculation
- 6. Student arrives, reports to the graduate program, is assigned a graduate advisor and develops a roster of courses and credits with the advisor
- 7. Student subject to continuous registration policy until graduation
- 8. Student signs and submits Patent Agreement
- 9. Program encouraged by Graduate School to require student to develop a Plan of Graduate Work, in consultation with and with the approval of his/her graduate advisor and DGP. If submitted via SIS to the Graduate School, Graduate Records staff will review the Plan of Graduate Work and advise the program of any changes that would need to be made before the

Request for a Permit to Schedule the Master's Oral Examination or Request for Option B Graduation Checkout can be approved by the Graduate School

- 10. Student passes language examination, if required
- 11. Student passes written examination, if required
- 12. Student submits Diploma Order Request form by end of third week of the semester or summer session of anticipated graduation
- 13. A GPA of at least 3.00 for the degree requirements as well as on overall graduate course work at NC State is required for graduation
- 14. All degree requirements must be completed within six calendar years, beginning with the date the student takes courses carrying graduate credit applicable to the degree program, unless a more restrictive time limit has been established by the program or academic college/school.

## **Students in Thesis Programs**

- 1. Graduate advisory committee of three or more Graduate Faculty members is appointed by the DGP.
- 2. A preliminary copy of the thesis is submitted to the chair of the student's advisory committee
- 3. When all requirements except completion of the course work in the final semester are satisfied and after the thesis is complete except for such revisions as may be necessary as a result of the exam, the DGP submits to the Graduate School the Request for a Permit to Schedule the Master's Oral Examination
- 4. If Graduate School requirements are met, the Request for a Permit to Schedule the Master's Oral Examination is approved by the Graduate School within 10 working days of receipt of the request, and the permit, Admission to the Final Master's Oral Examination, is issued
- 5. At least two weeks prior to the final oral examination, the chair of the student's advisory committee submits the thesis, if required, to the other members of the advisory committee for review
- 6. Final examination is scheduled and conducted
- 7. The Admission to the Final Master's Oral Examination form is completed by the committee members, including date and result, and submitted to the Graduate School by the DGP. The Graduate School should receive the report within five working days of the examination
- 8. Student submits three copies of the thesis, signed by each member of his/her advisory committee, to the Graduate School
- 9. The deadline for submitting the thesis to the Graduate School in order for the student to graduate in a given semester or summer session appears in the Graduate School Calendar
- 10. The thesis is reviewed by the Graduate School to ensure that the format conforms to the specifications prescribed in the Thesis and Dissertation Guide.

## Students in Master's of Discipline Non-Thesis Programs

- 1. Graduate advisory committee of three or more Graduate Faculty members is appointed by the DGP
- When all requirements except completion of the course work in the final semester are satisfied, DGP submits to the Graduate School the Request for a Permit to Schedule the Master's Oral Examination

- 3. If Graduate School requirements are met, a Request for a Permit to Schedule the Master's Oral Examination is approved by the Graduate School within 10 working days of receipt of the request and the permit, Admission to the Final Master's Oral Examination, is issued
- 4. Final examination is scheduled and conducted
- 5. Final examination report, including date and result of the examination, submitted to the Graduate School by the DGP. The Graduate School should receive the report within five working days of the examination
- 6. The deadline date for unconditionally passing the final examination in order for the student to graduate in a given semester or summer session appears in the Graduate School Calendar.

## **Students in Option B Programs**

DGP submits requests for graduation checkout to the Graduate Dean no later than six weeks after the first day of the semester (seven working days after the first day of the summer session) in which the student is taking the last course in his or her program and anticipates graduation.

## **Doctor of Philosophy and Doctor of Education Degrees**

The doctorate symbolizes the ability of the recipient to undertake original research and scholarly work at the highest levels without supervision. The degree is therefore not granted simply upon completion of a stated amount of course work but rather upon demonstration by the student of a comprehensive knowledge and high attainment in scholarship in a specialized field of study. The student must demonstrate this ability by writing a dissertation reporting the results of an original investigation and by passing a series of comprehensive preliminary examinations in the field of specialization and related areas of knowledge, and successfully defending the dissertation.

## Requirements

- 1. At least two residence credit points secured in continuous semesters' residence as a graduate student at the University.
- 2. Doctoral degrees at North Carolina State University require a minimum of 72 graduate credit hours beyond the Bachelor's degree. For a student who has a Master's degree from a university other than NC State, a maximum of 18 hours of relevant graduate credit from the Master's degree may be applied toward this minimum, upon the recommendation of the student's Graduate Advisory Committee. If a student completes a Master's degree at NC State and continues for a doctoral degree without a break in time, up to 36 credit hours taken while in Master's status may be used to meet minimum requirements for the doctoral degree.
- 3. A preliminary comprehensive examination (written and oral components)
- 4. A dissertation
- 5. A final comprehensive oral examination
- 6. Dissertation defense.

## **Residence Credits**

A student working toward a doctoral degree is expected to be registered for graduate work at NC State for at least six (6) semesters beyond the Bachelor's degree. The University has basic residence

requirements, as defined below, but the academic schools/colleges have the prerogative of establishing more restrictive requirements within the respective schools/colleges. Residence credit is determined by the number of semester hours of graduate work carried during a regular semester.

The POW should include both a list of the course work to be undertaken (in all programs) and the dissertation topic; be developed by the student and his/her advisory committee; be approved by the committee and the DGP or Department Head prior to submission to the Graduate School for final approval; be submitted prior to completion of 12 hours of a doctoral program.

At least two residence credits are necessary in continuous residence (registration in consecutive semesters) as a graduate student at the University, but failure to take courses in the summer does not break continuity.

Semester Credits (Hours)	Residence Credits
9 or more	1
6-8	2/3
less than 6 (including registration in 590, 690 series)	1/3

## **Summer Residency**

Summer course work, however, can be used in partial fulfillment of this requirement. A single summer session is equal to one-half of the corresponding amount for a regular semester. For example, six semester hours carried during a summer session will earn one-third of a residence credit; less than six credit hours will earn one-sixth of a residence credit.

## **Doctoral Advisor and Advisory Committee**

All students in graduate programs must have a graduate advisor who is a member of the Graduate Faculty in the student's major program and is appointed by the Dean of the Graduate School upon recommendation of the DGP. The graduate advisor serves as chair or co-chair of the committee.

The primary function of the committee is to advise the student in all aspects of the educational program and to monitor and evaluate that student's progress toward the degree. The committee should provide an intellectually stimulating foundation for the student's professional and scholarly development and should be sensitive to any difficulties in the student's progress, research performance or methodology requiring attention. The committee certifies whether the student has met NC State's standards for a graduate degree. Advising and guiding the student on how best to qualify for the requirements of a degree is a key part of this responsibility.

A doctoral student's committee will consist of at least four NC State Graduate Faculty members, one of whom represents the minor field if a minor has been declared. The committee is indicated on the Plan of Graduate Work. In this way, the committee is officially recommended by the DGP, and must be approved by the Graduate School at the time of the approval of the Plan of Graduate Work.

## Plan of Work

Doctoral students are required to complete a <u>Plan of Work</u> (POW) in consultation with their advisors. The doctoral POW, including the courses to be undertaken in the student's program and the dissertation topic, should be prepared by the doctoral student and his/her advisory committee and submitted electronically to the Graduate School. The POW as a whole should be rationally unified, with all constituent parts contributing to an organized plan of study and research, and courses must be selected from groups embracing one principal subject of concentration, the major, with the option of designating courses in a cognate field, the minor. When a student elects to designate a minor, he/she should select the minor course work from a discipline or field that, in the judgment of the advisory committee, provides relevant support to the major field.

The POW should include both a list of the course work to be undertaken (in all programs) and the dissertation topic; be developed by the student and his/her advisory committee; be approved by the committee and the DGP or Department Head prior to submission to the Graduate School for final approval; be submitted prior to completion of 12 hours of a doctoral program.

## **External Minor**

Minors granted at the doctoral level for work completed at another institution are called "external minors." Typically, in these cases a doctoral student at NC State wishes to have course work from a prior extradisciplinary Master's program at another university approved as the minor for their current doctoral degree. The DGP must recommend a representative at NC State from the discipline of the proposed external minor to both serve on the advisory committee and to review and determine whether the course work is sufficient to constitute the minor at the doctoral level.

## **Co-Major**

Students may co-major at the doctoral level with the approval of both programs and with the appointment of a co-chair from each program on the advisory committee. Co-majors are not permitted between Doctor of Philosophy and Doctor of Education degree programs. Co-majors must meet all requirements for majors in both programs. One degree is awarded and the co-major is noted on the transcript.

## Candidacy

A doctoral student is admitted to candidacy by the Graduate School upon passing the preliminary examinations without conditions or after fulfilling any conditions specified by the advisory committee.

## **Comprehensive Examinations**

## **Preliminary Examinations**

Each doctoral student is required to take preliminary or comprehensive examinations, consisting of written examinations and an oral examination, not earlier than the end of the second year of graduate study and not later than one semester (four months) before the final oral examination.

Written examination questions may cover any phase of the course work taken by the student during graduate study or any subject logically related to an understanding of the subject matter in the major and minor areas of study. The questions are designed to measure the student's mastery of his/her field and the adequacy of preparation for research. Committee members must notify the DGP when a student has completed the written examination. Failure to pass the written portion terminates the student's work at this institution, subject to departmental and/or school/college policies with respect to reexamination.

Upon satisfactory completion of the written portion of the preliminary examinations and after completion of all course work relevant to the examination, the student submits a <u>Request to Schedule</u> <u>the Doctoral Oral Examination</u>, indicating that he/she wishes to schedule the preliminary examination.

The preliminary oral examination is conducted by the student's advisory committee and the Graduate School Representative and is open to all Graduate Faculty members. The Graduate School will notify the student and the examining committee. The oral examination is designed to test the student's ability to relate factual knowledge to specific circumstances, to use this knowledge with accuracy and promptness and to demonstrate a comprehensive understanding of the field of specialization and related areas.

A unanimous vote of approval by the members of the advisory committee is required for the student to pass the preliminary oral examination. Approval may be conditioned, however, on the successful completion of additional work in some particular field(s). All committee actions may be appealed by written application to the Graduate Dean (refer to <u>NC State policy on grievance procedures for students</u>).

Failure to pass the preliminary oral examination terminates the student's work at this institution unless the examining committee recommends a reexamination. No reexamination may be given until at least one full semester has elapsed, and only one reexamination is permitted in a given doctoral program.

## **Final Oral Examination**

As with the preliminary oral examination, the chair of the student's advisory committee is in charge of conducting the final oral examination. The final oral examination is scheduled after the dissertation is complete except for such revisions as may be necessary as a result of the examination, but not earlier than four calendar months after admission to candidacy and not before all required course work has been completed or is currently in progress.

The examination consists of the candidate's defense of the methodology used, the data collected, and the conclusions reached in the research, as reported in the dissertation. It is conducted by an examining committee, which consists of the student's advisory committee and a Graduate School Representative. This examination is open to the University community.

While the chair has the option of allowing visitors to ask questions of the candidate, the chair also has the obligation to maintain a scholarly atmosphere and to keep the student's best interest foremost. Graduate Faculty members who are not on the advisory committee will have the opportunity to express their opinions to the committee in the absence of the student. However, the final deliberations

and the vote are private to the examining committee.

A unanimous vote of approval of the advisory committee is required for passing the final oral examination. Approval may be conditioned, however, on the student's meeting specific requirements prescribed by the student's advisory committee. Failure of a student to pass the examination terminates his or her work at this institution unless the advisory committee recommends a reexamination. No reexamination may be given until one full semester has elapsed and only one reexamination is permitted.

Oral examinations where one or more of the participants are located remotely from the others may occasionally become necessary, but they should never be normal practice. If such circumstances arise, please see <u>Section 3.6</u> of the Administrative Handbook for rules for requesting and conducting a remote exam.

## Dissertation

The doctoral dissertation is the document presenting the results of the student's original investigation in the field of primary interest. It must represent a contribution to knowledge, adequately supported by data, and be written in a manner consistent with the highest standards of scholarship. Publication is expected and encouraged.

The dissertation will be reviewed by all members of the advisory committee and must receive their approval prior to submission to the Graduate School. Information on the required form and organization of the dissertation, in addition to other regulations, is presented in the University's <u>Thesis</u> and <u>Dissertation Guide</u>. At the time of the dissertation's submission to the Graduate School, the student is also required to submit one copy each of the Survey of Earned Doctorate form and University Microfilms International Agreement form and to complete a brief, standard questionnaire about his or her experience as a graduate student at NC State. The University also requires that all doctoral dissertations be microfilmed by University Microfilms International, Ann Arbor, MI, including the publication of the abstract in Dissertation Abstracts International. The student pays the cost of this service.

## Time Limit

Doctoral students must attain candidacy for the degree within six (6) calendar years. All degree requirements must be completed within ten (10) calendar years. For further information about the time limit for degrees, please see <u>Administrative Handbook Section 3.4</u>.

## **Summary of Doctoral Procedures**

- 1. Application materials and required fee received
- 2. Application materials reviewed by graduate program
- 3. Graduate program forwards recommendation regarding applicant's admissibility to Graduate Dean
- 4. The graduate program's recommendation is reviewed and the student is notified of the action taken on the request for admission

- 5. Outstanding transcripts, if any, showing any or all post-secondary coursework attempted and degree(s) conferred since application should be submitted by student to the Graduate School, prior to matriculation
- 6. If admitted, the student arrives, reports to the graduate program, is assigned an advisor and makes out a roster of courses in consultation with the departmental advisor and DGP
- 7. Advisory committee of at least four NC State Graduate Faculty members, one of whom is designated as the chair and one of whom represents the minor field (where appropriate), is appointed by the Graduate Dean upon the recommendation of the DGP. The Graduate Dean also selects a Graduate Faculty member to serve as the Graduate School Representative on the student's committee
- 8. Student signs and submits Patent Agreement
- 9. A dissertation subject is selected and an outline of the proposed research is submitted to the student's advisory committee and the DGP for review and approval
- 10. Plan of Graduate Work is prepared by the advisory committee with the student, is approved by the DGP, and is submitted to the Graduate School for approval as soon as feasible after completion of 12 hours of course work
- 11. Written examinations in the major and minor fields are scheduled no earlier than the end of the second year of graduate study and not later than one semester before the final oral examination. The results of these examinations will be reported to the Graduate School
- 12. When all written examinations have been completed satisfactorily, the chair submits the Request for Approval to Schedule the Doctoral Oral Examination, designating the preliminary oral examination, at least two weeks prior to the suggested date. Upon approval of the request, the student and examining committee are notified of the time and place. The DGP sends the report of the exam to the Graduate School and if the exam is passed without conditions, the student is admitted to candidacy
- 13. A copy of the preliminary draft of the dissertation is submitted to the chair of the student's advisory committee for review.
- 14. The Diploma Order Request Form must be filed with the Graduate School by the end of the sixth week of the semester or summer session of anticipated graduation. Failure to submit the form by this date may result in the student's failure to receive the diploma at graduation
- 15. At least two weeks prior to the final oral examination, the chair of the student's advisory committee submits the dissertation to advisory committee members for review
- 16. Four calendar months after admission to candidacy or later, and after the dissertation is complete except for such revisions as may be necessary as a result of the final exam, the chair submits to the Graduate School the Request for Approval to Schedule the Doctoral Oral Examination, designating a request for permission for the candidate to take the final oral exam. Requests should be filed at least two weeks before the date of the examination. Upon approval of the request, the student and the examining committee, including a Graduate School representative, are notified of the time and place of the examination. The Graduate School Representative receives a copy of the dissertation at least one week prior to the examination
- 17. The Graduate School requires that all theses and dissertations be submitted electronically following the requirements in the ETD website (electronic thesis and dissertation). Specific deadlines for each semester, as well as formatting requirements, are posted in the online Thesis and Dissertation Guide, located within the ETD website.
- 18. The dissertation is reviewed by the Graduate School to ensure that the format conforms to the specifications prescribed in the Thesis and Dissertation Guide.

- 19. All course work scheduled in a graduate degree classification must be completed prior to graduation
- 20. A GPA of at least 3.00 is required for graduation.
- 21. All degree requirements must be completed within ten (10) calendar years, beginning with the date the student commences courses carrying graduate credit applicable to the degree program, unless a more restrictive time limit has been established by the program or academic college/school.

## Registration

The <u>Department of Registration and Records</u> must have authorization from the Graduate School before a graduate student in any classification will be permitted to register for classes. This authorization will be sent to the Department of Registration and Records at the time the student is notified of acceptance for graduate study. All students attending classes must be registered for credit or audit. Grade records are furnished the students at the end of each scheduled school term.

Course Load Full-time/Part-time Determination for Graduate Students Accelerated Bachelor's/Master's Degree Program Continuous Registration Course Numbering Grading and Academic Standing Audits Graduation Diplomas Interinstitutional Registration Cooperating Raleigh Colleges Academic Common Market

## **Course Load**

## **Fall and Spring Semesters**

A full-time graduate course load is nine to 15 credits per semester. Graduate students holding assistantships, however, have additional course load restrictions

## **Summer Sessions**

Graduate students are not required to be registered in summer sessions. If they are full time in the previous spring semester and are continuing their graduate study in the following fall semester, they are considered to be full time in the summer. If a student needs to be registered, one credit hour is considered full time.

## **International Students**

The <u>U.S. Citizenship and Immigration Services</u> (USCIS) requires international students on F-1 and J-1 visas to carry a full-time course of study to remain in status.

## **Course loads and assistantships**

Graduate students holding assistantship appointments are restricted to 9 hours per semester if they hold an appointment of one-half-time or greater and 12 hours per semester if they hold a one-quarter-time appointment. With advance written permission from the Graduate School, a student may take

more than the maximum semester course load during a particular semester if the total credit hours do not exceed the maximum for the term of the appointment.

#### Full-Time/Part-Time Determination for All Graduate Students

NC State uses a uniform Schedule of Full-Time Status of Graduate Students for Loan Deferment, Financial Aid, Payroll Tax Withholding and Veteran's Benefits Purposes. To maintain consistency throughout the university system, faculty members do not have the authority to submit individual letters verifying the status of a graduate student. This schedule will be the only resource used to determine a student's status for these purposes. <u>Registration and Records</u> in Room 1000, Harris Hall processes all student loan deferments. The Graduate School will not be directly involved in preparing loan deferment letters.

These definitions apply to all graduate students, U.S. and international, participants and nonparticipants in the Graduate Student Support Plan.

Classification	Full-Time	Half Time		
Non-Thesis Master's	Registration for nine (9) or more credit hours per Fall or Spring semester, or a minimum of three (3) hours per semester during the semester in which the student is completing the last course(s) required to complete the degree. Students who have completed <sup>1</sup> all credit hour requirements for their degree must register for three (3) hours of XXX 689 (Non-Thesis Master Continuous Registration – Full Time Registration). Students may register for this course a maximum of one semester.	Registration for 3-8 credit hours per Fall or Spring semseter, or one (1) hour of XXX 688 (Non-Thesis Master's Continuous Registration- Half Time Registration) for students who have completed <sup>3</sup> all credit hour requirements for their degree.		
Thesis Master's	Registration for nine (9) or more credit hours per Fall or Spring semester, or a minimum of three (3) hours per semester during the semester in which the student is completing the last course(s) required to complete the degree. For thesis students, this could include XXX 695. Students who have completed <sup>2</sup> all credit hour requirements (including research	Registration for 3-8 credit hours per Fall or Spring semester, or one (1) hour of XXX 699 (Master's Thesis Preparation) for students who have completed <sup>4</sup> all credit hour requirements (including research credits) for their degree and are completing their research and/or writing and defending the thesis.		

#### Fall and Spring Semesters

	credits) for their degree except for completing their research and/or writing and defending the thesis should register for three (3) hours of XXX 699 (Master's Thesis Preparation) each semester until graduation.	
Doctorate	Registration for nine (9) or more credit hours per Fall or Spring semester until the student completes all credit hour requirements for the degree, including research credits, and the oral preliminary examination, or three (3) hours per semester of XXX 899 (Doctoral Dissertation Preparation) for students who have completed <sup>5</sup> all credit hour requirements for their degree (including research credits and the oral preliminary examination) except for completing their research and/or writing and defending the dissertation.	Registration for 3-8 credit hours per Fall or Spring semester, or one (1) credit of XXX 899 for students who have completed <sup>6</sup> all credit hour requirements for their degree (including research credits and the oral preliminary examination) except for completing their research and/or writing and defending the dissertation.

<sup>1</sup>Students with an IN grade who have successfully completed all of the remaining degree requirements that are listed above are also eligible to register for three (3) hours of 689 and be considered full time.

<sup>2</sup>Students with an IN grade who have successfully completed all of the remaining degree requirements that are listed above are also eligible to register for three (3) hours of 699 and be considered full time.

<sup>3</sup>Students with an IN grade who have successfully completed all of the remaining degree requirements that are listed above are also eligible to register for one (1) hour of 688 and be considered half time.

<sup>4</sup>Students with an IN grade who have successfully completed all of the remaining degree requirements that are listed above are also eligible to register for one (1) hour of 699 and be considered half time.

<sup>5</sup>Students with an IN grade who have successfully completed all of the remaining degree requirements that are listed above are also eligible to register for three (3) hours of 899 and be considered full time.

<sup>6</sup>Students with an IN grade who have successfully completed all of the remaining degree requirements that are listed above are also eligible to register for one (1) hour of 899 and be considered half time.

## **Summer Sessions**

Graduate students are not required by the University to be registered during the summer. However, students who receive a stipend but who are not enrolled in the University during a period of five weeks or more are subject to Social Security tax withholding. In particular, this means that Social Security taxes will be withheld from the paychecks of Graduate Research Assistants (RAs) who do not register in the summer. Specifically, Social Security taxes will be withheld in June for RAs who are not registered in Summer Session I and in July for RAs who are not registered in Summer Session II. The source of funds that pays the stipend must pay the same amount of Social Security tax as is withheld from the

student's paycheck during these months.

Two special registration categories are available for Graduate Research Assistants who would not otherwise take courses in the summer: XYZ 696 (Summer Thesis Research) and XYZ 896 (Summer Dissertation Research), where XYZ represents the course prefix of a specific department or program. Each of these courses is for 1 hour of credit, with registration for 10 weeks, beginning the first day of Summer Session I. Social Security taxes will not be withheld from the June or July paychecks of RAs who register for either 696 or 896.

Please note that student who are not registered during the summer do not have access to financial aid during that period, nor do they have access to the Student Health Service unless they pay the student health fee for each of the two summer sessions.

## Accelerated Bachelors/Masters Degree Program

The objective of the Accelerated Bachelors/Master's (ABM) degree program is to provide a means by which exceptional undergraduate students at NC State may complete the requirements for both the Bachelor's and Masters degrees at an accelerated pace. It provides an opportunity for exceptional undergraduate students at NC State to double count up to 12 credits and obtain a non-thesis Master's degree within 12 months of completing the Bachelor's degree or obtain a thesis based Master's degree within 24 months of completing the Bachelor's degree.

Students interested in the ABM Program should contact their department.

## **Continuous Registration**

After a student is admitted to the Graduate School and enrolls for the first time, she/he is required to maintain continuous registration, i.e., be enrolled each semester, excluding summer sessions, until she/he has either graduated or her/his graduate program at NC State has been terminated. All students who graduate during the second summer session must be registered for either the first or second summer session.

## Leave of Absence

A student in good academic standing who must interrupt her/his graduate program for good reasons may request a <u>leave of absence</u> from graduate study for a definite period of time not to exceed one year within a given graduate program. The request should be made at least one month prior to the term involved. Upon endorsement of the request by the student's graduate advisory committee and Director of Graduate Programs, and approval by the Graduate School, the student would not be required to be registered during the leave of absence. The time that the student spends on an approved leave of absence will be included in the time allowed to complete the degree, i.e., six (6) years for Master's and ten (10) for doctoral.

#### Termination

Graduate students whose programs have been terminated because of failure to maintain continuous registration and who have not been granted a leave of absence during a fall or spring semester will be required to reapply for admission, and pay the admission fee (\$65.00 for US Citizens and Permanent Residents or \$75.00 for Non-Resident Aliens [Internationals]), if they wish to resume their graduate studies at NC State.

#### **Adding Courses**

Courses may be added during the first week of a semester, via MyPack Portal alone, or during the second week, via MyPack Portal and with permission of the instructor. In a summer session, courses may be added during the first two days via MyPack Portal alone, and/or during the third and fourth days via MyPack Portal with permission of the instructor. To add a student to a course after the deadline for adding courses, an instructor must submit a <u>Schedule Revision Form</u> to the School/College or Graduate Dean's approval.

## **Dropping Courses**

All 500-800 level courses may be dropped through MyPack Portal without grades during the first eight weeks of a semester and during the first two weeks of a summer session. Students and advisors should consult the specific Registration and Records calendar for drop deadlines. Students should make schedule changes as early as possible in the semester. The number of hours for which a student is officially enrolled and upon which tuition and fees are based is that number in which the student is enrolled at the end of the second week of classes of a semester and at the end of the fifth day of a summer session (the last day to withdraw or drop a course with a refund). A <u>Schedule Revision Form</u> is required to drop a course after the deadline. No dropping of courses shall be allowed except for documented medical reasons or other verified, unforeseen grounds of personal or family hardship. Making such exceptions to policy requires the recommendation of the chair of the student's advisory committee, the DGP or Department Head, and the Dean of the Graduate School. Courses may not be dropped after the final grades have been submitted by the instructor and processed by Registration and Records.

#### **Dropping Minicourses**

The drop date for a five-week minicourse is the last day of the third week of the mini-course. The drop date for a seven-week minicourse is the last day of the fourth week of the minicourse. Instructors teaching minicourses (courses which last only a portion of the semester) should announce at the outset of these courses their appropriate drop deadlines.

#### **Course Numbering**

Graduate-level courses are numbered at the 500, 600, 700 and 800 levels. Courses at the 500- and 600level are available to advanced undergraduate students in the Accelerated Bachelor's/Master's (ABM) Degree Program and to students holding Bachelor's degrees. Courses at the 700 and 800 level are doctoral courses and are open only to students holding Bachelor's degrees. Exceptions may be made for undergraduate students in honors program and seniors in the ABM Program. Consent of the department is required for enrollment in all 600- and 800-level courses. Refer to the <u>NC State</u> <u>University Courses Catalog</u> for course descriptions and prerequisites.

**Note:** Courses at the 500 and 700 level are letter graded. Students cannot enroll in these courses for "credit only".

#### **Grading and Academic Standing**

#### The Grading System

NC State University uses the following grading system:

Grade	Grade Points/Credit Hour		
A+	4.33		
A	4.00		
A-	3.67		
B+	3.33		
В	3.00		
B-	2.67		
C+	2.33		
С	2.00		
C-	1.67		
D+	1.33		
D	1.00		
D-	0.67		
F	0.00		

#### Grade Point Average (GPA)

The number of credit hours at the 400-level of higher that are attempted in a semester or summer session (for which regular grades are received) is divided into the total number of grade points earned to arrive at the grade point average. The cumulative and semester GPAs will include the effect of any A+ grades awarded (at 4 1/3 grade points) up to a grade point average of 4.000. The GPA will be calculated to three decimal points. Credits earned in PBS classification are also included in the GPA calculations and the determination of academic standing that become part of the Plan of Graduate Work.

## **Graduate Credit**

To receive graduate degree credit, a grade of "C-" or higher is required in all courses taken after admission. Grades on courses taken for graduate credit as an undergraduate at NC State, in PBS classification, or transferred from other universities must have a grade of "B" or better to be transferred. All grades on courses numbered 400 and above taken in a graduate classification or for graduate credit as an undergraduate are included in the graduate GPA. Courses at the 300 level and below are not eligible for graduate credit and subsequently do not affect the graduate GPA. To graduate, a student must have a minimum 3.00 average on all graduate course work as well as all courses on his or her Plan of Graduate Work.

Graduate students who take 400-level courses that are letter graded do not have the option of taking the courses for "credit only" if they intend for the course to be part of their Plan of Graduate Work. It is appropriate for them to take selected 400-level letter-graded courses that are required by the program but will not be included in the Plan of Graduate Work for S-U grade. Examples would be 400-level courses in the student's major and FLE courses.

## **Grading of Graduate Courses**

5XX	Letter Graded Master's Courses
6XX	S-U Graded Master's Courses
7XX	Letter Graded Doctoral Courses (ALL 7XX courses are restricted to the following classification of students (class MR, DR, SR, SP and GR)
8XX	S-U Graded Doctoral Courses (ALL 8XX courses with the exception of those specifically listed at the end of this section are restricted to the following classification of students class MR, DR, SR, SP and GR)
9XX	Professional Courses in the College of Veterinary Medicine (not covered by this document)

**NOTE:** Courses at the 500 and 700 level are letter graded. Students cannot enroll in these courses for "credit only".

## Incompletes

The grade of "IN" (Incomplete) may be given in any course at the discretion of the instructor for work not completed because of a serious interruption in the student's work not caused by their own negligence. An "IN" must not be used, however, as a substitute for an "F" when the student's performance in the course is not passing. An "IN" is only appropriate when the student's record in the course is such that the successful completion of particular assignments, projects, or tests missed as a result of a documented serious event would enable that student to pass the course. Only work missed may be averaged into the grades already recorded for that student.

A student who receives an "IN" must complete the unfinished work to have the Incomplete converted to a final grade by the end of the next semester in which the student is enrolled, provided that this

period is not longer than 12 months from the end of the semester or summer session in which the "IN" was received. Otherwise, the "IN" will be automatically converted to "F" or "U," in accord with the grading approved for the particular course. All grades of "IN" must be cleared prior to graduation. Students must not register again for any courses in which they have "IN" grades. Such registration does not remove "IN" grades, and the completion of the course on the second occasion will automatically result in an "F" for the incomplete course.

Except in the case of Interinstitutional Registration, grades on courses transferred from another institution will not be included in computing the GPA.

## **Grade Changes**

When submitted to the Department of Registration and Records, end-of-course grades are final and not subject to change by reason of a revision of the instructor's judgment; nor are submitted grades to be revised on the basis of a second trial (e.g., a new examination or additional work undertaken or completed). Changes may only be made within one calendar year after the date final grades were submitted in order to correct an error of computation or transcribing or where part of the student's work has been unintentionally overlooked.

## Academic Warning, Probation and Termination

Graduate students are given a notice of academic warning if they have accumulated 18 or fewer hours at the 400 level or above and have less than a 3.00 GPA. Graduate students are placed on academic probation if they have accumulated more than 18 hours at the 400 level or above and have a GPA in the range of 2.67 to 2.99 and will be ineligible for financial aid or appointment or reappointment to an assitantship or fellowship. A student's graduate study is terminated if they have accumulated more than 18 hours at the 400 level or above and have a GPA below 2.67 or if they have accumulated 30 or more hours and have less than a 3.0 GPA. In the case of program termination, no further registration in a graduate classification will be permitted. Under extenuating circumstances the student will be reinstated upon the written recommendation of the department and approval by the Graduate Dean. Departments have the prerogative of recommending the termination of a student's graduate admission at any time if the student is not making satisfactory progress toward the degree.

Students who are eligible to attend the first summer session are eligible to attend either or both summer sessions. For example, students who receive a notice of "Graduate Admission Terminated" at the end of the first summer session may register for second summer session unless the major department recommends otherwise.

## Eligibility for Assistantship, Fellowship or Traineeship

A graduate student must be in good academic standing to be eligible for appointment to an assistantship, fellowship or traineeship and must be registered in each semester in which the appointment is in effect.

### Audits

Graduate students wishing to audit a course must have the approval of their advisor and of the department offering the course. While auditors receive no course credit, they are expected to attend class regularly. The degree to which an auditor must participate in class beyond regular attendance is optional with the instructor. Any auditing requirements should be clearly explained in writing to the student at the beginning of the semester. Should an instructor conclude that an auditor has failed to fulfill the stipulated requirements, the instructor is justified in marking NR (no recognition given for an audit) on the final grade report.

Audits (AU) in subjects in which the graduate student has had no previous experience will be evaluated at full credit value in determining course loads. Audits taken as repetition of work previously accomplished are considered at one-half their credit value in calculating course loads. With the single exception of foreign language audits, all audit registration must fall within the maximum permissible course loads. While audit registrations are evaluated for purposes of determining permissible course loads in terms of the regulations of the Graduate School, the University Cashier's Office considers all audits, except one permitted free of charge, in terms of full credit value in calculating tuition.

## Graduation

There are three official graduations for graduate students per year, occurring at the end of the fall and spring semesters and at the end of the second summer session. Formal commencement exercises are held at the end of spring and fall semesters, but any student who graduated the preceding second summer session is eligible to participate in the December commencement. All students scheduled to graduate in the fall or spring semesters are strongly encouraged to attend the respective commencement. Any doctoral candidate wishing to have the degree conferred in absentia must notify the Graduate School in writing; Master's candidates should contact their departments or programs.

#### Diplomas

Doctoral students graduating in the spring and fall are awarded their diplomas during the commencement exercises. Master students, both Master and Doctoral students graduating at the end of second summer session or those students receiving permission to receive the degree in absentia can pick up their diploma during the designated pick-up dates and times in Registration and Records. Any diplomas not picked up are mailed by the Department of Registration and Records, which is also responsible for the ordering of diplomas.

Students earning a Master of Arts, Master of Science, Doctor of Education or Doctor of Philosophy degree will receive diplomas designating the degree but not the major or program of study. Students earning a Master degree in a designated field will receive diplomas indicating the field of specialization, i.e., Master of Forestry.

Students with co-majors will have those identified on their transcripts, but not on their diplomas.

#### **Apply to Graduate**

Each student must make sure to Apply to Graduate in MyPack Portal (Student Self Service > Degree

Progress / Graduation > Apply for Graduation) for the term in which they plan to graduate in. It is advised that students apply to graduate when the defense is scheduled, but it can be done at any time in the semester up until 5:00 p.m. on the Apply to Graduate Deadline, which is the same as the Registration Required Thesis Review Deadline. The date is on the Graduate School Calendar. A student must apply to graduate in order to graduate, have transcript posted, and receive a diploma.

## Interinstitutional Registration Program

NC State participates in an <u>Interinstitutional Registration program</u> with the <u>University of North Carolina</u> <u>at Chapel Hill</u>, the <u>University of North Carolina at Greensboro</u>, the <u>University of North Carolina at</u> <u>Charlotte</u>, <u>North Carolina Central University</u>, and <u>Duke University</u>. The program provides the opportunity for students to enroll at another institution for a course or courses not offered on their home campus. Other activities include a cooperative library arrangement, joint student activities, and faculty cooperation and interchange.

Even though taking a course on another campus, the student is exclusively under the administrative direction of the NC State Graduate School. Enrollment for courses on other campuses will take place on this campus, using an <u>Interinstitutional Approval</u> form from Registration and Records. Such courses are considered by the Graduate School to be a part of the student's normal load and the student will be billed for the courses through the NC State University Cashier's Office. During the summer, the procedure is somewhat different in that a student must be enrolled in a least one course on the NC State campus during the same session as the requested interinstitutional registration.

When the grading system of the other institutions varies from that of NC State, grades received under Interinstitutional Registration will be converted to the NC State system. "H," "P," "L, and "F" grades earned at the University of North Carolina at Chapel Hill and "E," "G," "S" and "F" grades earned at Duke University will be converted to "A," "B," "C" and "F" grades, respectively.

## **Cooperating Raleigh Colleges**

The <u>Cooperating Raleigh Colleges</u> (CRC) is a voluntary organization composed of <u>NC State</u>, <u>Meredith</u> <u>College</u>, <u>Peace College</u>, <u>St. Augustine's College</u>, and <u>Shaw University</u>. Graduate programs are currently offered only at NC State and Meredith College, but graduate students can enroll at either institution for a course or courses not offered by their home campus.

Any NC State graduate degree student who is enrolled in at least three graduate credit hours on the NC State campus may take a course at Meredith College during fall or spring semester, provided that

- 1. the course is not taught on the NC State campus, and
- 2. the advisory committee considers the course educationally desirable.

NC State students may not register for more than a total of two courses in any semester at Meredith, and not more than six of the required academic credits for a Master's degree at NC State may be accepted from that institution. Grades from Meredith are not used in computing a student's NC State grade point average.

Under this agreement, regular tuition and fees are paid to NC State. Special fees may be required for specific courses at Meredith, and the student is responsible for paying these fees.

## Academic Common Market

The <u>Academic Common Market</u> (ACM) is a cooperative agreement among universities in 16 states in the southeastern United States. The ACM allows a student to enroll in a graduate program at a university in another state without having to pay out-of-state tuition if that program of study is neither

- 1. offered by the public institutions in the student's home state, nor
- 2. commonly available in the other southeastern states.

## **Tuition and Fees**

The <u>University Cashier's Office</u> provides billing, financial aid disbursement and account management services to all students. All students paying tuition and fees are entitled to University services, facilities and programs, including the services, facilities, and programs offered by the Student Center, Health Services, Physical Education Department, and Athletics Department.

## Residence for Tuition Purposes

## **Financial Aid**

Graduate students may receive financial support through fellowships, traineeships and teaching or research assistantships sponsored by federal, state and private agencies. A graduate student must be in good academic standing (3.0 GPA or better) to be eligible for appointment to an assistantship, fellowship, or traineeship and must be registered in each semester in which the appointment is in effect. There are also minimum registration requirements for eligibility for tuition and health insurance benefits.

<u>Assistantships</u> <u>Fellowships</u> <u>Graduate Student Support Plan</u>

## Admission to Degree Programs

The <u>Office of Scholarships and Financial Aid</u> (OSFA) assists students and parents in applying for and securing financial assistance when family resources are insufficient to meet educational expenses. The OSFA offers assistance with any part of the financial aid process (including scholarships, grants, loans and campus employment), as well as providing financial aid counseling assistance.

## Accounting

## **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Accounting</u>					Y		

## **GRADUATE FACULTY**

## F. A. Buckless, Department Head

## Director of Graduate Programs:

K. A. Krawczyk, Box 8113, 54439, katherine krawczyk@ncsu.edu, Accounting

Deloitte Professor: M. S. Beasley KPMG Professor: F. A. Buckless

**Professors:** J. W. Bartley, B. C. Branson, Y. A. Chen, K. A. Krawczyk, D. P. Pagach, R. L. Peace, R. B. Sawyers, P. F. Williams; **Associate Professors:** M. Bradford, J. F. Brazel, R. L. Wright, G. J. Zuckerman; **Assistant Professors:** R. Pennington, E. Z. Taylor

The Master of Accounting (MAC) is a professional degree designed to prepare students for careers in public Accounting, in the Accounting and finance divisions of major corporations, and in education, government, and non-profit institutions. Job titles of recent graduates include Staff Accountant, Internal Auditor, Financial Analyst, Budget Analyst, Cost Accountant, Tax Specialist, Assistant Controller, SBI Agent, State Auditor, and Internal Revenue Agent. Graduates will also be prepared to complete the CPA Examination.

**Admission Requirements:** Admission to the MAC program is competitive. The best-qualified applicants will be accepted up to the number of spaces available for new students. The Admissions Committee evaluates candidates on three criteria:

- undergraduate academic record and grade point average;
- GMAT score\*;
- "Leadership" -- such as relevant activities and/or work experience; and presence, leadership, integrity, and other personal characteristics.

[\*The Admissions Committee requires all applicants who score below 500 on their first attempt to retake the exam prior to the application deadline.]

Individuals with a Bachelor's degree in any major may apply to the program; however, any applicant without a Bachelor's degree in Accounting must complete a series of undergraduate Accounting prerequisites before qualifying as a MAC degree candidate. More complete information can be found on the <u>MAC website</u>.
**Master's Degree Requirements:** Students complete a 12-course sequence in one year that includes ten graduate-level Accounting courses and two non-Accounting MBA courses (31 total credit hours). The curriculum is designed to provide a broad-based professional education. Students can choose to obtain a concentration in Information Technology (IT) or Enterprise Risk Management (ERM).

**Other Relevant Information:** Masters students must begin the degree program in the summer or in the fall semester. The program is primarily designed for full-time students, and most classes meet during the day. A limited part-time option, where students complete the program in two years, is also available.

All application materials are due by one of two application deadlines--**February 1** for consideration in both the MAC Fellowship and Scholarship programs; **March 1** for all other applicants.

# **Adult and Higher Education**

## **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Adult and Community College Education		Y	Y			Y	
Higher Education Administration		Y	Y			Y	
Human Resource Development			Y				
Training and Development						Y	

## **GRADUATE FACULTY**

#### R. C. Serow, Department Head

#### Director of Graduate Programs:

D. Akroyd, Box 7801, 5-1745, duane akroyd@ncsu.edu, Educational Leadership and Policy Studies

## Goodnight-Glaxo Wellcome Endowed Chair: C. R. Tittle

Professors: D. Akroyd, C. E. Kasworm, K. M. Moore; Adjunct Professors: D. G. Oblinger, R. S. Ralls;
Emeritus Professors: E. J. Boone, G. L. Carter, J. C. Glass, G. B. Vaughan; Emeritus Named Distinguished
Professors: G. A. Baker; Associate Professors: J. E. Bartlett, J. G. Gayles, T. G. Hatcher, A. J. Jaeger, B. S.
Mehlenbacher, P. D. Umbach; Adjunct Associate Professors: B. I. Mallette; Assistant Professors: T. A.
Bowles, S. J. Bracken, A. N. Bryant, J. Storberg-Walker; Adjunct Assistant Professors: D. W. Bailey, B. E.
Brown, J. E. Fleming, C. W. Geary, L. D. Hunt, M. A. Jablonski, D. S. Jackson, C. W. Johnson, L. D. Krute,
D. C. Luckadoo, T. R. Luckadoo, D. D. McGraw, L. Moneta, M. H. Nadelman, J. M. Pettitt, C. D.
Raubenheimer, D. L. Reichard, D. J. Rodas, C. J. Shaffer, C. H. Thornton, S. W. Williams; Teaching
Associate Professors: P. Lari

The department offers degrees in adult and community college education, higher education administration, and training and development to meet the professional needs of leaders, administrators, program specialists, instructors, and consultants in community colleges, four-year colleges and universities, business and industry, and other adult and higher education organizations. Program specializations include adult and continuing education, community college leadership and higher education, health professions education, training and development, community college teaching, and student affairs.

**Admission Requirements:** In addition to Graduate School admission requirements, the department requires the student to submit GRE results (no older than five years). Specific information regarding admission can be obtained at the department's website: <u>ced.ncsu.edu/ahe/admissions.htm</u>.

**Master's Degree Requirements:** The M.S. and M.Ed. programs require a minimum of 36 semester hours. The Master of Science degree requires a final oral examination and thesis approved by the student's graduate committee.

**Doctoral Degree Requirements:** Students must have completed a Master's degree before being admitted to the doctoral program. The Ed.D. degree requires a minimum of 72 semester hours of which a maximum of 12 are dissertation. Students are expected to be advanced to candidacy no later than their sixth year and to complete all degree requirements no later than the end of the tenth year. For more specific information on departmental admissions: <u>ced.ncsu.edu/ahe/admissions.htm</u>.

**Student Financial Support:** Information on financial aid at NC State may be found at www7.acs.ncsu.edu/financial\_aid.

# Agricultural and Extension Education

## **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Agricultural and Extension Education		Y					
Agricultural Education			Y		Y		
Extension Education			Y		Y		

## **GRADUATE FACULTY**

#### J. L. Flowers, Interim Department Head

#### Director of Graduate Programs:

G. E. Moore, Box 7607, 5-1756, gary moore@ncsu.edu, Agricultural and Extension Education

#### J.C. Raulston Distinguished Professor: D. J. Werner

Professors: J. L. Flowers, L. A. Guion, D. M. Jenkins, B. M. Kirby, T. T. McKinney, G. E. Moore, R. W.
Shearon; Adjunct Professors: M. M. Baker, J. S. Lee; Emeritus Professors: G. W. Bostick, R. D. Mustian;
Associate Professors: D. B. Croom, R. M. Stewart, C. S. Whisnant, E. B. Wilson; Adjunct Associate
Professors: R. J. Harrell; Emeritus Associate Professors: C. D. Bryant; Assistant Professors: J. A. Bruce,
K. S. Jayaratne, D. W. Jones, M. J. Kistler; Adjunct Assistant Professors: D. A. Boone, D. D. Peasley, J. H.
Smith

The Agricultural and Extension Education Department provides advanced study for professionals in agricultural education, extension education or related careers. Programs of study are designed to meet the individual needs of the student. Courses may be selected that lead to advanced teacher licensure in agriculture or an emphasis in extension education leading to advancement in careers in the Cooperative Extension Service. Additional specialization in the student's teaching or extension field is provided through a minor or advised elective courses. The following graduate programs are available in the Department:

Graduate Certificate in Agricultural Education (requires 15 hours) Master of Science in Agricultural Education (requires 36 hours including a thesis) Master of Science in Extension Education (requires 36 hours including a thesis) Master of Agricultural Education (requires 36 hours) Master of Extension Education (requires 36 hours) Master of Agricultural Education (a 100% internet-based degree program requires 36 hours) Sixth-Year Certificate in Agricultural Education Doctor of Education in Agricultural and Extension Education

Admission Requirements: In addition to the Graduate School admission requirements, the department requires the GRE, three positive references, and a statement of career goals and/or research interests. An interview (personal or by telephone) may be required.

**Master's Degree Requirements:** The Department offers an M.S. degree, which requires a thesis for which the student receives six hours of credit, and a Master of Agricultural Education and a Master of Extension Education as a non-thesis track. All Master's degree programs require a total of 36 credit hours. The Master of Science in Extension Education and the Master of Extension Education require a core of 21 hours (AEE 501, 505, 521, 523, 526, 577, and 578). The Master of Science in Agricultural Education require a core of 18 hours (AEE 501, 505, 526, 528, 529, 535 or 735, and 578). Minors are optional but, if selected, require a minimum of nine credit hours.

**Graduate Certificate Requirements:** The Department also offers a graduate certificate in agricultural education. This certificate program involves completion of 15 credit hours. Students are to choose from AEE 500, 503, 521, 522, 528, 529, 535, 641, and 735.

**Sixth-Year Certificate:** The Department offers an array of courses that are recognized by the Department of Public Instruction as comprising a Sixth-Year Certificate. Students are required to complete 24 hours of advanced graduate work past the Master's degree. Contact the Director of Graduate Programs for details.

**Doctoral Degree Requirements**: A Doctor of Education degree in Agricultural and Extension Education is offered. A minimum of 72 hours past the Bachelor's degree is required. More hours may be required based upon the past degrees and experiences of the candidate. The student's graduate committee will determine the specific courses needed. At least six hours of statistics is required. Twelve hours of credit is earned for writing the dissertation.

**Student Financial Support:** A limited number of research and/or teaching assistantships are available on a competitive basis. Other financial aid is available from the Office of Financial Aid and on a competitive basis from the Graduate School.

**Other:** The graduate courses listed below are available live, online, or both. Students should refer to the current <u>Registration and Records Course Inventory</u> or to the <u>AEE graduate program</u> website.

# Analytics

## **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Analytics			Y				

## **GRADUATE FACULTY**

## Director of Graduate Programs:

M. A. Rappa, Box 7268, 919.513.0480, michael\_rappa@ncsu.edu, Analytics

*Alan T. Dickson Distinguished University Professor:* M. A. Rappa *Edwin Gill Professor of Business Management:* C. P. Jones *William Neal Reynolds Professor:* D. A. Dickey

Associate Professors: P. K. Bergey, B. P. Bullock, R. Y. Chirkova, J. B. Earp, C. G. Healey, S. M. Hsiang, R. S. Warr, B. A. Watson, L. A. Williams; Assistant Professors: T. Xie; Teaching Associate Professors: J. R. Thompson

The Master of Science in Analytics (MSA) is an intensive 10-month degree with a strong practical orientation designed to give students a thorough understanding of the tools, methods, and applications of advanced analytics. The curriculum is designed entirely for MSA students and classes are taught as a cohort. Students work frequently in teams and receive hands-on training with industry-standard software tools. Its educational objectives include but are not limited to topics, such as data quality and integration, data and text mining, time series forecasting, optimization, survival analysis, and other areas of statistics; data security and privacy; project management and communication skills. Student team projects aim to provide experience with solving complex analytical problems in industry and in other areas of science and engineering.

**Admission Requirements:** Admission to the MSA program is highly competitive. The best-qualified applicants will be accepted up to the limited number of seats available for students each year. The Admissions Committee evaluates candidates on criteria such as:

- overall academic record and grade point average;
- academic performance in analytical/quantitative subjects;
- GRE General Test score;
- relevant employment experience and potential to succeed in the profession; and
- leadership, integrity, and other personal character traits.

Individuals with a Bachelor's degree in any major may apply to the program; however, an applicant without prior coursework in statistics, mathematics, computer programming, would need to complete a set of prerequisite courses before qualifying as a candidate for admission. More information can be found on the MSA website.

**Master's Degree Requirements:** Students complete 30 credit hours of defined coursework in a period of ten months beginning in Summer Session II and ending the following Spring semester. The integrated curriculum is designed to provide a focused education in the software tools, methods and applications of data analytics.

**Other Relevant Information:** Students must begin the degree program in the first semester (Summer Session II) and complete all 30 credit hours of the curriculum. The program is designed for full-time students only. Applications for admission are reviewed between January and April. International applicants are encouraged to apply early.

# **Animal Science**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Animal Science			Y		Y		

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

C. E. Farin, Box 7621, 54022, char farin@ncsu.edu, Animal Science

#### William Neal Reynolds Professor: J. Odle

Professors: G. W. Almond, W. J. Croom, J. Eisemann, K. L. Esbenshade, C. E. Farin, W. L. Flowers, W. M. Hagler, B. A. Hopkins, G. B. Huntington, D. K. Larick, J. M. Luginbuhl, W. M. Morrow, R. M. Petters, J. A. Piedrahita, M. H. Poore, O. W. Robison, M. T. See, J. W. Spears, E. VanHeugten, S. P. Washburn, C. M. Williams; USDA Professors: J. C. Burns; Adjunct Professors: M. Choct, D. E. Pritchard, W. B. Roush, T. A. van Kempen; Emeritus Named Professors: E. Eisen, J. G. Lecce; Emeritus Professors: B. P. Alston-Mills, L. S. Bull, K. R. Butcher, J. C. Cornwell, R. G. Crickenberger, R. W. Harvey, W. L. Johnson, J. R. Jones, C. A. Lassiter, R. D. Mochrie, R. M. Myers, C. R. Parkhurst, F. D. Sargent, J. C. Wilk, G. H. Wise; Associate Professors: M. S. Ashwell, J. P. Cassady, V. Fellner, S. W. Kim, H. Liu, J. A. Moore, K. E. Saker, P. D. Siciliano, C. H. Stahl, C. S. Whisnant, M. D. Whitacre; Adjunct Associate Professors: G. R. Hansen, C. Maltecca, S. E. Phillips; Research Assistant Professors: L. Xi; Adjunct Assistant Professors: D. S. Casey, J. V. Felts, A. G. Gernat, C. L. Heggen-Peay, R. O. Maguire, T. F. Middleton, D. W. Newcom; Extension Assistant Professors: J. E. Turner

Animal science offers an opportunity for training in a diversity of basic sciences and the integration of such knowledge into the framework of a living system. Students may major or co-major in animal science or one of the following disciplines: biochemistry, genomics, genetics, microbiology, nutrition, physiology or statistics. Students may also concentrate in management and production areas.

**Admission Requirements:** Factors considered for admission include: grade point average, scores on the GRE (for M.S. and Ph.D. applicants), undergraduate courses, letters of recommendation and a member of the Animal Science Department faculty willing to serve as the applicant's advisor.

**Master of Science:** A minimum of 30 credit hours of graduate work in the degree program is required. The minor is optional and external faculty representation is not required on the advisory committee.

**Master of Animal Science:** The non-thesis Master of Animal Science degree (Option B) requires a minimum of 36 credit hours, 19 credits of core courses and 17 credits of elective courses. Additional information regarding core courses and elective course requirements can be found on the <u>Animal</u> <u>Science Graduate Program</u> web site.

**Doctoral Degree Requirements:** The department offers a Ph.D. program in <u>Animal Science and Poultry</u> <u>Science</u> with a concentration in Animal Science.

**Student Financial Support:** A limited number of research and teaching assistantships are available through the department and are awarded on a competitive basis. Students may also be supported by research grant funds awarded to faculty members. Students applying for assistantships are advised to apply by February 15 for fall admission.

**Other Relevant Information:** To provide an opportunity for students to develop their teaching skills, all graduate students are required to assist in the departmental teaching program, regardless of source of financial support.

# **Animal Science and Poultry Science**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Animal Science & Poultry Science	Y						

## **GRADUATE FACULTY**

## Directors of Graduate Programs:

C. E. Farin, Box 7621, 54022, char\_farin@ncsu.edu, Animal Science J. T. Brake, Box 7608, , jbrake@ncsu.edu, Poultry Science

# William Neal Reynolds Distinguished Professor: J. T. Brake William Neal Reynolds Professor: P. R. Ferket, J. Odle

Professors: G. W. Almond, K. E. Anderson, F. W. Edens, J. Eisemann, K. L. Esbenshade, C. E. Farin, W. L. Flowers, J. L. Grimes, W. M. Hagler, G. B. Havenstein, B. A. Hopkins, G. B. Huntington, D. K. Larick, J. M. Luginbuhl, W. M. Morrow, J. F. Ort, S. L. Pardue, J. N. Petitte, R. M. Petters, J. A. Piedrahita, M. H. Poore, O. W. Robison, M. T. See, T. D. Siopes, J. W. Spears, E. VanHeugten, D. P. Wages, S. P. Washburn, C. M. Williams, M. J. Wineland; USDA Professors: J. C. Burns; Adjunct Professors: W. L. Bryden, W. O. Herring, K. K. Krueger, D. E. Pritchard, S. M. Shane, Z. Uni; Emeritus Named Professors: E. Eisen, J. G. Lecce; Emeritus Professors: B. P. Alston-Mills, L. S. Bull, K. R. Butcher, T. A. Carter, V. L. Christensen, J. C. Cornwell, R. G. Crickenberger, J. D. Garlich, E. W. Glazener, J. R. Harris, R. W. Harvey, W. L. Johnson, J. R. Jones, C. A. Lassiter, R. D. Mochrie, R. M. Myers, C. R. Parkhurst, F. D. Sargent, B. W. Sheldon, J. C. Shih, J. C. Wilk, G. H. Wise; Associate Professors: C. M. Ashwell, M. S. Ashwell, D. K. Carver, J. P. Cassady, V. Fellner, S. W. Kim, H. Liu, J. A. Moore, P. E. Mozdziak, K. E. Saker, C. H. Stahl, C. S. Whisnant, M. D. Whitacre; Adjunct Associate Professors: R. J. Harrell, C. E. Whitfill; Emeritus Associate Professors: C. L. Heggen-Peay, T. F. Middleton, D. W. Newcom, C. J. Williams

**Doctoral Degree Requirements:** A doctoral degree in Animal Science and Poultry Science with a concentration in either Animal Science or Poultry Science is offered. Specific course requirements are flexible and each student's program of study is developed in consultation with their Ph.D. advisory committee. The minor is optional but external faculty representation is required on the advisory committee.

**Note:** The Master's program in Animal Science and Poultry Science are administered independently by each department.

**Admission Requirements:** Factors considered for admission include: grade point average, scores on the GRE, undergraduate courses, and letters of recommendation. A member of either the Animal Science Department or Poultry Science Department faculty can serve as the applicant's advisor.

**Student Financial Support:** The Departments of Animal Science and Poultry Science offer a limited number of research and teaching assistantships that are awarded on a competitive basis. Students may also be supported by research grant funds awarded to faculty members. Students applying for these assistantships are advised to apply by February 15 for fall admission.

**Other Relevant Information:** There are two curriculum codes for the Animal Science and Poultry Science doctoral degree program. If a student is interested in a program concentration in Animal Science the appropriate curriculum code for the admissions application is ANA. If the student is interested in a program concentration in Poultry Science the appropriate curriculum code for the admissions application is ANA. If the student is admissions application is ANP. If the appropriate curriculum code is not selected, it will likely delay the department's receipt of the applicant's information from the Graduate School.

Click on Graduate Courses - Animal Science for current course information.

Click on Graduate Courses - Poultry Science for current course information.

# Anthropology

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Anthropology				Y			

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

S. M. Fitzpatrick, Box 8107, , smfitzpa@sa.ncsu.edu, Sociology

Adjunct Professors: A. L. Schiller; Associate Professors: D. T. Case, S. M. Fitzpatrick, N. M. Haenn, A. H. Ross, J. M. Wallace; Assistant Professors: R. S. Ellovich; Teaching Associate Professors: W. E. Wormsley

The graduate degree in Anthropology is a 36-hour, two-year long Master of Arts thesis program which will enable students to gain a deeper understanding of the behavior, beliefs, and evolutionary legacy of the human species. In addition to common core courses, students select one of three concentrations in which to focus their studies: Bioarchaeology, Cultural Anthropology, or Environmental Anthropology.

The program provides excellent preparation for students wishing to pursue a Ph.D. in Anthropology. Graduates of the program may also pursue employment in a variety of areas including development organizations and non-profits, human resource management, cultural resource management, or in physical anthropology or archeology labs.

**Admissions Requirements:** In addition to general Graduate School requirements, applicants are required to provide a completed application, including transcripts, GRE scores, three letters of recommendation, and a personal statement. A writing sample and CV are optional but encouraged. The deadline for completed applications is January 15. The curriculum is set for fall admission only.

**Master's Degree Requirements:** The M.A. degree requires a total of 36 credit hours. All students take six hours of common core courses in theory and qualitative research and then select one of the three specializations: cultural anthropology, environmental anthropology, or bioarcheaology. Students in all three concentrations will take six hours of thesis research credit (ANT 695).

**Student Financial Support:** Teaching assistantships are available on a competitive basis. Students are appointed to assistantships with the expectation of reappointment, assuming normal progress, for a total period of two years.

# Architecture

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Architecture</u>					Y		

#### **GRADUATE FACULTY**

#### R. F. Abrams, Director of the School of Architecture

Director of Graduate Programs: D. B. Hill, Box 7701, , dbhill@ncsu.edu, Architecture

**Professors:** R. F. Abrams, T. M. Barrie, G. Bizios, R. H. Clark, M. J. Malecha, W. Place, J. P. Rand, P. Tesar; **Adjunct Professors:** J. S. Lee; **Emeritus Professors:** P. Batchelor, F. A. Rifki; **Associate Professors:** B. W. Laffitte, W. H. Redfield, K. J. Schaffer, J. O. Tector; **Assistant Professors:** P. R. Battaglia, D. B. Hill

The School of Architecture offers three tracks to the Master of Architecture degree: Track 1 is for applicants with a four-year undergraduate pre-professional degree in architecture and may be completed in two years of full-time study. Track 2 is for applicants holding a five-year NAAB-accredited Bachelor of Architecture degree and normally requires three semesters in residence. Track 3 is for students with degrees in fields other than architecture. This track normally requires three semesters of preparatory work before entering the final two-year program of graduate study. Some applicants with design-related academic or professional experience may be able to complete the preparatory work in less time.

A variety of courses are available within the School of Architecture in urban and community design, architectural history and theory, material fabrication, professional practice, building technology and environmental systems.

Admission Requirements: In addition to documents required by the Graduate School, students apply to the Master of Architecture program by submitting the following documents by January 5: (1) Portfolio of work; (2) Completed School Personal Data Form; (3) GRE scores (Track 3 applicants only); (4) TOEFL scores (foreign language students only). Applicants will be considered on an individual basis. Exceptions to Graduate School policy may be made for students indicating other qualifications and professional experience.

**Master's Degree Requirements:** The school stipulates the minimum course credits based on educational and professional goals to individualize a plan of study.

**Student Financial Support:** The school awards a number of scholarships, awards, and teaching assistantships competitively. It also supports national and statewide scholarships, fellowships, and awards. All support is merit based, not need based. No special application for such support is necessary at the time of admissions.

**National Architectural Accrediting Board (NAAB)**: "In the United States, most state registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit U.S. professional degree programs in architecture, recognizes three types of degrees: the Bachelor of Architecture, the Master of Architecture, and the Doctor of Architecture. A program may be granted a six-year, three-year, or two-year term of accreditation, depending on its degree of conformance with established educational standards.

"Master's degree programs may consist of a pre-professional undergraduate degree and a professional graduate degree that, when earned sequentially, comprise an accredited professional education. However, the pre-professional degree is not, by itself, recognized as an accredited degree.

"Professional degree programs in the NC State University School of Architecture (i.e. Master of Architecture and Bachelor of Architecture) are fully accredited by the NAAB. The Bachelor of Environmental Design in Architecture (BEDA) degree, being a pre-professional program, does not fall under NAAB accreditation jurisdiction although it serves as the foundation for the two accredited professional degrees."

# Art and Design

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Art and Design					Y		

#### **GRADUATE FACULTY**

#### C. D. Cox, Department Chair

#### Director of Graduate Programs:

S. D. Brandeis, Box 7701, 5-3876, susan\_brandeis@ncsu.edu, Art And Design

**Professors:** S. D. Brandeis, C. E. Joyner; **Associate Professors:** C. D. Cox, L. M. Diaz, P. J. Fitzgerald, V. K. Plume, D. G. Raymond, S. M. Toplikar; **Assistant Professors:** M. Freeman, J. Wan; **Teaching Associate Professors:** K. C. Rieder

The Art and Design program offers an educational structure that creates a new art and design professional: one for whom artistic and practical talents are developed as different expressions of individual potential. Our objectives are to graduate highly educated art and design professionals with integrated competencies in art, design, aesthetics, hand and digital technologies, skills in the concentration and other disciplines of human knowledge.

Areas of concentration in the Master of Art and Design are (1) Fibers and Surface Design, and (2) Animation and New Media.

Admission Requirements: Students will be required to submit a portfolio of past work in slide or electronic format; three letters of recommendation; a statement of personal goals; and transcripts of undergraduate work (minimum undergraduate GPA of 3.0). An interview will be required, but in cases of international applicants or those quite distant from NC State University, may be conducted by means of a long distance phone conversation or may be waived at the faculty's discretion.

**Masters Degree Requirements:** The program of study requires a minimum of 48 credit hours of graduate work depending on background preparation of the applicant. A separate track of 60 credit hours accommodates students with insufficient background in the chosen concentration.

**Other Information:** We will only admit students to the program in the fall semester each year. Deadline for application is January 5.

# **Biochemistry**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Biochemistry</u>	Y		Y		Y		

#### **GRADUATE FACULTY**

#### D. T. Brown, Department Head

Director of Graduate Programs:

E. S. Maxwell, Box 7622, 5-5803, stu maxwell@ncsu.edu, Biochemistry

# Edwin F. Conger Distinguished Professor of Forestry and Environmental Resources: R. R. Sederoff William Neal Reynolds Distinguished Professor of Biochemistry: W. L. Miller William Neal Reynolds Professor: J. Cavanagh, L. K. Hanley

Professors: P. F. Agris, D. T. Brown, H. M. Hassan, C. L. Hemenway, E. S. Maxwell, E. S. Miller, J. W. Moyer, E. C. Sisler, P. L. Wollenzien; *Adjunct Professors:* K. S. Korach, J. D. Otvos; *Emeritus Professors:* J. S. Kahn, I. S. Longmuir, E. C. Theil; *Emeritus Named Distinguished Professors:* H. R. Horton; *Emeritus Distinguished Professors:* H. E. Swaisgood; *Associate Professors:* J. W. Brown, A. C. Clark, M. B. Goshe, C. C. Hardin, J. M. Horowitz, J. A. Knopp, C. Mattos, R. B. Rose, K. R. Weninger; *Research Associate Professors:* H. Gracz, R. Hernandez; *Adjunct Associate Professors:* D. F. Ferreira; *Assistant Professors:* F. Meilleur; *Adjunct Assistant Professors:* R. E. Cannon

The graduate program in biochemistry is designed to prepare individuals for careers in research and teaching. Emphasis is primarily focused on laboratory research, where graduate students work closely with faculty. The department is well equipped to conduct research in biochemistry, biophysics, molecular biology and molecular genetics.

Admission Requirements: Students entering the graduate program in biochemistry should have a bachelor's degree in biochemistry, chemistry or a related physical or biological science, including undergraduate courses in organic chemistry, calculus, physics and physical chemistry, as well as biochemistry/molecular biology.

**Master of Science Degree Requirements:** The Master of Science degree requires a minimum of 30 credit hours of courses and thesis research including nine credit hours in biochemistry graduate core courses. On average, completion of the M.S. degree requires two to three years.

**Doctoral Degree Requirements:** Requirements for the Ph.D. degree include a minimum of 30 credit hours in course work and thesis research, including the three graduate core courses and at least two advanced courses in biochemistry/ molecular biology; teaching experience. Formal course work may be completed within three semesters; on average, completion of the Ph.D. degree requires five years.

**Student Financial Support:** The department endeavors to meet the financial needs of students accepted into its doctoral program. Essentially all admitted students are offered the opportunity to apply for graduate teaching and research assistantships.

**Other Relevant Information:** The Department of Biochemistry is jointly administered by the Colleges of Agriculture and Life Sciences and Physical and Mathematical Sciences. The department, committed to a strong research environment, interacts with other life science departments on campus as well with the other research universities and institutes of the Research Triangle area.

# **Biological and Agricultural Engineering**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<b>Biological and Agricultural Engineering</b>	Y		Y		Y		

#### **GRADUATE FACULTY**

R. O. Evans, Department Head

#### Director of Graduate Programs:

D. H. Willits, Box 7625, 515-6755, dan willits@ncsu.edu, Biological and Agricultural Engineering

# Phillip Morris Professor: M. D. Boyette William Neal Reynolds Distinguished Professor: K. R. Swartzel William Neal Reynolds Distinguished Professor of Biological and Agricultural Engineering: R. W. Skaggs

Professors: C. F. Abrams, S. W. Broome, J. J. Cheng, C. R. Daubert, R. O. Evans, B. E. Farkas, S. A. Hale, G. D. Jennings, T. M. Losordo, S. C. Roe, K. P. Sandeep, R. S. Sowell, L. F. Stikeleather, P. W. Westerman, D. H. Willits; USDA Professors: J. W. Dickens; Adjunct Professors: L. M. Safley, L. M. Sykes; Emeritus Professors: J. C. Barker, C. G. Bowers, L. B. Driggers, A. E. Hassan, E. G. Humphries, W. H. Johnson, G. J. Kriz, W. F. McClure, F. M. Richardson, R. P. Rohrbach, A. R. Rubin, R. E. Sneed, C. W. Suggs, T. B. Whitaker, E. H. Wiser, J. H. Young; Emeritus Named Distinguished Professors: J. W. Gilliam; Associate Professors: J. J. Classen, G. L. Grabow, M. N. Guddati, R. L. Huffman, W. F. Hunt, P. L. Mente, G. T. Roberson, S. B. Shah; Research Associate Professors: G. M. Chescheir; Emeritus Associate Professors: G. R. Baughman; Assistant Professors: F. P. Birgand, M. R. Burchell, M. S. Chinn, P. Kolar, R. R. Sharma, M. W. Veal, L. Wang, M. A. Youssef; Research Assistant Professors: O. D. Simmons; Adjunct Assistant Professors: J. Spooner

Course offerings or research facilities are available in the following areas: bioinstrumentation, biomechanics, bioprocessing, food and process engineering, biological systems modeling, aquaculture, hydrology, water table management, ground water management, animal waste management, non-point source pollution, power and machinery, soil and water, controlled environment agriculture, electrical and electronic systems, robotics and machine vision.

**Admission Requirements:** A baccalaureate in biological or agricultural engineering or the equivalent is the preferred prerequisite for admission. Those with strong academic background in the physical or biological sciences may also be admissible with a requirement for certain additional background undergraduate work. In the case of applicants with Master's degrees, a Master's GPA of at least 3.2 is required for admission. Exceptions to the overall undergraduate GPA requirements may be made for cases where performance in the major or during the last two years was at or above the 3.00 level.

GRE scores are recommended for those with academic performance records near the minimal level.

Applicants without engineering degrees from domestic accredited institutions must submit GRE scores to be considered for admission. Admission decisions are made by a faculty review committee. The best-qualified applicants will be accepted up to the number of spaces available for new students.

#### **Master's Degree Requirements**

*M.BAE:* This Option B non-thesis degree requires 30 hours of approved graduate course work. This degree is available via Distance Education.

*M.S.:* This is a thesis degree requiring 30 hours of approved graduate coursework.

**Doctoral Degree Requirements:** Course hour requirements are flexible but typically include at least 36 hours beyond a Master's degree. Direct admission without a Master's is possible in exceptional cases. A minor is required.

**Student Financial Support:** Graduate assistantships are available to students in this program on a competitive basis.

# **Biomathematics**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<b>Biomathematics</b>	Y		Y		Y		

#### **GRADUATE FACULTY**

#### Directors of Graduate Programs:

A. L. Lloyd, Box 8205, <u>allloyd@math.ncsu.edu</u>, Mathematics
P. J. Arroway, Box 8203, 919/515-1955, <u>arroway@stat.ncsu.edu</u>, Statistics

Burroughs Wellcome Professor of Pharmacology: J. E. Riviere Camille Dreyfus Distinguished University Professor: C. K. Hall Drexel Professor of Mathematics: H. T. Banks William Neal Reynolds Distinguished Professor: W. R. Atchley William Neal Reynolds Professor: S. Zeng

Professors: J. F. Gilliam, A. L. Lloyd, S. R. Lubkin, S. V. Muse, K. H. Pollock, J. F. Selgrade, R. E. Stinner, J. L. Thorne, H. T. Tran, G. G. Wilkerson; *Adjunct Professors:* R. B. Conolly, L. B. Crowder, J. M. Hoenig, P. H. Morgan, R. W. Setzer; *Emeritus Professors:* J. W. Bishir, H. E. Schaffer; *Associate Professors:* K. Gross, N. M. Haddad, M. A. Haider, G. R. Hess, W. O. McMillan, M. Olufsen, C. E. Smith; *Assistant Professors:* B. J. Reich, W. Sun, Y. Wu; *Adjunct Assistant Professors:* G. Bobashev, J. S. Kimbell, M. W. Lutz

Biomathematics is an interdisciplinary graduate program offering courses and research opportunities in basic and applied mathematical biology. Degree programs are flexible to accommodate students with backgrounds in the biological, mathematical or physical sciences. The program also offers Ph.D. and master's-level minors. Additional information on requirements, courses, faculty and current research can be found at the website <u>www.ncsu.edu/biomath</u>.

Admission Requirements: Applicants should have either a Bachelor's degree in biology with evidence of aptitude and interest in mathematics, or a bachelor's in a mathematical science with evidence of aptitude and interest in biology. Advanced (multivariate) calculus, linear algebra and general biology are prerequisites for all BMA courses, and deficiencies in these should be remedied during the first year of graduate study. The application must include a narrative statement (1-2 pages) of the applicant's goals and reasons for interest in the BMA program.

**Master's Degree Requirements:** The M.S. and M.BMA. degrees require BMA 771-772 and one other BMA course; two upper-level biology courses; and three courses from the mathematical sciences or statistical sciences. The M.S. degree requires a thesis, and the M.BMA. requires two additional courses and a written project.

**Doctoral Degree Requirements:** Course requirements consist of a "core" and a "concentration" in

some area of biology or mathematical sciences. Core requirements are: BMA 771-772, 773 and 774; three upper-level biology courses from at least two areas (e.g., physiology and evolution); and additional courses from the mathematical or statistical sciences. Concentration consists of either a Ph.D. co-major in a biological or mathematical science or a coherent series of five graduate courses approved by the student's committee, which must include a two-semester sequence and at least one 700-level course.

**Financial Assistance:** TAs (generally in the Departments of Statistics or Mathematics), RAs and internships are available. Awards are based on GRE scores, transcripts, letters of recommendation, and the personal statement. RAs usually are held by continuing students. To receive **full** consideration for financial aid, the completed application must be received by January 15.

**Other Relevant Information:** All students are required to participate in the BMA Graduate Seminar. Course requirements can be met by examination or by demonstrating that an equivalent course was completed at another university.

# **Biomedical Engineering**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<b>Biomedical Engineering</b>	Y		Y				

#### **GRADUATE FACULTY**

#### H. T. Nagle, Interim Department Head

#### Director of Graduate Programs:

S. B. Knisley, Box 7115, 966-6653, Biomedical Engineering

# Distinguished University Research Professor: D. L. Bitzer INVISTA Professor of Fiber and Polymer Chemistry: A. E. Tonelli William Neal Reynolds Professor: J. Cavanagh

Professors: C. F. Abrams, A. J. Banes, M. Chow, R. P. Gardner, E. Grant, R. M. Grossfeld, S. A. Hale, H. Hsiao, C. Kleinstreuer, S. B. Knisley, H. Krim, A. V. Kuznetsov, G. Lazzi, W. Lin, S. R. Lubkin, D. J. Marcellin, N. Monteiro, H. T. Nagle, R. J. Narayan, E. D. Pisano, M. K. Ramasubramanian, S. C. Roe, W. E. Snyder, L. F. Stikeleather, M. K. Stoskopf, D. E. Thrall, M. A. Vouk; *Research Professors:* W. C. Holton; *Adjunct Professors:* S. L. Cooper, B. J. Oberhardt; *Emeritus Professors:* C. N. Lucas, S. A. Rajala; *Associate Professors:* G. D. Buckner, P. A. Dayton, R. G. Dennis, M. Gamcsik, R. E. Gorga, M. A. Haider, O. A. Harrysson, D. S. Lalush, E. G. Loboa-Polefka, J. M. Macdonald, M. G. McCord, P. L. Mente, J. F. Muth, M. Olufsen, A. Rabiei, S. Seelecke, C. E. Smith, A. M. Stomp, M. A. Tommerdahl; *Research Associate Professors:* C. N. Favorov, R. L. Goldberg, S. R. Quint; *Adjunct Associate Professors:* C. C. Finley; *Assistant Professors:* C. M. Gallippi, S. M. Gomez, G. S. McCarty, B. N. Steele, G. M. Walker; *Teaching Associate Professors:* J. J. Brickley, L. A. Cartee, H. O. Ozturk

The Joint Biomedical Engineering Graduate Program is administered by the combined biomedical engineering graduate faculty from both North Carolina State University and University of North Carolina at Chapel Hill. The joint program also has close working relations with the Research Triangle Institute and industry within the Research Triangle area. These associations enable students to obtain research training in a wide variety of fields and facilitate the selection and performance of dissertation research. The department, thus, provides students with excellent opportunities to realize the goal of enhancing medical care through the application of modern technology.

Biomedical engineering is a dynamic field stressing the application of engineering techniques and mathematical analysis to biomedical problems. Faculty research programs are key to the program, and they include bioinformatics and functional genomics; biomechanics and modeling; imaging and biophotonics; neural systems engineering; medical devices and rehabilitation; molecular, cellular, and tissue engineering; biomaterials and medical textiles. Facilities include a biomedical sensors laboratory, a tissue engineering laboratory, tissue and cell mechanics laboratories, and an array of cell culturing and computing resources.

Students enter this program with backgrounds in engineering, physical science, mathematics or biological science. Curricula are tailored to fit the needs and develop the potential of individual students. In addition, courses in statistics, mathematics, life sciences and engineering sciences provide a well-rounded background of knowledge and skills.

**Admission Requirements:** Students must satisfy all entrance requirements for the Graduate Schools of the University of North Carolina at Chapel Hill or North Carolina State University and must demonstrate interest and capability commensurate with the quality of the biomedical engineering program. Prospective students may apply to the graduate school at either UNC-CH or NC State. Generally, applications should be submitted by January 1 for consideration for admission in the coming fall semester. Applicants are expected to present Graduate Record Examination (GRE) scores; scores for verbal should be at or above the 50<sup>th</sup> percentile and quantitative should be at or above the 50<sup>th</sup> percentile to be competitive. The program requires that a one-to-three page personal statement about research interest and background be submitted.

Students should have a good working knowledge of mathematics at least through differential equations, plus two years of physical or engineering science and basic courses in biological science. Deficiencies in preparation can be made up in the first year of graduate training

**Master's Degree Requirements:** For students with a strong engineering background a minimum of 31 semester hours of graduate study is required for the M.S. Degree. Three hours must be in thesis and three hours must be in a course intended for graduate students only (the 700 level at NC State or the 700-800 level at UNC-CH). Further information on the BME Master's program can be found on the <u>department website</u>.

**Doctoral Degree Requirements:** A minimum of 52 semester hours of graduate work is required (beyond the Bachelor's degree). Degree candidates in this program are expected to obtain experience working in a research laboratory during their residence and to demonstrate proficiency in both teaching and research. The Ph.D. dissertation should be judged by the graduate committee to be of publishable quality. The student must meet the Graduate School's residency requirement at UNC-CH or NC State as appropriate. Further information on the BME Ph.D. program can be found on the <u>department website</u>.

**Required and highly recommended courses:** Students are required to take Introduction to Biomedical Engineering Seminar (BMME 400) offered at both UNC-CH and NC State and at least one credit of research experience in the first year of study. Students must also complete nine credits of graduate engineering topics, eight credits of graduate life science topics, six credits of engineering mathematics, and three credits of statistics. Students may choose from a number of courses to meet these requirements. Such choices are made in consultation with the student's academic advisor and the Director of Graduate Programs/Studies.

**Comprehensive and Qualifying Examinations:** Master's students are required to take a Comprehensive examination, encompassing coursework and thesis research. The Master's Comprehensive exam may be either written or oral, and is administered by the students advisory committee. Doctoral students qualify for the Ph.D. degree by meeting grade requirements in their

core courses, and then advance on to written and oral preliminary exams before admission to candidacy. Details can be found on the <u>department website</u>.

Click on <u>Graduate Courses</u> for more current course information.

For UNC courses, see <a href="http://www.bme.ncsu.edu/academics/syllabi.php">http://www.bme.ncsu.edu/academics/syllabi.php</a>

# **Business Management**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<b>Business Administration</b>					Y		

#### **GRADUATE FACULTY**

#### S. H. Barr, Department Head

**Director of Graduate Programs:** 

S. G. Allen, Box 7229, 5-5584, steve allen@ncsu.edu, Economics

Alan T. Dickson Distinguished University Professor: M. A. Rappa Bank of America Distinguished University Professor: R. B. Handfield Edwin Gill Professor of Business Management: C. P. Jones Zelnak Professor of Marketing Innovation: M. M. Montoya-Weiss

Professors: S. G. Allen, P. Arasu, S. H. Barr, J. W. Bartley, D. L. Baumer, Y. A. Chen, R. L. Clark, R. E. Kouri, S. E. Margolis, A. Padilla, D. P. Pagach, I. R. Weiss; *Emeritus Professors:* J. R. Canada, G. W. Dickson, D. M. Holthausen; *Associate Professors:* L. Aiman-Smith, E. A. Baker, P. K. Bergey, J. D. Bohlmann, C. C. Bozarth, M. Bradford, J. F. Brazel, S. N. Chapman, B. R. Danielsen, K. S. Davis, J. B. Earp, D. H. Henard, S. K. Markham, J. K. McCreery, K. Mitchell, S. Moon, P. W. Mulvey, C. M. Newmark, F. C. Payton, J. C. Poindexter, B. B. Tyler, M. D. Walker, R. S. Warr, D. P. Warsing, G. S. Young, G. J. Zuckerman; *Emeritus Associate Professors:* C. W. Harrell, E. A. McDermed; *Assistant Professors:* T. Caner, T. Hollmann, W. Kang, C. L. Rossetti, D. Sirdeshmukh, M. A. Stanko, D. M. Townsend, J. Zhao; *Teaching Associate Professors:* S. J. Schanz

The Master of Business Administration (MBA) program develops leaders for tomorrow's markets and technologies. NC State's MBA provides a solid foundation in the principles of finance, marketing, and other traditional business subjects.

The most distinctive feature of the program is its emphasis on management of technology. We offer concentrations in BioSciences Management, Financial Management, Marketing Management, Product Innovation Management, Services Management, Supply Chain Management, and Technology Entrepreneurship. Most students have a technology background, either from their undergraduate degree or previous work experience.

Admission Requirements: In addition to basic Graduate School admission requirements, applicants must submit recent GMAT scores. Admission decisions are based on academic performance and potential, GMAT scores, essays, and relevant work experience. Students must have a previous coursework in calculus before entering the program. For further information, please visit the MBA website at <u>www.mba.ncsu.edu</u>.

**Master's of Business Administration:** The MBA curriculum requires that every student complete the core curriculum listed below, along with concentration and elective courses, for a total of 56 credit hours for full-time students and 47 credit hours for part-time students.

MBA 500 Managerial and Career Effectiveness MBA 503 Survey of Accounting MBA 504 Data Analysis and Forecasting Methods for Management MBA 505 Global Economics for Managers MBA 520 Managerial Finance MBA 530 Managing the Global High-Tech Workforce MBA 540 Operations and Supply Chain Management MBA 550 Management of Technology and Innovation MBA 560 Marketing Management and Strategy MBA 580 Global Strategy

**Technical Concentration:** Minimum of 12 hours of courses in one of the following areas: Biotech/Pharmaceuticals Management, Financial Management, Marketing Management, Product Innovation Management, Services Management, Supply Chain Management, and Technology Entrepreneurship

**Electives:** Minimum of 15 hours for full-time students; minimum of nine (9) hours for part-time students.

**Minor in Management:** Students enrolled in Master's and doctoral programs can complete the minor by taking courses that meet requirements for the MBA degree. Master's students must take nine (9) hours; doctoral students must take 15 hours.

# **Chemical Engineering**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Chemical Engineering	Y		Y		Y		

#### **GRADUATE FACULTY**

#### P. S. Fedkiw, Department Head

**Director of Graduate Programs:** 

S. A. Khan, Box 7905, 5-4519, khan@eos.ncsu.edu, Chemical Engineering

Alcoa Professor of Chemical and Biomolecular Engineering: S. A. Khan, G. N. Parsons ALCOA Professor of Chemical Engineering: R. M. Kelly Camille Dreyfus Distinguished University Professor: C. K. Hall Celanese Acetate Professorship in Chemical and Biomolecular Engineering: J. Genzer Distinguished Professor: D. F. Ollis Elis and Signe Olsson Professorship: H. Jameel Frank Hawkins Kenan Distinguished Professor: R. G. Carbonell INVISTA Professorship in Chemical and Biomolecular Engineering: O. D. Velev William A. Klopman Distinguished Professor: B. Pourdeyhimi William R. Kenan, Jr. Distinguished Professor of Chemistry: J. M. DeSimone Worley H. Clark Distinguished University Professor: K. E. Gubbins

Professors: C. M. Balik, C. R. Daubert, P. S. Fedkiw, M. C. Flickinger, C. S. Grant, H. H. Lamb, P. K. Lim, R. J. Spontak, P. R. Westmoreland; *Adjunct Professors:* A. L. Andrady, S. L. Cooper, G. H. Findenegg, D. J. Hammond, P. K. Kilpatrick, D. J. Kiserow, J. B. McClain, M. Schoen, M. Sliwinska-Bartowiak, J. J. Spivey, P. Vlcek; *Emeritus Named Professors:* R. M. Felder, H. B. Hopfenberg; *Emeritus Professors:* G. W. Roberts; *Associate Professors:* A. C. Clark, R. E. Gorga, J. M. Haugh, S. W. Peretti; *Adjunct Associate Professors:* K. Caster; *Assistant Professors:* M. D. Dickey, W. Henderson, B. M. Rao; *Research Assistant Professors:* K. Efimenko, J. S. Jur, S. Smoukov; *Adjunct Assistant Professors:* M. D. Burke, P. V. Gurgel, J. P. Hinestroza, E. E. Santiso; *Extension Associate Professors:* H. Winston; *Teaching Assistant Professors:* J. H. van Zanten

Research activities in the department include: biomolecular engineering; catalysis, electrochemical and reaction engineering; electronic materials; green chemistry and engineering; polymers and colloids; nanotechnology and interfacial science; thermodynamics and molecular simulation; and supercritical fluids.

Admissions Requirements: Students admitted to the graduate program normally have a Bachelor's degree in chemical engineering or its equivalent. Students with undergraduate degrees in chemistry, physics or other engineering disciplines may be admitted but will be required to make up undergraduate course work deficiencies in chemical engineering without graduate credit. The most

promising candidates will be accepted up to the number of spaces available.

**Master of Science Degree Requirements:** The M.S. degree requires a minimum of 30 credit hours. A set of four core courses is required. Two options are provided. In the thesis option, the final thesis must be defended in a final public oral examination. In the non-thesis option, the student must satisfactorily complete a total of 10 graduate courses.

**Master of Chemical Engineering Degree Requirements:** The M.Ch.E. degree requires a minimum of 30 credit hours. A set of four core courses is required. A three-credit project is also required.

**Doctor of Philosophy Degree Requirements:** Students normally take a set of five core courses, two advanced courses and at least 6 credits of dissertation research. A thesis is required; this must be defended in a final public oral examination. In addition, the candidate must: (1) submit and defend an original written proposition in any area of chemical engineering, and (2) submit and defend a proposal to perform his/her thesis research.

# Chemistry

## **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Chemistry</u>	Y		Y		Y		

## **GRADUATE FACULTY**

M. Khaledi, Department Chair

Director of Graduate Programs:

C. B. Gorman, Box 8204, , chris gorman@ncsu.edu, Chemistry

# *Glaxo Distinguished University Professor of Chemistry:* J. S. Lindsey *Howard J. Schaffer Distinguished Professor of Chemistry:* B. M. Novak *Kobe Steel Distinguished Professor:* D. W. Brenner

Professors: A. J. Banks, E. F. Bowden, C. L. Bumgardner, D. L. Comins, S. Franzen, C. B. Gorman, K. W. Hanck, F. C. Hentz, M. Khaledi, J. D. Martin, D. C. Muddiman, D. A. Shultz, A. I. Smirnov, G. H. Wahl, M. H. Whangbo, J. L. Whitten; *Emeritus Professors:* R. D. Bereman, H. H. Carmichael, L. D. Freedman, F. W. Getzen, R. H. Loeppert, C. G. Moreland, S. T. Purrington, A. F. Schreiner, E. O. Stejskal, W. P. Tucker, R. C. White; *Associate Professors:* C. B. Boss, A. Deiters, T. B. Gunnoe, M. T. Oliver-Hoyo, W. L. Switzer, D. W. Wertz, J. L. White; *Assistant Professors:* R. A. Ghiladi, L. He, E. A. Ison, P. A. Maggard, C. C. Melander, A. A. Nevzorov, T. I. Smirnova, L. A. Sombers

The Department of Chemistry offers programs of study leading to the Doctor of Philosophy and Master of Science degrees. These degrees are based on coursework and original research. Many research projects merge disciplines such as biochemistry, computational science, materials science, physics, statistics and toxicology with chemistry. General courses as well as advanced and special topics courses are offered.

Admission Requirements: Applicants should have an undergraduate degree in chemistry or in a closely related field with a strong chemistry background. A GPA of at least 3.0 in the sciences is needed for consideration. GRE General Test scores are required, and the Subject Test is recommended. Admission decisions are made as completed applications are received. For most favorable consideration for the fall term, all application materials should be received by January 15 (domestic students) and January 1 (international students); for spring admission, by August 15.

**Master's Degree Requirements:** The Master of Science (M.S.) degree in chemistry is a research degree that requires six graduate courses, a minimum of 30 credit hours, and research leading to a thesis.

**Doctoral Degree Requirements:** In the doctoral program, emphasis is placed on original research and a comprehensive knowledge of one's chosen field.

**Student Financial Support:** Incoming graduate students are supported by departmental teaching assistantships. Outstanding applicants are eligible for supplemental fellowships during their first year of study. Research assistantships are normally available to second-, third-, and fourth-year students. The department also has fellowships for students interested in the area of electronic materials, biotechnology and pharmaceutical and synthetic organic chemistry.

**Other Relevant Information:** The Department of Chemistry is one of five academic departments in the College of Physical and Mathematical Sciences. Fifteen new faculty members have been added in the last ten years, thereby greatly enhancing opportunities for graduate research especially in cutting edge interdisciplinary programs.

# **Civil Engineering**

## **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Civil Engineering	Y		Y		Y		

## **GRADUATE FACULTY**

## G. F. List, Department Head

## Director of Graduate Programs:

V. C. Matzen, Box 7908, 5-7736, matzen@eos.ncsu.edu, Civil Engineering

#### Distinguished Professor of Civil Engineering: S. Rizkalla

*Edward I. Weisiger Distinguished Professor in Construction Engineering and Management:* D. W. Johnston

Professors: M. A. Barlaz, J. W. Baugh, R. C. Borden, R. H. Borden, E. D. Brill, B. L. Edge, H. C. Frey, M. A. Gabr, M. I. Hoit, J. E. Hummer, N. P. Khosla, Y. R. Kim, D. R. Knappe, M. J. Kowalsky, G. F. List, V. C. Matzen, J. M. Nau, M. F. Overton, M. S. Rahman, S. Ranjithan, W. J. Rasdorf, N. M. Rouphail, J. R. Stone; *Adjunct Professors:* B. Kasal; *Emeritus Professors:* M. Amein, P. D. Cribbins, J. F. Ely, J. S. Fisher, A. K. Gupta, K. S. Havner, C. L. Heimbach, Y. Horie, S. W. Nunnally, C. C. Tung, H. E. Wahls; *Emeritus Distinguished University Professors:* J. M. Hanson, P. Z. Zia; *Associate Professors:* F. De Los Reyes, J. Ducoste, M. N. Guddati, A. Gupta, T. Hassan, M. L. Leming, G. Mahinthakumar, R. Seracino, A. A. Tayebali, B. M. Williams; *Adjunct Associate Professors:* N. M. Abdel-Rahman, L. R. Goode, D. van der Vaart; *Emeritus Associate Professors:* W. L. Bingham, A. C. Chao, E. D. Gurley, J. C. Smith; *Assistant Professors:* S. Arumugam, C. P. Bobko, J. F. DeCarolis, T. M. Evans, M. Liu, E. A. Sumner, J. Yu; *Adjunct Assistant Professors:* B. J. Schroeder

Graduate programs are offered in coastal and water resources engineering, computer-aided engineering, construction engineering and management, environmental engineering, geotechnical engineering, public works engineering, structural engineering and mechanics, transportation engineering and materials.

Admission Requirements: Normal minimum requirements include a 3.0 GPA in a related engineering major. Provisional admission may be granted to applicants who do not satisfy normal admission criteria but have other special qualifications. Applicants without academic experience in civil engineering, construction engineering, or environmental engineering may be required to take undergraduate courses to remove deficiencies, without graduate credit. The Graduate Record Examination normally is required of all applicants.

**Master's Degree Requirements:** Two Master's degrees, each requiring a minimum of 30 credit hours, are available. At least two-thirds of a Master's program should be in a well-defined major area of concentration. The M.CE. is a non-thesis (Option B) degree with other requirements, such as

independent projects or core courses, specified in some areas of specialization. A formal minor is not permitted. The M.CE. is available both on-campus and through distance education. The M.S. degree requires a thesis and a formal minor is optional.

**Doctoral Degree Requirements:** The Ph.D. typically requires one year of full-time course work beyond the master's degree and research culminating in a dissertation. The program must develop a well-defined major area of concentration and may include supporting courses outside the major or a formal minor in a related field.

**Student Financial Support:** Departmental teaching and research assistantships are available including coverage of tuition and health insurance. Fellowships supplementing the assistantships, which may include coverage of academic fees, are available for exceptional applicants. All financial aid recipients are selected on merit-based competition with other applicants. Applications requesting financial aid should be submitted early: February 1 for Fall admission and by July 15 (international) or October 1 (U.S.) for Spring admission, although these are not deadlines.

# Communication

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<b>Communication</b>			Y				

#### **GRADUATE FACULTY**

#### K. S. Zagacki, Interim Department Head

#### **Director of Graduate Programs:**

M. A. Johnson, Box 8104, 515-9757, melissa johnson@ncsu.edu, Communication

*Professors:* D. M. Berube, V. J. Gallagher, W. J. Jordan, J. Keyton, R. L. Schrag, C. A. Smith, K. S. Zagacki; *Emeritus Professors:* C. A. Parker; *Associate Professors:* K. Albada-Jelgersma, D. P. Dannels, D. A. DeJoy, E. T. Funkhouser, J. K. Jameson, M. A. Johnson, W. J. Kinsella, J. Kiwanuka-Tondo, J. Packer, S. R. Stein, S. B. Wiley; *Emeritus Associate Professors:* B. L. Russell; *Assistant Professors:* E. A. Craig, A. de Souza e Silva, A. C. Farr, J. W. Ingram, K. A. Kosenko, J. L. Moore, R. D. Waters

The Master of Science program in communication is designed to provide graduate-level expertise for solving problems in modern organizations and social systems from a communication perspective and addresses issues concerned with interpersonal, relational and technologically mediated communication systems essential to modern, networked organizations and societies. Its graduates will acquire advanced-level expertise in communication theory, research and applications that will improve processes and enhance outcomes within and across diverse social systems. The degree prepares students for higher-level managerial positions in communication professions.

**Admission Requirements:** Applicants should have a minimum 3.0 GPA in the undergraduate major and a minimum of 3.0 over the last 60 hours of undergraduate work.

**Master's Degree Requirements:** The degree requires 36 credit hours with a minimum of 27 credit hours taken in communication; up to 9 hours may be taken outside of the department with the approval of the graduate advisor. Students will be required to complete 9 hours in communication theory, 6 hours in communication research methods and 12 hours in applied communication courses. They will also be required to complete 9 hours as electives to be chosen from among the first three groups of courses or up to 9 hours of electives may be taken outside the department with the approval of the graduate advisor.

# Communication, Rhetoric and Digital Media

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Communication Rhetoric and Digital Media	Y						

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

S. B. Wiley, Box 8104, 3-1468, steve wiley@ncsu.edu, Communication

## Distinguished University Professor: C. M. Anson SAS Institute Distinguished Professor of Rhetoric and Technical Communication: C. R. Miller

**Professors:** D. M. Berube, M. P. Carter, B. D. Faber, V. J. Gallagher, W. J. Jordan, H. D. Kellner, A. M. Penrose, R. L. Schrag, K. S. Zagacki; **Associate Professors:** K. Albada-Jelgersma, D. H. Covington, D. P. Dannels, R. S. Dicks, J. K. Jameson, M. A. Johnson, S. M. Katz, W. J. Kinsella, J. Kiwanuka-Tondo, S. K. Miller-Cochran, S. R. Stein, J. Swarts, S. B. Wiley; **Assistant Professors:** A. C. Farr, J. W. Ingram, D. M. Rieder

The interdisciplinary Ph.D. program in Communication, Rhetoric, and Digital Media (CRDM) is offered by the College of Humanities and Social Sciences with the cooperation of the Department of Communication and the Department of English. Built on the premise that new developments in communication media and information technologies require a dramatic shift in instruction and research, the program integrates the study of oral, written, and visual modes of communication to focus on the human dimensions of information and communication technologies.

Students can create programs of study in areas such as computer-mediated communication, visual rhetoric, digital culture, electronic communication across the curriculum, media and technology policy, textual mediation, digital literacy, and online information design. Graduates will help meet the increasing national demand for faculty with technology specializations to teach and lead programs in areas such as writing and speaking across the curriculum, organizational and interpersonal communication, composition studies, technical communication, rhetorical studies, and media studies. Industry and government also need professionals to conduct research, manage development, and analyze policy in the uses and applications of new communication technologies.

Admission Requirements: Master's degree in Communication, English, Rhetoric, or other relevant field with GPA of 3.0 or better. Master's level work should include one quantitative or qualitative methods course, as well as three courses in an approved <u>disciplinary area</u> and one in a second disciplinary area. Applicants who are otherwise well qualified may make up these courses after admission. GRE scores, a statement of goals and interests, a resume of work experience, and a writing sample are also required for application to the program. See our <u>website</u> for more detail.

The application deadline for Fall semester admission is February 1. The program will notify applicants of admission decisions by March 1 and expects acceptance of admission offers by April 15.

**Ph.D. Degree Requirements:** A minimum of 56 hours beyond the Master's degree are required to complete the Ph.D. program: 15 credit hours of core courses, 3 hours of research methods, 6 hours of professional preparation, 12 hours in an elective focus area, and 20 hours of research and dissertation. Students entering directly from a Master's program at NC State may be able to count additional Master's work toward some of these requirements.

**Student Financial Support:** The CRDM program offers a limited number of Teaching Assistantships, with a stipend, health insurance, and tuition (excluding fees). Teaching Assistants will be assigned according to their interests and qualifications to either the Communication or the English Department with the possibility of teaching in both departments during their course of study; those who do not have sufficient qualifications to teach in the first semester will participate in a training program. Some Research Assistantships may also be available.

# **Comparative Biomedical Sciences**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Comparative Biomedical Sciences	Y		Y				

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

S. L. Jones, Box 8401, 3-6459, sam jones@ncsu.edu, Clinical Sciences

## Burroughs Wellcome Professor of Pharmacology: J. E. Riviere William Neal Reynolds Professor: R. R. Anholt

Professors: K. B. Adler, G. W. Almond, K. L. Anderson, P. Arasu, H. J. Barnes, A. T. Blikslager, M. Breen, E. B. Breitschwerdt, T. T. Brown, J. M. Cullen, G. A. Dean, D. C. Dorman, L. N. Fleisher, F. J. Fuller, J. E. Gadsby, B. C. Gilger, J. S. Guy, B. Hammerberg, E. C. Hawkins, C. L. Hemenway, L. Jaykus, S. L. Jones, S. M. Laster, J. M. Law, J. F. Levine, M. G. Levy, D. H. Ley, M. C. McGahan, N. Monteiro, W. M. Morrow, E. J. Noga, T. J. Olivry, P. E. Orndorff, M. G. Papich, J. A. Piedrahita, M. C. Roberts, P. L. Sannes, B. Sherry, R. C. Smart, J. W. Spears, M. K. Stoskopf, D. E. Thrall; Research Professors: A. R. Brody, S. Kennedy-Stoskopf; Clinical Professors: R. A. Mansmann; Adjunct Professors: M. W. Dewhirst, H. A. Fine, C. S. Lau, J. A. Raleigh, R. M. Simpson; Associate Professors: R. E. Baynes, J. C. Bonner, M. T. Correa, P. Cowen, P. W. Farin, S. Y. Gardner, W. A. Gebreyes, M. L. Hauck, J. M. Hinshaw, J. M. Horowitz, D. X. Lascelles, P. E. Mozdziak, N. J. Olby, M. Rodriguez-Puebla, M. Schramme, B. D. Slenning, G. W. Smith; Adjunct Associate Professors: R. S. DeWoskin, J. A. Dye, R. W. Litaker, R. C. Sills; Assistant Professors: C. S. Bailey, A. J. Birkenheuer, J. L. Davis, T. Ghashghaei, I. M. Gimeno, J. L. Gookin, Y. Kim, R. J. McMullen, N. M. Nascone-Yoder, J. A. Neel, S. E. Suter, S. Thakur, J. A. Yoder; Research Assistant Professors: T. L. Leavens, X. R. Xia; Clinical Associate Professors: R. B. Baker, S. L. Marks; Clinical Assistant Professors: K. H. Chappell, K. E. Linder; Adjunct Assistant Professors: D. E. Malarkey; Teaching Associate Professors: J. A. Barnes

Course offerings and research topics currently include, but are not limited to: cell biology, genomics, infectious diseases, developmental biology, immunology, cardiology, pharmacokinetics, oncology, toxicology, gastroenterology, neuroscience, reproductive physiology, biotechnology, microbiology, aquatic/ wildlife biology, biomedical engineering, endocrinology, molecular biology, pulmonary biology, epidemiology, population medicine, health systems monitoring, transplantation and radiology.

Admission Requirements: All applications are reviewed by the Graduate Studies Committee of the CBS Program, composed of faculty members representing each area of the graduate program and a graduate student representative. Scores from the GRE are required for admission by all applicants. Candidates who do not have a DVM degree must have a baccalaureate degree or advanced degree from a college or university recognized as standard by a regional or general accrediting agency. Students with a 3.0 (on a 4.0 scale) undergraduate or DVM curriculum with appropriate course background will be considered for admission.
**Doctoral Degree Requirements:** Credit hour requirements for the Ph.D. degree are determined by the graduate student's committee with approval of the Director of Graduate Programs and the Graduate School.

**Student Financial Support:** Research assistantships are awarded to qualified candidates on the competitive basis by the College. These are for 12-month periods, and stipends are competitive with those of other programs. These positions are funded by the grants of individual faculty members and the state appropriations to the College and departments.

**Other Relevant Information:** The program is organized as five areas of concentration which include: cell biology, epidemiology/ population medicine, infectious diseases, pathology, and pharmacology. These provide extensive interdisciplinary training and maintain a highly effective liaison with graduate programs in other colleges of the university, as well as those of nearby Duke University and the University of North Carolina at Chapel Hill.

Click on Graduate Courses for current course information.

# **Computer Networking**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Computer Networking			Y				

#### **GRADUATE FACULTY**

#### Directors of Graduate Programs:

D. J. Thuente, Box 8206, 515-7003, <u>thuente@csc.ncsu.edu</u>, Computer Science H. J. Trussell, Box 7911, 5-5126, <u>hit@eos.ncsu.edu</u>, Electrical and Computer Engineering

Alan T. Dickson Distinguished University Professor: M. A. Rappa Alton and Mildred Lancaster Distinguished Professor: R. J. Trew Distinguished Professor of Computer and Electrical Engineering: N. A. Masnari Distinguished University Professor: B. J. Baliga Lampe Professor of Electrical and Computer Engineering: M. B. Steer McPherson Family Distinguished Professor of Engineering Entrepreneurship: T. K. Miller Progress Energy Distinguished Professor in Electrical and Computer Engineering: A. Q. Huang

Professors: W. E. Alexander, A. I. Anton, M. E. Baran, S. A. Bedair, G. L. Bilbro, M. Chow, M.
Devetsikiotis, A. Duel-Hallen, P. D. Franzon, E. Grant, B. L. Hughes, K. W. Kim, R. M. Kolbas, H. Krim, G.
Lazzi, L. Lunardi, V. Misra, H. T. Nagle, A. Nilsson, M. C. Ozturk, H. G. Perros, D. S. Reeves, I. Rhee, G.
Rouskas, M. P. Singh, W. E. Snyder, W. J. Stewart, J. K. Townsend, H. J. Trussell, I. Viniotis, M. A. Vouk;
Adjunct Professors: G. J. Iafrate, S. P. Iyer; *Emeritus Named Professors:* J. R. Hauser; *Emeritus Professors:* D. F. McAllister, C. M. Osburn, S. A. Rajala; Associate Professors: S. T. Alexander, D. W.
Barlage, G. T. Byrd, H. Dai, W. R. Davis, A. G. Dean, R. Dutta, D. Y. Eun, J. F. Muth, P. Ning, E. Rotenberg, M. L. Sichitiu, Y. Solihin, W. Wang, M. W. White, L. A. Williams; Adjunct Associate Professors: K. Gard, M.
Ghovanloo, A. J. Rindos; Teaching Professors: J. J. Grainger; Teaching Assistant Professors: L. J.

The Master of Science in computer networking may be earned through the M.S. with thesis option or through the non-thesis option. Either option may be used as preparation for further graduate study or employment in industrial research, development or design environment, although students planning to continue on for a Ph.D. should discuss the option selected with their advisors.

**Admission Requirements:** Admissions criteria will adhere to those currently listed on the program website: <u>http://networking.ncsu.edu</u>

**Master's Degree Requirements:** Computer networking core courses constitute 9 of the 30 minimum credit hours. Students take 12 additional credit hours of computer networking courses from one of four currently defined technical concentration areas: network design, network hardware, network software, or networking services. The remaining 9 credit hours may be taken from an approved

management concentration sequence, as additional courses in the computer networking technical concentration areas, or as 6 hours of thesis and 3 credit hours from the list of approved computer networking courses. At least 6 of the 30 credits must come from the 700 level, and non-letter graded courses such as individual studies courses may account for a maximum of 3 credit hours.

#### **CORE COURSES**

CSC(ECE) 570 Computer Networks CSC(ECE) 579 Introduction to Computer Performance Modeling

Select one of the following business courses: MBA 554 Project Management (Summer, Fall, Spring) MBA 590 Special Topics: Management Foundations (Fall) MBA 590 Special Topics: Service Management (Spring)

#### **TECHNICAL CONCENTRATION**

CSC 501 Operating System Principles CSC(ECE) 506 Architecture of Parallel Computers CSC 510 Software Engineering CSC 513 E-Commerce technology CSC(MBA) 516 E-commerce Practicum CSC 557 Multimedia Technology CSC(ECE) 573 Internet Protocols CSC(ECE) 574 Information Systems Security CSC(ECE) 575 Introduction to Wireless Networking CSC(ECE) 576 High Speed Networks CSC 714 Real-Time Computer Systems CSC 715 Concurrent Software System CSC 716 Design of Secure and Reliable Systems CSC 724 Advanced Distributive Systems CSC 750 Service-Oriented Computing CSC(ECE) 772 Survivable Networks CSC(ECE) 773 Advanced Topics in Internet Protocols CSC(ECE) 774 Network Security CSC(ECE) 776 Performance Evaluation of Computer Networks CSC(ECE) 775 Advanced Topics in Wireless Networks CSC(ECE) 777 Telecommunications Network Design CSC(ECE) 779 Advanced Computer Performance Modeling CSC(ECE) 778 Optical Networks ECE 514 Random Processes ECE 520 Digital ASIC Design ECE 521 Computer Design and Technology ECE 523 Photonics and Optical Communications ECE 546 VLSI System Design ECE 733 Digital Electronics ECE 761 Design Automation for VLSI

#### MANAGEMENT CONCENTRATION

MBA 503 Survey of Accounting MBA 514 Technology, Competition and the Law MBA 520 Managerial Finance MBA 541 Supply Chain Relationships MBA 542 Supply Chain Logistics MBA 543 Planning and Control Systems MBA 554 Project Management

MBA 576 Technology Evaluation and Commercialization Concepts

MBA 577 High Technology Entrepreneurship

MBA 590 Special Topics: Decision Support Systems

MBA 590 Special Topics: Business Process Analysis and Design

MBA 590 Special Topics: Business Relationship Management

MBA 590 Special Topics: Consulting

MBA 590 Special Topics: Service Management

# **Computer Science**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Computer Science	Y		Y		Y		

#### **GRADUATE FACULTY**

#### M. A. Vouk, Department Head

#### Director of Graduate Programs:

D. J. Thuente, Box 8206, 515-7003, thuente@csc.ncsu.edu, Computer Science

### Alan T. Dickson Distinguished University Professor: M. A. Rappa Distinguished University Research Professor: D. L. Bitzer McPherson Family Distinguished Professor of Engineering Entrepreneurship: T. K. Miller SAS Institute Distinguished Professor of Computer Science: J. Doyle

Professors: A. I. Anton, J. W. Baugh, M. Devetsikiotis, R. J. Fornaro, E. L. Kaltofen, G. Lazzi, J. C. Lester II, C. Meyer, H. G. Perros, D. S. Reeves, I. Rhee, R. D. Rodman, G. Rouskas, C. D. Savage, M. P. Singh, W. E. Snyder, M. F. Stallmann, W. J. Stewart, A. L. Tharp, D. J. Thuente, I. Viniotis, M. A. Vouk; *Adjunct Professors:* S. P. Iyer; *Emeritus Professors:* W. Chou, E. W. Davis Jr, J. C. Glass, D. F. McAllister; *Associate Professors:* D. R. Bahler, G. T. Byrd, R. Y. Chirkova, A. G. Dean, R. Dutta, V. W. Freeh, E. F. Gehringer, K. H. Harfoush, C. G. Healey, T. L. Honeycutt, X. Ma, G. Mahinthakumar, R. F. Mueller, P. Ning, E. Rotenberg, N. F. Samatova, J. S. Scroggs, M. L. Sichitiu, Y. Solihin, R. A. St. Amant, W. Wang, B. A. Watson, L. A. Williams, R. M. Young, T. Yu; *Adjunct Associate Professors:* X. Wang, P. R. Wurman; *Assistant Professors:* X. Gu, S. Heber, X. Jiang, K. Ogan, T. Xie; *Adjunct Assistant Professors:* J. Kang, A. J. Rindos

The Department of Computer Science is one of the leading computer science departments in the country and indeed the world. Recent developments include adding over 20 tenure-track faculty, 18 of whom have received NSF CAREER development awards. Total research expenditures have quadrupled over the last few years and graduate enrollments have climbed to nearly 500 students. The faculty has broad-ranging research strengths including *Theory* (Algorithms, Theory of Computation); *Systems* (Computer Architectures and Operating Systems, Embedded and Real-Time Systems, Parallel and Distributed Systems, Scientific and High Performance Computing); *Artificial Intelligence* (Intelligent Agents, Data-Mining, Information and Knowledge Discovery, Engineering and Management; eCommerce Technologies; Information Visualization, Graphics and Human-Computer Interaction); *Networks* (Networking, Performance Evaluation, Sensor Networks, Protocols); *Security* (Software and Network Systems Security, Information Assurance, Privacy); *Software Engineering* (Requirements, Formal Methods, Reliability Engineering, Process and Methods, Programming Languages); and *Computer-Based Education*. Areas of strength in applied research include bioinformatics, scientific computation, e-commerce and data mining.

**Admission Requirements:** Minimum application requirements include an accredited Bachelor's degree with at least a B average and computer science course work at least equivalent to nearly a major. Applicants must submit scores for the GRE General Tests. It is recommended that financial aid and Ph.D. applicants also take the GRE Computer Science Subject Test.

**Master's Degree Requirements:** The M.S. requires 30 graduate credits including at least one course from each of the core areas of Theory (CSC 505, 512, 565, 579, 580, and 707) and Systems (CSC 501, 506, 510, 520, 540, 562, and 570) and thesis research (typically six credits). The advisory committee may waive the thesis requirement for students planning to pursue the Ph.D. who pass the Ph.D. written preliminary examination and complete specified additional course work in lieu of thesis research. The Master of Computer Science (M.C.S.) is a professional degree granted upon successful completion of 30 hours of course work, including three core courses with at least one from each of the two core areas and CSC 600. The M.C.S. degree is offered as an on-campus program or as a distance education program. The Master of Science in Computer Networking (M.S.C.N.) is a 30 credit-hour degree offered as either a thesis or non-thesis program. It is expected to be offered as a Distance Education program in January 2010.

**Doctoral Degree Requirements:** Ph.D. students normally complete 72 semester hours of postbaccalaureate course work. They must also complete at least two courses from each of the two core areas with at least a 3.5 GPA and two 700-level CSC courses, individualized in-depth written and oral preliminary examinations, and a public defense of their dissertation describing substantial, original, and independent scholarly work.

**Student Financial Support:** During 2008-2009 academic year, approximately 200 students held teaching and research assistantships. The Department also has Nortel, IBM, GEM, Provost's, and Dean's Fellowships, which are awarded to outstanding candidates. In addition, the Department's Industrial Assistantship and Fellowship Programs and co-ops provide graduate student RA positions and part-time work at IT firms across the country.

**Other Relevant Information:** Graduates at all levels are highly respected and recruited. They well paid locally and throughout the country and the world. Many Master's degree graduates begin or continue careers in advanced networking or software development in the Research Triangle Park and on the West Coast at companies such as IBM, Microsoft, Google, SAS, Intel, Netapp, and Cisco. Many recent Ph.D.s have positions of technical leadership in well-known large companies and prominent research laboratories including Google, Microsoft Research, and IBM Research Labs, and some have obtained tenure-track faculty positions at Research I institutions.

Click on Graduate Courses for current course information.

# **Crop Science**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Crop Science	Y		Y		Y		

#### **GRADUATE FACULTY**

#### W. D. Smith, Interim Department Head

*Director of Graduate Programs:* R. Wells, Box 7620, 53667, <u>randy\_wells@ncsu.edu</u>, Crop Science

Bayer Environmental Science Professor of Sustainable Development: T. W. Rufty
Philip Morris Professor: R. E. Dewey
Phillip Morris Professor: W. D. Smith
R. J. Reynolds Tobacco Company Professor: J. C. Wynne
University Research Professor: W. F. Thompson
William Neal Reynolds Distinguished University Professor: M. M. Goodman

Professors: D. C. Bowman, R. J. Cooper, E. J. Dunphy, K. L. Edmisten, J. T. Green, C. H. Haigler, R. W. Heiniger, T. G. Isleib, D. L. Jordan, J. M. Luginbuhl, G. L. Miller, J. P. Mueller, J. P. Murphy, R. P. Patterson, C. H. Peacock, R. Qu, R. C. Rufty, J. F. Spears, H. T. Stalker, P. R. Weisz, R. Wells, T. R. Wentworth, G. G. Wilkerson, F. H. Yelverton; USDA Professors: F. L. Booker, J. C. Burns, J. W. Burton, T. E. Carter, E. L. Fiscus, J. B. Holland, D. P. Livingston, D. S. Marshall, R. F. Wilson; Adjunct Professors: K. D. Getsinger, R. Liebl, T. R. Sinclair; *Emeritus Named Professors:* W. K. Collins, G. F. Peedin, A. C. York; Emeritus Professors: C. A. Brim, A. H. Bruneau, B. E. Caldwell, D. S. Chamblee, H. D. Coble, W. A. Cope, F. T. Corbin, D. A. Emery, W. T. Fike, J. D. Gregory, H. D. Gross, G. L. Jones, J. A. Lee, W. M. Lewis, H. M. Linker, R. C. Long, H. Seltmann, G. A. Sullivan, D. H. Timothy, J. B. Weber, W. W. Weeks, A. K. Weissinger, A. D. Worsham; *Emeritus Named Distinguished Professors:* E. A. Wernsman; *Associate* Professors: J. M. Alonso, J. D. Burton, A. J. Cardinal, D. A. Danehower, T. H. Emigh, G. E. Fernandez, L. R. Fisher, E. B. Wilson; USDA Associate Professors: G. Brown-Guedira, K. O. Burkey, P. Kwanyuen; Emeritus USDA Professors: G. R. Gwynn, D. E. Moreland, D. L. Thompson; Adjunct Associate Professors: M. D. Netherland; Emeritus Associate Professors: R. D. Keys; Assistant Professors: S. Johnson, V. Kuraparthy, R. S. Lewis, S. R. Milla-Lewis, S. C. Reberg-Horton, R. J. Richardson, M. S. Schroeder-Moreno; Research Assistant Professors: S. P. Tallury; Teaching Assistant Professors: C. V. Jordan

The Department of Crop Science offers programs of study leading to the Master of Crop Science (M.C.S.), Master of Science (M.S.) and Doctorate of Philosophy (Ph.D.) degrees. The M.S. and Ph.D. programs are based upon original research while the M.C.S degree is a non-thesis degree program. Areas of study in the department include plant breeding, genetics and molecular biology; crop production, management, chemistry and physiology; sustainable agriculture and agro-ecology; turf grass management and science; integrated pest management, weed science and crop modeling.

Excellent facilities for graduate education are available, including wet and dry labs for preparation and analysis of plant and soil samples, cold storage facilities, greenhouses, controlled environmental chambers, computing facilities and the Southeastern Plant Environment Laboratories (Phytotron) for highly controlled plant environmental research. Agriculturally, North Carolina has a wide array of environments and soils for field research. This includes the sandy coastal plains and black lands of eastern NC, the central Piedmont with its clay soils, and the mountains of NC with their unique environments and soils. University and State research stations are located strategically throughout each of these regions and are widely used for field research.

Crop Science programs also benefit from strong cooperative ties with other departments and institutions. Graduate students in Crop Science work cooperatively with and/or obtain instruction in the Departments of Animal Science, Biochemistry, Chemistry, Computer Science, Entomology, Horticultural Science, Genetics, Mathematics, Microbiology, Plant Biology, Plant Pathology, Soil Science and Statistics. Cooperative efforts link our programs with faculty at a number of land grant and international universities as well as with leaders in agribusiness and environmental protection.

Admissions Requirements: Prospective students should be graduates of an accredited university with a major in agronomy, animal science, biology, crop science, genetics, horticulture, plant science or related field of study. Graduates from other degree programs will be considered but may be asked to make up certain undergraduate deficiencies. Acceptance of applicants is competitive and limited by program space and funding. Applicants should have a minimum of a 3.0 (out of 4.0) GPA and a minimum combined GRE score of 1000 on the verbal and quantitative portions of the exam. Exceptions to these guidelines may be made for students with special backgrounds, abilities or interests

**Master's Degree Requirements:** *Master of Science Degree:* Requirements include a minimum of 30 semester hours of course work, including one hour of Seminar (CS 601) and six hours of Statistics (ST 511 and ST 512 or equivalent), completion of a thesis, a comprehensive oral examination and presentation of an exit seminar. *Master of Crop Science Degree:* M.C.S. requirements include a minimum of 36 semester hours of graduate work with a minimum of four, but no more than six, credit hours of Special Problems (CS 620). One hour of Crop Science Seminar (CS 601), three hours of Statistics (ST 511 or equivalent), a comprehensive oral examination and presentation of an exit seminar are also required.

**Doctoral Degree Requirements:** Ph.D. Candidates must demonstrate an ability to conduct original research and scholarly work at the highest level and produce an acceptable dissertation. Doctoral students must take a minimum of 72 graduate credit hours beyond the Bachelor's degree. They must also pass a preliminary examination (written and oral components) and a final oral examination. Presentation of an exit seminar is required.

**Student Financial Support:** Graduate assistantships and fellowships will be awarded to qualified applicants depending on funding availability and program space. Tuition is typically waived for students granted assistantships. Student health insurance is also provided to all students on assistantship.

**Other Relevant Information:** A thesis (M.S. and Ph.D.) or special problem (Master of Crop Science) outline and Plan of Graduate Work should be submitted to the Director of Graduate Programs by the end of the first regular (spring or fall) semester.

Click on <u>Graduate Courses</u> for current course information.

# **Curriculum and Instruction**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Counselor Education	Y		Y			Y	
Counselor Education, Agency Counseling			Y			Y	
Counselor Education, Student Personnel in Higher Education			Y			Y	
Curriculum and Instruction	Y		Y			Y	
Curriculum and Instruction, English Education			Y			Y	
Curriculum and Instruction, Reading			Y			Y	
Curriculum and Instruction, Social Studies Education			Y			Y	
Instructional Technology - Computers			Y			Y	
Middle Grades Education			Y			Y	
Special Education			Y			Y	
Special Education, Behavior Disorders			Y			Y	
Special Education, Learning Disabilities			Y			Y	
Special Education, Mental Retardation			Y			Y	

#### **GRADUATE FACULTY**

- E. S. Vasu, Department Head, Curriculum and Instruction
- S. Ting, Asst. Dept. Head, Curriculum and Instruction

#### Directors of Graduate Programs:

E. R. Gerler, Box 7801, , <u>Edwin Gerler@ncsu.edu</u>, Curriculum, Instruction, & Counselor Education R. J. Pritchard, Box 7801, 51784 or 5152231, <u>rule pritchard@ncsu.edu</u>, Curriculum, Instruction, & Counselor Education

Professors: S. B. Baker, C. Brownie, C. K. Coe, C. L. Crossland, D. A. Cullinan, D. M. Daley, B. J. Fox, E. R. Gerler, P. L. Marshall, E. McIntyre, T. P. O'Brien, J. A. Picart, G. A. Ponder, C. A. Pope, R. J. Pritchard, E. J. Sabornie, R. D. Safrit, H. A. Spires, E. S. Vasu; *Emeritus Professors:* L. K. Jones, D. C. Locke, B. R. Poulton, N. A. Sprinthall; *Associate Professors:* C. M. Beal, J. T. DeCuir-Gunby, R. C. Kochersberger, J. K. Lee, S. C. Nassar-McMillan, J. L. Nietfeld, E. O'Sullivan, J. W. Osborne, S. S. Osborne, A. J. Reiman, S. S. Snyder, J. E. Swiss, S. Ting, C. A. Young; *Adjunct Associate Professors:* B. M. Gorham; *Emeritus Associate Professors:* J. F. Arnold, L. M. Thies-Sprinthall; *Assistant Professors:* H. A. Davis, H. C. Edwards, M. A. Grimmett, L. B. Holcomb, M. M. Manfra, K. M. Oliver; *Research Assistant Professors:* A. S. Overbay; *Clinical Assistant Professors:* R. A. Callanan, L. L. Grable, R. L. Honeycutt, L. E. Huffman, S. T. Johnson, M. K. Monaco, T. E. Ray, T. H. Stafford, R. S. Sutton, R. E. Tyler; *Extension Assistant Professors:* M. N. Stumpf; *Teaching Assistant Professors:* D. E. Benge, D. J. Lucas, J. R. Smith

**Curriculum and Instruction:** The Department offers Master's degrees in curriculum and instruction generalist, curriculum and instruction with a concentration in business and marketing education, English education, instructional technology, middle grades education, reading education, social studies education, special education, and curriculum/supervision. Emphasis areas in special education are offered in the areas of behavior disorders, learning disabilities and intellectual disabilities. The Master's degree in middle grades education includes either a concentration in language arts or social studies. Instructional Technology offers an online e-learning certificate and the hours can be applied to the Master's degree. The Ph.D. program in curriculum and instruction is primarily designed to prepare students for roles as researchers and educators in higher education, industry, or for instructional leadership at school district and state levels. The program is built on foundations of research and application and is composed of three strands: (1) content area specialization, (2) research, and (3) preparation for professional roles. Nine doctoral areas of scholarly endeavor (focus) are offered by the department: Business and Marketing Education, Instructional Technology, Middle Grades Education, Reading (Literacy) Education, Social Studies Education, and Special Education.

The NC Department of Public Instruction has conferred accreditation to the graduate programs in Curriculum and Instruction. The College of Education is approved by the National Council for Accreditation of Teacher Education (NCATE).

**Counselor Education:** The Department also offers Master's degrees in counselor education: school counseling, student personnel in higher education (college counseling), and agency counseling. The Ph.D. degree program is offered in Counselor Education. The Council for Accreditation of Counseling and Related Educational Programs (CACREP), a specialized accrediting body recognized by the Council on Post-Secondary Accreditation (COPA), has conferred accreditation to all graduate programs in Counselor Education. The Department also offers a new online certificate program in Counselor Education.

**Master's of Arts of Teaching:** Beginning in Spring 2009, this new degree program offers graduate licensure in the following areas that are part of the Department of Curriculum and Instruction: Social Studies Education, English Education, Middle Grades Education, Special Education. Existing graduate courses are part of this degree as well as new courses. The courses with the ED prefix listed below are core courses that MAT students will take across departments.

Admission Requirements: *Curriculum and Instruction:* A 500-800 word statement describing professional goals is required. Some areas of study require that applicants be qualified to hold a baccalaureate-level teaching license or have teaching experience. The Graduate School requires a 3.0 in the undergraduate program. GRE scores not more than five years old are required for the doctoral program. GRE or MAT scores not more than five years old are required for the Master's program. *Counselor Education:* Requirements include a 3.00 average (4.00 scale) of the undergraduate program, and one year of work experience in a human service capacity. The best qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum grade-point average and work experience requirements may be made for students with special backgrounds, abilities and interests.

**Master's Degree Requirements:** *Curriculum and Instruction:* A minimum of 36 course credit hours and a written examination or culminating project are required. For the M. S. degree, a minimum of 39 hours is required. The M. S. degree requires a final oral examination and thesis approved by the graduate committee. The Master's of Arts of Teaching is a 30-hour program, with many courses offered online or by distance education. *Counselor Education:* A minimum of 48 credits hours is required for the M.Ed degree. The M. S. degree requires completion of a total of 60 credits, including a thesis.

**Doctoral Degree Requirements:** *Curriculum and Instruction:* A minimum of 72 course credit hours beyond a Bachelor's degree is required, which includes 15-18 hours of research, a curriculum specialty, and 12 hours of dissertation credit. At least 54 new hours must be taken after the student matriculates into the doctoral program. *Counselor Education:* A minimum of 62 credits hours beyond the Master's degree is required, including the courses in research, counselor education theory, a cognate area, and professional application.

**Student Financial Support:** No financial aid is available on a regular basis. The Counselor Education program works with the Division of Student Affairs to offer graduate assistantships.

Click on <u>Graduate Courses - Curriculum and Instruction</u> for current course information.

Click on Graduate Courses - Counselor Education for current course information.

# Design

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Design</u>	Y						

#### **GRADUATE FACULTY**

### Director of Graduate Programs:

M. J. Davis, Box 7701, 58328, meredith davis@ncsu.edu, Graphic Design

Professors: M. J. Davis, H. Khachatoorian, R. C. Moore, W. Place, A. R. Rice, M. Scotford, P. Tesar;
 Emeritus Professors: F. A. Rifki; Associate Professors: C. Q. Raub, K. J. Schaffer, J. O. Tector; Research
 Associate Professors: P. K. Baran, N. G. Cosco; Assistant Professors: P. R. Battaglia, S. B. Joines; Visiting
 Assistant Professors: J. Hu

The mission of the Doctor of Philosophy in Design Program in the College of Design at NC State University is to improve human condition through design research and scholarship. This mission is built in equal parts on the recognition of a fertile common ground among the design disciplines and on the need for specificity and depth within them. The Ph.D. Program therefore values a broad range of research interests that aim to improve the human condition through design.

The aim of the Ph.D. in design is to prepare students holding previous degrees in a design discipline to conduct research in the areas of: design for health and well-being; design for learning; design for sustainability; design and technology; design and the urban context; design methods; and design history and criticism.

**Admission Requirements:** Two official academic transcripts; three letters of reference; GRE scores; TOEFL scores (for international students); residency statement (U.S. residents only); College of Design personal data form; statement of research intent; and portfolio.

**Doctoral Degree Requirements:** The program of study requires a minimum of 54 credit hours of graduate work beyond the Master's degree, and of these credit hours, 18 will be independent research and dissertation credit with the remaining 36 hours of course work being completed in the Ph.D. program. In addition, there are three (3) 1-credit colloquia.

**Student Financial Support:** Teaching and research assistantships are available to several doctoral students, and in addition, those students receiving some form of research assistantship will also receive tuition remission. Assistantships are awarded on the recommendation of the admissions committee.

Click on <u>Graduate Courses</u> for current course information.

# **Economics**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Agricultural and Resource Economics			Y				
Economics	Y			Y	Y		

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

T. C. Morant, Box 8110, 515-4617, tamah morant@ncsu.edu, Economics

Hugh C. Kiger Professorship: A. B. Brown
UNIVERSITY DISTINGUISHED PROFESSOR: V. K. Smith
William Neal Reynolds Distinguished Professor: M. L. Walden, M. K. Wohlgenant
William Neal Reynolds Professor: D. A. Dickey, B. K. Goodwin, W. N. Thurman

Professors: S. G. Allen, R. H. Bernhard, J. A. Brandt, M. Caner, R. L. Clark, L. A. Craig, E. A. Estes, P. L.
Fackler, D. J. Flath, T. J. Grennes, A. R. Hall, D. N. Hyman, A. Inoue, C. E. Joyner, H. J. Kleiss, C. R.
Knoeber, J. S. Lapp, S. E. Margolis, M. C. Marra, R. B. Palmquist, D. K. Pearce, D. J. Phaneuf, N. E.
Piggott, M. A. Renkow, C. D. Safley, J. J. Seater, L. O. Taylor, T. C. Tsoulouhas, T. Vukina, W. J. Wessels,
G. A. Wossink; *Research Professors:* L. U. Hatch; *Adjunct Professors:* T. P. Holmes; *Emeritus Professors:*G. A. Carlson, L. E. Danielson, J. E. Easley, E. W. Erickson, D. Fisher, D. M. Holthausen, T. Johnson, C. L.
Moore, R. A. Schrimper; *Associate Professors:* J. Gervais, A. E. Headen, M. B. McElroy, C. M. Newmark,
A. W. Oltmans, D. Pelletier, R. H. von Haefen, K. D. Zering; *Emeritus Associate Professors:* D. S. Ball, E.
A. McDermed; *Assistant Professors:* P. A. Guerron, R. G. Hammond, I. T. Kandilov, A. Leblebicioglu, T. S.
Morrill, R. M. Rejesus, M. J. Roberts, X. Zheng; *Research Assistant Professors:* M. S. Morrill; *Adjunct Assistant Professors:* B. J. Hubbell, D. J. MacNair; *Teaching Assistant Professors:* T. C. Morant

The economics graduate program is a joint program of the Department of Agricultural and Resource Economics and the Department of Economics. Emphasis is placed on economic theory and quantitative economic analysis and their application to economic problems. The major fields of specialization are: agricultural economics, econometrics, environmental/resource economics, industrial organization, international economics, labor economics and macro-monetary economics.

Admission Requirements: Minimum background for admission includes intermediate microeconomics and macroeconomics, at least one semester of calculus (two for Ph.D.) and undergraduate statistics. Some students are admitted conditional on their taking certain prerequisites. The submission of GRE scores is only required for students applying for financial aid.

**Master's Degree Requirements:** The Master of Science in agricultural and resource economics and the Master of Arts in economics require core courses in micro-economics (ECG 700), macroeconomics (ECG 703), statistics (ST 514) and applied econometrics (ECG 561). Both degrees have thesis and elective

requirements. The Master of Economics is a non-thesis degree with two options: (1) Ph.D. Preparatory and (2) Applied Economics and Policy Analysis. Both options require a core of ECG 700 (or ECG 505), ECG 703 (or ECG 506), ST 514 and ECG 561. In addition ECG 765 is highly recommended for Option 1, while Option 2 also requires ECG 562 and ECG 580. Both options have elective requirements. All three Master's degrees require a total of 30 credit hours. Accelerated Bachelor's/Master's degree programs are available for all three Master's degrees.

**Doctoral Degree Requirements:** The Ph.D. program requires a minimum of 72 hours and at least six semesters of work beyond the Bachelor's degree. Students must pass written comprehensive examinations in micro-economics and macro-economics. Course requirements include two semesters of econometrics and six field courses.

**Student Financial Support:** Research and teaching assistantships are available and are awarded on a competitive basis. These assistantships go to Ph.D. students only; there is no financial support for Master's students. Prospective doctoral students who wish to be considered for assistantships are advised to apply for fall admission by the third week in January.

**Other Relevant Information:** Graduate students on financial support are provided office space or study carrels. Other students may be assigned study carrels if available. All students have access to the economics graduate student computer lab.

Click on <u>Graduate Courses</u> for current course information.

# **Educational Leadership and Policy Studies**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Educational Administration and Supervision		Y					
Educational Research and Policy Analysis	Y						
School Administration					Y		

#### **GRADUATE FACULTY**

#### R. C. Serow, Head

#### Director of Graduate Programs:

L. D. Fusarelli, Box 7801, 9195130507, <u>lance\_fusarelli@ncsu.edu</u>, Educational Leadership and Policy Studies

Professors: L. D. Fusarelli, B. M. Kirby, G. M. Kleiman, E. J. Sabornie, R. C. Serow, E. S. Vasu; Emeritus
Professors: T. Johnson, R. G. Taylor; Associate Professors: T. L. Alsbury, P. F. Bitting, V. W. DeLuca, B. C.
Fusarelli, S. S. Osborne; Assistant Professors: K. P. Brady, M. C. Militello, T. V. Young; Clinical Assistant
Professors: H. S. Lupton-Smith; Adjunct Assistant Professors: C. S. Bingham, K. A. Branch, E. M. Colbert,
G. E. Hicks, L. D. Hunt, A. W. Jackl, D. J. Olsen, R. S. Sutton, D. E. Wiese; Emeritus Assistant Professors:
R. L. Haley; Teaching Assistant Professors: K. H. Brinson, P. A. Hessling, L. Schoen

Admissions Requirements: Application materials will include the following.

- Application for admission
- Nonrefundable application fee
- Residency statement
- One official transcript from each school attended
- Official statement of GRE or MAT scores, taken within the last five (5) years. The MSA and Ed.D. programs accept either the GRE or MAT; the Ph.D. program requires applicants to take the GRE only.
- Three (3) letters of reference, including one from the immediate supervisor
- Letter of Application including statement of purpose and career goals
- Resume
- Autobiographical Statement
- Test of English as a Second Language (if required)

Apply online and check the status of your application at: <u>www2.acs.ncsu.edu/grad/prospect.htm</u>.

**Master's Program Requirements:** A minimum of 42 credit hours is required for the Master's of School Administration. Applicants must have a minimum of three (3) years of successful teaching experience

and be currently working in a K-12 environment; meet graduate school and program requirements; rolling admissions for on-campus program.

**Ed.D. Program Requirements:** A minimum of 54 credit hours beyond the Master's is required for the Ed.D. in Educational Administration and Supervision. Applicants are required to have a North Carolina's Principal's license or be eligible to receive one and to meet graduate school and program requirements. The admissions deadlines for the Ed.D. program are **April 1** and **October 1**.

# Ph.D Program Requirements:

- Bachelor's degree received from an accredited institution; however, a Master's degree is preferred.
- A 3.0 overall GPA in the most recent degree program completed.
- Graduate Record Examination scores that are no more than five (5) years old.
- Evidence of strong analytical, conceptual, and communication skills as assessed in a prescribed written narrative and test scores.
- Completion of an application for admission to the Graduate School.
- Three (3) letters of reference from persons who can attest to the applicant's scholarly aptitude and motivation.
- Official statement of GRE scores.

The deadline for the receipt of all Ph.D. application materials is April 1.

Click on Graduate Courses for current course information.

# **Electrical and Computer Engineering**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Computer Engineering	Y		Y				
Electrical Engineering	Y		Y				

#### **GRADUATE FACULTY**

#### R. J. Trew, Department Head

#### Director of Graduate Programs:

H. J. Trussell, Box 7911, 5-5126, hit@eos.ncsu.edu, Electrical and Computer Engineering

Alton and Mildred Lancaster Distinguished Professor: R. J. Trew Distinguished Professor of Computer and Electrical Engineering: N. A. Masnari Distinguished University Professor: B. J. Baliga Distinguished University Professor of Physics: D. E. Aspnes Distinguished University Research Professor: D. L. Bitzer John C. C. Fan Family Distinguished Professor of Materials Science and Engineering: J. Narayan Lampe Professor of Electrical and Computer Engineering: M. B. Steer McPherson Family Distinguished Professor of Engineering Entrepreneurship: T. K. Miller Progress Energy Distinguished Professor in Electrical and Computer Engineering: A. Q. Huang

Professors: W. E. Alexander, M. E. Baran, S. A. Bedair, G. L. Bilbro, M. Chow, M. Devetsikiotis, A. Duel-Hallen, P. D. Franzon, E. Grant, B. L. Hughes, K. W. Kim, R. M. Kolbas, H. Krim, G. Lazzi, L. Lunardi, V. Misra, H. T. Nagle, A. Nilsson, M. C. Ozturk, H. G. Perros, D. S. Reeves, G. Rouskas, J. F. Schetzina, W. E. Snyder, M. F. Stallmann, J. K. Townsend, H. J. Trussell, I. Viniotis, M. A. Vouk; *Research Professors:* M. O. Aboelfotoh, W. C. Holton, J. M. Zavada; Adjunct Professors: R. K. Cavin, G. J. Iafrate, R. Luo, J. W. Mink, D. L. Woolard; Emeritus Named Professors: J. R. Hauser; Emeritus Professors: T. H. Glisson, A. J. Goetze, M. A. Littlejohn, J. B. Oneal, C. M. Osburn, S. A. Rajala, J. J. Wortman; *Emeritus Distinguished* University Professors: D. R. Rhodes; Associate Professors: S. T. Alexander, D. W. Barlage, G. T. Byrd, R. Y. Chirkova, H. Dai, W. R. Davis, A. G. Dean, W. W. Edmonson, D. Y. Eun, E. F. Gehringer, K. H. Harfoush, R. F. Mueller, J. F. Muth, E. Rotenberg, M. L. Sichitiu, Y. Solihin, W. Wang, M. W. White; Adjunct Associate Professors: J. M. Conrad, J. H. Kim; Emeritus Associate Professors: G. F. Bland, W. C. Peterson; Assistant Professors: S. Bhattacharya, M. J. Escuti, X. Liu, S. M. Lukic, D. Schurig, J. Tuck, G. M. Walker, C. M. Williams, T. Xie; Adjunct Assistant Professors: R. J. Evans, K. Gard, M. Ghovanloo, Y. L. Jou, A. J. Montalvo, A. S. Morris, A. J. Rindos, J. M. Wilson; *Teaching Professors:* J. J. Grainger; *Teaching* Associate Professors: J. J. Brickley, S. D. Jackson, T. L. Mitchell, H. O. Ozturk, S. J. Walsh, D. G. Yu; Teaching Assistant Professors: L. J. Bottomley

Admissions Requirements: Admission to the M.S. program requires a B.S. in electrical engineering, computer engineering or computer science, and an overall undergraduate GPA of at least 3.25. The

minimum acceptable TOEFL score for admission to the M.S. program is 90 (minimum 18 in each area). Admission is further limited by available room in the elected program of study. Meeting the minimum above requirements alone does not guarantee admission.

Admission to the Ph.D. program requires a B.S. or M.S. in electrical engineering, computer engineering or computer science with an overall GPA of at least 3.60. The minimum acceptable TOEFL score for admission to the Ph.D. program is 90 (minimum 18 in each area). Admission is further limited by available room in the elected program of study, and meeting the minimum requirements as given above does not guarantee admission.

**Master's Degree Requirements:** Thirty (30) credit hours; a thesis is optional. Students must have at least 21 hours of ECE courses that cover at least three specialty areas and have at least six credit hours of advanced-level ECE courses. Students electing the Option B non-thesis option must meet core course requirements and have at least six credit hours of 700-level ECE courses.

**Doctoral Degree Requirements:** Approximately 42 credit hours are required beyond the M.S. degree or 72 credit hours beyond the B.S. degree. A minimum of 18 of the 42 credit hours or a minimum of 42 of the 72 credit hours must be in scheduled courses. Nine hours of graduate-level courses outside the major area are required.

The department wishes to evaluate a Ph.D. student's research potential as quickly as possible. Consequently, all Ph.D. students are required to pass a qualifying review before the end of their third semester of study. This review is based on the student's academic performance to date and the results of a project with one of their committee members. Results are presented to the committee in both written and oral form. Based on this review, the committee will decide if the student may continue in the Ph.D. program.

**Student Financial Support:** The department offers financial support to qualified students in the form of teaching assistantships, research assistantships, fellowships and tuition remission.

Click on Graduate Courses for current course information.

# **Elementary Education**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Elementary Education			Y			Y	

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

E. McIntyre, Box 7801, , emcinty@gwced.ncsu.edu, Elementary Education

**Professors:** E. McIntyre, P. Sztajn; **Associate Professors:** C. M. Beal; **Assistant Professors:** S. J. Amendum, S. J. Carrier, M. J. Jeffries, J. Minogue, A. M. Wiseman; **Adjunct Assistant Professors:** R. L. Honeycutt

The mission of the Department of Elementary Education is to develop teacher leaders who have a deep, general content knowledge with a focus in science and mathematics, expert pedagogy, and a commitment to equity and social justice. The Department offers a Masters in Elementary Education – a program designed to prepare education professionals for the 21st century.

**Admission Requirements:** A 500-800 word statement describing professional goals is required. This program requires that applicants hold a baccalaureate-level teaching license. GRE or MAT scores not more than five years old are required for the Master's program

**Master's Degree Requirements:** The M.S. degree requires a total of 39 credit hours -- minimum of 36 course credit hours plus three practicum hours. The M.S. degree also requires (1) a written examination or culminating project, (2) a final oral examination, and (3) thesis approved by the graduate committee.

Student Financial Support: No financial aid is available on a regular basis.

Click on Graduate Courses for current course information.

# Engineering - (Online)

### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Engineering					Y		

### **GRADUATE FACULTY**

### Director of Graduate Programs:

T. J. Hodgson, Box 7906, 5-5194, hodgson@ncsu.edu, Industrial Engineering

Alcoa Professor of Chemical and Biomolecular Engineering: S. A. Khan, G. N. Parsons Celanese Acetate Professorship in Chemical and Biomolecular Engineering: J. Genzer Distinguished Research Professor: J. J. Cuomo Edward I. Weisiger Distinguished Professor in Construction Engineering and Management: D. W. Johnston

James T. Ryan Distinguished Professor of Industrial Engineering and Furniture Manufacturing: T. J. Hodgson

Kobe Steel Distinguished Professor: C. C. Koch

R. J. Reynolds Professor in Mechanical and Aerospace Engineering: R. D. Gould

Professors: M. A. Barlaz, M. Chow, A. Duel-Hallen, Y. Fathi, P. D. Franzon, C. S. Grant, J. M. Nau, H. G. Perros, S. Ranjithan, D. S. Reeves, P. I. Ro, G. Rouskas, R. O. Scattergood, L. M. Silverberg, M. P. Singh, J. K. Townsend, H. J. Trussell, I. Viniotis, M. A. Vouk; *Research Professors:* R. B. Benson; *Emeritus Named Professors:* C. F. Zorowski; *Emeritus Professors:* T. Johnson, C. M. Osburn; *Associate Professors:* J. W. Eischen, E. F. Gehringer, T. L. Honeycutt, E. C. Klang, M. L. Leming; *Emeritus Associate Professors:* E. Sanii; *Adjunct Assistant Professors:* L. D. Krute; *Teaching Associate Professors:* J. P. Lavelle

The College of Engineering offers a program leading to the Master of Engineering. This degree is primarily for individuals whose schedule or location does not allow on-campus study. Convenience and flexibility are the key advantages of this program. The students can take a variety of courses in different engineering fields and in computer science. This Option B program requires 30 credit hours and does not require GRE, thesis, final oral exam, or on-campus attendance. All international students are required to provide evidence of English proficiency. Two exams will be accepted to demonstrate English proficiency: Test of English as a Foreign Language (TOEFL) with a total score of *at least 80* on the Internet-based Test (iBT) or International English Language Testing System (IELTS) scores with an overall band score of *at least 6.5*. The Master of Engineering degree can be earned totally through the Engineering Online program. The Engineering Online program delivers credit courses in Engineering and in Computer Science directly to home or workplace via streaming media on the Internet. The online courses are the same as the on-campus courses in terms of content, requirements and academic rigor.

Each student in the Master of Engineering program must complete a minimum of three (3) courses from a single concentration area and courses from a second area of engineering or computer science.

The concentration area will appear on the student's transcript if a minimum of five (5) courses is taken in the designated concentration field. At least 18 hours of the minimum 30 hours required to satisfy the Master of Engineering degree requirements must be taken from a department in the College of Engineering. The concentration fields in the Master of Engineering are Chemical Engineering, Computer Science, Electrical and Computer Engineering, Industrial Engineering, Materials Science and Engineering, and Mechanical and Aerospace Engineering.

Admission Requirements: Prerequisites for admission to the Master of Engineering include an accredited undergraduate degree in engineering or physical sciences with a minimum overall GPA of 3.0.

### **GRADUATE COURSES**

EGR 688 Non-Thesis Master's Continuous Registration - Half-Time Registration EGR 689 Non-Thesis Master's Continuous Registration - Full-Time Registration

# English

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Creative Writing							Y
<u>English</u>				Y			
Technical Communication			Y				

#### **GRADUATE FACULTY**

#### A. H. Harrison, Department Head

#### Directors of Graduate Programs:

C. A. Prioli, Box 8105, 54107, <u>prioli@social.chass.ncsu.edu</u>, English R. S. Dicks, Box 8105, 37354, <u>sdicks@unity.ncsu.edu</u>, English

Alumni Distinguished Undergraduate Professor: J. M. Grimwood

Distinguished Professor: M. T. Hester

Distinguished University: A. H. Harrison

Distinguished University Professor: C. M. Anson

**SAS Institute Distinguished Professor of Rhetoric and Technical Communication:** C. R. Miller **William C. Friday Distinguished University Professorship:** W. A. Wolfram

Professors: J. Balaban, M. P. Carter, A. M. Davis-Gardner, B. D. Faber, C. Gross, W. J. Jordan, H. D.
Kellner, J. J. Kessel, Y. R. Kim, D. L. Laux, T. D. Lisk, L. H. MacKethan, J. C. McCorkle, J. M. Nfah-Abbenyi, M. E. Orr, A. M. Penrose, M. T. Pramaggiore, C. A. Prioli, L. R. Severin, A. F. Stein, E. R. Thomas, J. F.
Thompson, M. H. Thuente, J. N. Wall, R. V. Young; *Emeritus Professors:* B. J. Baines, G. W. Barrax, P. E.
Blank, L. S. Champion, J. W. Clark, J. D. Durant, M. Halperen, L. T. Holley, H. G. Kincheloe, A. S. Knowles, B. G. Koonce, W. E. Meyers, F. H. Moore, J. J. Small, L. Smith, J. J. Smoot, W. B. Toole, M. C. Williams, P.
Williams; *Associate Professors:* A. Baker, W. W. Barnhardt, B. A. Bennett, A. Bolonyai, H. G. Braunbeck, D. H. Covington, R. S. Dicks, N. Halpern, S. M. Katz, R. C. Kochersberger, L. S. May, S. K. Miller-Cochran, J. D. Morillo, D. A. Orgeron, M. G. Orgeron, J. Packer, S. M. Setzer, S. Smith McKoy, J. Swarts; *Emeritus Associate Professors:* E. P. Dandridge, M. F. King, C. E. Moore, H. C. West; *Assistant Professors:* B.
Blackley, J. C. Charles, C. J. Crosbie, R. M. Dodsworth, M. K. Dudley, D. A. Hooker, M. E. Lamont, W. J.
Miller, J. L. Reaser, D. J. Reavis, D. M. Rieder, T. L. Stinson, R. A. Walsh, M. L. Welch; *Teaching Assistant Professors:* S. L. Joffe

#### **MASTER OF ARTS (MA)**

The Master of Arts program offers instruction in English and American literature, world literature, film studies, rhetoric and composition, and linguistics. It can serve either as a complete course of study or as the first phase of study toward a doctoral degree at another institution.

**Admission Requirements:** Overall GPA of 3.0 or higher. Applicants should submit GRE scores (general aptitude and analytical writing); one official transcript of all undergraduate and graduate work; three letters of recommendation; a personal statement; and a writing sample.

**Requirements for MA in English:** The program requires 32 credit hours. American/British literature and world literature students take a distribution of four courses, one each in English literature before 1660, English literature after 1660, American literature and a fourth category including composition theory, rhetoric, linguistics, or literary theory. Linguistics and rhetoric/composition students take two literature classes of their choice to fulfill the distribution requirement. Film studies students take four literature courses of their choice. In addition, all students (except those in linguistics) must take an introduction to research and bibliography (ENG 669). All students must pass a foreign language reading requirement, and complete a Master's capstone project.

Beyond these basic requirements, the program comprises five concentrations in British and American literature, film studies, composition and rhetoric, world literature, and linguistics. Each concentration requires five additional courses, of which three must pertain to the area of concentration. The capstone project will be in the area of the concentration and directed by a specialist in the field.

**Student Financial Support:** Teaching assistantships are available for a limited number of promising students. Applications for assistantships are due February 1 for those entering in the fall, and November 1 for those entering in the spring. (New assistantships are rarely available for the spring semester.) During their first year those selected to teach composition must take ENG 511 (Theory and Research in Composition), be mentored by a composition instructor, and attend a second workshop (ENG 624) in their third semester.

# **TECHNICAL COMMUNICATION (MS)**

The Master of Science in technical communication is designed to prepare professional communicators for advanced positions in industry and research organizations; with appropriate electives, students can prepare for careers in web design and development, software documentation, environmental communication, medical writing, industrial training in writing and editing, publications management and related areas.

Admission Requirements: Applicants should submit a resume and a writing sample. Prerequisites for the program are basic editing (ENG 214) and technical writing (ENG 314, 317, 331, 332, or 333) or equivalent courses and/or work experience. The application deadline is June 15 for the fall semester and November 1 for the spring semester. Those who wish to be considered for teaching assistantships should complete the application by February 1 for fall.

**Requirements for MS in Technical Communication:** The program requires 33 semester hours: 15 hours in the fields of technical writing, publication management, rhetoric and a projects course; the remaining hours are taken in applications, theory and methods and cross-disciplinary courses. Students must also satisfy a requirement for one semester of professional work experience.

Student Financial Support: Teaching assistantships are available for a limited number of promising

students. These students work with an experienced teacher in their first year to assist in 300-level writing courses. They devote half time in subsequent semesters to teaching technical communication.

#### **CREATIVE WRITING (MFA)**

The Department of English offers a two-year studio/academic program in fiction or poetry leading to the Master of Fine Arts degree. The program provides an opportunity for students of superior and demonstrated ability in imaginative writing to develop their skills and critical judgment through the practice of writing and the study of literature. The aim of the program is to prepare talented students for careers in writing. Degree candidates are expected to produce a book-length work of literary value and publishable quality.

**Admission Requirements:** Overall GPA of 3.0 or higher; applicants should submit GRE scores (general aptitude and analytical writing); one official transcript of all undergraduate and graduate work; three letters of recommendation; and two writing samples, one creative, one critical. Creative sample: for fiction, two short stories, or for a novel, three chapters (or one chapter and a short story) totaling 25-40 pages; for poetry, 12 complete poems. Critical sample: no more than 15 pages of writing demonstrating your ability to succeed in graduate-level literature classes, a required part of the MFA curriculum

**Requirements for the MFA in Creative Writing:** Candidates for the MFA degree must complete a total of 36 credits. Eighteen of these are taken in the area of writing specialization. These include workshop courses (12 credits) and thesis (6 credits). The remaining credits are taken in literature and directed readings (12 credits), elective (3 or 6 credits), and, for those on a composition teaching assistantship, ENG 511, Theory and Research in Composition (3 credits).

In their final semester, students must pass a comprehensive written examination on writing craft, based on a book list selected jointly by the student and the faculty. The final thesis must be a book-length manuscript in the student's field of interest. In fiction, an approximate 200 pages are expected; in poetry, 60 pages.

**Student Financial Support:** Teaching assistantships are available for a limited number of promising students. Selected new Teaching Assistants are also eligible for fellowship money awarded as an increase in assistantship stipend. TAs in the MFA train to teach undergraduate creative writing classes or composition classes.

**Other Relevant Information:** Application deadline is April 1 for both U.S. and international students; February 1 for those seeking assistantships. Students are admitted for the fall semester only.

The English department has a long tradition of academic and literary excellence, including its heritage of writers from Guy Owen to Lee Smith, its publishing of the *Southern Poetry Review, The John Donne Journal, Free Verse,* and *Obsidian*. The strength of NCSU in the sciences offers students the opportunity to do creative work that engages with issues of technology and its effect on individuals and institutions that are not typically addressed in fine arts programs.

Through its Owen/Walters Readings Series, the department sponsors readings and residencies by distinguished poets, fiction and non-fiction writers, and has initiated a semester-long Visiting Distinguished North Carolina Writers program.

Click on <u>Graduate Courses</u> for current course information.

# Entomology

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Entomology	Y		Y		Y		

#### **GRADUATE FACULTY**

G. G. Kennedy, Department Head

Director of Graduate Programs:

F. P. Hain, Box 7613, 5-3804, fred hain@ncsu.edu, Entomology

Blanton J. Whitmire Professor of Structural Pest Management: C. J. Schal
Charles G. Wright: J. Silverman
William Neal Reynolds Distinguished Professor: F. L. Gould, G. G. Kennedy, R. M. Roe
William Neal Reynolds Professor: C. S. Apperson, R. L. Brandenburg

Professors: J. T. Ambrose, J. S. Bacheler, R. J. Borski, L. J. Frampton, F. P. Hain, C. L. Hemenway, J. R. Meyer, D. J. Robison, C. E. Sorenson, R. E. Stinner, C. G. VanDyke, E. L. Vargo, J. F. Walgenbach, D. W. Watson, B. M. Wiegmann; *Adjunct Professors:* J. J. Arends, A. C. Cohen, G. Gordh, N. M. Hamon, D. M. Jackson, D. E. Sonenshine; *Emeritus Named Professors:* J. W. VanDuyn; *Emeritus Professors:* R. C. Axtell, J. R. Baker, J. R. Bradley, W. M. Brooks, W. V. Campbell, L. L. Deitz, M. H. Farrier, J. D. Harper, R. J. Kuhr, H. B. Moore, H. H. Neunzig, J. F. Roberts, R. L. Robertson, K. A. Sorensen, P. S. Southern, C. G. Wright; *Associate Professors:* W. G. Buhler, N. M. Haddad, W. O. McMillan, J. A. Moore, D. B. Orr, D. R. Tarpy; *Adjunct Associate Professors:* S. Bloem, C. M. Grozinger, K. S. Hedlund, D. A. Herbert, K. R. Lakin, C. Nalepa, A. A. Perez de Leon, R. A. Sequeira, J. W. Smith; *Emeritus Associate Professors:* R. C. Hillmann; *Assistant Professors:* M. R. Abney, D. B. Buchwalter, H. J. Burrack, Y. J. Cardoza, A. R. Deans, R. R. Dunn, S. D. Frank, M. D. Lorenzen, D. D. Reisig; *Adjunct Assistant Professors:* C. Devorshak, K. A. Suiter; *Extension Associate Professors:* M. G. Waldvogel

Course offerings or research facilities are available in the following areas: agricultural entomology, apiculture, aquatic entomology, behavior, biological control, ecology, forest entomology, functional genomics, host-plant resistance, insect pathology, medical and veterinary entomology, pest management, physiology, molecular biology, population dynamics, urban entomology, systems analysis, systematics and toxicology.

Admission Requirements: A minimum score of 1000 (verbal plus quantitative) is necessary for admission to the M.E. or M.S. program while a score of 1100 is required for the Ph.D. program. Students are expected to have a background in biology in addition to appropriate courses in chemistry, biochemistry, mathematics and physics. A "B" average (3.0 GPA) is required in biology courses and an overall 3.0 GPA during the last two years of the undergraduate program.

**Master's Degree Requirements:** A minimum of 30 credits are required for graduation. Two core courses are required (Insect Systematics, and Insect Morphology and Physiology), however students who have had these courses from another institution can be exempted from taking them with the permission of the instructor. The instructor will meet with the student and determine, through oral and/or written questioning, whether they have adequate background. In addition, six credits of letter grade entomology courses and two credits of entomology student seminars are also required.

**Doctoral Degree Requirements:** A minimum of 72 credits (18 may be transferred from a Masters degree) are required for graduation. Two core courses are required (insect Systematics, and Insect Morphology and Physiology), however students who have had these courses from another institution can be exempted from taking them with the permission of the instructor. The instructor will meet with the student and determine, through oral and/or written questioning, whether they have adequate background. In addition, nine credits of letter grade entomology courses and three credits of entomology student seminars are also required.

**Student Financial Support:** Graduate assistantships and other forms of aid are available to students as described in the Fellowships and Graduate Assistantships section of the Graduate Catalog.

**Other Relevant Information:** Admission is permitted only after acceptable applicants have secured an advisor and appropriate financial support. All students are expected to begin their research as soon as possible.

Click on Graduate Courses for current course information.

# **Fiber and Polymer Science**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Fiber and Polymer Science	Y						

### **GRADUATE FACULTY**

### Director of Graduate Programs:

W. Oxenham, Box 8301, 515-6573, william oxenham@ncsu.edu, College of Textiles

Alcoa Professor of Chemical and Biomolecular Engineering: S. A. Khan Burlington Industries Professorship of Textile Technology: R. L. Barker Celanese Acetate Professorship in Chemical and Biomolecular Engineering: J. Genzer Charles A. Cannon Professor: S. K. Batra Ciba-Geigy Distinguished Professor: H. S. Freeman Cone Mills Professorship of Textile Chemistry: C. B. Smith Glaxo Distinguished University Professor of Chemistry: J. S. Lindsey Howard J. Schaffer Distinguished Professor of Chemistry: B. M. Novak INVISTA Professor of Fiber and Polymer Chemistry: A. E. Tonelli Joseph D. Moore Professorship of Textile and Apparel Management and Technology: A. B. Godfrey Lineberger Chair in Yarn Manufacturing: W. Oxenham William A. Klopman Distinguished Professor: B. Pourdeyhimi

Professors: H. Ade, C. M. Balik, K. R. Beck, M. A. Bourham, C. L. Bumgardner, N. L. Cassill, T. G. Clapp, R. A. Donaldson, P. S. Fedkiw, R. E. Fornes, T. K. Ghosh, C. B. Gorman, B. S. Gupta, H. Hamouda, P. J. Hauser, D. Hinks, S. M. Hudson, W. J. Jasper, M. W. King, T. J. Little, J. P. Rust, A. M. Seyam, M. W. Suh, R. A. Venditti; *Emeritus Named Professors:* J. A. Cuculo, S. P. Hersh, H. B. Hopfenberg, S. C. Winchester, C. F. Zorowski; *Emeritus Professors:* D. R. Buchanan, A. H. El-Shiekh, P. L. Grady, G. N. Mock, H. G. Olf, S. T. Purrington, E. O. Stejskal, W. C. Stuckey, M. H. Theil, C. Tomasino, P. A. Tucker; *Emeritus Distinguished Professors:* M. H. Mohamed; *Associate Professors:* P. Banks-Lee, K. A. Barletta, R. E. Gorga, H. H. Hergeth, G. L. Hodge, C. L. Istook, J. A. Joines, M. R. Jones, R. Kotek, W. E. Krause, T. A. Lamar, E. G. Loboa-Polefka, M. G. McCord, S. Michielsen, O. J. Rojas, R. Shamey, G. W. Smith; *Assistant Professors:* K. E. Carroll, H. Lee, M. Pasquinelli, X. Zhang; *Research Assistant Professors:* N. Anantharamaiah, B. Maze, E. Shim; *Adjunct Assistant Professors:* J. P. Hinestroza, R. T. Kuehn, H. Vahedi Tafreshi

Fiber and Polymer Science is a multidisciplinary program bringing together the disciplines of mathematics, chemistry and physics and the application of engineering principles for the development of independent scholars versed in all aspects of fiber materials science. Thus, fiber and polymer science is concerned with the formation of and the mechanical, physical and chemical properties of polymeric materials, fibers produced from them, fiber assemblies in one-, two- and three-dimensional forms, and fiber reinforced composites, as well as the utilization thereof.

Admission Requirements: Students majoring in the physical sciences, engineering, mathematics, textiles and having a Master's degree will normally qualify for admission. For exceptionally qualified students, the Master's degree requirement may be waived, and the student can be admitted directly into the Ph.D. program.

**Doctoral Degree Requirements:** Credit-hour requirements for the Doctor of Philosophy degree are 72. (Up to 18 hours from an M.S. may be applied against the 72.) Students are admitted to candidacy for the Ph.D. degree after passing a series of written cumulative examinations, completing a scholarly critique of existing knowledge in the field of specialization, and orally defending a research proposal. A written examination in a minor field may be accepted in place of the scholarly critique. They must also have passed an English technical writing course during their college career.

**Student Financial Support:** Financial aid in the form of assistantships and fellowships is normally available for all U.S. full-time students. Financial aid in the form of Graduate Research/Teaching Assistantships may be available to a limited number of international students.

**COURSE OFFERINGS** (Extensive use may be made of graduate course offerings in other colleges on campus when developing the minor field.)

Click on Graduate Courses for current Fiber and Polymer Science course information.

#### **OTHER GENERAL COURSES**

TC 704 Fiber Formation--Theory and Practice TC(CH,MSE) 762 Physical Chemistry of High Polymers--Bulk Properties TC 791 Special Topics in Textile Science TMS 500 Fiber and Polymer Microscopy TMS 761 Mechanical and Rheological Properties of Fibrous Material TMS 762 Physical Properties of Fiber Forming Polymers, Fibers and Fibrous Structures TMS(MSE) 763 Characterization of Structure of Fiber Forming Polymers

#### COURSES IN AREAS OF SPECIALIZATION

**Polymer Chemistry and Synthesis** TC 530 The Chemistry of Textile Auxiliaries TC(MSE) 561 Organic Chemistry of Polymers TC 720 Chemistry of Dyes and Color TC 721 Dye Synthesis Laboratory

#### **Polymer Physics and Physical Chemistry**

TC 704 Fiber Formation--Theory and Practice TC 705 Theory of Dyeing TC(CH,MSE) 762 Physical Chemistry of High Polymers--Bulk Properties TC(CHE) 769 Polymers, Surfactants and Colloidal Materials TC(CH,MSE) 772 Physical Chemistry of High Polymers--Solution Properties TC(CHE) 779 Diffusion in Polymers TC 792 Special Topics in Fiber Science TMS 500 Fiber and Polymer Microscopy

#### **Mechanics of Textile Materials and Processes**

FPS(TT) 781 Mechanics of Twisted Structures

FPS(TT) 782 Mechanics of Fabric Structures

- TE 565 Textile Composites
- TT 500 Understanding the Textile Complex
- TT 503 Materials, Polymers, and Fibers used in Nonwovens
- TT 504 Introduction to Nonwovens Processes and Products
- TT 505 Advanced Nonwovens Processing
- TT 506 Bonding Principles in Nonwovens
- TT 507 Nonwoven Characterization Methods
- TT 508 Nonwoven Product Development
- TT 520 Yarn Processing Dynamics
- TT(TE,TMS) 521 Filament Yarn Production Processing and Properties
- TT 549 Warp Knit Engineering and Structural Design
- TT 550 Production Mechanics and Properties of Woven Fabrics
- TT 551 Advance Woven Fabric Design & Structure
- TT 552 Formation, Structure and Assembly of Medical Textile Products
- TT 570 Textile Digital Design and Technology
- TT 571 Professional Practices in Textile Design and Technology
- TT 581 Technical Textiles
- TT 591 Special Studies in Textile Technology
- TT(FPS) 720 Yarn Production Properties: Advanced Topics

# **Financial Mathematics**

### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Financial Mathematics					Y		

### **GRADUATE FACULTY**

### Director of Graduate Programs:

J. S. Scroggs, Box 8205, 5-7817, <a href="mailto:scroggs@unity.ncsu.edu">scroggs@unity.ncsu.edu</a>, Mathematics

# **Distinguished University Professor of Industrial Engineering for International Competitiveness:** S. E. Elmaghraby

William Neal Reynolds Professor: D. A. Dickey

**Professors:** R. H. Bernhard, P. Bloomfield, P. L. Fackler, S. K. Ghosh, K. Ito, N. G. Medhin, S. G. Pantula, J. J. Seater, T. Vukina, J. R. Wilson; **Associate Professors:** J. Gervais, M. J. Kang, T. Pang, D. Pelletier, J. S. Scroggs, C. E. Smith; **Assistant Professors:** B. J. Reich, M. J. Roberts, W. Sun, Y. Wu

The Departments of Agricultural and Resource Economics, Economics, Industrial and Systems Engineering, Mathematics, and Statistics offer a program leading to the degree of Master of Financial Mathematics. After completing the core requirements, students choose electives to suit their individual needs and interests.

**Admissions Requirements:** Applicants for admission should have an undergraduate degree that would preferably include courses in advanced calculus, modern algebra, and linear algebra. It is strongly recommended that applicants take the GRE Advanced Test in Mathematics.

**Master of Financial Mathematics Requirements:** In addition to course requirements (six core courses and four electives), the Master of Financial Mathematics degree requires completion of a three-credit internship or research project.

**Student Financial Support:** No financial aid is available on a regular basis. Some funding is available through a limited number of scholarships. Consideration for the scholarships is automatic.

### **REQUIRED CORE COURSES**

ECG(MA) 790 Advanced Special Topics ECG 590 Special Economics Topics (Asset Pricing) ISE 711 Capital Investment Economic Analysis MA(ST) 546 Probability and Stochastic Processes I MA 547 Financial Mathematics ST 522 Statistical Theory II

#### **GRADUATE COURSES**

MBA 522 Portfolio and Capital Market Theory

MBA 526 International Finance

- MBA 529 New Firm Financing
- MBA 590 Special Topics in Business Management (Advanced Corporate Finance)

ECG 716 Topics in Environmental and Resource Economics

ECG 749 Monetary Aspects Of International Trade

ECG(ST) 751 Econometrics

ECG(ST) 752 Topics in Econometrics

ECG 784 Advanced Macroeconomics

ISE 709 Dynamic Programming

ISE 712 Bayesian Decision Analysis for Engineers and Managers

MA(ST) 747 Probability and Stochastic Processes II

MA(ST) 748 Stochastic Differential Equations

MA 584 Numerical Solution of Partial Differential Equations-Finite Difference Methods

ST 730 Applied Time Series Analysis

ST 782 Time Series Analysis: Time Domain

ST 783 Time Series Analysis: Frequency Domain

ST 810 Advanced Topics in Statistics

# **Fisheries and Wildlife Sciences**

### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Fisheries and Wildlife Sciences	Y		Y		Y		

### **GRADUATE FACULTY**

# Directors of Graduate Programs:

C. E. Moorman, Box 8001, , <u>chris\_moorman@ncsu.edu</u>, Forestry
H. V. Daniels, Box 7617, 919/515-4589, <u>harry\_daniels@ncsu.edu</u>, Zoology
S. T. Warren, Box 8001, 515-7996, <u>stwarren@ncsu.edu</u>, Forestry and Environmental Resources

# William Neal Reynolds Professor: C. V. Sullivan

Professors: R. J. Borski, H. V. Daniels, D. B. Eggleston, J. F. Gilliam, E. J. Jones, R. A. Lancia, J. F. Levine, T. M. Losordo, J. M. Miller, K. H. Pollock, J. A. Rice, C. E. Sorenson, M. K. Stoskopf; *Research Professors:* S. Kennedy-Stoskopf; *USDI Professors:* J. A. Collazo, J. E. Hightower, T. J. Kwak, T. R. Simons; *Adjunct Professors:* W. G. Dorgeloh, J. Rogers; *Emeritus Professors:* G. T. Barthalmus, P. T. Bromley, B. J. Copeland, P. D. Doerr, R. L. Noble, R. A. Powell; *Associate Professors:* J. A. Buckel, W. G. Cope, L. A. Degernes, J. R. Godwin, N. M. Haddad, C. A. Harms, G. R. Hess, J. M. Hinshaw, C. E. Moorman, S. C. Nelson, J. L. Stape, T. A. Steelman; *Assistant Professors:* D. D. Aday, C. S. DePerno, R. J. Richardson; *Adjunct Assistant Professors:* D. T. Cobb, R. J. Heise; *Extension Associate Professors:* S. E. Moore

The fisheries and wildlife sciences degrees are offered through the Fisheries and Wildlife Sciences program, an intercollegiate program administered by the Department of Forestry and Environmental Resources and shared with the Department of Zoology and the College of Veterinary Medicine. Students are affiliated with the department of their major professor. The degrees emphasize assessment, biology, ecology and management of fish and wildlife species and their habitats.

Admissions Requirements: Application for admission is made directly to the Fisheries and Wildlife Sciences program. Minimum requirements include an undergraduate grade point average of 3.0 in an appropriate biological discipline and a graduate record examination score of 1000, calculated as the sum of verbal and quantitative scores. Admission is competitive and depends on the willingness of a member of the faculty to serve as major professor. Exceptions to minimum requirements may be made for students with special backgrounds.

**Master's Degree Requirements:** The M.S. degree program requires a minimum of 30 credit hours, including 1-2 hours of seminar and no more than six hours of research. A research-based thesis is required, as is a minor (usually 9-10 hours). The Master of Fisheries and Wildlife Sciences degree requires a minimum of 36 credits, including 4-6 hours of special problems and 1-2 hours of seminars, and a professional paper is required. For either degree, further requirements may be imposed by the advisory committee and/or department.

**Doctoral Degree Requirements:** The Ph.D. program requires 36 to 54 credits of course work beyond the Master's degree, including two seminars and an ethics course, and a dissertation. Exceptionally well-prepared students may petition to have their degree objective changed to Ph.D. before completing the Master's degree.

**Student Financial Support:** Graduate research and teaching assistantships are offered for qualified students through participating departments. Commitments for assistantships are normally made at the time of admission to graduate study.

**Other Relevant Information:** Research near campus is facilitated by excellent field, laboratory and computer resources. Off-campus research is conducted at the Pamlico Aquaculture Field Laboratory, research and extension centers in eastern and western NC, The Center for Marine Sciences and Technology in Morehead City, Bull Neck Swamp, Hill and Hofmann Forests, and at facilities of state and federal agencies and private organizations. For additional information, see the Fisheries and Wildlife Sciences graduate web page: <u>http://cnr.ncsu.edu/fer/grads/gradfw.html</u>

Click on Graduate Courses for current course information.

#### COURSES FROM ASSOCIATED DEPARTMENTS

ST 506 Sampling Animal Populations ZO 501 Ornithology ZO(ENT) 509 Ecology of Stream Invertebrates ZO 519 Limnology ZO 542 Herpetology ZO 544 Mammalogy ZO(MEA) 550 Principles of Biological Oceanography ZO 603 Aquatic Ecology Seminar ZO 721 Fishery Science ZO(MEA) 756 Ecology of Fishes ZO 784 Advanced Topics in the Study of Mammals ZO 789 Advanced Limnology

# Food, Bioprocessing, and Nutrition Sciences

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Food Science	Y		Y		Y		

#### **GRADUATE FACULTY**

#### D. R. Ward, Department Head

#### **Director of Graduate Programs:**

J. C. Allen, Box 7624, 3-2257, jon allen@ncsu.edu, Food, Bioprocessing, & Nutrition Sciences

### Alcoa Professor of Chemical and Biomolecular Engineering: S. A. Khan William Neal Reynolds Distinguished Professor: E. A. Foegeding, K. R. Swartzel William Neal Reynolds Distinguished University Professor: T. R. Klaenhammer

Professors: J. C. Allen, K. E. Anderson, L. C. Boyd, G. L. Catignani, C. R. Daubert, M. A. Drake, B. E.
Farkas, D. P. Green, S. A. Hale, H. M. Hassan, T. J. Hoban, L. Jaykus, S. Kathariou, T. C. Lanier, D. K.
Larick, M. Lila, J. L. Oblinger, J. E. Rushing, K. P. Sandeep, J. D. Sheppard, L. G. Turner, D. R. Ward; USDA
Professors: R. F. McFeeters, T. H. Sanders; Adjunct Professors: A. Kilara, R. C. Theuer; Emeritus
Professors: L. W. Aurand, H. R. Ball, R. E. Carawan, D. E. Carroll, M. E. Gregory, A. P. Hansen, M. W.
Hoover, V. A. Jones, C. J. Lackey, D. H. Pilkington, S. J. Schwartz, B. W. Sheldon; Emeritus Distinguished
Professors: H. E. Swaisgood; Associate Professors: S. L. Ash, P. Cowen, D. J. Hanson; Research
Associate Professors: J. Simunovic; USDA Associate Professors: F. Breidt, V. D. Truong; Emeritus USDA
Professors: H. P. Fleming, W. M. Walter; Assistant Professors: F. M. Arritt, L. S. Goodell, G. K. Harris, T.
G. Phister, R. R. Sharma; USDA Assistant Professors: J. P. Davis, L. L. Dean, I. M. Perez Diaz; Adjunct
Assistant Professors: A. Amezquita, S. Sang

The department's professional activities include teaching, research, and extension functions. The program provides an educational, research, and informational center in food science for North Carolina and the nation. The department also houses two research centers, the Southeast Dairy Foods Research Center and the Center for Advanced Processing and Packaging Studies. Course offerings and research facilities are available in the following areas: chemistry-biochemistry, engineering, microbiology, nutrition and processing technology.

Admissions Requirements: To be admitted, a student should be a graduate of an accredited program in food science or the equivalent. Graduates of other majors can be admitted but will have additional course requirements. The best qualified applicants will be accepted up to the number of spaces that are available for new students.

**Master's Degree Requirements:** A Master's program must include courses from at least two of the following categories: chemistry-biochemistry, engineering, microbiology, nutrition and processing technology. The M. S. in Food Science requires 30 credit hours and the Master of Food Science requires
36 credit hours of course work.

**Doctoral Degree Requirements:** A doctoral program must include courses from at least three of the categories listed above (or equivalent courses at another university). Total course credits will vary depending on the needs of the student and the requirements of the Graduate School. All doctoral students are required to pass a departmentally administered written preliminary exam, designed to evaluate a Ph.D. student's general knowledge and comprehension of food science.

**Student Financial Support:** Graduate assistantships and other forms of student aid available to students in this program are described elsewhere in the Graduate Catalog. Admission does not guarantee availability of financial support.

**Other Relevant Information:** Students are encouraged to make personal contact with individual faculty whose research program is of interest to them. Information describing each faculty member's program is available at our website (<u>http://ncsu.edu/foodscience</u>).

Click on Graduate Courses for current course information.

### **Foreign Languages and Literatures**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
French Language and Literature				Y			
Spanish Language and Literature				Y			

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

J. S. Despain, Box 8106, 919.513.1482, <u>despain@social.chass.ncsu.edu</u>, Foreign Languages and Literatures

#### Distinguished Professor: M. L. Sosower

Professors: G. A. Dawes, T. P. Feeny, R. V. Gross, Y. B. Rollins, E. Tai; *Emeritus Professors:* G. F. Gonzalez, J. R. Kelly, M. A. Witt; *Associate Professors:* V. Bilenkin, H. G. Braunbeck, M. A. Darhower, J. S. Despain, M. D. Garval, H. A. Jaimes, M. M. Magill, D. M. Marchi, J. Mari, J. P. Mertz, L. A. Mykyta, J. A. Pasten, A. N. Taj, E. L. Vilches; *Emeritus Associate Professors:* R. A. Alder, S. T. Alonso, M. L. Salstad; *Assistant Professors:* S. E. Garrigan, J. C. Michnowicz, T. E. Wolford, V. A. Wust

#### **Admission Requirements:**

- A baccalaureate degree from an accredited college or university
- Undergraduate GPA of 3.0 or above
- Narrative statement of professional and personal objectives (in English, 300 words).
- Language proficiency as determined by writing sample and a speaking sample in the target language (French or Spanish).
- Some applicants may be given provisional admittance on condition of taking specific undergraduate courses conducted in the target language and passing with a B or better.
- Students admitted provisionally must complete at least 9 hours of graduate courses making grades of A or B to be considered for full graduate standing.

**Degree Requirements:** Both programs require at least 30 hours of course work and a culminating project. Each student's program is tailored to enhance his or her career objectives. Students who plan to pursue a Ph.D. receive the requisite training and assistance. Students who plan to teach in community colleges or universities may complete the degree without a concentration or with a concentration in another language, English, History, or another discipline. K-12 teachers who already have "A" licensure may earn "M" licensure by taking 36 hours in specified disciplines. K-12 teachers who already hold "A" licensure can add-on English as a Second Language (ESL) licensure by taking 36 hours in specified disciplines.

**Student Financial Support:** Graduate assistantships and fellowships are available to students in both programs and are awarded by open competition.

**Other Relevant Information:** Students are admitted for the fall semester only; deadlines for applications are February 15 for international students and May 1 for U.S. students. Students interested in a teaching assistantship indicate this interest on the Graduate School application and must have their application in by March 1 for full consideration.

Click on Graduate Courses - General for current course information.

Click on <u>Graduate Courses - French</u> for current course information.

Click on Graduate Courses - Spanish for current course information.

### Forestry

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Forestry</u>	Y		Y		Y		

#### **GRADUATE FACULTY**

#### B. Goldfarb, Department Head

#### Director of Graduate Programs:

S. T. Warren, Box 8001, 515-7996, stwarren@ncsu.edu, Forestry and Environmental Resources

#### Edwin F. Conger Distinguished Professor of Forestry and Environmental Resources: R. R. Sederoff Jordan Family Distinguished Professorship for Natural Resources Innovation: V. C. Chiang

Professors: R. C. Abt, V. P. Aneja, R. R. Braham, R. I. Bruck, F. W. Cubbage, H. A. Devine, W. S. Dvorak, L. J. Frampton, B. Goldfarb, F. P. Hain, L. E. Hinesley, G. R. Hodge, J. B. Jett, E. J. Jones, S. Khorram, R. A. Lancia, B. Li, S. E. McKeand, D. L. Osmond, D. J. Robison, J. P. Roise, W. E. Winner; USDA Professors: F. E. Bridgwater; USDI Professors: T. R. Simons; Adjunct Professors: R. G. Campbell, B. Dimitriades, P. J. Donoso, W. G. Dorgeloh, P. M. Dougherty, T. P. Holmes, J. G. Laarman, J. P. McTague, D. E. Mercer, M. Olsson, K. H. Riitters, D. N. Wear; Emeritus Named Professors: C. B. Davey; Emeritus Professors: H. L. Allen, P. T. Bromley, A. W. Cooper, E. B. Cowling, P. D. Doerr, E. C. Franklin, J. D. Gregory, A. E. Hassan, D. L. Holley, R. C. Kellison, R. Lea, R. A. Powell, E. A. Wheeler, B. J. Zobel; *Emeritus Distinguished* Professors: S. W. Buol; Associate Professors: R. E. Bardon, G. B. Blank, B. P. Bullock, M. Fuentes, D. W. Hazel, G. R. Hess, J. S. King, C. E. Moorman, S. C. Nelson, E. G. Nichols, T. H. Shear, E. O. Sills, J. L. Stape, T. A. Steelman, A. M. Stomp, S. T. Warren, R. W. Whetten; *Research Associate Professors:* F. Isik; USDA Associate Professors: G. Sun; Adjunct Associate Professors: K. L. Abt, B. A. Bergmann, M. C. Conner, J. W. Coulston, W. J. Fleming, T. R. Fox, C. H. Greenberg, D. L. Loftis, J. B. McCarter, S. Pattanayak, J. P. Prestemon, R. H. Wynne; *Emeritus Associate Professors:* H. V. Amerson, L. D. Gustke; Assistant Professors: C. S. DePerno, A. L. James, M. R. McHale; Research Assistant Professors: K. K. Beratan, G. P. Catts, J. Domec, R. M. Jetton, F. H. Koch Jr, A. Noormets, K. M. Potter; USDA Assistant Professors: S. G. McNulty; Adjunct Assistant Professors: D. M. Amatya, C. B. Davidson, B. Hannrup, J. S. liames, C. A. Maier, A. A. Myburg, U. J. Nilsson, J. N. Phelan, R. A. Rubilar, F. G. Sanchez, J. L. Schuler, L. M. Van Zyl, B. E. Washburn, Y. T. Yamamoto; *Extension Associate Professors:* S. E. Moore; *Teaching Associate* Professors: H. M. Cheshire

The department offers training in all of the major sub-disciplines of forest, natural resources, and environmental-related science and management. Considerable flexibility is allowed in developing graduate programs tailored to the student's objectives.

Admission Requirements: All parts of the application, including the GRE general test, are considered in making decisions. Admission is competitive and depends on the willingness of at least one member of the faculty to serve as major professor. An undergraduate degree in forestry is not required.

**Master's Degree Requirements:** Course work requirements range from 30 to 36 credits depending on the specific master's option. Students without an appropriate background will require additional preparatory work. For the M.S. degree, a minor is required.

#### **Doctoral Degree Requirements:**

As a rule, students must complete a master's degree before entering the Ph.D. program. However, exceptionally well-prepared students may petition to have their degree objective changed to Ph.D. before completing the master's degree. In addition to the dissertation, Ph.D. programs require 36 to 54 credits of course work beyond the master's degree. A minor is required.

**Student Financial Support:** Merit-based research assistantships are available most years in most fields of specialization. Stipend levels allow students to graduate without incurring significant debt. Those who begin without an assistantship are considered for funding as projects become available. Additional funding is available through a limited number of teaching assistantships.

**Other Relevant Information:** Every graduate student must meet the following requirements: (1) take a one-credit research methodology course, FOR 603 or 803, early in his/her program; (2) take a seminar course (typically FOR 601/801), for students starting in their program in Fall 2008 or later; and (3) begin the final oral exam with a seminar to the department based on work accomplished during the graduate program. Ph.D. students must meet a one-time teaching requirement by assisting a faculty member teach an undergraduate forestry or natural resources course.

Click on Graduate Courses for current course information.

## Genetics

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Genetics</u>	Y		Y		Y		

#### **GRADUATE FACULTY**

D. W. Threadgill, Department Head

Director of Graduate Programs:

S. E. Curtis, Box 7614, 515-5747, securtis@ncsu.edu, Genetics

Edwin F. Conger Distinguished Professor of Forestry and Environmental Resources: R. R. Sederoff University Research Professor: W. F. Thompson
William Neal Reynolds Distinguished Professor: W. R. Atchley, W. F. Boss, F. L. Gould
William Neal Reynolds Distinguished Professor of Genetics: T. F. MacKay
William Neal Reynolds Distinguished University Professor: M. M. Goodman, T. R. Klaenhammer
William Neal Reynolds Professor: R. R. Anholt, R. S. Boston, R. A. Dean, L. K. Hanley, S. Lommel, S. Zeng

Professors: S. E. Curtis, J. W. Mahaffey, C. H. Opperman, D. Robertson, S. L. Spiker, J. L. Thorne, D. W. Threadgill; Adjunct Professors: M. D. Chilton, G. C. Gibson, M. D. Purugganan; Emeritus Named
Professors: E. Eisen; Emeritus Professors: W. D. Hanson, W. E. Kloos, D. F. Matzinger, W. H. McKenzie, J. G. Scandalios, H. E. Schaffer, A. C. Triantaphyllou; Emeritus Named Distinguished Professors: C. S. Levings, E. A. Wernsman; Associate Professors: J. M. Alonso, T. H. Emigh, W. O. McMillan; Research Associate Professors: P. A. Estes; Emeritus USDA Professors: C. W. Stuber; Adjunct Associate Professors: C. M. Grozinger; Assistant Professors: R. G. Franks, L. D. Mathies; Research Assistant Professors: D. M. Nielsen; Adjunct Assistant Professors: R. E. Cannon, M. A. Conkling, P. Hurban, S. J. Uknes

The department provides a well-balanced program of graduate course work and research training. The faculty conducts basic research in the genetics of a variety of model animal, and plant systems. The student has a choice of research projects in the broad areas of molecular, developmental, quantitative and population genetics.

Admission Requirements: Applicants may come from a number of undergraduate programs that include biological, agricultural, physical and mathematical science training. All applications are screened by a departmental committee, and the best qualified applicants will be accepted up to the number of spaces that are available for new students.

**Master's Degree Requirements:** The M.S. degree requires a minimum of 30 credit hours; the Master's of Genetics requires a minimum of 36 credit hours. A 12-hour sequence of five core courses is required of all majors; nine of these hours are required for minors. A minimum of two additional graduate

genetics courses is required.

**Doctoral Degree Requirements:** A 14-hour sequence of six core courses is required of all majors; nine of these hours are required for minors. A minimum of four additional graduate genetics courses is required.

**Student Financial Support:** Graduate assistantships and fellowships are available to the students from a number of sources. Information will be provided at the time of acceptance into the program.

**Other Relevant Information:** New students supported by fellowships or research assistantships will rotate through three laboratories during their first semester. At the end of the semester, they will choose a laboratory for their research activities consistent with their interests and available research projects. Provisions are available for a co-major and cooperative research in more than one laboratory.

Click on Graduate Courses for current course information.

### **Genomic Sciences**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<b>Bioinformatics</b>	Y				Y		
Functional Genomics	Y		Y		Y		

#### **GRADUATE FACULTY**

#### Directors of Graduate Programs:

D. M. Bird, Box 7616, 56813, <u>david bird@ncsu.edu</u>, Plant Pathology S. Zeng, Box 1500, 51942, <u>zeng@stat.ncsu.edu</u>, Statistics

ALCOA Professor of Chemical Engineering: R. M. Kelly
Distinguished University Research Professor: D. L. Bitzer
Drexel Professor of Statistics: A. A. Tsiatis
Edwin F. Conger Distinguished Professor of Forestry and Environmental Resources: R. R. Sederoff
Jordan Family Distinguished Professorship for Natural Resources Innovation: V. C. Chiang
Philip Morris Professor: R. E. Dewey
University Research Professor: W. F. Thompson
William Neal Reynolds Distinguished Professor of Genetics: T. F. MacKay
William Neal Reynolds Distinguished University Professor: M. M. Goodman, T. R. Klaenhammer
William Neal Reynolds Professor: R. R. Anholt, R. S. Boston, J. Cavanagh, M. E. Daub, M. Davidian, R. A. Dean, L. K. Hanley, S. Lommel, J. Odle, G. A. Payne, C. V. Sullivan, S. Zeng

Professors: K. B. Adler, P. F. Agris, P. Arasu, D. M. Bird, R. J. Borski, M. Breen, E. B. Breitschwerdt, D. T. Brown, S. D. Clouse, S. E. Curtis, G. A. Dean, C. E. Farin, L. J. Frampton, F. J. Fuller, J. E. Gadsby, S. K. Ghosh, B. Goldfarb, C. L. Hemenway, J. M. Hughes-Oliver, E. L. Kaltofen, S. Kathariou, S. Leath, D. H. Ley, B. Li, J. W. Mahaffey, E. S. Maxwell, S. E. McKeand, E. S. Miller, J. W. Moyer, D. C. Muddiman, S. V. Muse, C. H. Opperman, P. E. Orndorff, J. N. Petitte, R. M. Petters, J. A. Piedrahita, J. B. Ristaino, D. Robertson, M. C. Sagui, B. Sherry, R. C. Smart, J. L. Thorne, W. Tompkins, M. A. Vouk, B. M. Wiegmann, P. L. Wollenzien; USDA Professors: J. B. Holland; Adjunct Professors: G. C. Gibson, N. L. Kaplan, M. D. Purugganan, R. D. Wolfinger; *Emeritus Named Professors:* E. Eisen; *Emeritus Professors:* T. H. Regan; Associate Professors: J. M. Alonso, C. M. Ashwell, M. S. Ashwell, J. W. Brown, I. Carbone, J. P. Cassady, A. C. Clark, J. R. Godwin, M. B. Goshe, A. M. Grunden, J. M. Haugh, J. M. Horowitz, J. A. Knopp, D. S. Lalush, H. Liu, C. Mattos, W. O. McMillan, P. E. Mozdziak, J. W. Olson, M. Rodriguez-Puebla, C. E. Smith, J. L. Stape, R. W. Whetten, Q. Y. Xiang, D. Zhang; *Research Associate Professors:* P. A. Estes, F. Isik; Adjunct Associate Professors: C. M. Grozinger, E. R. Hauser; Emeritus Associate Professors: H. V. Amerson; Assistant Professors: R. G. Franks, S. Heber, M. D. Koci, L. Li, L. D. Mathies, F. Meilleur, A. A. Motsinger, B. J. Reich, H. A. Sederoff, M. L. Sikes, E. A. Stone, W. Sun, J. Tzeng, P. Veronese, H. Wang, Y. Wu, D. Xie, J. A. Yoder; *Research Assistant Professors:* D. M. Nielsen; USDA Assistant Professors: I. M. Perez Diaz; Adjunct Assistant Professors: J. L. Stephenson; Teaching Associate Professors: J. A. Barnes; Teaching Assistant Professors: B. J. Grubb, J. L. Lubischer, A. Y. Scales

Genomic sciences has two components. Functional genomics, the generation of large bodies of data relating to organism function, encompasses gene discovery, gene expression, protein and nucleic acid structure and function, gene and gene product interactions, and genomic approaches to breeding and comparative studies relevant to ecology and evolutionary biology. Bioinformatics is the analysis of these vast and complex data sets including methods to analyze extremely large sets of genomic information such as DNA sequences and expression from DNA microarrays. Students register in either of these two fields but also receive a solid grounding in the other through core courses common to both programs. Unique and exceptional resources include the <u>Bioinformatics Research Center</u> and the <u>Genome Research Laboratory</u>.

Admission Requirements: Students should have an undergraduate major in the biological or physical sciences, mathematics, statistics or computer science and have completed calculus and other comparable courses. In addition to the other application requirements, a student should submit a statement of interests and career goals.

**Master's Degree Requirements:** Students take a 15-credit core curriculum of courses common to both programs followed by courses specific to the degree and discipline. The Master's of Bioinformatics requires a minimum of 33 credit hours. The Master's of Functional Genomics requires a minimum of 30 credit hours, and the Master's of Science in Functional Genomics requires a minimum of 36 credit hours.

**Doctoral Degree Requirements:** The Ph.D. program requires a total of 72 credits, and all students participate in a journal club, monthly seminar series and research ethics training. A co-mentoring system exists between bioinformatics and functional genomics through which each student has advisors from both disciplines. Throughout the program they will have the opportunity to gain practical experience in the Genome Research Laboratory, Bioinformatics Research Center and DNA Sequencing Facility.

**Student Financial Support:** A significant number of fellowships are available through the genomics program, and students may also be supported by research grant funds awarded to genomics faculty members.

#### **GRADUATE COURSES**

Many courses are available and cross-listed through 25 participating departments in the Colleges of Agriculture & Life Sciences, Engineering, Natural Resources, Physical & Mathematical Sciences, and Veterinary Medicine.

### **Global Innovation Management**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Global Innovation Management					Y		

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

D. H. Henard, Box 7229, 919.515.8945, david henard@ncsu.edu, Business Management

Zelnak Professor of Marketing Innovation: M. M. Montoya-Weiss

**Professors:** D. P. Pagach; **Associate Professors:** L. Aiman-Smith, E. A. Baker, D. H. Henard, S. K. Markham, J. K. McCreery, P. W. Mulvey, M. D. Walker; **Assistant Professors:** D. Sirdeshmukh; **Teaching Associate Professors:** S. J. Schanz

The Jenkins Graduate School of Management, part of the North Carolina State University College of Management, in partnership with the <u>Université Paul Cézanne Graduate School of Management</u> (IAE Aix-Marseille III) in Aix-en-Provence France, offers a Master's degree in Global Innovation Management. The curriculum is designed to give engineering, science and other technology-oriented students a strong exposure to core business management skills while providing in-depth exposure to a host of global innovation management issues. It was designed specifically for students who are looking to create a personal competitive advantage for today's global job market.

Students in the program come from around the world and classes will be held in both France and the United States. Students are taught by international professors who are leaders in their fields. Interactions with global firms will occur both in the classroom and via internships.

Admission Requirements: Applicants are required to complete the standard NC State Graduate School application process. Applicant assessments will be done on an individual-by-individual basis. Concurrent acceptance activities will be at both IAE and NC State. GMAT or GRE scores are required of all applicants. International applicants must complete the TOEFL.

U.S. applicants will need a valid U.S. passport and visa for traveling to France. Upon acceptance to the program, students can apply for a visa. Applicants should also be prepared for additional program costs (airfare to and from Europe and travels within Europe, lodging and meals while in France).

**Master's Degree Requirements:** The MGIM degree requires 33 credit hours and can be completed in one year. It does not require courses in subject areas such as economics and operations management which are required in the MBA. This one-year program awards two master degrees:(1) a degree from NC State University and (2) a degree from the Université Paul Cézanne.

#### **Core Courses:**

MBA 550 Management of Technology and Innovation MBA 554 Project Management MBA 564 Business Relationship Management

#### **Elective Courses:**

MBA 563 Product and Brand Management MBA 570 Entrepreneurship MBA 585 Current Topics in BioSciences Management MBA 586 Legal and Marketing Dynamics in Pharmaceutical and Biotechnology MBA 590 Special Topics in Business Management (Services Innovation)

**Other Relevant Information:** After two years of full-time work experience, qualified students who earn the dual master degree in Global Innovation Management can receive their full-time MBA from NC State University's Jenkins Graduate School of Management after completing an additional 30 hours of study. Students must complete a separate application to the MBA program.

# **Graphic Design**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Graphic Design					Y		

#### **GRADUATE FACULTY**

#### S. J. Piedrafita Iglesias, Department Head

#### Directors of Graduate Programs:

H. Khachatoorian, Box 7701, 515-8331, <u>haig khachatoorian@ncsu.edu</u>, Industrial Design M. J. Davis, Box 7701, 58328, <u>meredith davis@ncsu.edu</u>, Graphic Design

# Professors: D. M. Crisp, M. J. Davis, M. Scotford; *Emeritus Professors:* A. S. Lowrey; Associate Professors: K. L. Bailey, S. J. Piedrafita Iglesias, S. Townsend; Assistant Professors: W. F. Temple

Recognizing that graphic design is both a social activity and a form of cultural production, faculty and students in the Department of Graphic Design define the study of the discipline as necessarily contextual; graduate research examines the creation, reproduction, distribution, and reception of design from a multidisciplinary perspective. The Master of Graphic Design Program also emphasizes the importance of understanding design as the creation of cognitive and cultural artifacts; study focuses on the construction of messages, the reproduction of such artifacts, the systems for their distribution, and their reception within various cultures of society.

Graduate students in graphic design learn through their own search for problems within critical content frameworks presented by the faculty. The program places primary importance on the ability of students to be critical agents; to seek problems and to pose questions. Faculty evaluate graduate students on their capacity to define individual investigations and to support their decision-making with an independent program of reading and research; on their ability to critically evaluate and articulate discoveries; and on their skills in synthesizing ideas through the creation of design artifacts.

The Master of Graphic Design Program provides focused study and research in the discipline that reflects concern for how designers will shape and respond to the changing technological and social communications environments of the future. The Program has the broad objective to educate socially responsible, intellectually curious, historically aware, and technologically adept communication design professionals.

In the Track III Program, students whose undergraduate preparation is in fields other than graphic design examine relationships between their previous study and graphic design. While acquiring design skills and knowledge in graphic design, they apply concepts and methods from their previous study to design research and innovation.

Admissions Requirements: Students must make application to the Department of Graphic Design by

January 5. In addition to Graduate School requirements, the department requires department personal data forms, a slide portfolio of design and two-dimensional visual work, and a statement of intent. The GRE is required for students whose first degree is not in Graphic Design.

**Master's Degree Requirements:** The Master's of Graphic Design degree requires a minimum of 48 credit hours. Studio credits presented for transfer must be accompanied by a portfolio of work from the courses under consideration.

**Student Financial Support:** The department has limited provisions for tuition remission and assistantships. Assistantships are awarded on the basis of student and departmental needs. Assistantship applications are available from the Department of Graphic Design and should be submitted with the application for admission (for incoming students) or by the advertised deadline (for continuing students).

Click on Graduate Courses for current course information.

## History

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>History</u>				Y			
Public History				Y			

#### **GRADUATE FACULTY**

#### J. K. Ocko, Department Head

#### Director of Graduate Programs:

K. P. Luria, Box 8108, 513-2224, luria@social.chass.ncsu.edu, History

#### Distinguished University: A. H. Harrison

Professors: W. Adler, D. P. Gilmartin, O. J. Kalinga, K. P. Luria, J. K. Ocko, S. T. Parker, R. H. Sack, R. W.
Slatta, K. P. Vickery, K. S. Vincent, D. A. Zonderman; *Emeritus Professors:* J. R. Banker, B. F. Beers, M. L.
Brown, C. H. Carlton, A. J. DeGrand, M. S. Downs, L. M. Edwards, W. C. Harris, J. P. Hobbs, D. E. King, A.
J. Lavopa, G. W. O'Brien, J. M. Riddle, E. D. Sylla, M. E. Wheeler, B. W. Wishy; *Associate Professors:* D.
R. Ambaras, R. K. Bassett, H. Brewer, J. E. Crisp, C. T. Friend, W. A. Jackson, B. M. Kelley, A. F. Khater, M.
G. Kim, W. C. Kimler, A. W. Mitchell, S. L. Spencer, G. Surh, J. E. Swiss; *Adjunct Associate Professors:* J.
R. Lankford; *Assistant Professors:* M. M. Booker, R. S. Ellovich, S. M. Lee, J. L. Mell, K. Mellen-Charron,
L. N. Minsky, T. W. Ort, B. S. Sirota; *Teaching Assistant Professors:* J. C. Bonham, J. W. Caddell, H. C.

Admission Requirements: In the required career goals statement, the major country, topic and historical period of interest should be included. Students admitted provisionally must complete at least 9 hours of graduate courses making grades of A or B to be considered for full graduate standing.

**Master's Degree Requirements:** *Master of Arts Degree in History:* This program requires a total of 30 semester hours, including six hours for the thesis. Each student's program is tailored to enhance his or her career objectives. Social studies teachers, for example, may earn advanced competency on completion of the M.A. in history with additional course work in education. Similarly, students who plan to pursue a Ph.D. degree receive the requisite training and assistance. *Master of Arts Degree in Public History:* This non-thesis program requires 36 credit hours of course work. Half the hours fall in historical studies, the rest in applied history classes, including innovative courses in archival and special collections management, paper conservation, documentary editing, museum studies, and historic preservation. Students may select practicums in their own special areas of interest -- including archival management, historic site administration, museology, historic preservation, and historical publications.

**Student Financial Support:** Graduate assistantships and fellowships are available to students in both programs and are awarded by open competition.

**Other Relevant Information:** Application deadline is January 1; students are admitted for the fall semester only. The general portion of the GRE is required for those seeking admission to both the history and public history programs. No subject test is required for either program.

Click on <u>Graduate Courses</u> for current course information.

## **Horticultural Science**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Horticultural Science	Y		Y		Y		

#### **GRADUATE FACULTY**

#### J. L. Kornegay, Department Head

#### Director of Graduate Programs:

S. D. Clouse, Box 7609, 5-5360, steve clouse@ncsu.edu, Horticultural Science

# J.C. Raulston Distinguished Professor: D. J. Werner Phillip Morris Professor: M. D. Boyette

Professors: J. R. Ballington, T. E. Bilderback, S. M. Blankenship, F. A. Blazich, S. D. Clouse, N. G.
Creamer, J. M. Dole, W. C. Fonteno, L. E. Hinesley, W. E. Hooker, G. D. Hoyt, J. L. Kornegay, D. W.
Monks, J. C. Neal, P. M. Perkins-Veazie, E. B. Poling, T. G. Ranney, J. R. Schultheis, S. E. Spayd, T. C.
Wehner, B. E. Whipker, L. G. Wilson, F. H. Yelverton, G. C. Yencho, E. Young; *Adjunct Professors:* P. S.
Zorner; *Emeritus Professors:* W. E. Ballinger, A. A. DeHertogh, P. R. Fantz, R. G. Gardner, W. R.
Henderson, T. R. Konsler, C. M. Mainland, T. J. Monaco, P. V. Nelson, D. M. Pharr, M. A. Powell, W. A.
Skroch, C. R. Unrath; *Associate Professors:* W. G. Buhler, J. D. Burton, J. M. Davis, G. E. Fernandez, S. J.
McArtney, M. L. Parker, B. R. Sosinski, A. M. Spafford, J. D. Williamson; *Research Associate Professors:* G. C. Allen; *Assistant Professors:* L. K. Bradley, A. F. Brown, B. Fair, C. Gunter, H. T. Kraus, A. V. Lebude, D. R. Panthee, J. T. Sherk; *Research Assistant Professors:* K. M. Jennings; *Adjunct Assistant Professors:* F. C. Wise

The NCSU Horticultural Science Graduate Program offers one of the most comprehensive programs in the country – providing students with a broad selection of courses and projects ranging from applied industry-oriented studies to molecular biology. Studies may focus on such commodity areas as floriculture, ornamental and landscape horticulture, pomology (fruit crops) and olericulture (vegetables) or on cross-commodity topics such as plant physiology, breeding and genetics, herbicide physiology and weed control, nutrition, propagation, tissue culture, growth regulators, postharvest physiology, environmental control, landscape horticulture and biochemistry.

Admission Requirements: To be admitted, a student should have completed course work in physics, mathematics, chemistry, biochemistry, soils, plant pathology, genetics, plant physiology, entomology and several courses in horticulture. An applicant deficient in course work may be admitted on a provisional basis until the deficiency is made up. Applicants must provide the basic graduate record examination (GRE) scores, three letters of reference, two official transcripts for each prior degree, and a statement of career goals.

Master's Degree Requirements: The Master's degree is a research-oriented degree requiring 30 credit

hours and a written thesis. Four credits of core courses (HS 701-707, 717) and one credit of HS 601 must be completed. Up to 6 of the 30 credits may be research credits (HS 695), but there is no requirement to enroll for research credit. At least 20 semester hours must be 500, 600 or 700 level courses, and 6 of these credits must be at the 700 level.

For students wishing a more general educational background in horticultural science without the thesis requirement, the *Master of Horticultural Science* (M.H.S.) degree is offered. The M.H.S. requires 36 credit hours. Twenty credits must be at the 500-700 level. One credit of HS 601 and at least four and no more than six credits of HS 693 are required. Up to 16 hours of 400-level courses can be taken as a part of the M.H.S. program, however, you may only take six hours of HS 400-level courses. Students are encouraged, but not required, to fulfill the four credit Horticultural Science core course requirement (HS 701-707, 717).

**Doctoral Degree Requirements:** The Ph.D. program is designed for individuals desiring to pursue careers in research and teaching. A minimum of 54 credit hours beyond the Master of Science program is required. Three credits of the core courses (HS 701-707, 717) and one credit of HS 601 are required; HS 601 is not required if already taken during the MS.

**Student Financial Support:** The department has a limited number of assistantships available on a competitive basis for promising students. Benefits include tuition and health insurance as covered under the Graduate School's Graduate Student Support Plan. Applicants are considered for assistantship support at time of application. Those interested should apply at least seven months prior to their anticipated enrollment date. Also, many faculty programs have research grant-funded assistantships; potential students should contact faculty directly whose programs are of interest.

**Other Relevant Information:** Facilities for graduate studies include 40,500 square feet of greenhouse space at the USTL and the nearby Horticultural Field Lab; the University Phytotron (available for controlled environmental studies on horticultural crops); 19 well-equipped laboratories; 14 controlled temperature storage rooms, an extensive collection of plant materials, both living and preserved; and a variety of climates and soils from coast to mountains in North Carolina on fifteen outlying research stations. North Carolina has a dynamic horticulture industry, ranking among the top ten in many of the commodity areas.

Click on Graduate Courses for current course information.

### **Human Development and Family Studies**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Human Development & Family Studies-Family Life & Parent Educ			Y				

#### **GRADUATE FACULTY**

#### R. M. Stewart, Department Head

#### **Director of Graduate Programs:**

K. B. DeBord, Box 7606, 919/515-9147, <u>karen DeBord@ncsu.edu</u>, Human Development & Family Studies

Professors: K. B. DeBord, P. C. Dunn, J. W. McClelland; Associate Professors: L. B. Bearon, S. D. Kirby; Emeritus Associate Professors: D. W. Matthews; Assistant Professors: A. O. Behnke, C. L. Bird; Extension Assistant Professors: S. S. Jakes

Parent Education and Family Life Education are rapidly growing fields of research and practice. Demand for professionals to teach and create support systems for families is arising through government initiatives, community agencies, court systems, prisons, social service organizations, health care, schools, and communities. The Department of Family and Consumer Sciences at North Carolina State University and the <u>Department of Human Development and Family Studies at the</u> <u>University of North Carolina at Greensboro</u> offer a jointly administered Masters of Science degree in Human Development & Family Studies with a concentration in Family Life & Parent Education.

Admission Requirements: Students may apply to the joint program through NC State via the normal admissions procedures. As of Spring 2009, students will be accepted by NCSU only, not UNC-G. Plans are that by Fall 2010, new course requirements and new course options will be available See <a href="http://www.ces.ncsu.edu/depts/4hfcs/academics/masters/new\_flyer.doc">http://www.ces.ncsu.edu/depts/4hfcs/academics/masters/new\_flyer.doc</a> for more information about planned programs.

**Master's Degree Requirements:** The Masters of Human Development and Family Studies is a nonthesis degree that requires a total of 34 credit hours that includes six hours of core content, nine hours in the area of specialization, six hours of applied research, and four to seven hours of applied research internship and professional development. In addition, the student and program advisor will jointly select six to nine hours of elective courses.

**Other Relevant Information:** This program is designed to make most of the coursework accessible to students enrolled at either the University of North Carolina at Greensboro or North Carolina State University. Course delivery methods include: Web-based classes, seminar classes with a live internet feed connecting classrooms at both institutions, and on-campus seminars at both institutions. This is not a 100% online degree, however. A blending of teaching methods are used.

Click on <u>Graduate Courses</u> for current course information.

### Immunology

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Immunology	Y		Y				

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

S. Tonkonogy, Box 8401, 513-6252, sue tonkonogy@ncsu.edu, Population, Health, and Pathobiology

Professors: G. W. Almond, E. B. Breitschwerdt, G. A. Dean, F. J. Fuller, B. Hammerberg, L. C. Hudson, S. L. Jones, S. M. Laster, T. J. Olivry, B. Sherry, M. B. Tompkins, W. Tompkins; *Research Professors:* E. A. Havell, S. Kennedy-Stoskopf; *Adjunct Professors:* M. K. Selgrade; *Associate Professors:* S. Tonkonogy; *Assistant Professors:* A. J. Birkenheuer, P. R. Hess, M. D. Koci, M. L. Sikes, S. E. Suter, J. A. Yoder; *Research Assistant Professors:* J. E. Fogle, K. E. Howard, S. K. Nordone; *Adjunct Assistant Professors:* M. I. Gilmour

Course offerings or research facilities are available in the following areas: infectious disease immunology, mucosal immunology, immunotoxicology, immunoparasitology, environmental immunology, and immunology of non-vertebrate species.

Students will be accepted into the immunology program based on their academic records (GPA) as undergraduates and/or as veterinary or medical students, results of the GRE, letters of recommendation and expression of interest in immunology. For the Ph.D. program, special consideration will be given to students who have prior experience in a research laboratory setting, especially in immunology, microbiology, biochemistry or genetics, or students who are completing strong clinical residency programs. Completed applications should be received by December 1 for fall admission.

To be admitted, a student should be a graduate of a major accredited biological science or medical science program. Students lacking appropriate courses may be considered for admission but will be required to make up certain undergraduate deficiencies without graduate credit.

Ph.D. and Master's students must take IMM 751 (Immunology) and at least one other 700-level immunology course, and a graduate-level biochemistry course (e.g. BCH 553 Biochemistry of Gene Expression). Also required are CBS 662 (Professional Conduct in Biomedical Research) and ST 511 (Experimental Statistics for Biological Sciences I). IMM 816 (Advanced Topics in Immunology) is required each semester. The remaining credit hours should include seminar (IMM 807) and research and teaching credits.

Students wishing to pursue a minor in Biotechnology should complete the core course in biotechnology (BIT 510) and two additional credit hours in the biotechnology series.

Graduate assistantships are available to students in the immunology program through the affiliated departments and graduate training grants. In addition, there are graduate research assistantships provided by individual faculty of the program.

The immunology program is an interdepartmental graduate program with faculty drawn from the College of Veterinary Medicine and the College of Agriculture and Life Sciences. For administrative purposes, all students accepted into the program will also have to be student members of one of the participating departments.

Click on <u>Graduate Courses</u> for current course information.

### **Industrial Design**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Industrial Design					Y		

#### **GRADUATE FACULTY**

#### H. Khachatoorian, Interim Department Head

#### Director of Graduate Programs:

H. Khachatoorian, Box 7701, 515-8331, haig khachatoorian@ncsu.edu, Industrial Design

Professors: S. D. Brandeis, C. E. Joyner, H. Khachatoorian; *Emeritus Professors:* V. Foote; Associate
Professors: C. D. Cox, L. M. Diaz, P. J. Fitzgerald, P. R. Hooper, B. Jin, B. W. Laffitte, V. K. Plume, D. G.
Raymond, S. M. Toplikar; Assistant Professors: T. W. Buie, S. B. Joines; Adjunct Assistant Professors: E.
C. Jordan

Industrial Design is the professional service of creating and developing concepts and specifications that optimize the value, function and appearance of products and product systems to the mutual benefit of both user and manufacturer. This service is often provided in the context of a cooperative working relationship with other members of a development group.

Typical groups include management, marketing, engineering and manufacturing specialists. Industrial designers place special emphasis on human characteristics, needs and interests. These require particular understanding of visual, tactile, safety and convenience criteria. Industrial designers combine these considerations with practical concern for technical processes and requirements for manufacture; marketing opportunities and economic constraints; and distribution, sales and servicing arrangements. Industrial designers are guided by the awareness of their obligations to protect and promote public safety and well being; to respect the environment; and to observe ethical business practices.

Graduates with a Master of Industrial Design have career opportunities in four general areas; corporate design offices in manufacturing companies, independent design consulting firms, governmental agencies and educational institutions.

**Admissions Requirements:** Applicants will be considered for admission on an individual basis and plans of study will be developed to take into account previous academic and professional experiences. In addition to other forms, applications must include departmental personal data forms and a portfolio.

Master's Requirements: The Master of Industrial Design degree requires a minimum of

- 30 credit hours for applicants with extensive experience in industry;
- 48 credit hours for applications with a Bachelor's degree in Industrial Design, or
- 78 credit hours for applications with Bachelor's degrees in an area other than Industrial Design.

Click on <u>Graduate Courses</u> for current course information.

# **Industrial Engineering**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Industrial Engineering	Y		Y		Y		

#### **GRADUATE FACULTY**

#### P. Cohen, Department Head

Director of Graduate Programs:

R. E. King, Box 7906, 5-5186, king@ncsu.edu, Industrial Engineering

A. Doug Allison Distinguished Professor: S. D. Roberts
Clifton A. Anderson Distinguished Professor: R. Uzsoy
Distinguished University Professor of Industrial Engineering for International Competitiveness: S. E. Elmaghraby
Edgar S. Woolard Distinguished Professor: P. Cohen
Henry A. Foscue Distinguished Professor: C. T. Culbreth Jr
James T. Ryan Distinguished Professor of Industrial Engineering and Furniture Manufacturing: T. J.
Hodgson
Walter Clark Professor of Industrial Engineering: S. C. Fang

Professors: M. A. Ayoub, R. H. Bernhard, Y. Fathi, D. B. Kaber, R. E. King, Y. Lee, D. J. Marcellin, R. J. Narayan, J. R. Wilson, R. E. Young; *Emeritus Named Professors:* A. L. Prak; *Emeritus Professors:* J. R. Canada, T. Johnson, R. G. Pearson, W. A. Smith; *Associate Professors:* G. D. Buckner, O. A. Harrysson, T. L. Honeycutt, S. M. Hsiang, M. G. Kay, D. P. Warsing; *Research Associate Professors:* J. Taheri; *Adjunct Associate Professors:* N. J. Currie, R. Stoll; *Emeritus Associate Professors:* E. Sanii; *Assistant Professors:* B. Denton, J. Dong, J. S. Ivy; *Adjunct Assistant Professors:* N. Couch, L. B. Davis, D. G. Humphrey; *Teaching Professors:* H. L. Nuttle; *Teaching Associate Professors:* S. D. Jackson, J. P. Lavelle

The graduate faculty of the Edward P. Fitts Department of Industrial and Systems Engineering supports academic and research interests in four areas: (1) manufacturing systems (manufacturing processes, medical device manufacturing systems, CAM, CIM, robotics, automation, rapid prototyping and concurrent engineering); (2) production systems (logistics systems, supply chain management, scheduling, inventory control, materials handling, facility design, furniture manufacturing and management, quality control, and engineering economics); (3) systems analysis and optimization (health systems, stochastic processes, simulation, mathematical programming, and soft computing); and (4) ergonomics (human performance, occupational safety, and biomechanics). The department faculty actively supports independent graduate degree programs in operations research, integrated manufacturing systems engineering, and financial mathematics.

Admission Requirements: Applications are accepted from undergraduate majors in engineering and in the behavioral, physical and mathematical sciences who meet prerequisites in calculus and linear

algebra, computer science, and statistics.

**Master's Degree Requirements:** The M.S. degree requires 30 credit hours and involves depth of study in a specified area of concentration, nine hours in a minor, and six hours of research credit. The Master of Industrial Engineering (M.IE.) degree may be obtained by course work only; project work is optional. A minimum of 33 credit hours is required for the M.IE.

**Doctoral Degree Requirements:** This degree requires 72 credit hours of course and research work beyond the Bachelor's degree. Undergraduate students with superior credentials may apply directly to the doctoral program and bypass the master's degree. For students who have completed the Master's degree, typically 30 to 36 hours of additional course work are required. A departmental written qualifying examination is required.

**Student Financial Support:** Research and teaching assistantships are available on a competitive basis to early applicants. Fellowships that supplement assistantship stipends are available to U.S. applicants with superior credentials. Award priority is given to Ph.D. and then to M.S. applicants.

Click on Graduate Courses for current course information.

### **Integrated Manufacturing Systems Engineering**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Integrated Manufacturing Systems Engineering					Y		

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

S. D. Jackson, Box 7906, 5-3808, <u>steve\_jackson@imsei.ncsu.edu</u>, Integrated Manufacturing Systems Engineering

A. Doug Allison Distinguished Professor: S. D. Roberts
Alan T. Dickson Distinguished University Professor: M. A. Rappa
Bank of America Distinguished University Professor: R. B. Handfield
Burlington Industries Professorship of Textile Technology: R. L. Barker
Henry A. Foscue Distinguished Professor: C. T. Culbreth Jr
James T. Ryan Distinguished Professor of Industrial Engineering and Furniture Manufacturing: T. J.
Hodgson
Phillip Morris Professor: M. D. Boyette
Zelnak Professor of Marketing Innovation: M. M. Montoya-Weiss

Professors: Y. A. Chen, M. Chow, T. G. Clapp, M. Devetsikiotis, B. L. Edge, Y. Fathi, T. K. Ghosh, W. J. Jasper, R. E. King, J. W. Leach, Y. Lee, T. J. Little, M. K. Ramasubramanian, W. J. Rasdorf, P. I. Ro, R. D. Rodman, J. P. Rust, A. M. Seyam, J. R. Wilson, R. E. Young; *Research Professors:* R. L. Lemaster; *Emeritus Named Professors:* C. F. Zorowski; *Emeritus Professors:* R. E. Carawan, P. L. Grady, T. Johnson, W. A. Smith; *Associate Professors:* D. R. Bahler, P. Banks-Lee, K. A. Barletta, G. D. Buckner, S. N. Chapman, O. A. Harrysson, G. L. Hodge, J. A. Joines, M. G. Kay, K. Mitchell, D. P. Warsing; *Research Associate Professors:* A. D. Batchelor, J. Taheri; *Emeritus Associate Professors:* E. Sanii; *Assistant Professors:* B. Denton, J. S. Ivy, D. E. Saloni, E. A. Sumner; *Adjunct Assistant Professors:* J. A. Janet; *Teaching Professors:* H. L. Nuttle; *Teaching Associate Professors:* S. D. Jackson

The Integrated Manufacturing Systems Engineering (IMSE) Institute was established in 1984. IMSE provides multidisciplinary graduate-level education and practical training opportunities in the theory and practice of integrated manufacturing systems engineering at the masters level. IMSE focuses on providing a manufacturing presence and a program environment in the College of Engineering where faculty, graduate students and industry can engage cooperatively in multidisciplinary graduate education, basic and applied research, and technology transfer in areas of common interest related to modern manufacturing systems technology. The objective of the IMSE program is to offer students with traditional discipline backgrounds in engineering and the physical sciences an opportunity to broaden their understanding of the multidisciplinary area of manufacturing systems. Core areas of concentration are offered in manufacturing systems, logistics, mechatronics, and biomanufacturing.

Admission Requirements: Admission to the IMSE master's program requires a B.S. degree from an

accredited institution in engineering, physics, mathematics, or computer science. Check with the Institute if your degree is in a field other than these listed.

**Master's Degree Requirements:** The IMSE program requires a minimum of 27 hours of graduate course work and six hours of research project. The graduate course work includes five required core courses that provide a multidisciplinary overview of subject materials basic to manufacturing systems, logistics, mechatronics, and biomanufacturing. Specialization is provided in the student's elective courses. The six hours of research project is performed either individually or in teams in areas that compliment and reinforce the graduate course work.

**Student Financial Support:** Assistantships, fellowships and internships are available to qualified students. The full financial support package covers tuition and health insurance.

**Fellowship/Internship:** The IMSE internship program was established to provide a cooperative industrial and academic experience for some IMSE students and our industrial sponsors. Several Fellowship/Internships awards are made available every year for special training in IMSE member companies. Students who are selected to participate in the internship program receive financial support for four semesters and one summer. Typically, the student attends classes for two semesters (fall and spring), works at the sponsor company for the following summer and fall semester, and completes the IMSE course requirements the following spring semester. The student uses the experience at the sponsor company as the basis for their IMSE research project.

**Other Relevant Information:** The Institute is supported by an industrial affiliates group of member companies. They have included ABB, ABCO Automation, Applied Materials, AT&T, AIMS, Bayer, B/S/H, Biogen Idec, Bosch Tools, CDB Corporation, CP&L, Carver Machine Works, Castle Hill Technologies, Caterpillar, Closure Medical, Corning Cable Systems, CSX, Inc., Dupont, Elkay, Ford Motor, GE, IBM, Intel, John Deere Turf Care, Meadows Mills, Morganite, Nekton Technologies, Nortel, OdorSweep, Rxmedic, and Snap-on Incorporated. The Institute interacts with member companies through an Industry Advisory Board and internships.

Core areas of concentration are offered in manufacturing systems, logistics, mechatronics, and biomanufacturing.

Area 1	CSC 510 - Software Engineering CSC 742 - Database Management Systems ISE(CSC,OR) 762 - Computer Simulation Techniques ISE(CSC) 441 - Introduction to Simulation ISE 719 - CIM System Design
Area 2	MBA 520 - Managerial Finance ISE 510 - Applied Engineering Economy ISE 711 - Capital Investment Economic Analysis
Area 3	ISE 514 - Manufacturing Product Engineering ISE 707 - Real-time Control of Automated Manufacturing ISE 715 - Manufacturing Process Engineering ISE 716 - Automated Systems Engineering

#### I. Manufacturing Core (one from each area)

Area 4	ISE 723 - Production Planning, Scheduling and Inventory Control					
Area 5	MAE(WPS) 534 - Mechatronic Design MAE 742 - Mechanical Design for Automated Assembly					

### II. Logistics Core (one from each area)

Area 1	CSC(ECE) 510 - Software Engineering CSC 742 - Database Management ISE(CSC,OR) 762 - Computer Simulation Techniques ISE 441 - Introduction to Simulation ISE 719 - CIM Systems Design
Area 2	MBA 520 - Managerial Finance ISE 510 - Applied Engineering Economy ISE 711 - Capital Investment Economic Analysis
Area 3	MBA 541 - Supply Management MBA 542 - Supply Chain Logistics
Area 4	ISE 723 - Production Planning, Scheduling and Inventory Control
Area 5	ISE 754 - Logistics Engineering

### III. Mechatronics Core (one from each area)

Area 1	MAE (WPS) 534 - Mechatronic Design ECE 556 - Agent-Based Mechatronics Systems
Area 2	MAE 513 - Principles of Structural Vibration MAE(ECE) 535 – Design of Electromechanical Systems MAE 742 - Mechanical Design for Automated Assembly
Area 3	ECE 511 - Analog Electronics ECE 555 - Computer Control of Robots ECE 755 – Advanced Robotics
Area 4	CSC(ECE) 517 - Object-oriented Languages and Systems ECE 561 – Embedded Systems Design ECE 742 – Artificial neural Networks ISE 719 - CIM System Design
Area 5	ECE 437 – Distribution Real-time Control Systems ECE 516 – System Control Engineering ISE 707 – Real-time Control of Automated Manufacturing ISE 716 – Automated Systems Engineering

### IV. Biomanufacturing Core (one from each area)

Area 1	ISE/OR/CSC 762 – Computer Simulation ISE 719 - CIM Systems Design
Area 2	MBA 520 - Managerial Finance ISE 520 – Applied Engineering Economy
Area 3	ISE 514 - Manufacturing Product Engineering ISE 707 – Real-Time Control of Automated Manufacturing
Area 4	ISE 723 – Production Planning, Scheduling, and Inventory Control
Area 5	ISE 789 – Quality Control in Biomanufacturing Applications

TE 589 – Six Sigma Quality

Click on <u>Graduate Courses</u> for current course information.

## **International Studies**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
International Studies					Y		

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

H. H. Hobbs, Box 8102, , heidi hobbs@ncsu.edu, Political Science

#### William Neal Reynolds Professor: M. D. Schulman

Professors: F. W. Cubbage, D. M. Daley, J. K. Ocko, R. P. Patterson, M. A. Renkow, F. J. Smith, A. J. Taylor; Adjunct Professors: A. L. Schiller; Emeritus Professors: L. S. Bull, C. H. Carlton, E. W. Erickson, R. L. Moxley, J. C. Shih, M. S. Soroos, M. A. Witt; Emeritus Distinguished Professors: S. W. Buol; Associate Professors: W. A. Boettcher, S. H. Greene, C. E. Griffin, H. H. Hobbs, M. A. Johnson, A. F. Khater, J. Kiwanuka-Tondo, R. C. Kochersberger, A. W. Mitchell, R. S. Moog, E. O'Sullivan, R. F. Stephen, R. J. Thomson, J. M. Wallace, S. T. Warren, S. B. Wiley; Emeritus Associate Professors: L. D. Gustke; Assistant Professors: L. N. Minsky, M. J. Struett; Adjunct Assistant Professors: T. E. Ray

The Master of International Studies (MIS) is a 36-hour, non-thesis professional degree program that prepares students for careers in government service, non-profit administration, international businesses, and higher education administration in international student services and study abroad. Located in the School of Public and International Affairs, the MIS degree draws upon faculty and courses from colleges and departments across the university. Approximately half of the course work for the degree is devoted to developing international knowledge and competencies. The remaining coursework is comprised of regional, topical, professional or technical specializations that are designed by students in consultation with their faculty advisors.

**Admission Requirements:** Applicants must provide GRE scores in addition to other application materials required by the Graduate School.

Degree Requirements: The requirements for the MIS degree are as follows:

- 1. 36 credit hours of course work;
- 2. One course from each of the following groupings:

#### **Group A - International Relations** PS 530 Seminar in International Relations

PS 533 Global Problems and Policy

HI 554 History of U.S. Foreign Relations, 1900-Present

**Group B - Comparative Politics/Societies** PS 540 Seminar in Comparative Politics PS 542 Western European Politics PS 543 Latin America and Caribbean Politics PS 545 Comparative Systems of Law and Justice SOC 514 Developing Societies SOC 727 Comparative Societies

**Group C - International Law and Organization** PS 431 The United Nations and Global Order PS 531 International Law PS 536 Global Environmental Law and Policy

**Group D - International Economy/Development** BUS 426 International Financial Management or EC 449 International Finance EC 448 International Trade ECG 540 Economic Development PS 539 International Political Economy

**Group E - Cross-cultural Communication** COM 523 International and Intercultural Communication PSY 755 Cross-Cultural Research and Development

3. Individualized specialization of 12-15 hours. The specialization may be in a geographical region (e.g., Latin America, South Asia), an international topic (e.g., security, environment, sustainable development), a professional field (e.g., business, public administration, non-profit management), or a technical specialty (e.g., agriculture, information technology). The specialization may include an appropriate research methodology course, if recommended by the student's faculty advisory;

4. Capstone seminar (three hours) and oral presentation of work to faculty and peers;

5. A significant foreign work or study experience;

6. Reading/listening/speaking competency in a foreign language as determined by the Department of Foreign Languages and Literatures (FLL).

Click on Graduate Courses for current International Studies course information.

# Landscape Architecture

### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Landscape Architecture					Y		

### **GRADUATE FACULTY**

#### E. H. Bressler, Department Head

#### Directors of Graduate Programs:

D. B. Hill, Box 7701, , <u>dbhill@ncsu.edu</u>, Architecture

F. H. Magallanes, Box 7701, 5-8348, <u>f magallanes@ncsu.edu</u>, Landscape Architecture

Professors: E. H. Bressler, A. R. Brown-Graham, H. A. Devine, R. C. Moore, A. R. Rice; Adjunct
Professors: R. L. Swink; Emeritus Professors: A. R. Abbate, R. R. Wilkinson; Associate Professors: F. H.
Magallanes, T. H. Shear; Research Associate Professors: J. D. Tomlinson; Assistant Professors: K. M.
Boone; Adjunct Assistant Professors: M. D. Jennings, C. Van Der Wiele; Teaching Assistant Professors:
C. F. Delcambre

Course offerings or research facilities are available in the following areas: site planning and design, landscape history, urban public spaces, community design, regional design, resource management, outdoor learning environments, international urban and rural landscapes, and specialized landscapes.

**Admission Requirements:** The best-qualified applicants are accepted up to the maximum number of spaces that are available for new students. Exceptions to the minimum 3.00 GPA may be made for students with special backgrounds, abilities and interests.

#### Master's Degree Requirements.

*I. Accredited First Professional Degree in Landscape Architecture:* Candidates follow an 82-hour sequence of courses over a six-semester period. Three semesters of the program of study are determined by the required curriculum. The last three semesters of study are outlined by the student's Chair of the Department, Director of Graduate Programs, and/or advisor. Research and case studies lead to the final project and design application. The investigative direction is set in collaboration with the chair of the faculty committee. A formal presentation of findings to the faculty, student body and local professionals is required. The summary research and project report must be submitted to the College of Design faculty to meet the graduation requirements. *II. Advanced Studies in Landscape Architecture:* Candidates with an accredited undergraduate Landscape Architecture degree follow a 48-hour sequence of courses. Twenty-seven hours of electives are chosen through advising with the Director of Graduate Programs, advisors and faculty committee. Comprehensive research work is required for a final project with a final report is required. A formal presentation of findings to the faculty, student body and local professionals is also required.

**Other Relevant Information:** Students have the option of including a graduate minor in their course of studies. Minors can be in any other graduate program offered at NC State, UNC-CH and Duke University. Some examples of graduate minors are: natural resources, parks, recreation and tourism management, architecture, education, planning, civil engineering, and art and design. The College of Design includes the Center for Universal Design, the Office of Research, Extension & Engagement, and the Natural Learning Initiative.

Click on <u>Graduate Courses</u> for current course information.

### **Liberal Studies**

### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Liberal Studies				Y			

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

R. C. Kochersberger, Box 8105, 515-4159, rckeg@unity.ncsu.edu, English

#### **Distinguished University:** A. H. Harrison **SAS Institute Distinguished Professor of Rhetoric and Technical Communication:** C. R. Miller

Professors: J. P. Braden, C. K. Coe, J. A. Gomez, L. A. Guion, J. S. Lapp, J. C. Leiter, L. H. MacKethan, R. P. Patterson, R. D. Safrit, M. H. Thuente, K. S. Vincent, R. A. Waschka; *Emeritus Professors:* A. J. Lavopa; *Associate Professors:* P. F. Bitting, C. C. Brookins, D. H. Crumbley, S. M. Fitzpatrick, N. M. Haenn, P. W. Hamlett, W. A. Jackson, S. H. Kessler, D. M. Marchi, R. S. Moog, E. O'Sullivan, M. L. Vasu, J. M. Wallace, C. A. Warren, S. T. Warren; *Emeritus Associate Professors:* R. E. Peterson; *Assistant Professors:* J. R. Brunet, A. de Souza e Silva, M. T. Leach; *Clinical Associate Professors:* B. L. Sherman; *Extension Assistant Professors:* S. K. Straus; *Teaching Professors:* J. C. Kramer

The Master of Arts in Liberal Studies (MALS) program is an interdisciplinary graduate program administered by the College of Humanities and Social Sciences. This is a broad, interdisciplinary program of part-time or full-time graduate study that integrates and expands the student's knowledge and awareness and that is geared to the student's personal interests. Each student, in consultation with an academic advisor, designs an individual program of study around an interdisciplinary theme or topic that is of intrinsic interest to the student or that relates to the student's professional or vocational interests. Students take graduate courses across a range of NC State departments as well as MALS seminars designed specifically for the program.

Admissions Requirements: Students entering the Master's program in liberal studies must have an undergraduate degree. In addition to the material required by the Graduate School, students applying are asked to submit a four to five page statement describing their objectives in doing a degree in liberal studies and a resume. GRE scores are not required. All applicants are interviewed.

**Master's Degree Requirements:** Thirty hours of course work made up of (1) three MALS seminars or two MALS seminars and a research methods course, (2) 18 hours representing the student's interdisciplinary theme or concentration, and (3) a three-hour culminating project. Examples of concentrations that are well supported by graduate courses in the NC State curriculum are: science, technology and society, the American experience and leadership.

Click on Graduate Courses for current Liberal Studies course information.

### Marine, Earth and Atmospheric Sciences

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Marine, Earth, and Atmospheric Sciences	Y		Y				

#### **GRADUATE FACULTY**

#### J. C. Fountain, Department Head

#### **Director of Graduate Programs:**

G. S. Janowitz, Box 8208, 5-7837, janowitz@ncsu.edu, Marine, Earth and Atmospheric Sciences

#### William Neal Reynolds Professor: J. M. Burkholder

Professors: V. P. Aneja, N. E. Blair, D. J. DeMaster, D. B. Eggleston, R. V. Fodor, J. C. Fountain, D. P. Genereux, J. P. Hibbard, G. S. Janowitz, D. Kamykowski, G. M. Lackmann, E. L. Leithold, D. A. McConnell, J. M. Miller, L. J. Pietrafesa, S. Raman, F. H. Semazzi, W. J. Showers, M. K. Stoskopf, T. G. Wolcott, L. Xie, Y. Zhang; *Research Professors:* T. S. Hopkins, C. R. Philbrick, S. Rebach, R. H. Tolson; *Adjunct Professors:* S. W. Chang, W. J. Cooper, R. S. Harmon, S. K. Leduc, S. T. Rao, R. Rotunno; *Emeritus Professors:* S. S. Arya, H. S. Brown, V. V. Cavaroc, B. J. Copeland, J. M. Davis, L. J. Langfelder, C. J. Leith, W. J. Saucier, C. W. Welby, E. A. Wheeler; *Associate Professors:* R. He, M. M. Kimberley, J. Liu, H. Mitasova, M. D. Parker, M. H. Schweitzer, P. Shaw, S. E. Yuter; *Research Associate Professors:* C. J. Thomas; *Adjunct Associate Professors:* S. A. Braun, B. S. Ferrier, C. D. Harrington, C. Jang, A. G. Laing, J. C. Reid, J. C. Warner, R. W. Wiener; *Emeritus Associate Professors:* A. J. Riordan, E. F. Stoddard, G. F. Watson, D. L. Wolcott; *Assistant Professors:* A. Aiyyer, D. R. Bohnenstiehl, N. Meskhidze, C. L. Osburn, M. D. Petters, K. W. Wegmann; *Emeritus Research Professors:* D. A. Russell; *Adjunct Assistant Professors:* A. F. Hanna, G. J. Kirkpatrick, A. J. Lewitus, J. E. McNinch, J. M. Morrison, D. S. Niyogi, S. B. Phillips, P. A. Roelle, G. A. Sinclair, Q. Tong; *Extension Assistant Professors:* R. P. Boyles

Graduate disciplines in atmospheric science, geology and marine sciences are offered. Within marine sciences the subdisciplines of biological, chemical, geological and physical oceanography are recognized by the profession.

Admission Requirements: A bachelor's degree with research experience or a master's degree is required for entry into the Ph.D. program. The GRE Subject Test scores are required only for applicants in biological oceanography. A bachelor's degree in a science, mathematics or engineering is required for entry into the M.S. program in atmospheric science, geology, and biological, chemical, geological or physical oceanography. Undergraduate field camp is required of all students in the M.S. program in geology; this requirement may be fulfilled before or after admission. An M.S. degree with a non-thesis option for students on leave for a fixed period from government positions is available and admission to this option must be requested at the time of application.

**Master's Degree Requirements:** The M.S. degree requires a minimum of 30 credit hours. Specific course requirements are determined by the advisory committee of each student. However, MEA 601 Seminar is required of all M.S. students no later than the third semester in residence. Marine science students are required to take core courses in two of the three subdisciplines other than their own.

**Doctoral Degree Requirements:** Specific courses are determined by the student's advisory committee. Registration in seminar, MEA 801, is required of all Ph.D. students no later than the fourth semester in residence. Marine science students are required to take core courses in all three subdisciplines other than their own; this requirement may be fulfilled at the M.S. level.

Student Financial Support: Research and teaching assistantships are available.

**Other Relevant Information:** Students are assigned initial advisors upon admission. It is the student's responsibility to secure the consent of a faculty member to serve as the permanent advisor who will chair or co-chair the advisory committee.

Click on <u>Graduate Courses</u> for current course information.
# **Materials Science and Engineering**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Materials Science and Engineering	Y		Y		Y		

### **GRADUATE FACULTY**

J. M. Rigsbee, Department Head

Director of Graduate Programs:

R. O. Scattergood, Box 7907, 5-7843, ron scattergood@ncsu.edu, Materials Science and Engineering

Alcoa Professor of Chemical and Biomolecular Engineering: G. N. Parsons
Celanese Acetate Professorship in Chemical and Biomolecular Engineering: J. Genzer
Distinguished Research Professor: J. J. Cuomo
Distinguished University Professor of Physics: D. E. Aspnes, G. Lucovsky
John C. C. Fan Family Distinguished Professor of Materials Science and Engineering: J. Narayan
Kobe Steel Distinguished Professor: D. W. Brenner, C. C. Koch, J. Schwartz, Z. Sitar

Professors: H. Ade, C. M. Balik, S. A. Bedair, N. A. El-Masry, J. Krim, H. H. Lamb, K. L. Murty, R. J. Narayan, J. M. Rigsbee, G. A. Rozgonyi, R. O. Scattergood, R. J. Spontak, Y. T. Zhu; *Research Professors:* M. O. Aboelfotoh, R. B. Benson, C. R. Guarnieri, P. E. Russell; *Adjunct Professors:* J. T. Prater, R. R. Reeber, F. Shimura; *Emeritus Named Professors:* R. F. Davis; *Emeritus Professors:* K. J. Bachmann, J. A. Bailey, H. Conrad, A. A. Fahmy, K. S. Havner, K. L. Moazed, H. Palmour, H. H. Stadelmaier; *Associate Professors:* R. E. Gorga, M. A. Johnson, J. Kasichainula, J. Maria, A. V. Melechko; *Research Associate Professors:* A. D. Batchelor, D. P. Griffis, A. Grouverman; *Adjunct Associate Professors:* P. G. Kotula, V. Zhirnov; *Emeritus Associate Professors:* J. V. Hamme; *Assistant Professors:* D. L. Irving, T. M. Luo, T. P. Pearl, J. B. Tracy, Y. G. Yingling; *Research Assistant Professors:* R. R. Collazo, D. J. Lichtenwalner, T. A. Rawdanowicz; *Teaching Professors:* K. Dawes; *Teaching Assistant Professors:* C. L. Reynolds Jr

Materials and materials limitations pervade all of the engineering and high technology fields that are an integral part of our society. Graduate programs in this department focus on understanding the structure, structure modification and properties of materials and the development of new or improved materials and advanced processing methods that are critical links between the design and the realization of new systems.

Admission Requirements: In addition to the general admission requirements as set by the Graduate School, the department requires submission of GRE scores. Non-native English speakers also require a minimum TOEFL score as established by the Graduate School.

**Master's Degrees Requirements:** The minimum requirements for the Master of Materials Science and Engineering degree are 33 credit hours and 30 credit hours for the Option B. The M.S. degree has the minimum requirement of 30 credit hours including six credit hours for research.

**Doctoral Degree Requirements:** The minimum requirements for the doctoral degree are 72 credit hours including credit hours for research.

**Student Financial Support:** Students in the graduate program normally receive financial support in the form of research or teaching assistantships or fellowships.

**Other Relevant Information:** The department reflects the interdisciplinary nature of the field of Materials Science and Engineering. A substantial number of current graduate students majored in fields other than but related to materials, and the department has a significant number of associated graduate faculty from other departments supervising thesis and dissertation research.

# Mathematics

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Applied Mathematics	Y		Y				
Mathematics	Y		Y				

# **GRADUATE FACULTY**

#### A. G. Helminck, Interim Department Head

# Director of Graduate Programs:

S. L. Campbell, Box 8205, 515-3300, s campbell@ncsu.edu, Mathematics

Drexel Professor of Mathematics: H. T. Banks, C. T. Kelley

Professors: J. D. Brown, S. L. Campbell, M. T. Chu, L. Chung, J. D. Cohen, A. Fauntleroy, J. E. Franke, R.
O. Fulp, P. A. Gremaud, R. E. Hartwig, A. G. Helminck, H. Hong, I. Ipsen, K. Ito, N. Jing, E. L. Kaltofen, A. Kheyfets, T. J. Lada, Z. Li, X. B. Lin, A. L. Lloyd, S. R. Lubkin, R. H. Martin, N. G. Medhin, C. Meyer, K. C. Misra, M. Paesler, M. S. Putcha, S. Schecter, J. F. Selgrade, F. H. Semazzi, M. Shearer, C. E. Siewert, J. W. Silverstein, M. F. Singer, R. C. Smith, E. L. Stitzinger, H. T. Tran, R. E. White; *Adjunct Professors:* R. L. Ives, J. Lavery, E. M. Peck, P. M. Schlosser; *Emeritus Professors:* J. W. Bishir, E. E. Burniston, R. E. Chandler, E. N. Chukwu, J. C. Dunn, J. Luh, J. A. Marlin, P. A. Nickel, C. V. Pao; *Emeritus Distinguished University Professors:* R. A. Struble; *Associate Professors:* B. N. Bakalov, A. E. Chertock, S. Ghoshal, M. A. Haider, P. L. Hersh, K. F. Hollebrands, M. J. Kang, I. A. Kogan, D. Labate, D. J. Lee, L. K. Norris, M. Olufsen, T. Pang, S. Paur, J. Rodriguez, J. S. Scroggs, A. Szanto, S. V. Tsynkov, D. V. Zenkov; *Emeritus Associate Professors:* H. J. Charlton, N. P. Reading, S. M. Sullivant; *Adjunct Assistant Professors:* R. T. Kuehn, V. Novak, K. K. Sivaramakrishnan; *Emeritus Assistant Professors:* D. J. Hansen

The Department of Mathematics offers programs leading to the degrees of Master of Science and Doctor of Philosophy in mathematics and in applied mathematics. Students may opt for the concentration in computational mathematics, which is attached to the program in applied mathematics. The Concentration in Interdisciplinary Mathematics (MAI) is available to Ph.D. students in either Mathematics or Applied Mathematics. It is not available to Masters Students. Through the Center for Research in Scientific Computation, which is housed in the Department of Mathematics, students may participate in the industrial applied mathematics program, a program of joint research endeavors with industrial and governmental partners.

Admissions Requirements: Applicants for admission should have an undergraduate or Master's degree in mathematics or the equivalent. This should include courses in advanced calculus, modern algebra and linear algebra. Applicants with degrees in other subjects may be admitted but may be required to take certain undergraduate courses in mathematics without receiving graduate credit. The GRE Subject Test in Mathematics is not required but a good score can be a positive factor in admission.

**Master of Science Requirements:** The M.S. degree requires a minimum of 30 credit hours. In addition to course requirements (27 credit hours), the M.S. degree requires a written Master's project for 3 hours credit.

**Ph.D. Requirements:** The Ph.D. requires a minimum of 72 credit hours. A student will typically take 50-60 semester hours of course credits for the Ph.D. These courses include one semester of modern algebra and one semester of mathematical analysis. The written preliminary examination consists of examinations in three areas of mathematics. These are chosen by the student from 14 possibilities. The research dissertation should represent a substantial contribution to an area of mathematics or its applications.

**Student Financial Support:** Teaching assistantships and some research assistantships are available. Teaching assistants benefit from a structured program of training in university-level teaching.

**Other Information:** The Department of Mathematics has a large number of workstations devoted exclusively to its graduate students.

# Mathematics, Science and Technology Education

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Mathematics Education	Y		Y			Y	
Science Education	Y		Y			Y	
Technology Education		Y	Y			Y	

#### **GRADUATE FACULTY**

#### P. E. Simmons, Department Head

#### Director of Graduate Programs:

A. Clark, Box 7801, 51771, aaron clark@ncsu.edu, Mathematics, Science and Technology Education

#### Joseph D. Moore Distinguished Professor: J. Confrey

Professors: S. B. Berenson, W. J. Haynie, M. G. Jones, P. E. Simmons, L. V. Stiff, P. Sztajn; *Emeritus*Professors: N. D. Anderson, L. M. Clark, J. K. Coster, D. M. Hanson, J. R. Kolb, J. E. Penick; Associate
Professors: L. Annetta, T. J. Branoff, G. S. Carter, A. Clark, V. W. DeLuca, K. F. Hollebrands, H. S. Lee, J.
A. Moore, K. S. Norwood, J. C. Park, E. N. Wiebe; *Research Associate Professors:* H. S. Stubbs; *Emeritus*Associate Professors: R. E. Peterson, W. M. Waters, L. W. Watson, R. E. Wenig, J. H. Wheatley;
Assistant Professors: M. R. Blanchard, S. J. Carrier, J. V. Ernst, K. A. Keene, A. W. McCulloch, J.
Minogue, E. C. Parsons, T. E. Varnado; Adjunct Assistant Professors: G. L. Holley; *Emeritus Assistant*Professors: J. L. Crow, W. J. VanDerWall; *Teaching Assistant Professors:* J. R. Busby, B. Matthews, A. Y.

The Department of Mathematics, Science and Technology Education offers graduate programs that lead to the degrees of Master of Science, Master of Education, Doctor of Education, and Doctor of Philosophy. We prepare educators for positions as teachers, as leaders, and as university faculty of the highest quality. We are particularly proud of our emphasis on the use of technology to enhance teaching. Students take courses in their educational specialty, in general professional education, and in mathematics, science, or technology cognate areas including: biological sciences, chemistry, computer science, earth science, interdisciplinary science, mathematics, physics, or statistics.

Master's programs are offered leading to North Carolina M-licensure as a teacher of mathematics, science, or technology at grades 6-9 and/or 9-12 for those who have an initial license. Programs are also available for those seeking advanced graduate-level certification as a teacher. Students may choose a program to prepare for teaching careers in post-secondary education.

Doctoral programs enroll students who are knowledge-seekers and are eager to pursue educational problems and develop critical thinking skills in a collaborative environment. The programs prepare individuals to be knowledgeable about and prepared to accept positions related to:

- 1. scholarly inquiry and discourse in their discipline,
- 2. preparation of K-12 teachers,
- 3. instruction and development issues in K-16, and
- 4. leadership positions.

**Admission Requirements:** Applicants for all of the M.S., M.Ed., Ed.D., and Ph.D. degrees in mathematics, science or technology education must submit a completed application specific to the program. Please see the <u>Mathematics, Science, and Technology</u> website for details. The deadlines for submission of an application, and academic and professional background necessary for admission differ by specific program.

**Master's Degree Requirements:** The Master's Degree programs require a minimum of 36 semester hours of graduate work. Students who choose the M.S. degree may be able to substitute up to six semester hours of thesis research for part of the course load.

**Doctoral Degree Requirements:** The Ed.D. program in Technology Education requires a minimum of 90 semester hours of graduate work beyond the Baccalaureate degree including a minimum of 12 semester hours of dissertation research. The Ph.D. program in Mathematics Education requires a minimum of 50 semester hours of course work and 12 semester hours of dissertation research beyond the Master's Degree requirements. The Ph.D. program in Science Education requires a minimum of 48 semester hours of course work and 9 semester hours of dissertation research beyond the Master's Degree requirements. For both degrees, students may be required to supplement their course work with internships and/or other experiential activities to meet competencies.

**Student Financial Support:** A small number of teaching and research assistantships are available, and out-of-state tuition remission may be available for one year for students on assistantships. Please discuss these opportunities directly with program area faculty.

Click on Graduate Courses - Math and Science Education for current course information.

Click on Graduate Courses - Technology Education for current course information.

# **Mechanical and Aerospace Engineering**

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Aerospace Engineering	Y		Y				
Mechanical Engineering	Y		Y		Y		

# **GRADUATE FACULTY**

# R. D. Gould, Interim Department Head

# Director of Graduate Programs:

R. T. Nagel, Box 7910, 5-5283, <u>nagel@eos.ncsu.edu</u>, Mechanical and Aerospace Engineering

# Dean F. Duncan Distinguished University Professorship in Mechanical Engineering: T. A. Dow R. J. Reynolds Professor in Mechanical and Aerospace Engineering: R. D. Gould

Professors: F. R. DeJarnette, H. M. Eckerlin, J. R. Edwards, E. Grant, P. A. Gremaud, H. A. Hassan, R. F. Keltie, C. Kleinstreuer, A. V. Kuznetsov, J. W. Leach, K. M. Lyons, R. T. Nagel, M. K. Ramasubramanian, P. I. Ro, W. L. Roberts, R. O. Scattergood, L. M. Silverberg, J. S. Strenkowski, J. F. Tu, F. Yuan, Y. T. Zhu, M. A. Zikry; *Research Professors:* R. H. Tolson; *Adjunct Professors:* N. T. Frink, A. R. Johnson, C. S. Kim, W. Linak, M. N. Noori, T. D. Scharton; *Emeritus Named Professors:* C. F. Zorowski; *Emeritus Professors:* E. M. Afify, J. A. Bailey, F. J. Hale, F. D. Hart, T. H. Hodgson, R. R. Johnson, D. S. McRae, J. C. Mulligan, J. N. Perkins, L. H. Royster, F. O. Smetana, F. Y. Sorrell; *Associate Professors:* M. A. Boles, G. D. Buckner, T. Echekki, J. W. Eischen, A. Gopalarathnam, C. E. Hall, O. A. Harrysson, E. C. Klang, H. Luo, A. P. Mazzoleni, P. L. Mente, G. Ngaile, K. J. Peters, A. Rabiei, A. V. Saveliev, S. Seelecke, F. Wu; *Research Associate Professors:* Z. Zhang; *Assistant Professors:* T. Fang, S. M. Ferguson, T. Ward, Y. Zhu; *Adjunct Assistant Professors:* P. A. Cooke, A. O. Hobbs; *Extension Assistant Professors:* S. D. Terry; *Teaching Associate Professors:* P. A. Cooper, P. B. Corson

The *Mechanical Engineering* graduate program prepares students in all aspects of mechanical and thermal systems design and manufacturing. Course offerings and research programs for mechanical engineering students are available in applied mechanics; biomechanics; combustion; design and manufacturing: dynamic systems and control; energy conversion and systems; experimental mechanics; fluid dynamics; heat transfer; mechanics of materials; micro, nano and MEMS; and vibration and acoustics. Sub-areas include adaptive and auto adaptive structures, controls and system identification, CFD, energy conversion and renewable energy, materials processing and tribology, mechatronics, precision engineering, and reactive and multiphase flows.

Graduate students in the *Aerospace Engineering* program focus on aircraft and space systems design, analysis, and manufacturing. Students can select course offerings and research programs in aerodynamics and applied aerodynamics; aerospace propulsion; computational fluid dynamics; dynamics and design of spacecraft and space systems; flight dynamics and control; and multifunctional

materials and smart structures. Sub-areas include acoustics, aeroelasticity, atomization, sprays, composite materials, reactive and multiphase flows, stability, and transition to turbulence.

Admission Requirements: An applicant to the master's program must be a graduate of an accredited undergraduate program with a B.S. degree in either mechanical or aerospace engineering. Graduates of other accredited programs in engineering, physical sciences and mathematics may be considered but will be required to make up undergraduate deficiencies without graduate credit. Provisional admissions, as well as exceptions, are sometimes granted under special circumstances. The most qualified applicants are accepted first. Applicants to the Ph.D. program must have met the M.S. admission requirements, completed the M.S. degree in mechanical engineering or aerospace engineering and additionally must satisfy the Ph.D. admissions requirements.

**Master's Degree Requirements:** The thesis-option M.S. degree programs in mechanical engineering and aerospace engineering require 24 hours of course credit and six hours of thesis research. The non-thesis M.S. degree programs in mechanical engineering and aerospace engineering require 27 hours of course credit and a three credit-hour project. The non-thesis M.S. degree programs in mechanical engineering and aerospace engrams in mechanical engineering and aerospace engineering require 27 hours of course credit and a three credit-hour project. The non-thesis M.S. degree programs in mechanical engineering and aerospace engineering are offered on campus and off campus through distance education.

**Ph.D. Degree Requirements:** A minimum of 54 hours of credit beyond the master's program is required. A direct path to the Ph.D. from the B.S. is also available with which the student is granted the M.S. degree "enroute" to the Ph.D.

**Student Financial Support:** Various types of assistantships and fellowships are available. Awards are made to the most qualified applicants first and generally are not available for all students.

**Other Relevant Information:** Each new student chooses an area of specialty, selects an advisor and committee, customizes a program of study and begins research in the first semester of residence. The Director of Graduate Programs acts as a temporary advisor initially and should be contacted with questions.

# Microbiology

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Microbial Biotechnology					Y		
<u>Microbiology</u>	Y		Y		Y		

# **GRADUATE FACULTY**

#### E. S. Miller, Interim Department Head

# Director of Graduate Programs:

M. R. Hyman, Box 7615, 5-7814, michael hyman@ncsu.edu, Microbiology

# ALCOA Professor of Chemical Engineering: R. M. Kelly William Neal Reynolds Distinguished University Professor: T. R. Klaenhammer

Professors: P. Arasu, D. T. Brown, M. C. Flickinger, F. J. Fuller, H. M. Hassan, C. L. Hemenway, L. Jaykus, S. Kathariou, S. M. Laster, G. Luginbuhl, J. M. Mackenzie, E. S. Miller, P. E. Orndorff, I. T. Petty, B. Sherry; *Adjunct Professors:* I. A. Casas; *Emeritus Professors:* W. J. Dobrogosz, G. H. Elkan, W. E. Kloos, L. W. Parks, J. J. Perry, J. C. Shih; *Associate Professors:* J. W. Brown, F. De Los Reyes, A. M. Grunden, M. R. Hyman, J. W. Olson; *USDA Associate Professors:* F. Breidt, R. G. Upchurch; *Emeritus USDA Professors:* P. E. Bishop; *Adjunct Associate Professors:* W. M. Casey, J. M. Ligon, S. H. Shore; *Assistant Professors:* J. M. Bruno-Barcena, P. T. Hamilton, F. Scholle, M. L. Sikes, D. S. Threadgill; *Adjunct Associate Professors:* L. Borbye

The Department of Microbiology is in the College of Agriculture and Life Sciences and has a unique blend of applied and basic research programs. The department offers courses of study and research leading to the Ph.D., M.S., Master of Microbiology (M.M.) and Master of Microbial Biotechnology (M.M.B.) degrees. The graduate program is designed to prepare individuals for careers in academic, industrial or research institute settings. Research in the department emphasizes study of fundamental biological processes, with several programs having important biotechnological, environmental and medical applications.

**Admission Requirements:** Applications are invited from individuals holding B.S. or M.S. degrees in the physical and life sciences. Applications should ideally be received in the department before January 15 to be considered for Fall semester admission. The Graduate Record Exam (GRE) should be taken sufficiently early so that scores can be submitted and evaluated along with the application. A written statement should describe the applicant's academic and career goals as well as their area of interest.

**Master's Degree Requirements:** The Master of Science (M.S.) is a research-oriented degree requiring 30 credit hours, a written thesis and at least one semester of laboratory instruction. For students

wishing a more general educational background in microbiology without the thesis requirement, the Master of Microbiology (M.M.) degree is offered.

The Department also offers a non-thesis Master of Microbial Biotechnology (M.M.B.) degree. This degree program is a Professional Science Masters that combines concentrations in Microbiology, Business and Biotechnology. This program also can be combined with a Master of Business Administration (M.B.A.) offered through the College of Management.

**Doctoral Degree Requirements:** The Ph.D. program is designed for individuals desiring to pursue careers in research and/or teaching. Students enroll in a core curriculum consisting of courses in metabolic regulation/physiology, virology, immunology, pathogenesis, and molecular genetics. In addition, the student, in consultation with and approval by his/her advisory committee, may select elective courses offered by the Department of Microbiology and by other departments on campus. In conjunction with the advisor, the student establishes a four-member faculty advisory committee to guide the research and academic program. At least one semester of laboratory instructorship is required. The final examination also includes a seminar presented by the candidate that is open to the university community.

**Student Financial Support:** Financial support for study towards Ph.D. and M.S. degrees is available in the form of teaching/research assistantships and competitive fellowships. All applications to the department are automatically considered for available assistantships. For highly qualified students, supplemental funds are frequently available.

**Other Relevant Information:** During the first semester, participation in the laboratory rotation program is required of all Ph.D. and M.S. students so that they become acquainted with departmental research programs, faculty and other graduate students. A faculty thesis advisor and laboratory research program are usually selected by the end of the first semester.

# **Natural Resources**

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Natural Resources			Y		Y		

# **GRADUATE FACULTY**

# Directors of Graduate Programs:

J. C. Peel, Box 8001, 515-3663, <u>iudy\_peel@ncsu.edu</u>, Parks, Recreation and Tourism Management S. T. Warren, Box 8001, 515-7996, <u>stwarren@ncsu.edu</u>, Forestry and Environmental Resources T. J. Smyth, Box 7619, 515-2838, <u>jot\_smyth@ncsu.edu</u>, Soil Science

# William Neal Reynolds Professor: M. J. Vepraskas

Professors: R. C. Abt, A. Amoozegar, D. H. Anderson, F. W. Cubbage, H. A. Devine, M. F. Floyd, B.
Goldfarb, J. L. Havlin, K. A. Henderson, S. Khorram, H. J. Kleiss, J. C. Peel, D. J. Robison, J. P. Roise, C. D.
Siderelis, T. J. Smyth, M. G. Wagger, W. E. Winner; *Emeritus Professors:* J. D. Gregory; *Associate Professors:* A. Attarian, G. B. Blank, B. P. Bullock, G. R. Hess, Y. Leung, F. H. Magallanes, R. L. Moore, C.
E. Moorman, S. C. Nelson, E. G. Nichols, T. H. Shear, J. L. Stape, T. A. Steelman, S. T. Warren; *Research Associate Professors:* P. K. Baran; *Emeritus Associate Professors:* L. D. Gustke; *Assistant Professors:* K.
M. Boone, A. L. James, M. N. Peterson; *Research Assistant Professors:* G. P. Catts; *Extension Assistant Professors:* M. A. Megalos; *Teaching Associate Professors:* H. M. Cheshire

The natural resources program is an interdepartmental program designed to prepare students for positions in both private and public natural resource organizations. A selection of technical options couple core courses in natural resources issues and management with a series of related courses in a variety of related technical disciplines. The purpose of the natural resources core curriculum is to educate professionals at a Master's level who are well-versed in policy and regulation and who have skills in quantitative assessments. Currently approved technical options include: assessment and analysis, ecological restoration, economics and management, policy and administration, international resources, hydrology, and spatial information systems in the Department of Forestry and Environmental Resources; outdoor recreation management; landscape architecture in the Department of Landscape Architecture; and soil science in the Department of Soil Science. With one exception, each option is available as either the M.S. in NR or as the non-thesis Master of NR. The soil science option is available only as the non-thesis degree.

Admissions Requirements: Students should have an undergraduate degree in natural resources or a related field. Experience in natural resources management and administration will be considered in lieu of an appropriate undergraduate degree. Admission is contingent upon meeting departmental requirements and acceptance by an advisor.

Master's Requirements: The M.S. degree requires a research thesis based on completion of a research

project. The Master of NR degree requires a practical project which develops and demonstrates problem-solving skills. Students enrolled in the Department of Forestry and Environmental Resources must take FOR 603 in the first or second semester. The minimum number of credit hours varies by technical option, but is generally 36 credit hours including research or project credits and core courses.

#### Core Courses (10 credit hours)

NR 500 Natural Resource Management NR 571 Current Issues in Natural Resource Policy ST 5<sup>\*\*</sup> Graduate-level statistics course Departmental seminar

# **Nuclear Engineering**

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Nuclear Engineering	Y		Y		Y		

# **GRADUATE FACULTY**

# Y. Y. Azmy, Department Head

# Director of Graduate Programs:

K. L. Murty, Box 7909, 5-3657, murty@eos.ncsu.edu, Nuclear Engineering

Professors: Y. Y. Azmy, B. Bhattacharyya, M. A. Bourham, J. M. Doster, R. P. Gardner, J. G. Gilligan, A. I. Hawari, V. C. Matzen, K. L. Murty, R. J. Spontak, P. J. Turinsky; *Research Professors:* B. W. Wehring; *Adjunct Professors:* R. M. Lindstrom, D. N. McNelis, M. W. Mickael, M. S. Wechsler; *Emeritus Professors:* D. J. Dudziak, T. S. Elleman, R. L. Murray, K. Verghese; *Associate Professors:* D. Y. Anistratov, A. Gupta, T. Hassan, S. C. Shannon, M. Yim; *Adjunct Associate Professors:* M. H. Stokely, B. W. Wieland; *Assistant Professors:* H. S. Abdel Khalik, J. Eapen; *Adjunct Assistant Professors:* A. Sood

The discipline of nuclear engineering is concerned with the development of nuclear processes for energy production and with the applications of radiation for the benefit of society. Representative topics of investigation include analytic, computational and experimental research in the neutronics, materials, thermal-hydraulics and control aspects of fission reactors; radiation detection and measurement of basic physics parameters; waste management and radiological assessment; applications of radioisotopes and radiation in industry, medicine and science; and plasma, plasma engineering and design aspects of fusion reactors.

Admission Requirements: Bachelor's degree graduates in any of the fields of engineering or physical sciences may be qualified for successful advanced study in nuclear engineering. Prior experience or course work in nuclear physics, partial differential equations and basic reactor analysis is helpful but may be gained during the first semester of graduate study. GRE scores (general test) are needed for financial aid.

**Master's Degree Requirements:** A total of 30 credit hours which includes a minor (at least nine semester hours) is required for both the M.S. and MNE degrees. An engineering project is required for the MNE degree and a formal thesis for the M.S. degree.

**Doctoral Degree Requirements:** A total of 72 credit hours which includes a minor (typically 12 hours) is required. NE 721 and NE 727 courses are required. Students must pass a departmental qualifying exam that covers basic nuclear engineering material.

**Student Financial Support:** Teaching assistantships, research assistantships and fellowships are available for qualified applicants. Opportunities are also available for graduate traineeships with utility

companies, reactor manufacturers and national laboratories providing a valuable combination of financial support and learning in the classroom, the research laboratory and on the job.

**Other Relevant Information:** The department has many excellent facilities including the one-megawatt PULSTAR fission reactor, ultra cold neutron source, neutron scattering facility, neutron radiography unit, neutron activation analysis laboratory, nuclear materials laboratory, plasma laboratories, instrumentation and controls equipment, radiation analyzers and tomography systems, and access to extensive computer facilities ranging from workstations to a supercomputer.

# Nutrition

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Nutrition</u>	Y		Y		Y		

# **GRADUATE FACULTY**

# Director of Graduate Programs:

J. C. Allen, Box 7624, 3-2257, jon allen@ncsu.edu, Food, Bioprocessing, & Nutrition Sciences

# William Neal Reynolds Distinguished Professor: J. T. Brake William Neal Reynolds Professor: P. R. Ferket, J. Odle

Professors: J. C. Allen, K. E. Anderson, L. C. Boyd, G. L. Catignani, W. J. Croom, P. C. Dunn, J. Eisemann, J. L. Grimes, W. M. Hagler, B. A. Hopkins, G. B. Huntington, S. Kathariou, J. M. Luginbuhl, J. W. McClelland, J. F. Ort, M. H. Poore, R. C. Smart, J. W. Spears, E. VanHeugten; *Emeritus Professors:* B. P. Alston-Mills, L. W. Aurand, L. S. Bull, E. V. Caruolo, J. D. Garlich, R. W. Harvey, W. L. Johnson, J. R. Jones, C. J. Lackey, R. D. Mochrie, S. J. Schwartz, J. C. Shih, G. H. Wise; *Emeritus Distinguished Professors:* H. E. Swaisgood; *Associate Professors:* S. L. Ash, V. Fellner, S. W. Kim, J. A. Knopp, J. A. Moore, P. E. Mozdziak, P. D. Siciliano; *USDA Associate Professors:* V. D. Truong; *Adjunct Associate Professors:* R. J. Harrell; *Assistant Professors:* L. S. Goodell, G. K. Harris, M. D. Koci, M. P. Martin, E. O. Oviedo-Rondon, S. E. Phillips, C. R. Stark; *Teaching Assistant Professors:* C. V. Jordan

The interdepartmental nutrition program consists of faculty from four departments (animal science, family and consumer sciences, food science, and poultry science). Students reside and conduct research in one of these departments under the direction of an appropriate advisor. Research in the nutrition program may be conducted with a variety of species and at various levels, such as molecular, cell, whole animal, and human communities. Research programs are primarily in the area of nutritional biochemistry or experimental animal nutrition (e.g. horses, ruminants, swine, poultry, rodents, and other species).

**Admission Requirement:** To be considered for admission, a student should have a B.S. or M.S degree in a science-related area. Students for M.S. or Ph.D. should contact and be recommended by a prospective major faculty advisor in their area of interest prior to final admission.

**Master's Degree Requirements:** A minimum of 24 course credit hours and a thesis is required for M.S., 36 for Master of Nutrition. The Master of Nutrition has options for all course delivery by Distance Education, with emphases in Feed Science or Human Nutrition, Food and Bioprocessing, and an option for course work that qualifies as a Professional Science Master's degree.

**Student Financial Support:** Assistantships and fellowships are available on a competitive basis from the departments in which the advisor resides. Admission does not guarantee availability of financial support.

# **Operations Research**

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<b>Operations Research</b>	Y		Y		Y		

# **GRADUATE FACULTY**

# Director of Graduate Programs:

T. J. Hodgson, Box 7906, 5-5194, hodgson@ncsu.edu, Industrial Engineering

A. Doug Allison Distinguished Professor: S. D. Roberts
Alan T. Dickson Distinguished University Professor: M. A. Rappa
Bank of America Distinguished University Professor: R. B. Handfield
Clifton A. Anderson Distinguished Professor: R. Uzsoy
Distinguished University Professor of Industrial Engineering for International Competitiveness: S. E.
Elmaghraby
Drexel Professor of Mathematics: C. T. Kelley
James T. Ryan Distinguished Professor of Industrial Engineering and Furniture Manufacturing: T. J.
Hodgson
Walter Clark Professor of Industrial Engineering: S. C. Fang
William Neal Reynolds Professor: S. Zeng

Professors: D. H. Anderson, J. W. Baugh, R. H. Bernhard, B. Bhattacharyya, E. D. Brill, S. L. Campbell, M. Devetsikiotis, B. L. Edge, Y. Fathi, R. E. Hartwig, I. Ipsen, K. Ito, R. E. King, Z. Li, G. F. List, N. G. Medhin, C. Meyer, A. Nilsson, H. G. Perros, K. H. Pollock, S. Ranjithan, J. P. Roise, G. Rouskas, C. D. Savage, M. P. Singh, R. C. Smith, M. F. Stallmann, W. J. Stewart, J. R. Stone, M. W. Suh, H. T. Tran, I. Viniotis, M. A. Vouk, J. R. Wilson; *Emeritus Professors:* J. W. Bishir, J. C. Dunn, H. J. Gold, D. M. Holthausen, D. F. McAllister; *Associate Professors:* K. A. Barletta, R. Y. Chirkova, S. Ghoshal, T. L. Honeycutt, S. M. Hsiang, J. A. Joines, M. G. Kay, T. Pang, T. W. Reiland, J. S. Scroggs, C. E. Smith, J. L. Stape, W. Wang, D. P. Warsing, F. Wu, T. Yu, D. V. Zenkov; *Research Associate Professors:* J. Taheri; *Adjunct Associate Professors:* P. R. Wurman; *Assistant Professors:* B. Denton, J. S. Ivy, W. Sun; *Adjunct Assistant Professors:* K. K. Sivaramakrishnan; *Teaching Professors:* H. L. Nuttle

Operations research is a graduate program of an interdisciplinary nature, governed by an administrative board and the program committee, and administered through the office of the program co-directors.

Admission Requirements: Applications are accepted from undergraduate majors in engineering and in physical and mathematical sciences who meet prerequisites in calculus and matrix-linear algebra, computer science, and statistics. A score on the GRE that is less than two years old is required if financial assistance is sought or if the student is transferring from another doctoral program.

Master's Degree Requirements: The Master of Operations Research degree is a terminal graduate

degree for students who seek careers as OR practitioners in either the private or public sector. The M.S. degree is designed to prepare students for careers in research and development.

**Doctoral Degree Requirements:** The Ph.D. degree is intended for students to be research scientists in industry or teachers and researchers in academia. This degree requires 72 credit hours of course and research work beyond the Bachelor's degree. Undergraduate students with superior credentials may apply directly to the doctoral program and bypass the Master's degree. For students who have completed the Master's degree, typically 30 to 36 hours of additional course work are required. A departmental written qualifying examination is required. Please consult the <u>Operations Research</u> website for more details of degree requirements.

**Student Financial Support:** Both teaching and research assistantships are available to qualified applicants. Award priority is given to Ph.D. then M.S. applicants. Outstanding students who are U.S. citizens and who shall be enrolled in the NC State Graduate School for the first time are eligible for the Engineering Dean's Graduate Fellowship Program.

Click on Graduate Courses for current course information.

**Suggested Cognate Courses:** Cognate courses are courses that are often included in OR programs of study, but which carry other departmental designations. They cover subject matter closely related to OR and provide additional insight into the theory or application of OR methodology. Students may include cognate courses in their programs of study with the consent of their faculty advisor.

BMA(MA,ST) 771, 772 Biomathematics I, II CE 775 Modeling and Analysis of Environmental Systems CHE 525 Chemical Process Control CSC 505 Design and Analysis of Algorithms CSC(MA) 580 Numerical Analysis I CSC(ECE) 779 Advanced Computer Performance Modeling CSC(MA) 780 Numerical Analysis II ECE 516 System Control Engineering ECE 521 Digital Computer Technology and Design ECG (ST) 561 Intermediate Econometrics ECG 750 Economic Decision Theory ECG(ST) 751 Econometrics ECG(ST) 752 Topics in Econometrics ISE 723 Production Planning, Scheduling and Inventory Control ISE 747 Reliability Engineering ISE 748 Quality Engineering ISE 861 The Design of Production Systems MA 515 Analysis I MA 523 Linear Transformations and Matrix Theory MA(ST) 546 Theory of Probability MA(CSC) 580, 780 Numerical Analysis I, II MA 715 Functional Analysis I MA 716 Advanced Functional Analysis MA 723 Theory of Matrices and Applications MA(ST) 746 Introduction to Stochastic Processes MA(ST) 778, 779 Measure Theory and Advanced Probability MA 798 Special Topics in Numerical Analysis ST 515, 516 Experimental Statistics for Engineers I, II

- ST 730 Applied Time Series Analysis
- ST 782, 783 Time Series Analysis I, II
- ST 785 Introduction to Statistical Decision Theory

# Parks, Recreation and Tourism Management

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Parks, Recreation, and Tourism Management	Y		Y		Y		

#### **GRADUATE FACULTY**

#### D. H. Anderson, Department Head

#### **Director of Graduate Programs:**

J. C. Peel, Box 8001, 515-3663, judy peel@ncsu.edu, Parks, Recreation and Tourism Management

Professors: D. H. Anderson, H. A. Devine, M. F. Floyd, K. A. Henderson, J. C. Peel, C. D. Siderelis, J. D.
Wellman; *Emeritus Professors:* P. S. Rea; Associate Professors: A. Attarian, J. N. Bocarro, G. L. Brothers, M. A. Kanters, Y. Leung, R. L. Moore, T. A. Steelman, C. G. Vick, B. E. Wilson; *Research Associate* Professors: P. K. Baran; *Emeritus Associate Professors:* L. D. Gustke; Assistant Professors: J. M. Casper, H. L. Grappendorf, M. G. Harrolle; *Teaching Assistant Professors:* E. K. Lindsay, R. W. Wade

The Master's degree provides students the opportunity to develop and enhance their critical understanding of both the conceptual foundations of parks, recreation and tourism management and the procedures of systematic inquiry and critical problem solving as applied to planning and management issues. The department offers educational opportunities and resources for the preparation of professionals concerned with planning, organizing, managing and directing parks, recreation, sport, and tourism programs, areas, and facilities. The general emphasis areas at the Master's level include: parks and recreation management, tourism development and management, geographic information systems, recreational sport management, and natural resource recreation management.

Doctoral degree allows students to match their particular research interests and career aspirations with departmental research activities and faculty expertise. The primary areas of interest for students include parks, recreation, sport, tourism, spatial information systems with a substantive area of study in another discipline.

**Master's Degree Requirements:** The M.S. degree requires 30 credit hours, of which six hours is Master's thesis research. A minor is optional with the M.S. degree. The M.P.R.T.M. requires a minimum of 35 hours of course work, of which three credit hours is a Master's project. A minor is optional with the M.S. degree. The department offers a dual Master's option with Public Administration which includes 48 hours of course work. A Master of Natural Resources degree is also available. Master's application deadline is March 15 for U.S. students; February 15 for international students. This program has fall admission *only*; there are no spring admissions.

**Doctoral Degree Requirements:** Although each doctoral course of study will be unique to the individual student, the usual course of study will include a minimum of 54 hours beyond the Master's.

These credit hours are distributed among the core courses, statistics and research methods, a minor or substantive area consisting of 15 hours of course work approved by the student's faculty advisor, and the dissertation. Students are expected to have completed a Master's degree, preferably one with a thesis. Students without research experience will have to demonstrate an ability to produce scholarly work in PRTM. Doctoral application deadline is February 15 for U.S. students, January 15 for international students. This program has fall admission *only*; there are no spring admissions.

**Student Financial Support:** Graduate assistantships and internships are available to students in this program on a competitive basis.

# **Physics**

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Physics</u>	Y		Y				

# **GRADUATE FACULTY**

# M. Paesler, Department Head

Director of Graduate Programs:

H. Ade, Box 8202, 515-8706, harald ade@ncsu.edu, Physics

Distinguished University Professor of Physics: D. E. Aspnes, G. Lucovsky Drexel Professor of Physics: J. Bernholc Kobe Steel Distinguished Professor: Z. Sitar

Professors: H. Ade, R. J. Beichner, J. M. Blondin, J. D. Brown, M. Buongiorno-Nardelli, R. W. Chabay, M. T. Chu, S. R. Cotanch, D. C. Ellison, R. E. Fornes, R. Golub, C. R. Gould, D. G. Haase, H. D. Hallen, P. R. Huffman, C. R. Ji, R. M. Kolbas, J. Krim, G. C. McLaughlin, L. Mitas, J. R. Mowat, R. J. Nemanich, M. Paesler, S. P. Reynolds, J. S. Risley, C. M. Roland, M. C. Sagui, T. M. Schaefer, J. F. Schetzina, A. R. Young; *Research Professors:* B. Fortner, G. E. Mitchell, C. R. Philbrick, J. E. Rowe, B. A. Sherwood; *Adjunct Professors:* U. Agvaanluvsan, N. C. Fuller, J. L. Hubisz, E. A. Joseph, P. J. Reynolds; *Emeritus Professors:* K. T. Chung, J. W. Cook, W. R. Davis, W. O. Doggett, G. L. Hall, A. W. Jenkins, K. L. Johnston, G. H. Katzin, F. Lado, J. D. Memory, R. R. Patty, L. W. Seagondollar, P. J. Stiles, D. R. Tilley; *Associate Professors:* L. I. Clarke, D. J. Lee, J. C. Park, K. R. Weninger; *Research Associate Professors:* K. Borkowski, A. Grouverman, J. H. Kelley, W. Lu; *Adjunct Associate Professors:* P. E. Garrett; *Emeritus Associate Professors:* G. C. Cobb, G. W. Parker; *Assistant Professors:* K. E. Daniels, D. B. Dougherty, K. Gundogdu, D. Lazzati, T. P. Pearl, R. Riehn; *Research Assistant Professors:* J. R. Bochinski

Theoretical/computational research opportunities are available in the following areas: astrophysics and relativity, nanoscience/materials and biomolecular simulations, and nuclear/particle physics. Experimental research opportunities are available in the following areas: astronomy, biophysics and soft-condensed matter physics, emergent phenomena and non-linear systems, nuclear physics, optics, physics education, materials physics and nanoscale science and technology, and synchrotron radiation research.

Admission Requirements: Bachelor's degree in physics (or the equivalent), GRE, and the GRE Advanced test in physics.

**Master's Degree Requirements:** A minimum of 30 credit hours beyond the Bachelor's degree; demonstrated mastery of aspects of the physics curriculum: PY 781, 782. Thesis and non-thesis options.

**Doctoral Degree Requirements:** Seventy-two (72) credit hours beyond the Bachelor's degree; demonstrated mastery of core physics curriculum: PY 721, 781, 782, 783, 785, 786; passing of written and oral preliminary exam and final oral defense.

**Student Financial Support:** Graduate teaching assistantships are available for new and continuing students; research assistantships are available to continuing students and occasionally to new students. More than 95% of students are supported by assistantships.

# Physiology

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Physiology</u>	Y		Y		Y		

# **GRADUATE FACULTY**

# Directors of Graduate Programs:

H. V. Daniels, Box 7617, 919/515-4589, <u>harry\_daniels@ncsu.edu</u>, Zoology P. E. Mozdziak, Box 7608, 919/515-5544, <u>paul\_mozdziak@ncsu.edu</u>, Poultry Science

# William Neal Reynolds Distinguished Professor: J. T. Brake, R. M. Roe William Neal Reynolds Professor: C. V. Sullivan

Professors: G. W. Almond, K. E. Anderson, B. L. Black, A. T. Blikslager, R. J. Borski, T. T. Brown, D. C. Dorman, F. W. Edens, K. L. Esbenshade, C. E. Farin, W. L. Flowers, J. E. Gadsby, R. M. Grossfeld, H. F. Heatwole, S. L. Pardue, J. N. Petitte, R. M. Petters, M. C. Roberts, T. D. Siopes, E. C. Sisler, D. W. Threadgill, H. A. Underwood, S. P. Washburn, T. G. Wolcott; *Emeritus Professors:* T. E. Levere, J. F. Roberts; *Associate Professors:* B. A. Breuhaus, P. W. Farin, P. E. Mozdziak, M. Rodriguez-Puebla, M. Schramme, G. W. Smith, C. H. Stahl, C. S. Whisnant, M. D. Whitacre; *Assistant Professors:* T. Ghashghaei, J. L. Gookin, M. D. Koci, A. J. Moeser, H. B. Patisaul, S. E. Phillips; *Teaching Assistant Professors:* B. J. Grubb, J. L. Lubischer

The Physiology Graduate Program is an interdisciplinary and interdepartmental program comprising faculty drawn from the College of Veterinary Medicine and the College of Agriculture and Life Sciences (including departments of animal science, biochemistry, clinical sciences, entomology, molecular and biomedical sciences, population health and pathobiology, poultry science, psychology, and zoology [biology]). An advanced degree in physiology is highly valued by the scientific community and can lead to careers in research and teaching in academia, industry and government laboratories, public policy and consulting. Research is carried out using a variety of model organisms, laboratory and companion and agriculturally important species.

Admission Requirements: Students entering the graduate program in physiology should have a Bachelor's degree in a related biological or physical science. Undergraduate courses should include physiology, biochemistry, organic chemistry, calculus, and physics. Each application package will be screened by the Admissions Committee. Factors considered for admission include: grade point average (3.0 is required for regular admission), GRE scores (at least 1000; combined verbal and quantitative), undergraduate courses, letters of recommendation, and the willingness of a member of the Graduate Physiology faculty to serve as the applicant's advisor. Some prior research experience is highly recommended.

**Master's Degree Requirements:** All Master's students are required to complete PHY 503, PHY 504, BCH 553, and a one-credit hour course in research ethics. *Master of Science Degree:* For a Master of

Science degree a minimum of 30 semester hours of graduate work in the degree program is required including a minimum of 20 hours of course work at the 500-800 level. On average, the M.S. degree takes two to three years. *Master of Physiology Degree:* The non-thesis Master's degree (Master of Physiology) requires a total of 36 credits. On average, the MOP degree takes two years to complete.

**Doctoral Degree Requirements:** A doctoral degree requires a minimum of 72 graduate credit hours beyond the Bachelor's degree in accordance with the requirements of the Graduate School. All Ph.D. students are required to complete PHY 503, PHY 504, BCH 553, PHY 801, one additional course in biochemistry or an alternative 800-level course, and a one-credit hour course in research ethics. On average, completion of the Ph.D. degree takes five years.

**Student Financial Support:** Financial assistance for qualified students in the form of research assistantships, fellowships and traineeships is available through participating departments only and not through the physiology program. Stipends will be offered to qualified applicants admitted to the program with advisors in the College of Veterinary Medicine. There is no financial support for students in the Master of Physiology program.

**Other Relevant Information:** The physiology program is jointly administered by the College of Agriculture and Life Sciences and the College of Veterinary Medicine. Graduate students enrolled as physiology majors are housed in the department of their major professor and may participate in departmental activities.

Click on <u>Graduate Courses</u> for current course information.

**Recommended Courses Normally Included in Programs of Study for the M.S. and Ph.D. Degrees and the Non-Thesis MOP Program:** Other recommended/supporting courses are available through many departments, e.g. animal science, biochemistry, biomathematics, biotechnology, cell biology, comparative biomedical sciences, entomology, genetics, immunology, microbiology, nutrition, pharmacology, poultry science, psychology, statistics, toxicology, and zoology, and may be included for consideration in the plan of work.

# **Plant Biology**

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Plant Biology</u>	Y		Y		Y		

# **GRADUATE FACULTY**

# M. E. Daub, Department Head

# Director of Graduate Programs:

R. S. Boston, Box 7612, 5-3390, boston@unity.ncsu.edu, Plant Biology

Philip Morris Professor: R. E. Dewey

University Research Professor: W. F. Thompson William Neal Reynolds Distinguished Professor: W. F. Boss, F. L. Gould William Neal Reynolds Professor: R. S. Boston, J. M. Burkholder, M. E. Daub, G. A. Payne

Professors: R. L. Blanton, C. S. Brown, S. D. Clouse, C. H. Haigler, T. L. Lomax, J. W. Moyer, D. Robertson, J. M. Stucky, C. G. VanDyke, T. R. Wentworth; *Emeritus Professors:* N. S. Allen, U. Blum, E. Davies, R. J. Downs, R. C. Fites, J. W. Hardin, R. L. Mott, E. D. Seneca, J. F. Thomas, J. R. Troyer; *Associate Professors:* R. L. Beckmann, J. E. Mickle, Q. Y. Xiang; *Research Associate Professors:* G. C. Allen; *Emeritus USDA Professors:* W. W. Heck; *Assistant Professors:* R. G. Franks, W. A. Hoffmann, M. T. Johnson, M. Pierce, H. A. Sederoff, D. Xie; *Research Assistant Professors:* I. Y. Perera; *Extension Assistant Professors:* C. V. Jordan

Course offerings or research facilities are available in the following areas: plant cell biology, cellular imaging, membrane biochemistry, seed biology, cellulose biology, cellular signaling, plant development, plant genetic engineering, transgene regulation and silencing, stress biology, plant gravitational genomics, phytochemistry, metabolic engineering, plant fungal interactions, aquatic ecology, toxic dinoflagellates, wetlands ecology, endangered species, plant community ecology, physiological ecology, tropical ecology, evolutionary ecology, paleobotany, plant systematics, evolution of flowering plants, chemical genomics.

Admission Requirements: Students entering the graduate program in plant biology should have a bachelor's degree in plant biology or a related undergraduate program that includes biological, physical and mathematical science training including undergraduate courses in organic chemistry, calculus and genetics, as well as biology. All applications are screened by a departmental committee, and the best qualified applicants will be accepted until all available spaces are filled.

**Master's and Doctoral Degree Requirements:** The M.S. requires a total of 30 credit hours (20 of the 30 credit hours must be from 500-, 600-, 700/800-level courses); the Master of Plant Biology requires a total of 36 credit hours. The Ph.D. requires a total of 72 credit hours. Two core courses (Plant Form and Function and Plant Functional Ecology) are required. Other requirements include: a Plant Biology

Colloquium, an additional plant biology course, a graduate statistics course, a graduate ethics course, a thesis (for the Ph.D. and M.S., but not the Master of Plant Biology), a comprehensive examination (Ph.D.), oral thesis defense and a one-semester teaching responsibility per degree. Students must maintain a "B" average in all course work.

**Other Relevant Information:** Graduate research and teaching assistantships and tuition remission information are available from the department. New students supported by departmental research/teaching assistantships may elect to rotate through three laboratories during their first semester. At the end of the semester, they will choose a laboratory for their research activities consistent with their interests and available research projects. Provisions are available for cooperative research in more than one laboratory. Graduate students are expected to attend and participate in the seminar program every semester they are in residence. The department participates in training grants in biotechnology and genomics.

# **Plant Pathology**

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Plant Pathology	Y		Y		Y		

# **GRADUATE FACULTY**

# J. W. Moyer, Department Head

#### Director of Graduate Programs:

E. L. Davis, Box 7616, 5-6692, rick@unity.ncsu.edu, Plant Pathology

Philip Morris Professor: H. D. Shew

*William Neal Reynolds Distinguished Professor:* G. G. Kennedy *William Neal Reynolds Professor:* R. S. Boston, M. E. Daub, E. L. Davis, R. A. Dean, L. K. Hanley, S. Lommel, G. A. Payne

Professors: D. M. Benson, D. M. Bird, R. I. Bruck, M. A. Cubeta, S. Franzen, L. F. Grand, W. M. Hagler, H. M. Hassan, C. L. Hemenway, J. S. Huang, S. Leath, F. J. Louws, T. A. Melton, J. W. Moyer, C. H. Opperman, C. H. Peacock, J. B. Ristaino, D. F. Ritchie, R. C. Rufty, T. B. Sutton, C. G. VanDyke; USDA Professors: J. B. Holland, D. S. Marshall; Visiting Professors: C. S. Hodges; Emeritus Named Professors: N. T. Powell; Emeritus Professors: J. L. Apple, C. W. Averre, R. Aycock, O. W. Barnett, D. F. Bateman, M. K. Beute, E. B. Cowling, G. V. Gooding, R. K. Jones, L. T. Lucas, C. E. Main, R. D. Milholland, J. P. Ross, P. B. Shoemaker, H. H. Triantaphyllou, J. C. Wells; Associate Professors: I. Carbone, G. J. Holmes, S. Hu, L. P. Tredway; Research Associate Professors: S. R. Koenning; USDA Associate Professors: P. J. Balint-Kurti, C. Cowger, R. G. Upchurch; Emeritus USDA Professors: H. W. Spurr; Adjunct Associate Professors: Y. Lee; Assistant Professors: K. L. Ivors, A. L. Mila, P. Ojiambo, P. Veronese; Research Associate Professors: B. B. Shew

Plant pathology is committed to solving plant disease problems with research that focuses on plantpathogen interactions at the genomic, cellular, organismal, and ecological levels. Approaches include disease management, epidemiology, molecular biology and host-parasite interactions. Focus areas are bacteriology, bioinfomatics, functional genomics, mycology, nematology, virology, soil-borne pathogens and mechanisms of pathogenesis, and host resistance.

Admission Requirements: The general application procedures of the Graduate School noted at the beginning of this section are followed. Applicants are required to submit GRE results. A detailed statement of applicant interests and goals in plant pathology is most useful to the admissions committee.

**Master's Degree Requirements:** There is a core curriculum of a minimum of 12 credit hours that includes PP 501, PP 502, PP 506, PP 707, and PP 601. The core should be supplemented with a minimum of 18 credit hours in courses at the 500 or higher level, which support the focus of the study.

Students serve as teaching assistants for one course.

**Doctoral Degree Requirements:** Students entering the Ph.D. degree program are expected to take the core curriculum outlined for the Master's degree or have had the equivalent at another institution. Additionally, Ph.D. students must include a departmental-approved ethics course, two credits PP 801, and at least two other 700-level Plant Pathology courses. Ph.D. students serve as teaching assistants for two courses.

**Student Financial Support:** A limited number of half-time assistantships are available on a competitive basis. Benefits include in-state tuition, out-of-state tuition and health insurance as covered under the Graduate School's Graduate Student Support Plan. Applicants are considered for assistantship support at time of application. Special supplements to assistantships are available on a competitive basis for outstanding students. Also, many faculty programs have research grant-funded or training grant-funded assistantships.

**Other Relevant Information:** Fully equipped and staffed laboratories for research are available in addition to greenhouse facilities and environmental growth chambers in the phytotron. Special facilities for experimental work on diseases under field conditions are available at 16 University-related locations throughout the state. Genomics facilities, microcomputers, library, mycological herbarium, digital imaging/graphics equipment programs, and an interdepartmental electron microscopy center are additional features available for the department.

# **Poultry Science**

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Poultry Science			Y		Y		

# **GRADUATE FACULTY**

#### S. L. Pardue, Department Head

#### Director of Graduate Programs:

J. T. Brake, Box 7608, , jbrake@ncsu.edu, Poultry Science

# William Neal Reynolds Distinguished Professor: J. T. Brake William Neal Reynolds Professor: P. R. Ferket

Professors: K. E. Anderson, W. J. Croom, F. W. Edens, J. L. Grimes, W. M. Hagler, G. B. Havenstein, J. F. Ort, S. L. Pardue, J. N. Petitte, T. D. Siopes, D. P. Wages, C. M. Williams, M. J. Wineland; *Adjunct Professors:* W. L. Bryden, M. Choct, K. K. Krueger, W. B. Roush, S. M. Shane, Z. Uni; *Emeritus Professors:* T. A. Carter, V. L. Christensen, J. D. Garlich, E. W. Glazener, J. R. Harris, C. R. Parkhurst, B. W. Sheldon, J. C. Shih; *Associate Professors:* S. L. Ash, C. M. Ashwell, D. K. Carver, P. E. Mozdziak, P. D. Siciliano, D. P. Smith; *Adjunct Associate Professors:* C. E. Whitfill; *Assistant Professors:* J. B. Hoffman, M. D. Koci, C. Maltecca, E. O. Oviedo-Rondon, S. E. Phillips, C. R. Stark; *Adjunct Assistant Professors:* D. S. Casey, J. V. Felts, A. G. Gernat, C. L. Heggen-Peay, R. O. Maguire, T. F. Middleton, C. J. Williams

Course offerings and research programs are comprehensive in the areas of physiology, nutrition, microbiology, molecular biology, biotechnology, food science, immunology, genetics, pathology, and toxicology. The demand for men and women with advanced training in poultry science is far greater than the supply. Opportunities exist for graduates in research and teaching in universities, government, and private industry.

Admission Requirements: Factors considered for admission include grade point average, strength of prior academic program, experience, letters of recommendation, and special skills or interests. GRE scores are required.

**Master's Degree Requirements:** While there are no specific course requirements for the master's degree in poultry science, most programs exceed the minimum 30 credit hours.

Doctoral Degree Requirements: See Animal Science and Poultry Science.

**Student Financial Support:** Both research and teaching assistantships are available on a competitive basis within the department. General requirements for these assistantships are as described in the Graduate Catalog. Other financial support may be available in the form of graduate stipend

supplementation, research grant support, or out-of-state tuition waivers in accordance with the University's Graduate Student Support Plan.

**Other Relevant Information:** The Department of Poultry Science occupies modern facilities in Scott Hall, a three-story building on the main campus adjacent to the D.H. Hill Library. The department consists of about 22 faculty, approximately 50 support staff, 25-35 graduate students and postdoctoral associates, and 60-80 undergraduate students.

For more information, visit the <u>Department of Poultry Science</u> website.

# Psychology

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Psychology</u>	Y		Y				

# **GRADUATE FACULTY**

# D. J. Gillan, Department Head

# Director of Graduate Programs:

D. H. Mershon, Box 7801, 515-1724, don mershon@ncsu.edu, Psychology

Professors: L. E. Baker-Ward, J. P. Braden, K. B. DeBord, D. W. Drewes, W. P. Erchul, D. J. Gillan, D. O. Gray, A. G. Halberstadt, M. E. Haskett, T. M. Hess, J. W. Kalat, D. W. Martin, D. H. Mershon, J. J. Michael, R. W. Nacoste, A. C. Schulte, F. J. Smith, M. S. Wogalter; *Adjunct Professors:* A. D. Hall, W. Schlenger, L. G. Tornatzky; *Emeritus Professors:* J. W. Cunningham, T. E. Levere, J. E. Luginbuhl, H. G. Miller, S. E. Newman, P. W. Thayer; *Associate Professors:* J. C. Allaire, C. C. Brookins, S. B. Craig, S. A. Lane, P. P. Martin, C. B. Mayhorn, A. W. Meade, B. S. Mehlenbacher, R. E. Mitchell, S. B. Pond, S. S. Snyder, S. A. Stage, L. F. Thompson, E. N. Wiebe, M. A. Wilson, M. B. Wyer; *Adjunct Associate Professors:* J. L. Cole, K. W. Klein; *Assistant Professors:* J. C. Begeny, D. Gruehn, A. C. McLaughlin, S. D. Neupert; *Clinical Assistant Professors:* P. W. Collins; *Adjunct Assistant Professors:* D. J. Holden, C. L. Kronberg, T. E. Ray

The Department of Psychology offers five courses of study leading to the Ph.D.: lifespan developmental psychology, human factors and ergonomics, psychology in the public interest, industrial-organizational psychology, and school psychology.

Admission Requirements: Applicants should have satisfactory grades in all undergraduate work and at least a "B" average in undergraduate psychology courses, satisfactory scores on the GRE and three satisfactory letters of recommendation. The GRE subject test is no longer required, but is strongly encouraged, especially for non-psychology majors. Faculty will examine transcripts for evidence of basic psychology competence. Match of applicants' research interests with current faculty research is usually an important consideration.

**Master's Degree Requirements:** Specific course requirements vary by concentration. Typical programs will include from 36 to 55 hours. The M.S. degree is available as part of work toward the doctorate, but students wishing to obtain a terminal M.S. are advised to consider other programs.

**Doctoral Degree Requirements:** The graduate program for each doctoral student is determined in conjunction with the student's graduate advisory committee and tailored to the needs, interests, and accomplishments of the individual. Students can expect to take from 36 to 54 hours of credit beyond the master's degree.

**Student Financial Support:** Many graduate students receive financial support in the form of teaching or research assistantships. Applicants should request such support when they apply to the program.

# **Public Administration**

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Public Administration	Y				Y		

# **GRADUATE FACULTY**

# Director of Graduate Programs:

E. O'Sullivan, Box 8102, 5-5070, elizabethann osullivan@ncsu.edu, Political Science

# William T. Kretzer Distinguished Professor: T. A. Birkland

**Professors:** C. K. Coe, D. M. Daley, G. D. Garson, R. C. Kearney, A. J. Taylor, M. Tschirhart; **Associate Professors:** J. D. Coggburn, E. O'Sullivan, J. E. Swiss, M. L. Vasu; **Assistant Professors:** R. Bosworth, J. R. Brunet, R. M. Clerkin, B. L. Nowell; **Extension Assistant Professors:** S. K. Straus

Administrative specialties include: non-profit management, and urban/local government management. Specialized courses are offered in environmental policy, financial management, and human resource management. The only doctoral program in public administration in N.C., the Ph.D. prepares students for teaching and research positions in public management and related fields. The program offers graduate certificates in non-profit management and public policy, both of which may be included as part of the M.P.A., another graduate degree program, or taken independently.

Admission Requirements: Applicants to the M.P.A. should submit all materials by May 15 (for fall admission) and by November 1 (for spring admission). Completed applications received by February 1 will receive consideration for all available university and department scholarships and assistantships. Admission to the doctoral program normally requires the completion of the M.P.A. or other relevant graduate degree. Ph.D. students are admitted only for the Fall semester. The Ph.D. application deadline is March 15. Applicants are encouraged to submit all materials as soon as possible to assure consideration for fellowships and assistantships.

**Master's Degree Requirements:** The M.P.A. degree is a 40-semester-hour program consisting of: (1) a core curriculum of 18 credit hours; (2) a choice of administrative specialties, or an individualized program, drawing on courses in public administration and other departments; and (3) an internship requirement for pre-service students. It is an option B Master's degree with a one-person committee and no final oral examination. Students who do not have at least two political science courses, including at least one American government course, a micro-economics course, and an intermediate-level statistics course must successfully complete equivalent coursework prior to graduation.

**Doctoral Degree Requirements:** The Ph.D. prerequisites are a graduate course in statistics, a course in methodology (covering research design, internal and external validity, sampling, and measurement), and at least two courses in American government or public policy. Students are required to complete M.P.A. core courses in (a) budgeting or management systems, and (b) policy analysis or micro-

economics unless they have equivalent courses from other institutions. Fifty-four hours beyond the Master's degree including research seminars (including PA 761, PA 762, PA 763, PA 803), four courses in methodology/statistics (including PA 715, PA 765, PA 766), and dissertation research are required.

**Student Financial Support:** A limited number of fellowships and graduate assistantships are offered by the department. Contact the department for more information. Other forms of student aid are described in the financial aid section of the Graduate Catalog.

# Social Work

# **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Social Work</u>					Y		

# **GRADUATE FACULTY**

# Director of Graduate Programs:

T. U. Hancock, Box 7639, 9195137958, tina hancock@ncsu.edu, Social Work

*Professors:* T. U. Hancock, J. T. Pennell; *Associate Professors:* N. R. Ames, J. D. Taliaferro, C. C. Waites; *Assistant Professors:* W. J. Casstevens, M. T. Leach, J. G. Wells; *Clinical Associate Professors:* L. R. Williams; *Clinical Assistant Professors:* J. K. Hall, K. M. Osborne; *Teaching Assistant Professors:* K. Y. Watkins

The mission of the MSW program is to promote a socially responsible society through education, research, and extension/community service. Within a framework emphasizing professional values and ethics, cultural competence, strengths, and partnerships, the MSW program prepares graduate students for advanced practice and leadership roles.

#### **Admission Requirements:**

- 1. Bachelor's degree from an accredited liberal arts college or university
- Cumulative undergraduate GPA of 3.0 or higher for the last 60 hours of academic work or a GPA of 3.0 or above in previous graduate work; students with a GPA less than 3.0 but greater than 2.5 for the last 60 hours of academic course work must also submit a Graduate Record Exam (GRE) score or a Miller Analogies Test (MAT) score
- 3. Liberal arts course work in the social sciences, humanities, human biology and statistics
- 4. Experience in human services (post baccalaureate, paid or volunteer)

**Master's Degree Requirements:** MSW Students select from two different courses of study: (1) twoyear, full-time course of study with courses during the fall and spring semesters and (2) a three-year, part-time course of study with courses during the fall and spring semesters and two summer sessions. There are two method options: (1) Direct Practice with a focus on work with individuals, families, and groups and (2) Community Partnerships with a focus on administration and community development. Students are required to complete a total of 60 hours/17 courses: 9 courses in the foundation curriculum, 7 courses in the advanced curriculum, and 1 elective.

**Other Relevant Information:** The Council on Social Work Education, Commission of Accreditation has granted accredited status to our MSW program.
# Sociology

### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Sociology</u>	Y		Y		Y		

### **GRADUATE FACULTY**

### Director of Graduate Programs:

T. N. Greenstein, Box 8107, 515-9006, Ted Greenstein@ncsu.edu, Sociology

Distinguished Professor: V. M. Aldige Goodnight-Glaxo Wellcome Endowed Chair: C. R. Tittle William C. Friday Distinguished University Professorship: W. A. Wolfram William Neal Reynolds Distinguished Professor: R. C. Wimberley William Neal Reynolds Professor: M. D. Schulman

Professors: M. P. Atkinson, L. R. Dellafave, T. N. Greenstein, T. J. Hoban, E. L. Kick, J. C. Leiter, P. L. McCall, T. L. Parcel, M. L. Schwalbe, M. A. Zahn, J. J. Zuiches; *Adjunct Professors:* A. L. Schiller, A. Thompson; *Emeritus Professors:* W. B. Clifford, E. M. Crawford, T. N. Hobgood, R. L. Moxley, R. D. Mustian, M. M. Sawhney; *Emeritus Distinguished Professors:* L. B. Otto; *Associate Professors:* D. T. Case, F. Chen, S. M. De Coster, S. M. Fitzpatrick, N. M. Haenn, S. C. Lilley, A. H. Ross, W. R. Smith, M. E. Thomas, M. S. Thompson, R. J. Thomson, J. M. Wallace; *Adjunct Associate Professors:* R. L. Engen, J. F. Thigpen; *Emeritus Associate Professors:* R. C. Brisson, R. F. Czaja, A. C. Davis, M. L. Walek; *Assistant Professors:* S. K. Bowen, B. L. Clark, M. L. Crowley, S. G. Elliott, R. S. Ellovich, A. K. Jorgenson, S. J. McDonald; *Teaching Associate Professors:* W. E. Wormsley

The department offers Master's and doctoral programs in sociology designed to prepare students for academic, research, and applied careers. The programs are structured to provide an intellectually stimulating and academically rigorous, yet supportive, environment that emphasizes developing research skills through course work and close collaboration with faculty.

Admissions Requirements: In addition to general Graduate School requirements, applicants are required to provide a writing sample and should be intending to complete the Ph.D. degree in sociology. We routinely accept applications only for the fall semester. The completed application should be received no later than January 1 to ensure full consideration for assistantship support. Applications for spring admission are considered only under special circumstances.

**Master's Degree Requirements:** Applicants should have received/be receiving a Bachelor's degree from an accredited institution with a major in sociology. Other majors are considered, but students may have to make up deficiencies without credit. The M.S. requires a thesis, whereas a Master of Sociology (M.SOC.) requires six semester credit hours of practicum (supervised field placement in an organization or agency) and a research paper. A minor for both degrees is optional. Thirty (30) hours of credit is required to obtain a Master's degree.

**Doctoral Degree Requirements:** The Ph.D. requires a total of 72 credit hours. The degree normally requires a Master's in sociology. Doctoral students take core courses in theory and methods/analysis and select courses in two areas of specialization. Some course work from the Master's may be applied. A minor is optional.

Student Financial Support: Teaching and research assistantships are available on a competitive basis.

Click on Graduate Courses for current course information.

# Soil Science

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Soil Science</u>	Y		Y		Y		

#### **GRADUATE FACULTY**

M. G. Wagger, Department Head

Director of Graduate Programs:

T. J. Smyth, Box 7619, 515-2838, jot smyth@ncsu.edu, Soil Science

William Neal Reynolds Distinguished Professor: J. T. Brake William Neal Reynolds Distinguished Professor of Biological and Agricultural Engineering: R. W. Skaggs William Neal Reynolds Professor: M. J. Vepraskas

Professors A American C M/ Droome C D Cresier L L Heuli

Professors: A. Amoozegar, S. W. Broome, C. R. Crozier, J. L. Havlin, D. L. Hesterberg, M. T. Hoover, G. D. Hoyt, H. J. Kleiss, D. L. Lindbo, R. A. McLaughlin, D. L. Osmond, W. P. Robarge, T. J. Smyth, M. G. Wagger; *Emeritus Professors:* D. K. Cassel, D. W. Israel, A. Reisman; *Emeritus Named Distinguished Professors:* J. W. Gilliam, E. J. Kamprath; *Emeritus Distinguished Professors:* S. W. Buol; *Associate Professors:* D. A. Crouse, M. R. Hyman, W. Shi, J. G. White; *Emeritus Associate Professors:* J. P. Lilly, G. C. Naderman; *Assistant Professors:* O. W. Duckworth, R. J. Gehl, A. K. Graves, J. M. Grossman, J. L. Heitman; *Adjunct Assistant Professors:* D. H. Hardy, R. O. Maguire, J. T. Walker

Graduate students in soil science may specialize in the following subdisciplines: soil physics, soil chemistry; soil microbiology and biochemistry; soil fertility and plant nutrition; soil genesis, morphology and classification; soil and water management and conservation; soil mineralogy.

**Admissions Requirements:** Graduate students accepted in soil science must have a Bachelor's or Master's degree with a major in soil science or a closely related field and with a strong background in the biological and physical sciences.

**Master of Science Degree Requirements:** Requirements include a minimum of 30 semester hours of course work, including at least one credit, but not more than two credit hours, of seminar (SSC 601) and a minimum of two, but not more than six, credit hours of research (SSC 693 or SSC 695), successful completion of a research problem, submittal of a written thesis that documents the research, a comprehensive oral examination and presentation of a non-credit exit seminar.

Master of Soil Science Degree Requirements (non-thesis distance education program): Requirements include a minimum of 36 semester credit hours of graduate work with a minimum of six credit hours of a Master's project. One credit hour of seminar (SSC 601) is required.

Master of Soil Science Degree Requirements (non-thesis program): Requirements include a minimum of 36 semester credit hours of graduate work with a minimum of four, but not more than six, credit hours of Special Problems (SSC 620). One credit hour of seminar (SSC 601) is required and a maximum of two credit hours is acceptable.

**Master of Natural Resources Requirements (non-thesis program):** Requirements include a minimum of 32 semester credit hours consisting of 15 hours in core courses, 17 hours in Soil Science courses, and the completion of a Master's project. One credit hour of seminar (SSC 601) is also required. A minor is optional, although one-third of the credits should usually be in courses outside of the department.

**Doctoral Degree Requirements:** Ph.D. candidates must demonstrate the ability to undertake original research with minimal supervision and write a dissertation reporting the results of this research. There are no definite course requirements for the Ph.D. degree; however, a minimum of 72 graduate credit hours is required beyond the Bachelor's degree. The Plan of Graduate Work must contain at least one credit hour of seminar (SSC 801) and at least two credit hours of research (SSC 893 or SSC 895). The candidate must also pass a preliminary examination (written and oral components) and a final oral examination. A non-credit exit seminar is required. A minor is optional, although one-third of the credits should usually be in courses outside of the department.

**Student Financial Support:** The department has a number of assistantships available to students who have demonstrated a high level of academic aptitude or potential. All of the graduate assistantships are half time.

Click on Graduate Courses for current course information.

## **Specialized Veterinary Medicine**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Specialized Veterinary Medicine					Y		

#### **GRADUATE FACULTY**

#### Directors of Graduate Programs:

D. C. Dorman, Box 8401, , <u>david\_dorman@ncsu.edu</u>, College of Veterinary Medicine S. L. Jones, Box 8401, 3-6459, <u>sam\_jones@ncsu.edu</u>, Clinical Sciences

### Burroughs Wellcome Professor of Pharmacology: J. E. Riviere Drexel Professor of Statistics: A. A. Tsiatis

Professors: G. W. Almond, K. L. Anderson, P. Arasu, C. E. Atkins, H. J. Barnes, A. T. Blikslager, M. Breen, E. B. Breitschwerdt, D. G. Bristol, T. T. Brown, J. M. Cullen, M. G. Davidson, G. A. Dean, H. A. Devine, D. C. Dorman, K. Flammer, L. N. Fleisher, O. J. Fletcher, R. B. Ford, F. J. Fuller, J. E. Gadsby, B. C. Gilger, C. B. Grindem, J. S. Guy, B. Hammerberg, E. M. Hardie, E. C. Hawkins, L. C. Hudson, S. L. Jones, B. W. Keene, S. M. Laster, J. M. Law, J. F. Levine, M. G. Levy, G. A. Lewbart, D. H. Ley, D. J. Marcellin, M. C. McGahan, D. J. Meuten, N. Monteiro, W. M. Morrow, E. J. Noga, T. J. Olivry, P. E. Orndorff, M. G. Papich, J. A. Piedrahita, M. C. Roberts, S. C. Roe, P. L. Sannes, D. Shea, B. Sherry, W. J. Showers, J. E. Smallwood, L. P. Tate, D. E. Thrall, M. B. Tompkins, W. Tompkins, S. L. Vaden, D. P. Wages, D. W. Watson; Research Professors: M. J. Dykstra, E. A. Havell, S. Kennedy-Stoskopf; Adjunct Professors: G. R. Burleson, R. L. Cooper, M. W. Dewhirst, K. L. Dreher, R. B. Meeker, J. A. Raleigh, M. K. Selgrade, F. Welsch; Emeritus Professors: T. M. Gerig, J. F. Roberts; Associate Professors: R. E. Baynes, J. C. Bonner, B. A. Breuhaus, D. K. Carver, M. T. Correa, P. Cowen, T. C. DeFrancesco, L. A. Degernes, P. W. Farin, R. E. Fish, S. Y. Gardner, B. Hansen, C. A. Harms, M. L. Hauck, J. M. Hinshaw, J. M. Horowitz, D. X. Lascelles, K. G. Mathews, K. R. Munana, S. C. Nelson, N. J. Olby, B. D. Slenning, C. R. Swanson, S. Tonkonogy, M. D. Whitacre, L. E. Williams; Adjunct Associate Professors: D. Dixon, T. E. Eling, R. C. Sills, R. J. Smialowicz; Assistant Professors: J. L. Gookin, P. R. Hess; Clinical Associate Professors: M. P. Gerard, W. R. Redding; Clinical Assistant Professors: A. L. Cannedy, K. E. Linder; Visiting Assistant Professors: R. Linnehan; Adjunct Assistant Professors: A. E. Bogan, M. R. Loomis, D. E. Malarkey, P. Ren; Teaching Associate Professors: J. A. Barnes

The creation of the non-thesis Master's degree track (MSpVM) for the Veterinary Medicine Graduate Program was proposed to enhance scholarship and competitiveness of veterinarians completing advanced specialty training at the College. These programs are designed to provide experiences appropriate for certification in the specialty College related to their area of study. Clinical and diagnostic material handled through the Veterinary Teaching Hospital and affiliated units will provide the basis for this training. Courses will incorporate seminars, rounds and journal club activities; individual supervised training; independent study programs; and basic statistics and ethics. Many of the programs will require a project, publication, and oral exam to be completed as part of the requirements. This **optional** track features an **interdepartmental**, **multidisciplinary** approach to graduate training with participating graduate faculty from all four departments of the College of Veterinary Medicine. These faculty represent <u>17 discipline areas</u> and will offer advanced training leading to the Master of Specialized Veterinary Medicine.

Each MSpVM student will have a unique graduate training program focused in his/her clinical specialty area and directed by a graduate committee comprising faculty experts from this clinical specialty and other specialty areas. Creation of the track will permit the College to document more clearly the effort that faculty commit to advanced training in 17 different veterinary specialties. The graduate track will help sustain the outstanding success the College has achieved in attracting the top national and international veterinary graduates for post-graduate clinical training.

Admission Requirements: Applicants must have a DVM/VMD degree from an accredited program and have a documented history of academic excellence. All applicants must meet minimum criteria for both the program and the NC State University Graduate School and be selected for participation in the track by the faculty of the specialty area identified by the applicant. Graduate Record Examination (GRE) scores may be required by specific specialty areas. Committee decisions will be based on academic performance while enrolled in a DVM/VMD program, letters of recommendation, professional experience, and perceived ability of the individual to complement the needs of our training program.

**Specialty Areas:** Each enrolled student will concentrate his/her studies in one of the existing <u>clinical</u> <u>specialty training areas</u> at the College of Veterinary Medicine. Additional training specialties may be created as warranted by demographic, economic and social changes that impact the profession.

**Course Requirements:** Students will complete 2 or 3 years of training depending on the requirements in the specific specialty area. The first year will predominately be spent participating in specialty training in the Veterinary Teaching Hospital, where students will receive supervised specialty training in the various clinical services offered by the VTH. During the first year, out of state students may enroll for fewer than 9 credits for the fall and spring semesters. Subsequently, students will complete the required 36 credit hours during the second and third year of their studies.

All students are required to complete 25 credit hours of general course requirements as well as additional elective course requirements in his/her specialty area. The general course requirements consist of:

Seminar/clinical rounds - 4 credit hours Research - 4 credit hours Supervised teaching (including rounds) - 1 credit hours Supervised specialty training - 12 credit hours Biostatistics - 3 credit hours Professional ethics - 1 credit hour

The courses selected to complete the balance of the required 36 credit hours will be determined by the student and his/her advisory committee. The following courses represent those that could be used by MSpVM students to complete the credit hour requirements for their degree.

Click on <u>Graduate Courses</u> for current course information.

# Statistics

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Statistics	Y		Y		Y		

#### **GRADUATE FACULTY**

#### S. G. Pantula, Department Head

#### Directors of Graduate Programs:

J. M. Hughes-Oliver, Box 8203, 515-1954, <u>hughesol@stat.ncsu.edu</u>, Statistics P. J. Arroway, Box 8203, 919/515-1955, <u>arroway@stat.ncsu.edu</u>, Statistics

Burroughs Wellcome Professor of Pharmacology: J. E. Riviere

Drexel Professor of Statistics: A. A. Tsiatis

Joseph D. Moore Professorship of Textile and Apparel Management and Technology: A. B. Godfrey William Neal Reynolds Distinguished Professor: W. R. Atchley William Neal Reynolds Distinguished University Professor: M. M. Goodman William Neal Reynolds Professor: M. Davidian, D. A. Dickey, S. Zeng

Professors: B. Bhattacharyya, P. Bloomfield, D. D. Boos, M. A. Bourham, C. Brownie, S. K. Ghosh, M. L. Gumpertz, A. R. Hall, J. M. Hughes-Oliver, J. F. Monahan, S. V. Muse, S. G. Pantula, K. H. Pollock, D. L. Solomon, L. A. Stefanski, M. W. Suh, J. L. Thorne; *Research Professors:* N. Sedransk; *Visiting Professors:* E. A. Thompson; *Adjunct Professors:* J. R. Chromy, R. B. Conolly, L. B. Crowder, J. H. Goodnight, P. D. Haaland, J. M. Hoenig, N. L. Kaplan, P. H. Morgan, D. W. Nychka, R. W. Setzer, R. D. Wolfinger, S. S. Young; *Emeritus Professors:* T. M. Gerig, F. G. Giesbrecht, H. J. Gold, A. H. Grandage, T. Johnson, L. A. Nelson, C. H. Proctor, C. P. Quesenberry, J. O. Rawlings, D. L. Ridgeway, R. G. Steel, W. H. Swallow, J. L. Wasik, O. Wesler; *Associate Professors:* T. H. Emigh, M. Fuentes, S. Ghoshal, K. Gross, A. E. Headen, W. Lu, D. E. Martin, J. A. Osborne, T. W. Reiland, C. E. Smith, D. Zhang; *Adjunct Associate Professors:* H. X. Barnhart, E. R. Hauser, A. S. Kosinski; *Emeritus Associate Professors:* A. C. Linnerud; *Assistant Professors:* H. D. Bondell, L. Li, H. M. McGowan, M. C. Militello, A. A. Motsinger, B. J. Reich, A. Staicu, E. A. Stone, W. Sun, J. Tzeng, H. Wang, Y. Wu, H. Zhang; *Research Assistant Professors:* C. Arellano; *Adjunct Associate Professors:* G. Bobashev, M. G. Ehm, J. S. Kimbell, Y. Li, M. W. Lutz, E. R. Martin, M. O'Connell; *Teaching Associate Professors:* P. J. Arroway, J. R. Thompson, K. S. Weems, R. Woodard

Admission Requirements: The well-prepared applicant to the department's Master's programs has good grades in a three-semester calculus sequence, a two-semester advanced calculus sequence, a semester of linear algebra, and a two-semester sequence in probability and statistics. Some of these courses may be taken as part of the program, but this may result in lengthening the stay. Students may apply to either the Master's or PhD program directly from a Bachelor's degree. GRE General Test scores are required, but Subject Test scores are not.

The written statement should not exceed two pages and should describe the applicant's academic and career goals as well as special interests in the area of statistics. Individuals applying for fall enrollment and who wish to be considered for financial aid should have their completed applications in by no later than December 15 of the preceding year. Applications arriving after that will be considered but may be assigned lower priority. Students are not normally admitted for spring or summer enrollment.

**Master's Degree Requirements:** All Master's programs in statistics require a minimum of 34 credit hours, of which 12 are first-year core (ST 512, ST 521, ST 522, ST 552 and their labs), one is supervised consulting (ST 641). The remainder are statistics and/or supporting electives.

**Doctoral Degree Requirements:** The Ph.D. program in statistics requires 22 course credit hours beyond the Master's, of which 15 are Ph.D. core courses (ST/MA 778, 779, ST 793, ST 794, and a computing course), one is supervised consulting (ST 841), and six are Ph.D.-level statistics electives. Requirements for co-majors are individually tailored.

**Student Financial Support:** Departmental assistantships and fellowships are awarded each year on a competitive basis. Approximately 40 teaching assistantships and 30 research assistantships and traineeships are available along with several graduate industrial traineeships supported by local industries.

**Other Relevant Information:** With a large graduate faculty representing virtually all major statistical specializations, the department is recognized as a world leader in graduate education and research in statistics. Its applied orientation sets it apart from most other departments in the country, offering education to those wishing to pursue careers as consulting statisticians in industry and government, as well as to those seeking careers in research and teaching.

Click on Graduate Courses for current course information.

# Teaching (College of Education Dean's Office )

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<b>Teaching</b>				Y			

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

G. L. Holley, Box 7801, 513-0083, grant holley@ncsu.edu, College of Education Dean's Office

Professors: E. McIntyre, R. J. Pritchard, E. J. Sabornie; Associate Professors: L. Annetta, V. W. DeLuca,
H. S. Lee, J. K. Lee, S. S. Osborne; Assistant Professors: M. R. Blanchard, M. J. Jeffries, M. M. Pop;
Adjunct Assistant Professors: G. L. Holley; Teaching Assistant Professors: D. E. Benge

The Master of Arts in Teaching (MAT) program is an accelerated teacher licensure program that leads its students to both an initial teaching license and a Master's degree in just a year and a half of full-time study. The program is distinct in that it as a focus on practice and is held in a public school facility. The content areas being served by the MAT are secondary Math, Science, Social Studies, and English; Middle Grades (Language Arts or Social Studies); Technology Education, Special Education and Elementary Education.

Admission Requirements: Applicants must have (1) a four-year degree from a college or university that holds regional accreditation, such as SACS; (2) a combined score of 1000 on the GRE (500 verbal and 500 quantitative); (3) 3.00 GPA or higher in prior work, as required by the Graduate School; (4) 24 Semester hours/credits in content relevant to the area in which you wish to teach (if you have fewer than 24 hours in a relevant content field, of if your course work does not prepare you adequately to teach the North Carolina curriculum, you may be assigned course work to overcome the deficiency).

Applications require original transcripts, 3 letters of recommendation, one of which should speak to teaching potential, a personal essay stating applicant's background and goals, GRE scores (and TOEFL if you have international citizenship), and a completed online application.

**Master's Degree Requirements:** Depending on the content area, the degree requirements will range from 39-42 hours. These hours include student teaching for non-lateral entry student.

**Student Financial Support:** Financial aid is available. Interested students should complete a <u>Financial</u> <u>Aid Federal Student Aid (FAFSA)</u> form.

Click on Graduate Courses for current course information.

# Textile Engineering, Chemistry and Science

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Textile Chemistry			Y				
Textile Engineering			Y				

#### **GRADUATE FACULTY**

#### B. S. Gupta, Interim Department Head

#### Director of Graduate Programs:

P. J. Hauser, Box 8301, 513-1899, peter hauser@ncsu.edu, Textile Engineering, Chemistry and Science

A. Doug Allison Distinguished Professor: S. D. Roberts
Burlington Industries Professorship of Textile Technology: R. L. Barker
Ciba-Geigy Distinguished Professor: H. S. Freeman
Cone Mills Professorship of Textile Chemistry: C. B. Smith
Henry A. Foscue Distinguished Professor: C. T. Culbreth Jr
INVISTA Professor of Fiber and Polymer Chemistry: A. E. Tonelli
Lineberger Chair in Yarn Manufacturing: W. Oxenham
William A. Klopman Distinguished Professor: B. Pourdeyhimi

Professors: K. R. Beck, T. G. Clapp, R. A. Donaldson, R. E. Fornes, T. K. Ghosh, M. L. Gumpertz, B. S. Gupta, H. Hamouda, P. J. Hauser, D. Hinks, S. M. Hudson, W. J. Jasper, M. W. King, J. P. Rust, A. M. Seyam, R. J. Spontak, M. W. Suh; *Adjunct Professors:* A. E. Bogdanovich, L. D. Claxton, W. G. O'Neal; *Emeritus Named Professors:* J. A. Cuculo, S. P. Hersh; *Emeritus Professors:* R. A. Barnhardt, D. R. Buchanan, A. H. El-Shiekh, P. L. Grady, G. N. Mock, H. G. Olf, M. H. Theil, C. Tomasino, P. A. Tucker; *Emeritus Distinguished Professors:* M. H. Mohamed; *Associate Professors:* P. Banks-Lee, L. I. Clarke, R. E. Gorga, G. L. Hodge, J. A. Joines, M. R. Jones, R. Kotek, W. E. Krause, M. G. McCord, S. Michielsen, R. Shamey; *Research Associate Professors:* D. B. Thompson; *Adjunct Associate Professors:* T. G. Montgomery; *Assistant Professors:* A. M. El-Shafei, M. Pasquinelli, X. Zhang; *Research Assistant Professors:* A. M. El-Shafei, M. Pasquinelli, X. Zhang; *Research Assistant Professors:* A. M. El-Shafei, M. Pasquinelli, X. Zhang; *Research Assistant Professors:* N. Anantharamaiah, B. Maze, E. Shim; *Adjunct Assistant Professors:* H. A. Boyter, R. F. Moore, H. S. Whang; *Teaching Associate Professors:* J. R. Thompson

**Master of Science in Textile Chemistry** (*MS/TC*): The Master of Science in Textile Chemistry degree program emphasizes the fundamental principles of chemistry, physics, and mathematical sciences and applies those to polymer science, dyeing and finishing technology, color science, dye chemistry, and fiber analysis and formation. Our program is highly relevant to many in the chemical, medical, polymer, retail and textile industries, as well as environmental and forensic science. Graduates of Textile Chemistry are recruited by a broad range of employers, such as DuPont, Proctor & Gamble, Nike, Wyeth, and even the State and Federal Bureaus of Investigation.

**Master of Science in Textile Engineering** (*MS/TE*): The Master of Science in Textile Engineering degree program offers unique educational and research opportunities within the domain of textile materials, structures, and technologies , as well as machine and process design. The program is interdisciplinary in nature, drawing upon mathematical sciences, other engineering disciplines, and the physical sciences. Current research activities in textile engineering include electro-mechanical design, inventory and supply chain control, molecular modeling, nonwoven thermal and fluid sciences, polymer and fiber science, biomedical applications of textiles, electro-textiles, textile composites, and pollution prevention. Since this program encompasses such diverse fields of study, many of our students opt to co-major in other programs at NC State. Examples of these co-majors are statistics, bio-medical engineering, chemical engineering, and industrial engineering. Graduates of Textile Engineering are recruited by a broad range of employers, such as Milliken and Co., Kimberly-Clark, Russell Corporation, Secant Medical, and even the United States Patent and Trademark Office.

Admission Requirements. (*MS/TC*): Applicants must have a physical science, engineering, mathematical, or technology background, preferably including higher math and physical chemistry. Applicants are also expected to meet the following minimum requirements: a GPA of **3.0** or First Class Honors in the Bachelor's degree; GRE scores in the 65th percentile; a TOEFL score of **213** for the computer-based, and **80** for internet-based(international students) OR IELTS scores with an overall band score of at least **6.5**; and three letters of reference.

**Degree Requirements.** (*MS/TC*): A minimum of 30 credit hours is required to fulfill the degree requirements. Normally, this degree requires 15 credit hours in approved textile chemistry/textile material science/textile technology offerings, 9 credit hours in a supporting area (minor), 6 credit hours of thesis research, and two semester credits from the College Seminar (TC 601). Additional course work may be substituted for part of the research credits. For off-campus (TOP) students and students earning the M.S. on the way to the Ph.D. degree in Fiber and Polymer Science (FPS); a thesis is optional and a minimum of 33 credit hours is required. (*MS/TE*): A minimum of 30 credit hours in approved textile engineering/textile material science/textile technology offerings, 9 credit hours in a supporting area (minor), 6 credit hours of thesis research, and two semester credits from the College Seminar (TE 601). Additional course work may be substituted for part of the research credits. For off-campus (TOP) students is required to fulfill the degree requirements. Normally, this degree requires 15 credit hours in a supporting area (minor), 6 credit hours of thesis research, and two semester credits from the College Seminar (TE 601). Additional course work may be substituted for part of the research credits. For off-campus (TOP) students and students earning the M.S. on the way to the Ph.D. degree in Fiber and Polymer Science (FPS); a thesis is optional and a minimum of 33 credit hours is required for MS/TC and 30 credit hours for MS/TE.

**Student Financial Support:** Financial aid in the form of research assistantships or fellowships is typically available for all full-time US students who apply early. Either through research projects of faculty or through centers and institutes within the College of Textiles. International students who seek funding must acquire this through individual faculty members who have research projects that require a graduate student. While international students can typically find support by their second semester, they should be prepared to cover all expenses for the first semester or so.

**Other Relevant Information:** The department either houses or has access to all major analytical tools necessary to conduct a quality research program covering a wide range of topics. It also houses state-of-the-art facilities for conducting research in fiber science and textile engineering. Close cooperation between College faculty and the fiber/textile and allied industries provides students with opportunities

for learning and employment.

- Click on <u>Graduate Courses -Textile Chemistry</u> for current course information.
- Click on <u>Graduate Courses -Textile Engineering</u> for current course information.
- Click on <u>Graduate Courses -Textile Materials Science</u> for current course information.
- Click on <u>Graduate Courses -Textile Technology</u> for current course information.

## **Textile Technology Management**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Textile Technology Management	Y						

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

W. Oxenham, Box 8301, 515-6573, william oxenham@ncsu.edu, College of Textiles

Alan T. Dickson Distinguished University Professor: M. A. Rappa Bank of America Distinguished University Professor: R. B. Handfield Burlington Industries Professorship of Textile Technology: R. L. Barker Charles A. Cannon Professor: S. K. Batra Ciba-Geigy Distinguished Professor: H. S. Freeman Cone Mills Professorship of Textile Chemistry: C. B. Smith Distinguished University Professor of Industrial Engineering for International Competitiveness: S. E. Elmaghraby INVISTA Professor of Fiber and Polymer Chemistry: A. E. Tonelli James T. Ryan Distinguished Professor of Industrial Engineering and Furniture Manufacturing: T. J. Hodgson Joseph D. Moore Professorship of Textile and Apparel Management and Technology: A. B. Godfrey Lineberger Chair in Yarn Manufacturing: W. Oxenham Walter Clark Professor of Industrial Engineering: S. C. Fang William A. Klopman Distinguished Professor: B. Pourdeyhimi Zelnak Professor of Marketing Innovation: M. M. Montoya-Weiss

Professors: K. R. Beck, N. L. Cassill, T. G. Clapp, R. A. Donaldson, T. K. Ghosh, B. S. Gupta, H. Hamouda, P. J. Hauser, D. Hinks, W. J. Jasper, M. W. King, R. E. King, T. J. Little, S. E. Margolis, J. P. Rust, A. M. Seyam, M. W. Suh, J. R. Wilson; *Emeritus Named Professors:* S. P. Hersh, S. C. Winchester; *Emeritus Professors:* R. A. Barnhardt, D. R. Buchanan, J. R. Canada, A. H. El-Shiekh, P. L. Grady, D. M. Holthausen, G. N. Mock, C. Tomasino, P. A. Tucker; *Emeritus Distinguished Professors:* M. H. Mohamed; *Associate Professors:* E. A. Baker, P. Banks-Lee, K. A. Barletta, C. C. Bozarth, S. N. Chapman, R. E. Gorga, H. H. Hergeth, G. L. Hodge, C. L. Istook, J. A. Joines, M. R. Jones, R. Kotek, W. E. Krause, T. A. Lamar, J. K. McCreery, S. Michielsen, M. M. Moore, N. C. Powell, R. Shamey, G. W. Smith; *Assistant Professors:* K. E. Carroll, H. Lee; *Research Assistant Professors:* N. Anantharamaiah, B. Maze, E. Shim; *Teaching Professors:* H. L. Nuttle

Textile Technology Management is a multidisciplinary program designed to educate students for research and management careers in technology management in the fiber, textile, apparel and related industries complex. The program is designed to give the students a breadth of knowledge of the materials and technologies employed in the industries as well as the quantitative and analytical tools of management.

Admission Requirements: Students majoring in textiles; industrial, systems and manufacturing engineering; statistics; operations research; computer science; economics; consumer economics; marketing; and business administration, and having an average in their undergraduate studies of 3.5/4.0 and a Master's degree will normally qualify for admission. Exceptionally qualified students (3.75/4.0 undergraduate GPA) may be admitted directly without a Master's degree.

**Doctoral Degree Requirements**: Fixed credit-hour requirements for the Doctor of Philosophy degree are 72. (Up to 18 hours from an M.S. may be applied against the 72.) Students are admitted to candidacy for the Ph.D. degree after passing two preliminary written and oral examinations (the first covering manufacturing technology and the second the management of technology) and orally defending a research proposal. They must also have passed an English technical writing course during their college career and, depending on the nature of their research interests, may also be required to demonstrate a reading knowledge of one foreign language.

**Student Financial Support:** Financial aid in the form of assistantships and fellowships is normally available for all U.S. full-time students. Financial aid in the form of Graduate Research/Teaching Assistantships may be available to a limited number of international students.

**Course Offerings:** Extensive use may be made of graduate course offerings in other colleges on campus when developing the minor field. See departmental listing for descriptions.

Click on <u>Graduate Courses - Textile Technology Management</u> for current course information.

Click on <u>Graduate Courses - Textile Technology</u> for current course information.

### **Textile and Apparel Management**

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Textiles</u>			Y		Y		

#### **GRADUATE FACULTY**

N. L. Cassill, Department Head

#### Director of Graduate Programs:

A. M. Seyam, Box 8301, 9195156583, a seyam@ncsu.edu, Textile and Apparel Management

Burlington Industries Professorship of Textile Technology: R. L. Barker Charles A. Cannon Professor: S. K. Batra Joseph D. Moore Professorship of Textile and Apparel Management and Technology: A. B. Godfrey Lineberger Chair in Yarn Manufacturing: W. Oxenham William A. Klopman Distinguished Professor: B. Pourdeyhimi

Professors: N. L. Cassill, T. G. Clapp, R. A. Donaldson, T. K. Ghosh, D. Hinks, M. W. King, T. J. Little, A. M. Seyam, M. W. Suh; Adjunct Professors: M. A. Messura, W. G. O'Neal, T. W. Theyson; Emeritus Named Professors: S. C. Winchester; Emeritus Professors: R. A. Barnhardt, A. H. El-Shiekh, W. C. Stuckey; Emeritus Distinguished Professors: M. H. Mohamed; Associate Professors: P. Banks-Lee, K. A. Barletta, H. H. Hergeth, G. L. Hodge, C. L. Istook, J. A. Joines, M. R. Jones, R. Kotek, T. A. Lamar, S. Michielsen, M. M. Moore, N. C. Powell, R. Shamey, G. W. Smith; Research Associate Professors: D. A. Shiffler; Adjunct Associate Professors: W. D. Harazin, E. D. Parrish; Emeritus Associate Professors: H. A. Davis, P. B. Hudson, M. L. Robinson; Assistant Professors: K. E. Carroll, H. Lee, L. L. Parrillo-Chapman, X. Zhang; Research Assistant Professors: E. Shim; Adjunct Assistant Professors: H. Vahedi Tafreshi; Extension Associate Professors: L. F. Rothenberg

The Department of Textile and Apparel, Technology and Management offers the Master of Science in Textiles and the Master of Textiles degrees. Textiles include the design, management, and technology of fiber-based products and processes. Textile design students explore issues in new product development, body scanning, direct digital printing, computer animation, and computer aided design (CAD). Textile management includes such topics as business intelligence, branding, business finance, information systems, global marketing, global competitiveness, supply chain management, and total quality management. Medical textiles, performance textiles, three-dimensional textile structures, aerospace applications, and smart textiles and nonwovens are examples of new areas for textile technology.

**Master of Science:** The objective of the Master of Science (MS) in Textiles is to develop the student's potential for research and the technical and analytical skills needed for the design and marketing of new products, processes and for careers in the textile supply chain, in marketing organizations, research laboratories, government agencies, and in higher education. The MS degree is a thesis-based

36-credit-hour program where students conduct independent investigation. Students may conduct research in the following areas: brand management and marketing, fashion and textile design, textile supply chain and textile technology. Students interested in continuing with a Ph.D. are encouraged to pursue the MS degree.

**Master of Textiles:** The objective of the Master of Textiles is to provide on- and off-campus students with an opportunity to strengthen their educational background and prepare them for productive careers in the textile supply chain, in marketing organizations, research laboratories, government agencies, and in higher education. The Master of Textiles is a non-thesis degree. The program is flexible to accommodate a breadth of student needs. The program can be completed in only two semesters of full-time on-campus study. The program is also available entirely via distance education (Textile Off-Campus Programs: TOP) and may be completed on a part-time basis. The university residency requirement is waived for this distance education program. The degree requires 30 credit hours of study with a final oral examination.

Students should have 20 credit hours from mathematics and natural sciences in their undergraduate degree. Students with a Bachelor of Science or a Bachelor of Arts degree may apply to either of the degree programs. Students apply with undergraduate degrees in textiles, engineering, management, merchandising and/or design.

**Student Financial Support:** Financial aid in the form of assistantships may be available for full-time Master of Science students.

**Other Relevant Information:** The Department of Textile and Apparel, Technology and Management, houses a Digital Design lab which specializes in 3D Body Scanning, Direct Digital Printing, Whole Body Knitted Garments, and Computer Aided Apparel and Fabric Design. Additionally, the department includes the Fashion Studio, The Textile Management Sciences Lab, Braiding Lab, Three-Dimensional Weaving Lab, and an Advanced Testing Lab that allow students to experience hands on advanced textile technology and management.

Click on Graduate Courses - Textile Technology for current course information.

Click on <u>Graduate Courses - Textile Technology Management</u> for current course information.

# Toxicology

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
<u>Toxicology</u>	Y		Y		Y		

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

R. C. Smart, Box 7633, 5-7245, rcsmart@unity.ncsu.edu, Toxicology

#### William Neal Reynolds Distinguished Professor: R. M. Roe

Professors: K. B. Adler, J. M. Cullen, H. M. Hassan, S. M. Laster, J. M. Law, G. A. LeBlanc, N. Monteiro, P. L. Sannes, D. Shea, R. C. Smart, M. K. Stoskopf; *Research Professors:* A. R. Brody; *Adjunct Professors:* N. Chernoff, H. C. Cunny, J. E. Gibson, J. A. Goldstein, L. E. Gray, W. F. Greenlee, R. J. Langenbach, R. J. Preston, A. J. Tobia, D. C. Zeldin; *Emeritus Professors:* E. Hodgson, R. B. Leidy, J. F. Roberts, T. J. Sheets; *Associate Professors:* R. E. Baynes, J. C. Bonner, W. G. Cope, J. M. Horowitz, M. R. Hyman, E. G. Nichols, M. Rodriguez-Puebla, J. Tsuji, Y. Tsuji; *Adjunct Associate Professors:* K. M. Crofton, T. E. Eling, B. A. Merrick, B. Veronesi; *Assistant Professors:* D. B. Buchwalter, S. W. Kullman, S. D. McCulloch, H. B. Patisaul, A. D. Wallace; *Research Assistant Professors:* P. D. McClellan-Green; *Adjunct Assistant Professors:* D. J. Dix, M. F. Oleksiak; *Teaching Assistant Professors:* C. S. Hofelt

The Department of Environmental and Molecular Toxicology provides a comprehensive program in course work and research training to prepare prospective toxicologists for careers in academia, government, and industry. Research in the department spans an array of topics ranging from the molecular to population level consequences of toxicant exposure. A common research theme in the department involves the elucidation of toxicant induced alterations in cell signaling and resultant changes in gene expression as it relates to toxicity at the cellular, organ and organism level. Linkage of adverse biological endpoints to toxicant exposure is a mechanistic goal. Specific research areas include: endocrine disruption, oxidative stress, cellular signaling pathways, transcriptional regulation, toxicogenomics, regulation and expression of xenobiotic metabolizing enzymes, molecular carcinogenesis, cell cycle regulation, apoptosis, chemical exposure assessment, analytical toxicology, ecotoxicology and risk assessment. Examples of types of environmental agents that are being investigated include environmental carcinogens, pesticides, particulates metals, endocrine disruptors, nanoparticles and radiation.

Admission Requirements: Prospective students should have a strong background in the biological and physical sciences with a minimum undergraduate grade point average of 3.0 (on a 4.0 scale) and a minimum GRE score of 1100 (combined Verbal and Quantitative scores). GRE subject tests are not required. International students whose primary language is not English must submit TOEFL scores. A written statement should describe the applicants academic and career goals as well as their area of interest. All applications are reviewed by a departmental committee and the best applicants will be accepted until all available spaces are filled. Students are encouraged to submit applications in early

January for Fall admission.

**Master of Science Degree Requirements:** The M.S. is a research-oriented degree requiring a minimum of 30 credit hours and a written thesis. At least 20 credit hours must be graduate-level courses and a core curriculum is required.

**Master of Toxicology Degree Requirements:** The MTOX degree is a non-research degree designed for those not intending to pursue a career in research, part-time students, and/or working professionals seeking to further their education and advance their careers. A minimum of 30 credit hours is required, with at least 14 credit hours in toxicology courses. While a thesis is not required, at the discretion of the student's advisor, a review paper focusing on the student's interest in some aspect of toxicology might be required. Unlike the M.S. degree, the MTOX degree is an Option B degree program and does not require a thesis, an advisory committee or a final oral comprehensive exam.

**Doctoral Degree Requirements:** The Ph.D. program is designed to train students to become independent scholars capable of conducting unsupervised and original research. Students enroll in a core curriculum similar to that of the M.S. degree and additional courses as determined by his/her advisory committee. Normally a total of 72 credit hours is required, with the majority of these credits being dissertation research. Students must pass both a written and oral preliminary exam prior to advancing to Ph.D. candidacy. A doctoral dissertation presenting the students original research is written and defended in a final oral examination.

**Student Financial Support:** Financial assistance is available for qualified applicants through traineeships, fellowships, teaching assistantships and research assistantships.

**Other Relevant Information:** Students pursuing either the M.S. or Ph.D. degree may elect to specialize in environmental toxicology or molecular and cellular toxicology. More details can be obtained on the <u>Department of Environmental and Molecular Toxicology website</u>.

Click on Graduate Courses for current course information.

### **Courses from Associated Departments**

BCH 553 Biochemistry of Gene Expression BCH 701 Macromolecular Structure BCH 703 Macromolecular Synthesis and Regulation BCH 705 Molecular Biology of the Cell BCH 761 Advanced Molecular Biology of the Cell BIT 510 Core Technologies in Molecular and Cellular Biology BIT 567 PCR and DNA Fingerprinting **BIT 568 Genome Mapping BIT 569 RNA Purification and Analysis** CBS 754 Principles of Analytical Epidemiology CBS 762 Principles of Pharmacology **CBS 770 Cell Biology CBS 787 Pharmacokinetics** CBS 795A Special Topics: Veterinary Pathology I. General Pathology FW 585 Advanced Wildlife Habitat Management FW 707 Environmental Stress Physiology

GN 701 Molecular Genetics HS 707 Environmental Stress Physiology MB 751 Immunology MEA 540 Principles of Physical Oceanography MEA 750 Marine Benthic Ecology MEA 756 Ecology of Fishes PHY 503 General Physiology I PHY 504 General Physiology II PHY 780 Mammalian Endocrinology ST 511 Experimental Statistics for Biological Sciences I ZO 509 Ecology of Stream Invertebrates ZO 513 Comparative Physiology ZO 515 Fish Physiology ZO 524 Comparative Endocrinology ZO 714 Advanced Cell Biology ZO 760 Principles of Ecology

Courses not listed above but approved by the students advisory committee can also be included toward the 6 credit hour elective requirement. Course descriptions can be found at the <u>Registration</u> and <u>Records website</u>.

# **Veterinary Public Health**

### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Veterinary Public Health					Y		

#### **GRADUATE FACULTY**

#### Director of Graduate Programs:

J. F. Levine, Box 8401, 3-6397, jay levine@ncsu.edu, Population, Health, and Pathobiology

#### Burroughs Wellcome Professor of Pharmacology: J. E. Riviere Drexel Professor of Statistics: A. A. Tsiatis

**Professors:** G. W. Almond, K. L. Anderson, P. Arasu, H. J. Barnes, E. B. Breitschwerdt, H. A. Devine, J. S. Guy, B. Hammerberg, J. M. Law, J. F. Levine, M. G. Levy, D. H. Ley, W. M. Morrow, M. G. Papich, M. C. Roberts, D. Shea, W. J. Showers, M. K. Stoskopf, D. P. Wages, D. W. Watson; **Research Professors:** S. Kennedy-Stoskopf; **USDA Professors:** D. S. Marshall; **Associate Professors:** R. E. Baynes, D. K. Carver, M. T. Correa, P. Cowen, P. W. Farin, C. A. Harms, S. C. Nelson, B. D. Slenning; **Assistant Professors:** M. P. Martin

The Master of Veterinary Public Health (MVPH) program is designed to provide graduate training for veterinarians interested in pursuing animal and public health service-oriented careers. The two-year non-thesis MVPH program provides advanced graduate training in: veterinary epidemiology and biostatistics; infection control and biosecurity; outbreak investigation, disease eradication; emergency program management, veterinary public health and the identification and control of zoonotic pathogens; food safety and security; geographic information systems, spatial analysis; and livestock health management and trade policy. The program's base of activity is focused at the NCSU College of Veterinary Medicine, however, enrolled students benefit from enrollment in classes at UNC-Chapel Hill and the breadth of additional public health expertise in the Research Triangle.

Admission Requirements: An applicant to the Master's program must have a degree in veterinary medicine or an equivalent degree from a college or school of veterinary medicine. The MVPH program admissions committee sometimes grants exceptions for students with prior public health experience (contact the program directory before applying). Applicants are accepted based on the recommendation of the MVPH program admissions committee and program director after a review of their prior academic performance, work experience, and letters of recommendation. No graduate record examination scores are required for graduates of U.S. accredited colleges of veterinary medicine; graduate record examination scores are required for applicants must meet the minimum TOEFL examination requirements of the <u>NCSU graduate program</u> and submit GRE examination scores.

**Degree Requirements:** Candidates for the Master of Public Health degree must complete 48 credit hours of core and elective courses, and conduct a practicum/project (five credits) related to some

aspect of epidemiology, public health, biosecurity, food safety, or other relevant topic identified by the student and their faculty mentors.

Other Relevant Information: Students can enroll full time or part time.

Click on Graduate Courses - Veterinary Public Health for current course information.

**Other Graduate Courses:** MVPH program students have the opportunity to take a wealth of classes offered by program faculty as well as faculty from numerous other NCSU departments, the <u>UNC Chapel</u> <u>Hill School of Public Health</u>, and other <u>North Carolina University Systems campuses</u>. Numerous online elective course options complement classroom instruction. Each student is assigned two faculty mentors who assist with course selection and career planning.

#### ADDITIONAL CORE CLASSES

- CBS 580 Clinical Veterinary Epidemiology
- CBS 581 Clinical Veterinary Epidemiology Laboratory
- CBS 784 Principles of Analytic Epidemiology
- EPI 710 Fundamentals of Epidemiology
- FS 520 Pre-Harvest Food Safety
- FS 540 Food Safety and Public Health
- PRT 562 Principles of Geographic Information Systems ST 505 Applied Nonparametric Biostatistics
- ST 511 Experimental Statistics for Biological Sciences
- ST 512 Experimental Statistics for Biological Sciences II

#### **ELECTIVE EPIDEMIOLOGY CLASSES (UNC)**

- EPI 715 Theory and Quantitative Methods In Epidemiology
- EPI 718 Epidemiologic Analysis of Binary Data
- EPI 722 Epidemiologic Analysis of Time-to-Event Data
- EPI 733 Clinical Trials in Epidemiology
- EPI 735 Cardiovascular Disease Epidemiology
- EPI 743 Genetic Epidemiology: Methods and Applications
- EPI 745 Molecular Techniques for Public Health Research
- EPI 751 Emerging and Re-Emerging Infectious Diseases
- EPI 752 Introduction to Methods in Infectious Disease Epidemiology
- EPI 753 Prevention and Control of Infectious Diseases at the Community Level
- EPI 754 Mathematical Modeling of Infectious Diseases
- EPI 756 Control of Infectious Diseases on Developing Countries
- EPI 757 Epidemiology of HIV/Aids in Developing Countries
- EPI 758 Methods and Principles of Applied Infectious Disease Epidemiology
- EPI 759 Methods in Field Epidemiology
- EPI 780 Occupational Injury and Violence as a Public Health Problem
- EPI 785 Environmental Epidemiology
- EPI 786 Community-Driven Epidemiology and Environmental Justice

#### COMMUNITY PREPAREDNESS AND DISASTER MANAGEMENT (UNC ONLINE)

HPAA 420 Community and Public Health Security HPAA 421 Community and Public Health HPAA 422 Analytic Methods HPAA 423 Disaster Management Issues

#### ELECTIVE STATISTICS AND GIS CLASSES |

BMA 722 Decision Analytic Modeling

**BMA 773 Stochastic Modeling** BMA 567 Modeling of Biological Systems FOR 554 Principles of Spatial Analysis PRT 555 Environmental Impacts of Recreation and Tourism PRT 563 Technical Issues In Geographic Information Systems PRT 764 Advanced Study In Geographic Information Systems ST 506 Sampling Animal Populations ST 535 Statistical Process Control ST 546 Probability and Stochastic Processes I ST 552 Linear Models and Variance Components ST 708 Applied Least Squares ST 711 Design of Experiments ST 714 Life-Testing and Reliability ST 715 Theory of Sampling Applied to Survey Design ST 721 Genetic Data Analysis ST 722 Decision Analytic Modeling ST 730 Applied Time Series Analysis ST 731 Applied Multivariate Statistical Analysis ST 732 Applied Longitudinal Data Analysis ST 733 Applied Spatial Statistics ST 740 Bayesian Inference and Analysis ST 744 Categorical and Censored Data Analysis ST 745 Analysis of Survival Data ST 746 Introduction to Stochastic Processes

#### ADDITIONAL ELECTIVE CLASSES

BUS 541 Strategic Information Technology FS 530 Post-Harvest Food Safety FS 553 Food Laws and Regulations FS 722 Microbial Food Safety MIS 601 Colloquium in International Development SOC 758 Rural Sociology SOC 762 Urban Ecology TOX 704 Chemical Risk Assessment VPH 555 Public Health, Sustainable Development and Gender in Global Context VPH 649 Issues in Preventive Medicine and Public Health VPS(FW) 720 Epidemiology of Wildlife Diseases ZO 582 Medical and Veterinary Entomology

# Wood and Paper Science

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Wood and Paper Science	Y		Y		Y		

#### **GRADUATE FACULTY**

#### S. S. Kelley, Department Head

#### Director of Graduate Programs:

R. A. Venditti, Box 8001, 515-6185, richard venditti@ncsu.edu, Wood and Paper Science

Alcoa Professor of Chemical and Biomolecular Engineering: S. A. Khan Buckman Professor: M. A. Hubbe Elis and Signe Olsson Professorship: H. Jameel Jordan Family Distinguished Professorship for Natural Resources Innovation: V. C. Chiang

Professors: D. S. Argyropoulos, J. Denig, J. A. Heitmann, S. S. Kelley, M. W. Kelly, A. G. Kirkman, M. J. Kocurek, R. A. Venditti; *Research Professors:* R. L. Lemaster; *Adjunct Professors:* L. L. Edwards, R. B. Phillips; *Emeritus Professors:* H. Chang, E. B. Cowling, E. L. Deal, E. L. Ellwood, I. S. Goldstein, C. Hart, L. G. Jahn, H. G. Olf, R. G. Pearson, R. J. Thomas, E. A. Wheeler; *Associate Professors:* L. A. Lucia, P. H. Mitchell, J. J. Pawlak, P. N. Peralta, I. M. Peszlen, O. J. Rojas, E. O. Sills, D. C. Tilotta; *Adjunct Associate Professors:* P. W. Hart; *Assistant Professors:* S. Dasmohapatra, S. Park, D. E. Saloni; *Teaching Associate Professors:* S. D. Jackson; *Teaching Assistant Professors:* M. V. Byrd

Course offerings and research facilities are available in the following areas: wood chemistry, biopolymer chemistry, bio-materials, bio-energy, pulping chemistry, process analysis, polymer chemistry, paper physics, paper recycling, wood physics (especially wood liquid relations), wood anatomy, wood biology, wood mechanics and engineering, wood machining, manufacturing processes, wood-based industry economics and marketing, and forest-based life cycle analysis.

**Admission Requirements:** Requirements listed here are in addition to graduate school requirements stated elsewhere. To be admitted, a student should have earned a B.S. degree with a major in wood and paper science or another suitable science or engineering degree. Students with a 3.0 GPA and with appropriate course backgrounds will be considered for admission. The GRE test scores are required except for the Master's of Wood and Paper Science offered through Distance Education.

**Master of Science Degree Requirements:** The M.S. degree requires a minimum of 30 credit hours. In addition, there are WPS core course requirements, which vary depending on the field of study. Six hours of research (WPS 695) must be taken. Two hours of Seminar (WPS 591) must be passed. A qualifying exam must be passed.

Master of Wood and Paper Science Degree Requirements: The Master of Wood and Paper Science is a

non-thesis, professional degree for students not interested in research. The Master of Wood and Paper Science Degree is offered both on campus and through Distance Education. For the on-campus program a minimum of 36 course credits is required. The regulations regarding credits are the same as for the M.S. degree except that no credit for WPS 695 is required or given and up to six credits of 400-level courses in the major field may be included. A technical report, which demonstrates the student's ability to gather, analyze and report information is required.

In addition to Graduate School requirements, the Distance Education program requires that the student be employed professionally in a wood or paper science or allied field, have one year of professional experience, and take required WPS core courses, which vary depending on the field of study. A minimum of 30 course credits is required of students who have relevant professional experience, including one hour of Seminar (WPS 591) and an independent project (WPS 625). For distance students without relevant professional experience, 36 hours is required.

**Doctoral Degree Requirements:** In addition to Graduate School requirements, Ph.D. candidates must present two departmental seminars (WPS 791) before their final oral examination which will be arranged. Candidates must also write and defend a research proposal on their intended research (first proposition) and a research proposal on an area outside of their dissertation/thesis research (termed a second proposition) and pass qualifying exams.

Student Financial Support: A number of research assistantships and fellowships are available.

**Other Relevant Information:** Graduate students should select a chairman and other advisory committee members and submit a plan of graduate work by the end of their first semester of residence. They are also required to take the qualifying examination(s) after one semester of residence. These examinations are to ensure that the student has the basic abilities to think independently as a scientist within the context of the forest biomaterials literature. The department believes M.S. and Ph.D. students should select a research topic and begin their dissertation or thesis research as early as possible.

As the field of wood and paper science is a derived science, students are urged to develop a strong secondary area of excellence in one or more of the supporting disciplines such as organic chemistry, polymer chemistry, chemical engineering, mathematics, statistics, biology, engineering mechanics, mechanical engineering, physics, and economics or business administration.

Click on Graduate Courses for current course information.

# Zoology

#### **Degrees Offered:**

Program Title	Ph.D.	Ed.D.	M.S.	M.A.	Master of	M.Ed.	MFA
Zoology	Y		Y		Y		

#### **GRADUATE FACULTY**

#### D. Shea, Interim Department Head

#### Director of Graduate Programs:

H. V. Daniels, Box 7617, 919/515-4589, harry daniels@ncsu.edu, Zoology

# *William Neal Reynolds Distinguished Professor of Genetics:* T. F. MacKay *William Neal Reynolds Professor:* R. R. Anholt, C. V. Sullivan

Professors: B. L. Black, R. J. Borski, H. V. Daniels, D. B. Eggleston, J. F. Gilliam, W. C. Grant, R. M.
Grossfeld, H. F. Heatwole, E. J. Jones, R. A. Lancia, T. M. Losordo, J. M. Miller, K. H. Pollock, J. A. Rice, H.
A. Underwood, T. G. Wolcott; USDI Professors: J. A. Collazo, J. E. Hightower, T. J. Kwak, T. R. Simons;
Adjunct Professors: J. G. Boreman, L. B. Crowder, J. J. Govoni, L. E. Gray, D. E. Hoss, P. H. Kelley, J.
Rogers; Emeritus Professors: G. T. Barthalmus, P. T. Bromley, B. J. Copeland, F. T. Corbin, P. D. Doerr, T.
L. Grove, C. F. Lytle, G. C. Miller, R. L. Noble, R. A. Powell, T. L. Quay, J. F. Roberts, D. E. Smith, J. G.
Vandenbergh; Associate Professors: J. A. Buckel, W. G. Cope, J. R. Godwin, K. Gross, N. M. Haddad, J.
M. Hinshaw, M. Niedzlek-Feaver; Adjunct Associate Professors: W. J. Fleming, R. M. Shelley, H. W.
VanDerVeer, M. P. Voiland; Assistant Professors: D. D. Aday, R. R. Dunn, H. B. Patisaul; Adjunct
Assistant Professors: E. M. Bennett, A. E. Bogan, D. R. Chalcraft, D. T. Cobb, L. B. Daniel, R. J. Heise, R.
W. Laney, A. J. McKerrow, K. W. Shertzer, W. C. Starnes, B. L. Stuart; Teaching Associate Professors: L.
D. Parks; Teaching Assistant Professors: J. L. Campbell, M. D. Engell, M. G. Ferzli, A. P. Flick, B. J. Grubb, M. B. Hawkins, J. L. Lubischer

Areas of study include: cell biology and physiology, ecology, behavior, and fisheries and wildlife biology. Specializations within these areas include developmental biology, neurobiology, genomics, invertebrate biology, animal reproduction, biorhythms, behavioral ecology, community ecology, population ecology, conservation biology, fisheries ecology, wildlife field studies, aquaculture and others.

**Application Deadlines:** To guarantee consideration for funding, applications should be complete by the following dates: for Fall Semester admission both U.S. and international applicants should have their application materials completed by March 1; for Spring Semester the deadline is July 15 for U.S. applicants and international applicants. Please note that it typically requires four to six weeks from the date of your request until transcripts, letters of recommendation, and GRE scores reach us. Applications received after the dates listed above will still be considered until the Graduate School deadlines (June 25 and November 25 for U.S. applicants, March 1 and July 15 for international applicants), however, opportunities for funding may be limited (note that the Biology Department does

not accept M.S. and Ph.D. students without support).

Admission Requirements: GRE scores (general) are required for admission. M.S. students are expected to have a GRE score of at least 1000, calculated as the Verbal score plus the Quantitative score. Ph.D. students are expected to have a GRE score of at least 1200. Regular admission for a Master's degree requires an undergraduate grade point average of 3.0 in an appropriate biological discipline; an undergraduate GPA of at least 3.2 is expected for Ph.D. students. Some research experience is highly recommended.

**Master's Degree Requirements:** *M.S.:* No more than six hours of temporary courses (ZO 624, ZO 824) or two hours of departmental seminar can be included in the 30-hour requirement for the M.S. Six hours of research credits (ZO 695) resulting in a thesis are required. A minor (usually 9-10 hours) is optional. *Master of Zoology:* Of the 36 credit hours required, 20 must be regular courses at the 500-800 level, and four to six must be special problems (ZO 631). Other requirements may be imposed by the advisor.

**Doctoral Degree Requirements:** A student's advisory committee recommends appropriate courses which will provide a strong foundation in the student's area of interest. A minimum of 10 hours of research (ZO 895) leading to a dissertation is required. A minor (usually 9-10 hours) is optional.

**Student Financial Support:** Graduate teaching and research assistantships are available to wellqualified M.S. and Ph.D. students.

**Other Relevant Information:** Students may also pursue degrees in interdepartmental programs in Biomathematics, Physiology, and Fisheries and Wildlife Sciences. Excellent research facilities, equipment and computers are available. Off-campus research is conducted at the Pamlico Aquaculture Field Laboratory, research and extension centers in Eastern and Western North Carolina, the Center for Marine Science and Technology in Morehead City, and at facilities of state and federal agencies and private organizations. Field work can be conducted at nearby natural areas and laboratory work at various state and federal laboratories associated with the department. For additional information see the Biology Department web page: <a href="https://www.harvest.cals.ncsu.edu/biology">www.harvest.cals.ncsu.edu/biology</a>.

Click on Graduate Courses for current course information.

### **Artificial Intelligence (Minor Program)**

#### **GRADUATE FACULTY**

Professors: J. Doyle, R. C. Luo, W. J. Rasdorf, R. D. Rodman, H. E. Schaffer, M. White; AssociateProfessors: D. R. Bahler, J. Lester, H. D. Levin, E. T. Sanii, M. Singh, R. St. Amant; Assistant Professors: C.Healey, P. Wurman, R. M. Young; Lecturer: J. C. Sutton III

Artificial intelligence is the branch of computer science concerned with designing computer systems that exhibit characteristics normally associated with intelligence in human behavior, such as understanding language, learning, reasoning, and solving problems. At NC State, artificial intelligence is an interdisciplinary field, with faculty from several departments engaged in fundamental research and applications.

The university offers courses of study leading to a minor in artificial intelligence as part of the M.S. and Ph.D. degrees. This option is available to all graduate students except those in computer science, who can choose artificial intelligence as an interest area.

To fulfill the academic requirements for a minor in artificial intelligence, each master's student must successfully complete at least three, and each doctoral student at least six, of the courses in the artificial intelligence curriculum. Two of the courses must be CSC 520, Artificial Intelligence I and CSC 720, Artificial Intelligence II. Other courses offered as part of the artificial intelligence curriculum include: CSC 523 Computational Linguistics; CSC 723 Computational Semantics; ECE 763 Computer Vision; CSC(IE) 556 Voice Input/Output Communication Systems; CSC(IE) 756 Advances in Voice Input/Output Communication Systems; CSC(IE) 756 Advances are offered covering subjects such as knowledge engineering, fuzzy reasoning, knowledge representation, neural networks, machine learning, artificial intelligence applications to CAD, and artificial intelligence in manufacturing.

Graduate students in computer science who select artificial intelligence as an interest area are subject to the same academic requirements that define other interest areas within computer science.

### **Biotechnology (Minor Program)**

Professor R. M. Kelly, Director Box 7512 919.515.4230 919.515.4231 (fax) Email: biotech@ncsu.edu

Dr. Sue Carson, Academic Coordinator 919.513.0330 Email: sue\_carson@ncsu.edu Home page: http://www.ncsu.edu/biotechnology/

The Biotechnology Program includes faculty from at least twenty departments in the Colleges of Agriculture and Life Sciences, Engineering, Natural Resources, Physical and Mathematical Sciences, and Veterinary Medicine. Graduate study leading to either an M.S. minor or a Ph.D. minor in biotechnology may be taken by students who reside and conduct their research in one of the participating departments. To obtain a minor in biotechnology, the student must successfully complete at least six credit hours in the laboratory core courses selected from the list below and must conduct graduate thesis research in an area of biotechnology.

Research in biotechnology is focused in three main areas: recombinant DNA technology, bioprocessing/bioanalytical techniques, and *in vitro* culture techniques. The multidisciplinary nature of biotechnology means that a wide range of research topics and techniques are applicable, such as molecular genetics and associated research in molecular biology, fermentation and protein purification, cell culture techniques, and microarray technology.

See the biotechnology home page for a current listing of faculty.

#### **GRADUATE COURSES**

BIT 501 Ethical Issues in Biotechnology BIT 510 Core Technologies in Molecular and Cellular Biology BIT 562 Gene Expression: Microarrays BIT(CHE) 563 Fermentation of Recombinant Microorganisms BIT 564 Protein Purification BIT 565 Real-time PCR Techniques BIT 665 Real-time PCR Techniques BIT 567 PCR and DNA Fingerprinting BIT 568 Genome Mapping BIT 568 Genome Mapping BIT 569 RNA Purification and Analysis BIT 570 Advanced Animal Cell Culture: Bioreactor Culture BIT 571 RNA Interference and Model Organisms BIT(PB) 581 Plant Tissue Culture and Transformation BIT 595 Special Topics BIT 815 Advanced Special Topics

### **Cognitive Science (Minor Program)**

Dr. Ronald P. Endicott, Program Director Department of Philosophy and Religion NCSU Box 8103 Phone: (919) 515-6195 Email: <u>ron\_endicott@ncsu.edu</u>

Cognitive Science is an area of interdisciplinary research that seeks to understand the nature, processes, and evolution of mind. The Cognitive Science Program is administered by the Department of Philosophy and Religion and supported by a strong faculty drawn from the fields of Psychology, Neurobiology, Computer Science, Linguistics, and Philosophy. The program thus fosters development of ideas and theories within the disciplines of Cognitive Science, for example, theories of rational agency, logical reasoning, cognitive processing, computational psychology, artificial intelligence, neurobiology, and the evolution of cognitive systems.

**Requirements:** Graduate students who minor in Cognitive Science must complete a minimum of nine hours of courses (or more as determined by the student's committee), with a grade of B or better, distributed as follows.

One core courses (3 hrs):

PHI/PSY 525 Introduction to Cognitive Science

Two additional courses (6 hrs) outside the degree-granting program from the following:

PSY 500 Visual Perception PSY 502 Physiological Psychology PSY 508 Cognitive Processes PHI 540 The Scientific Method CSC 520 Artificial Intelligence I CSC 522 Automated Learning and Data Analysis CSC 523 Computational Linguistics CSC 707 Automata, Languages and Computability Theory CSC 720 Artificial Intelligence II ENG 524 Introduction to Linguistics ENG 584 Studies in Linguistics ZO 588 Neurobiology

Any student who has previously completed the equivalent of the above core course for credit toward another degree (e.g., PHI/PSY 425 as an undergraduate) is required to complete an additional course (3 hours) from the above list.

Up to three credits of equivalent graduate course work may be accepted in the place of one course on the list above, subject to the approval of the Director for the Cognitive Science Program.

### **Computational Engineering and Sciences (Minor Program)**

#### **GRADUATE FACULTY**

Professor P. J. Turinsky, Program Coordinator

Camille Dreyfus Professor: C. K. Hall Graduate Alumni Distinguished Professor: G. E. Mitchell University Professor and Drexel Professor: H. T. Banks

**Professors:** W. E. Alexander, J. W. Baugh, J. Bernholc, D. W. Brenner, T. M. Conte, S. R. Cotanch, J. E. Franke, , E. F. Gehringer, C. Kleinstreuer, C. R. Ji, D. F. McAllister, D. S. McRae, T. K. Miller III, J. F. Monahan, H. G. Perros, R. O. Scattergood, W. J. Stewart, M. A. Vouk, M. H. Whangbo, R. E. White, J. L. Whitten; **Associate Professors:** J. M. Doster, G. Mahinthakumar

The Computational Engineering and Sciences Program includes faculty from twelve departments in the College of Engineering and College of Physical and Mathematical Sciences. Graduate students pursuing graduate study toward a master's or Ph.D. degree in one of the participating science or engineering departments may elect this program in place of the traditional minor. [Note that students wishing to earn a graduate degree in mathematics or computer science should reference these departments' sections of the Graduate Catalog for details on options available in computational mathematics and scientific computing.] To complete the program requirements, a student must successfully complete a sequence of graduate-level applied mathematics and computer science courses and, if a research dissertation is required, utilize advanced computational techniques in the course of conducting the research.

The Computational Engineering and Sciences Program is designed to efficiently prepare graduate students to undertake research utilizing scientific computing by combining course work in applied mathematics and computer science in addition to course work in the traditional major. The program recognizes that a new area of scientific pursuit, numerical simulation, has emerged as a new paradigm for scientific inquiry complementing theory and laboratory experiment. Typical areas of research include, but are not limited to, computational fluid dynamics, quantum chemistry and atmospheric modeling. Admission to the program is gained after enrollment in the Graduate School and the graduate program is underway. Program course requirements are selected from applied mathematics and computer science courses listed elsewhere in this Graduate Catalog. Typical courses that may be selected to satisfy this program's requirements include advanced calculus, numerical analysis, numerical linear algebra for parallel architectures, stochastic simulation, computer operating systems, digital systems architecture, computer graphics, compiler construction, software engineering, and design and analysis of algorithms.

### **Ecology (Minor Program)**

#### **GRADUATE FACULTY**

Stephen W. Broome, Coordinator NCSU Box 7619 Phone: 919.513.2555 Fax: 919.515.2167 E-mail: stephen broome@ncsu.edu

Ecology is the science concerned with the interactions of organisms with each other and with their environment. It is an integrative science through which one gains an understanding of biological and physical interrelationships and predicts the consequences of altering one or several components. Students in a number of basic and applied curricula may elect to minor in ecology at the M. S. and Ph.D. levels. The minor provides an opportunity for a broad overview of the science of ecology.

The ecology minor is an interdepartmental program drawing faculty from the Departments of Botany, Crop Science, Entomology, Forestry, Marine, Earth and Atmospheric Sciences, Parks, Recreation and Tourism Management, Plant Pathology, Soil Science, Statistics, and Zoology. The Ecology Advisory Committee administers the program.

#### **Requirements for a Minor in Ecology**

A graduate student's advisory committee must include one member of the Ecology Advisory Committee from a department other than that of the chairman of the student's committee.

**M.S. minor:** at least one course must be selected from the list of Ecology Core Courses, at least two additional courses selected from the list of Approved Ecology Courses or the Core Courses, and Ecology seminar (ECO 601), totaling a minimum of 9 semester hours. Courses selected form the list of Approved Ecology Courses must be from outside the student's major discipline.

**Ph.D. minor:** at least one course must be selected from the list of Ecology Core Courses, at least three additional courses selected from the list of Approved Ecology Courses or the Core Courses, and Ecology seminar (ECO 601), totaling a minimum of 12 semester hours. Courses selected form the list of Approved Ecology Courses must be from outside the student's major discipline. No courses used to meet the Ecology minor requirements for the M.S. degree may be used to meet the Ph.D. minor requirements.

#### **GRADUATE COURSES**

ECO 601 Seminar ECO 620 Special Problems

### Environmental Remote Sensing and Image Analysis (Minor Program)

Dr. Siamak Khorram Box 7106, (919) 515-2868 khorram@ncsu.edu

This graduate minor provides graduate students the opportunity to develop a recognized academic credential in remote sensing and image analysis in conjunction with their major program of graduate study. A minimum of 12 credit hours, 6 credit hours of required courses and 6 credit hours of elective courses, is required to complete the minor. Students can select coursework from the following list.

#### **GRADUATE COURSES**

#### **REQUIRED COURSES (6 credit hours)**

FOR 753 Environmental Remote Sensing ECE 759 Pattern Recognition, **OR** ST 733 Applied Spatial Statistics

#### **ELECTIVES (6 credit hours)**

ECE 751 Detection and Estimation Theory ECE 758 Digital Image Processing FOR 510 Introduction to GPS FOR 554 Principles of Spatial Analysis NR 531 Introduction to Geographic Information Science NR 532 Principles of Geographic Information Science NR 533 Application Issues in Geographic Information Systems ST 733 Applied Spatial Statistics

### Food Safety (Minor Program)

#### **GRADUATE FACULTY**

Professor Lee-Ann Jaykus, Director

**Professors:** B. P. Alston-Mills, K. Anderson, S. M. Blankenship, M. A. Drake, S. A. Hale, H. M. Hassan, T. J. Hoban, T. G. Isleib, L. Jaykus, S. Kathariou, T. R. Klaenhammer, J. Levine, G. Luginbuhl, W. E. M. Morrow, J. Riviere, D. Shea, C. E. Sorenson, D. R. Ward; **Associate Professors:** R. E. Baynes, M. Correa, P. Cowen, J. W. Olson

The primary objective of the Food Safety Minor is to prepare science professionals with the depth and breadth of training necessary to understand and to control food safety challenges. The interdisciplinary minor includes departments in the Colleges of Agriculture and Life Sciences and Veterinary Medicine with the occasional participation of other NCSU colleges. Participating graduate students are required to have, or to develop during the early part of their training, appropriate knowledge in the basic scientific disciplines of chemistry, biochemistry and microbiology. Further, it is highly desirable that formal course training in genetics and statistics be part of each student's academic program. Students in a master's program are required to have 10 credits from the core courses to earn the food safety minor. Students in a doctoral program are required to have, as a minimum, 10 credits from the core courses.

#### **CORE COURSES**

FSA 520 Pre-harvest Food Safety FSA(FS) 530 Post-harvest Food Safety FSA(FS) 540 Food Safety and Public Health FSA(FS) 580 Professional Development and Ethics in Food Safety

#### Geographic Information Systems (Certificate Program/Minor Program)

Dr. Hugh A. Devine, Coordinator NCSU Box 7106 Phone: (919) 515-3682 Email: hugh devine@ncsu.edu

#### **GRADUATE FACULTY**

Professors: H. A. Devine, G. D. Garson, M. L. Gumpertz, J. E. Hummer, S. Khorram, J. E. Parsons, W. J. Rasdorf, A. R. Rice, J. A. Rice, W. E. Snyder, A. B. Stein, H. J. Trussell; Associate Professors: M. L. Alibrandi, H. Cheshire, D. A. Crouse, M. Fuentes, C. G. Healey, R. W. Heiniger, G. R. Hess, M. M. Kimberley, H. Krim, J. F. Levine, S. C. Lilley, M. F. Overton, S. R. Raval, G. T. Roberson, W. R. Smith, R. A. St. Amant, J. R. Stone, M. L. Vasu; Research Associate Professor: P. K. Baran; H. S. Stubbs; Visiting Associate Professor: M. G. Genton; Adjunct Associate Professors: M. R. Loomis, H. Mitasova; Assistant Professors: L. A. Annetta, B. Bullock, M. G. Burton, Y.-F. Leung, S. A. C. Nelson, J. G. White, S. B. Wiley; Adjunct Assistant Professor: J. Fels

Geographic Information Systems (GIS) is the study of spatial distributions and relationships through the analysis and display of spatial data. The objectives of the GIS minor and certificate programs include an internationally recognized graduate GIS instruction program, addressing the high demand for professional GIS analysts and providing a focus for expanding the university's GIS research program. Currently, approximately 30 NC State graduate departments are active in varying applications of spatial analysis within their respective fields.

**GIS Graduate Certificate Program.** The certificate program consists of a minimum of 15 credit hours. Students entering the program will be expected to have a working knowledge of GIS software. The certificate program is open to both degree seeking and non-degree seeking students at the graduate level.

**Prerequisite:** An introductory course in GIS (e.g. PRT 462, PA 541 or equivalent) or demonstrated ability to use GIS software.

#### Core (7 credits):

NR 532 (3) Principles of Geographic Information Science NR 533 (3) Application Issues in Geographic Information Systems FOR 510 (1) Introduction to GPS

#### Electives (8 credits):

BUS 545 (3) Management Support Systems CE 538 (3) Information Technology and Modeling ECE 759 (3) Pattern Recognition ECE 763 (3) Computer Vision ECE 764 (3) Digital Image Processing FOR 554 (3) Principles of Spatial Analysis FOR 753 (3) Environmental Remote Sensing LAR 500 (6) Landscape Design Studio LAR 512 (3) Landscape Resource Management NR 535 (2) Computer Cartography NR 536 (3) Introduction to Visual Basic for GIS PA 541 (3) Geographic Information Systems for Public Administration SSC 535 (3) Precision Agriculture and Technology SSC 545 (3) Remote Sensing Applications in Soil Science and Agriculture ST 733 (3) Spatial Statistics

#### **Other Requirements:**

- Admission to the certificate program requires a grade of B or better *in NR532 and NR533*. After completing these required courses, contact Linda Babcock (515-3430 or L\_Babcock@ncsu.edu) to request admission to the certificate program. You will need to provide a copy of your NCSU transcript.
- Award of a certificate requires a grade of B or better in all of the certificate courses. The GISc Faculty Coordinator will be responsible for certifying the GPA of certificate candidates.

**GIS Graduate Minor Program.** The minor program consists of a minimum of 10 credit hours. Students entering the program will be expected to have a working knowledge of GIS software.

**Prerequisite:** An introductory course in GIS (e.g. PRT 462 or equivalent) or demonstrated ability to use GIS software.

#### **Course Requirements (10 credits):**

NR 532 (3) Principles of Geographic Information Science NR 533 (3)Application Issues in Geographic Information Systems FOR510 (1) Introduction to GPS Electives (3) - see list of electives for Certificate Program

**Other Requirements:** GISc Faculty as a member of the student's graduate committee. If no graduate committee is required by the student's program, the student must obtain approval of his or her minor program from the GISc Faculty Coordinator.
# **Interdisciplinary Minor**

The interdisciplinary minor requires two or more areas of coursework to be represented with a faculty member representing one of the areas of coursework.

# Life Science Ethics (Minor Program)

Dr. David Auerbach, Director Philosophy Department: 919.515.6331 Email: <u>auerbach@unity.ncsu.edu</u>

## **Primary Objectives:**

- to guide graduate students in careful discussion of ethical issues in the life sciences, especially those faced by life scientists in research;
- to provide graduate students with the conceptual tools and principles needed to recognize and respond to ethical challenges in the life sciences;
- to provide graduate students in the life sciences and related areas with an opportunity to enrich scientific training with an understanding of the history and theory of ethics.

Academic Requirements: Graduate students participating in the life science ethics minor must earn at least one credit in a Responsible Conduct of Research (RCR) training course. At the present time, several RCR courses are offered on campus by departments with graduate degree programs. These include: Ethics & Professional Practice in Public Administration (PA 510); Professionalism & Ethics (GN 820E); Professional Ethics and Conduct of Science (CBS 662); Special Topics: Graduate Research Ethics (CHE 596D); Ethics and Jurisprudence (VMC 915).

Students in these degree programs may take an RCR course offered by faculty in the department that grants their degree. Students from any graduate degree program may choose instead to fulfill the RCR requirement for the minor with Introduction to Research Ethics (PHI 816).

In addition to the RCR requirement, students must also complete the following nine graduate credits in philosophy with a grade of B- or better: Life-Science Ethics (PHI 515); Philosophical Issues in Environmental Ethics (PHI 522); The Scientific Method (PHI 540).

**Application to Minor Program:** Prospective students must apply to and meet all admission requirements of a graduate degree program (and be members in good standing of that program), and must declare their intention to minor by completing a form available in the <u>Department of Philosophy</u> and <u>Religion</u>.

# Plant Physiology (Minor Program)

## **GRADUATE FACULTY**

Professor T. W. Rufty Jr., Coordinator NCSU Box 7620 919.515.3660

Professors: N.S. Allen, S.M. Blankenship, W.F. Boss, R.S. Boston, S.D. Clouse, R.E. Dewey, J. Huang, M.M. Peet, T.G. Ranney, D Robertson; E.C. Sisler, S.L. Spiker, W.F. Thompson, R.Wells; Professors (USDA): E.L. Fiscus, D.W. Israel; Associate Professors: H.V. Amerson, D.C. Bowman, J.D. Burton, R. Whetten; Associate Professors (USDA): K.O. Burkey, D.P. Livingston; Research Associate Professor: J.D. Williamson

The plant physiology program is an interdepartmental offering. Although not a formal degree program, students may elect to major or minor in the plant physiology program at both the M.S. and Ph.D. levels. Students entering the program should have appropriate knowledge in plant biology, biochemistry, mathematics and physics. Some formal training in genetics and statistics is normally expected.

When majoring in plant physiology, students will be closely affiliated with the same department as their major professor. As such, they will be required to meet respective departmental requirements for teaching, written and oral examinations, and seminar attendance. Departments currently participating in this program are: Biochemistry, Botany, Crop Science, Forestry, Genetics, Horticultural Science, Plant Pathology, and Soil Science. The chair or co-chair of the student's advisory committee must be a member of the Plant Physiology Faculty.

The purpose of the plant physiology curriculum is to ensure that students obtain substantive understanding of the physiological processes controlling plant behavior. The course requirements for graduate students are set by each graduate committee. Advanced knowledge is expected in biochemistry, plant physiology, plant structure and function, and molecular biology.

The program is administered by the Plant Physiology Executive Committee. Additional information about the program may be obtained by writing to one of the listed faculty members or to the coordinator.

# Plant Physiology (Minor Program)

## **GRADUATE FACULTY**

Professor T. W. Rufty Jr., Coordinator NCSU Box 7620 919.515.3660

Professors: N.S. Allen, S.M. Blankenship, W.F. Boss, R.S. Boston, S.D. Clouse, R.E. Dewey, J. Huang, M.M. Peet, T.G. Ranney, D Robertson; E.C. Sisler, S.L. Spiker, W.F. Thompson, R.Wells; Professors (USDA): E.L. Fiscus, D.W. Israel; Associate Professors: H.V. Amerson, D.C. Bowman, J.D. Burton, R. Whetten; Associate Professors (USDA): K.O. Burkey, D.P. Livingston; Research Associate Professor: J.D. Williamson

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The purpose of the plant physiology curriculum is to ensure that students obtain substantive understanding of the physiological processes controlling plant behavior. The course requirements for graduate students are set by each graduate committee. Advanced knowledge is expected in biochemistry, plant physiology, plant structure and function, and molecular biology.

The program is administered by the Plant Physiology Executive Committee. Additional information about the program may be obtained by writing to one of the listed faculty members or to the coordinator.

## Solid State Sciences (Minor Program)

#### **GRADUATE FACULTY**

University Professor G. Lucovsky, Chair

Professors: D. E. Aspnes, K. J. Bachmann, S. M. Bedair, J. Bernholc, R. F. Davis, R. E. Fornes, J. R. Hauser, J. J. Hren, M. A. Littlejohn, R. M. Kolbas, J. Narayan, R. J. Nemanich, M. A. Paesler, G. Rozgonyi, P. E. Russell, J. F. Schetzina, A. F. Schreiner, E. O. Stejskal, M. H. Whangbo, J. J. Wortman

The university offers courses of study leading to a minor in solid state sciences as part of the M.S. and the Ph.D. degrees. This option is available to all graduate students pursuing research in the broad area of solid state science and requires that a member of the solid state sciences faculty serve on the student's research committee.

Solid state sciences is an interdisciplinary area of research that applies and extends concepts from the traditional academic disciplines of chemistry, electrical and computer engineering, materials science and engineering, and physics to basic and applied problems with a primary focus on solid state materials. At NC State, there are a significant number of such research programs that involve faculty and students in more than one of the academic departments listed above. This minor program can be customized to provide a course complement for these ongoing programs, as well as for any additional solid state materials research programs as they are initiated, developed and implemented.

To fulfill the academic requirements for a minor in solid state sciences, each master's student must successfully complete at least three, and each doctoral student, four of the courses in the solid states sciences curriculum. A partial listing of courses in this program includes: CH 701, 703 Advanced Inorganic Chemistry I, II; CH 731 Chemical Thermodynamics; CH 733 Chemical Kinetics; CH 737 Quantum Chemistry; ECE 730 Physical Electronics; ECE 739 Integrated Circuit Technology and Fabrication; ECE 723 Optical Properties of Semiconductors; ECE 724 Electronic Properties of Solid State Devices; ECE (PY) 727 Semiconductor Thin Films Technology; MAT 712 Scanning Electron Microscopy; MAT 715 Fundamentals of Transmission Electron Microscopy; MAT 560 Materials Science and Processing of Semiconductor Devices; MAT 795 Advanced Materials Experiments; MAT 722 Advanced Scanning Electron Microscopy and Surface Analysis; MAT 770 Defects, Diffusion and Ion Implantation in Semiconductors; MAT 792 Advanced Topics in Materials Science and Engineering; PY (ECE) 552 Introduction to the Structure of Solids. In addition, other courses (for example, special topics courses in any one of the participating departments) may also be substituted into an individual student's designated solid state sciences minor program at the discretion of his/her committee.

## Water Resources (Minor Program)

J. D. Gregory, Chair NCSU Box 8008 919.515;7567 E-mail: jim\_gregory@ncsu.edu

## WATER RESOURCES COMMITTEE

D. J. Phaneuf (Agricultural and Resource Economics), J. M. Burkholder (Botany), M. R. Overcash (Chemical Engineering), R. C. Borden (Civil Engineering), J. B. Weber (Crop Science), R. B. Palmquist (Economics), F. P. Hain (Entomology), W. G. Cope (Environmental and Molecular Toxicology), K. M. Keener (Food Science), A. B. Stein (Landscape Architecture), D. Genereux (Marine, Earth and Atmospheric Sciences), J. W. Gilliam (Soil Science), C. B. Smith (Textile Engineering, Chemistry and Science), J. F. Gilliam (Zoology)

The interdisciplinary, interdepartmental graduate minor in water resources is designed for students majoring in the many disciplines of natural resources, science, engineering, technology, and social sciences that are relevant to water resources. The minor exposes students to water resources courses and faculty members outside their major fields of study.

A graduate student may enroll in the water resources minor by including it on the plan of graduate work and sending that plan of work to J. D. Gregory for review. A graduate faculty member from outside the student's major department or program must be appointed to serve as the minor representative on his/her advisory committee. The minor representative may be a member of the Water Resources Committee or another faculty member from a department represented on the Water Resources Committee who is active in teaching/research related to water resources.

**Master's Degree:** Minimum course requirements for the minor are three courses (minimum of eight credit hours) from water resources areas outside the student's major field of study approved by the student's minor representative.

**Doctor of Philosophy Degree:** Minimum course requirements for the minor are three courses (minimum of eight credit hours) from water resources areas outside the student's major field of study approved by the student's minor representative. These courses shall be in addition to those previously taken at the Master's level when that degree included a Water Resources Minor.

A course in the legal, institutional, or economic aspects of water resources is recommended for each minor program. Suggested courses are listed below; other appropriate courses may be included in the minor. Contact J. D. Gregory for additional information.

#### WATER RESOURCES COURSES

Legal, Institutional and Economic Aspects of Water Resources EC(ARE) 436 Environmental Economics ECG 515 Environmental and Resource Policy ET 450 Environmental Regulation FOR 460 Renewable Resource Policy and Management NR 571 Current Issues in Natural Resource Policy PA 550 Environmental Policy

#### **Planning of Water Resources and Related Systems**

ET 460 Practice of Environmental Technology NR 484 Environmental Impact Assessment. LAR 430 Site Planning LAR 512 Landscape Resource Management

#### **Municipal and Industrial Water Management**

CE 484 Water Supply and Waste Water Systems CE 571 Physical Principles of Environmental Engineering CE 574 Chemical Principles of Environmental Engineering CHE 575 Advances in Pollution Prevention: Environmental Management TAM(PCC) 401 Environmental Aspects of the Textile Industry WPS 725 Pollution Abatement in Forest Products Industries WPS 750 Wastewater Treatment in the Paper Industry

#### **Agricultural and Forest Water Management**

BAE 471 Land Resources Enviromental Engineering BAE 472/572 Irrigation and Drainage BAE(CE) 578 Agricultural Waste Management CS(HS,SSC,TOX) 725 Pesticide Chemistry CS(HS,SSC,TOX) 727 Pesticide Behavior and Fate in the Environment SSC 461 Soil Physical Properties and Plant Growth SSC 511 Soil Physics SSC 562 Environmental Applications of Soil Science

#### **Biological and Ecological Aspects of Water Resources**

BO(ZO) 760 Principles of Ecology BO(MB) 774 Phycology FW(ZO) 420 Fishery Science FW(ZO) 586 Aquaculture I FW(ZO) 587 Aquaculture I Laboratory MEA(ZO) 549 Principles of Biological Oceanography ZO 441 Biology of Fishes ZO 519 Limnology ZO 789 Advanced Limnology

#### Hydrologic, Meteorologic, Oceanographic, and Water Quality Aspects of Water Resources

BAE 473 Introduction to Surface/Water Quality Modeling
BAE 502 Instrumentation for Hydrologic Applications
BAE 570 Soil Water Movement
BAE(SSC) 573 Hydrologic and Water Quality Modeling.
BAE 575 Design of Structural Stormwater BestManagement Practices.
BAE 576 Watershed Monitoring and Assessment.
BAE 577 Introduction to the Total Maximum Daily Load Program.
BAE 579 StreamChannel Assessment and Rstoration
BAE(SSC) 771 Theory of Drainage-Saturated Flow
BAE(SSC) 774 Theory of Drainage-Unsaturated Flow
CE 583 Engineering Aspects of Coastal Processes
CE 584 Hydraulics of Ground Water
CE 586 Engineering Hydrology

CE 607 Water Resource and Environmental Engineering Seminar

FOR(NR) 420/520 Watershed and Wetlands Hydrology

- MEA 455 Micrometeorology
- MEA 481 Principles of Geomorphology
- MEA 540 Principles of Physical Oceanography
- MEA 560 Chemical Oceanography
- MEA 585 Hydrogeology
- MEA 706 Meteorology of the Biosphere
- MEA 760 Biogeochemistry
- MEA 785 Chemical Hydrogeology
- SSC(BAE) 780 Transport and Fate of Chemicals in Soils and Natural Waters

#### Wetlands

NR 521 Wetland Assessment, Delineation, and Regulation SSC 570 Wetland Soils

## Women's and Gender Studies (Minor Program)

## **GRADUATE FACULTY**

#### Dr. C. M. Pierce, Director

Professors: N. S. Allen, M. A. Atkinson, V. J. Gallagher, C. Gross, A. G. Halberstadt, A. H. Harrison, K. A. Henderson, K. Luria, M. E. Orr, J. T. Pennell, C. M. Pierce, M. T. Pramaggiore, M. Scotford, L. R. Severin, E. D. Sylla, M. A. Witt, M. A. Zahn; *Associate Professors:* L. E. Baker-Ward, B. Bennett, H. G. Braunbeck, M. T. Correa, M. K. Cunningham, S. Greene, T. N. Greenstein, N. Haenn, A. F. Khater, M. G. Kim, D. Laryea, M. M. Magill, L. S. May, L. A. Mykyta, E. O'Sullivan, M. L. Schwalbe, S. M. Setzer, S. L. Spencer, S. R. Stein, M. S. Thompson, C. A. Warren, S. T. Warren, M. Wyer; *Assistant Professors:* K. Albada, A. Bolonyai, R. S. Ellovich, K. A. Harwood, D. A. Hooker, B. Kelley, J. L. Lubischer, M. G. Orgeron

The minor provides graduate students in the humanities, social sciences and sciences with the theories and the methodologies to study women and gender relations. The minor is intended to support and further students' research in their own field. Nine hours of graduate credit are required. No more than three hours of course work may overlap between the major department coursework requirement and the WGS minor. Students may choose from the courses listed below and/or a list of approved special topics courses.

## **GRADUATE COURSES**

ANT 544 Cross-cultural Perspectives on Women VPH 555 Public Health, Sustainable Development and Gender in Global Context WGS(PSY) 506 Psychology of Gender WGS(ECD) 540 Gender Issues in Counseling WGS(HI) 547 American Women to 1900 WGS(HI) 548 American Women in the 20th Century WGS(REL) 573 Religion, Gender, and Reproductive Technologies WGS 593 Special Topics WGS(SOC) 704 Feminist Thought in the Social Sciences WGS(SOC) 737 Sociology of Gender WGS(SOC) 739 Social Psychology of Inequality ZO 508 Brain, Sex, and Gender

# **Agricultural Education (Certificate)**

Dr. Gary E. Moore Director of Graduate Programs Agricultural and Extension Education NCSU Box 7607 Phone: 919.515.1756 Email: <u>gary moore@ncsu.edu</u>

The Department of Agricultural and Extension Education offers a Certificate in Agricultural Education.

**Requirements:** The certificate program involves completion of 15 credit hours. Students are to choose from AEE 500, 503, 521, 522, 528, 529, 535, 641, and 735.

# **Community College Teaching (Certificate)**

Dr. Pooneh Lari Assistant Professor Department of Adult and Higher Education Email: <u>pooneh lari@ncsu.edu</u> Phone: 919.515.6290

The department of Adult and Higher Education (AHE) within the College of Education at North Carolina State University offers a graduate certificate program in Community College Teaching.

The program focuses on developing the knowledge and skills necessary to design and deliver courserelated content through technology-enhanced learning environments for faculty who teach in community colleges and other post secondary settings or plan on teaching in the near future. The courses developed for the graduate certificate will enhance faculty abilities in both online and classroom environments. The key goal for the online Graduate Certificate Program in Community College Teaching is to provide high quality content and instruction for the systematic development of instructional expertise for community college and other post-secondary faculty.

**Curriculum.** The Graduate Certificate Program in Community College Teaching consists of 15 credit hours of coursework (five courses, three credits each). The sequence of the program is displayed at <a href="http://ced.ncsu.edu/ccteachonline/curriculum.htm">http://ced.ncsu.edu/ccteachonline/curriculum.htm</a>. The courses are listed below.

#### **Required:**

EAC 559 The Adult Learner EAC 538 Instructional Strategies in Adult and Community College Education EAC 580 Designing Instructional Systems in Training and Development EAC 560 Assessment and Evaluation in Adult and Higher Education EAC 539 Teaching in an Online Environment

#### Elective:

EAC 700 Community College and Two-year Postsecondary Education

For more information about the program and for application procedures, please see the <u>CCTeach</u> <u>Online</u> website.

# **Consumer Textile Product Design and Development (Certificate)**

Dr. Cynthia Istook Program Coordinator Textiles and Apparel, Technology and Management Phone: 919.515.6584 Email: <u>cistook@ncsu.edu</u>

The Graduate Certificate in Consumer Textile Product Design and Development (GCCTPDD), offered by the Department of Textile and Apparel, Technology and Management, will provide NC State graduate students the opportunity to develop recognized academic credentials in Consumer Textile Product Design and Development in addition to their major area of graduate study. Also it will offer non-degree graduate-level students the opportunity to develop recognized advanced expertise in Consumer Textile Product Design and Development.

**Applications:** Applicants must submit a Program Application, a resume identifying educational preparation and work experiences, and official transcripts of all undergraduate and graduate course work. Prior to completing the first course after being accepted into the program, students prepare and submit two copies of a contract using the Certificate Contract Application. The contract includes a statement of career goals, a rationale for completing the certificate program, and a timeline for certificate completion. Students can always elect to review their application with the Certificate Coordinator prior to contract preparation.

Academic Requirements: Applicants must meet one of the three following requirements:

- Be a graduate of an accredited four-year college or university, and have a GPA of at least 3.0 on a 4-point scale in their last 60 credit hours of undergraduate study;
- Be a degree student in good standing in an NC State University graduate program;
- Have a Master's degree.

**Program of Study:** The Graduate Certificate in Consumer Textile Product Design and Development requires a minimum of 15 hours, and includes the following courses:

## Core Courses (6 hours)

TTM 573 Management of Textile Product Development (3 hours) TTM 585 Market Research in Textiles (3 hours)

## Advanced Courses (minimum 9 hours)

TTM 515 Apparel Production (3 hours) TTM 517 Advanced Computer-Aided-Design for Fashion (3 hours) TT 570 Textile Digital Design and Technology (3 hours) TT 571 Professional Practices in Textile Design and Technology (3 hours) TTM 510 Apparel Technology Management (3 hours) TTM 632 Independent Study in Consumer Textile Product Design and Development (3 hours)

For more details about the Graduate Certificate in Consumer Textile Product Design and Development, please visit the <u>program website</u>.

# **Counselor Education (Online) (Certificate)**

Dr. Siu-Man "Raymond" Ting, Program Director Associate Professor Department of Curriculum and Instruction NCSU Box 7801 North Carolina State University Raleigh , NC 27695-7801 Phone: 919.515.6362 Email: <u>raymond ting@ncsu.edu</u>

The online graduate certificate program in Counselor education is designed for teachers, administrators, advisors, and tutors in schools and universities; human service professionals; and individuals who are interested in increasing their counseling and communication skills. Graduates of this program may help school counselors by supporting the students and parents or will strengthen communication skills for their work.

The certificate itself does not lead to professional certificates or licenses. However, the course credits may be transferred to future graduate degree programs. Students may also apply to master's programs in counseling and transfer the credits from this program.

**Admission:** Applicants must (1) be a graduate of an undergraduate degree program from an accredited four-year college with a GPA of at least a 3.0 on a 4-point scale in their major or last 60 credit hours of undergraduate study; or have a Master's degree.

Any applicants who do not meet the GPA requirements may be admitted provisionally based on past work experiences as a professional in the field of K-12 education, higher education, human resource development, or training and development and, ultimately, by earning at least a "B" (3.0) average in the first three credit hours of work in the certificate program.

To apply to the program, students submit a Certificate Contract Application, a resume identifying educational preparation and work experiences, and official transcripts of all undergraduate and graduate work (if any). The contract includes a statement of career goals, a rationale for completing the certificate program, and a timeline for certificate completion. When completed, students sign the Contract Application and submit two copies of all materials to the Certificate Coordinator. Students can also elect to review their application with the certificate coordinator prior to contract preparation.

**Requirements:** The Graduate Certificate in Counselor Education requires a minimum of 13 credits of the following courses.

ECD 510 Introduction to Counseling (3 credits) ECD 525 Cross-cultural Counseling (3 credits) ECD 524 Career Counseling and Development (3 credits) ECD 530 Theories and Techniques of Counseling (4 credits)

None of the courses may be taken "for credit only", and no transfer credits from other institutions are allowed for the Certificate.

Students must maintain a minimum overall GPA of B (3.0) in certificate program courses and must complete the requirements within the first four (4) calendar years beginning when the student begins the course work for the certificate. All Certificate students are expected to maintain continuous enrollment every semester (excluding summer sessions) until all course work is completed. Under unusual circumstances, a one-semester leave of absence will be granted if the student is unable to enroll in a course. Written approval from the certificate coordinator must be obtained before the beginning of the semester.

For more information about the program and to download an application, please see the <u>Graduate</u> <u>Certificate in Counselor Education</u> website.

# Design and Analysis of Environmental Systems: Watershed Assessment and Restoration (Certificate)

Dr. John Classen, Coordinator Department of Biological and Agricultural Engineering NCSU Box 7625 Phone: 919.515.6800 Fax: 919.515.7760 Email: gradcert-bae@ncsu.edu

The Department of Biological and Agricultural Engineering offers a Graduate Certificate Program in Design and Analysis of Environmental Systems: Watershed Assessment and Restoration.

## Objectives

- 1. Provide a focus and formal program for students from many disciplines to pursue training in the technical and engineering aspects of designing and analyzing environmental systems with an emphasis on the watershed-scale.
- 2. Provide students the opportunity to develop a solid foundation in engineering systems targeted at environmental issues, particularly related to non-point sources and their impact on water quality at the watershed-scale.
- 3. Provide practicing engineers and other professionals a source of graduate level engineering education in the environmental field.

Admission Requirements: Applicants must have successfully completed an accredited undergraduate engineering program with a GPA of 3.0 (based on a 4.0 scale), or with an overall undergraduate GPA of at least 2.8 coupled with a 3.0 or higher in the undergraduate major, or be currently enrolled in a graduate engineering program. Applicants with a four-year undergraduate science degree who have successfully completed (with a C or better) calculus, differential equations, physics and chemistry will also be considered. A program that includes fluid mechanics or hydraulics is highly recommended. Environmental professionals who do not meet the above criteria may also qualify if appropriate experience can be demonstrated.

**Program Requirements:** A minimum of 12 hours of coursework selected from the list below. One course can be selected from outside of BAE (up to 2 credit hours), but at least 9 credit hours must be BAE courses.

## At least 9 hours from the following:

- BAE 502 Instrumentation for Hydrologic Applications
- BAE 535 Precision Agriculture Technology
- BAE 573 Hydrologic and Water Quality Modeling
- BAE 575 Design of Structural Stormwater Best Management Practices
- BAE 576 Watershed Monitoring and Assessment
- BAE 577 Introduction to the Total Maximum Daily Load Program
- BAE 578 Agricultural Waste Management
- BAE 579 Stream Channel Assessment and Restoration
- BAE 581 Special Problems: Open Channel Hydraulics for Natural Systems
- BAE 583 Ecohydraulics and River Corridor Function

BAE 771 Theory of Drainage – Saturated Flow BAE 774 Theory of Drainage – Unsaturated Flow

#### Up to 3 credit hours can be selected from the following:

CE 580 Flow in Open Channels CE 584 Hydraulics of Groundwater CE 586 Engineering Hydrology CE 775 Modeling and Analysis of Environmental Systems CE 776 Advanced Water Management Systems CE 784 Ground Water Contaminant Transport CE 785 Urban Stormwater Management SSC 511 Soil Physics SSC 562 Environmental Applications of Soils SSC 570 Wetland Soils

**Other Information:** BAE 570 (Soil Water Movement) is a general prerequisite for the program, however students who complete SSC 511 (Soil Physics) or an equivalent course with a C or better, will be considered to have met the prerequisite.

# **E-Learning (Certificate)**

## **Adult Education**

Pooneh Lari, Teaching Assistant Professor Department of Adult and Higher Education NC State University Campus Box 7801 Raleigh, NC 27695-7801 Phone: 919.515.6290 Fax: 919.515.6200 Email: pooneh lari@ncsu.edu

## K-12 Education

Kevin Oliver, Assistant Professor Department of Curriculum and Instruction NC State University Campus Box 7801 Raleigh, NC 27695-7801 Phone: 919.515.6229 Fax: 919.513.1687 Email: <u>kevin\_oliver@ncsu.edu</u>

The Graduate Certificate in E-Learning (online) represents a response to increased interest toward elearning design and teaching competencies in K-12, post secondary, government and corporate sectors. The program is designed to prepare graduates with the knowledge and skills necessary to assume roles in integrating e-learning into the curriculum or teaching entirely online. All certificate courses are offered online and students are required to select a focus area of either K-12 or adult education.

Admissions: Applicants must meet at least one of the following criteria: (1) graduate of an accredited four year college and have a GPA of at least 3.0 on a four-point scale in their last 60 credit hours of undergraduate study; (2) degree student in good standing in an NC State graduate program; or (3) have a Master's degree.

**Requirements:** The Graduate Certificate in E-Learning requires a minimum of 15 hours, including 12 hours of core courses and 3 hours of electives. Students must maintain a minimum overall GPA of B (3.0).

**Other Information:** The program is offered jointly by the Department of Adult and Higher Education and the Department of Curriculum and Instruction.

For more information, see <a href="http://ced.ncsu.edu/ahe/elearning/">http://ced.ncsu.edu/ahe/elearning/</a>

## Geographic Information Systems (Certificate Program/Minor Program)

Dr. Hugh A. Devine, Coordinator NCSU Box 7106 Phone: (919) 515-3682 Email: hugh devine@ncsu.edu

## **GRADUATE FACULTY**

Professors: H. A. Devine, G. D. Garson, M. L. Gumpertz, J. E. Hummer, S. Khorram, J. E. Parsons, W. J. Rasdorf, A. R. Rice, J. A. Rice, W. E. Snyder, A. B. Stein, H. J. Trussell; Associate Professors: M. L. Alibrandi, H. Cheshire, D. A. Crouse, M. Fuentes, C. G. Healey, R. W. Heiniger, G. R. Hess, M. M. Kimberley, H. Krim, J. F. Levine, S. C. Lilley, M. F. Overton, S. R. Raval, G. T. Roberson, W. R. Smith, R. A. St. Amant, J. R. Stone, M. L. Vasu; Research Associate Professor: P. K. Baran; H. S. Stubbs; Visiting Associate Professor: M. G. Genton; Adjunct Associate Professors: M. R. Loomis, H. Mitasova; Assistant Professors: L. A. Annetta, B. Bullock, M. G. Burton, Y.-F. Leung, S. A. C. Nelson, J. G. White, S. B. Wiley; Adjunct Assistant Professor: J. Fels

Geographic Information Systems (GIS) is the study of spatial distributions and relationships through the analysis and display of spatial data. The objectives of the GIS minor and certificate programs include an internationally recognized graduate GIS instruction program, addressing the high demand for professional GIS analysts and providing a focus for expanding the university's GIS research program. Currently, approximately 30 NC State graduate departments are active in varying applications of spatial analysis within their respective fields.

**GIS Graduate Certificate Program.** The certificate program consists of a minimum of 15 credit hours. Students entering the program will be expected to have a working knowledge of GIS software. The certificate program is open to both degree seeking and non-degree seeking students at the graduate level.

**Prerequisite:** An introductory course in GIS (e.g. PRT 462, PA 541 or equivalent) or demonstrated ability to use GIS software.

## Core (7 credits):

NR 532 (3) Principles of Geographic Information Science NR 533 (3) Application Issues in Geographic Information Systems FOR 510 (1) Introduction to GPS

#### Electives (8 credits):

BUS 545 (3) Management Support Systems CE 538 (3) Information Technology and Modeling ECE 759 (3) Pattern Recognition ECE 763 (3) Computer Vision ECE 764 (3) Digital Image Processing FOR 554 (3) Principles of Spatial Analysis FOR 753 (3) Environmental Remote Sensing LAR 500 (6) Landscape Design Studio LAR 512 (3) Landscape Resource Management NR 535 (2) Computer Cartography NR 536 (3) Introduction to Visual Basic for GIS PA 541 (3) Geographic Information Systems for Public Administration SSC 535 (3) Precision Agriculture and Technology SSC 545 (3) Remote Sensing Applications in Soil Science and Agriculture ST 733 (3) Spatial Statistics

## **Other Requirements:**

- Admission to the certificate program requires a grade of B or better *in NR532 and NR533*. After completing these required courses, contact Linda Babcock (515-3430 or L\_Babcock@ncsu.edu) to request admission to the certificate program. You will need to provide a copy of your NCSU transcript.
- Award of a certificate requires a grade of B or better in all of the certificate courses. The GISc Faculty Coordinator will be responsible for certifying the GPA of certificate candidates.

**GIS Graduate Minor Program.** The minor program consists of a minimum of 10 credit hours. Students entering the program will be expected to have a working knowledge of GIS software.

**Prerequisite:** An introductory course in GIS (e.g. PRT 462 or equivalent) or demonstrated ability to use GIS software.

## **Course Requirements (10 credits):**

NR 532 (3) Principles of Geographic Information Science NR 533 (3)Application Issues in Geographic Information Systems FOR510 (1) Introduction to GPS Electives (3) - see list of electives for Certificate Program

**Other Requirements:** GISc Faculty as a member of the student's graduate committee. If no graduate committee is required by the student's program, the student must obtain approval of his or her minor program from the GISc Faculty Coordinator.

# Horticultural Science (Certificate Program)

Dr. Helen Kraus, Distance Education Coordinator
Department of Horticultural Science
Phone: 919.515.1208
FAX: 919.515.7747
Email: <u>helen kraus@ncsu.edu</u>

The <u>Certificate in Horticultural Science</u> is a non-degree program offered through the Department of Horticultural Science at North Carolina State University. The Certificate program is designed to increase personal knowledge and skills for current or future employment in the Horticultural Industry. Students may concentrate in one of three areas: General Horticulture, Food Horticulture and Ornamental Horticulture.

**Requirements:** The Certificate program requires a minimum of five courses resulting in at least 15 credits to be completed within 4 years. The courses will constitute a cohesive continuing education in Horticultural Science and will be selected by the candidate and the advisor.

Applicant must have a B.S. or higher degree from an accredited four-year college or university and have a GPA of at least 3.0 on a 4.0-point scale.

It is highly recommended that candidates have a major in horticulture, crop science, plant science, plant biology or agricultural education with a plant science emphasis. Applicants who do not meet the GPA requirement may be admitted provisionally based on past work experience as a professional in horticulture or a related field. Supporting documentation of professional experience in horticulture or a related field must be submitted for provisional admission. Students who are admitted provisionally must earn at least a 3.0 GPA average in the first two courses of the certificate program in order to obtain full admission into the program. Certificate students must maintain an average GPA of 3.0 and a minimum grade of C (2.00) in any of the Horticulture Graduate Certificate courses.

**Curriculum:** The following courses can be used for credit in the Horticultural Science Certificate Program. Please note: Not all courses are offered each semester. Students should consult their advisor and the course catalog for the most up-to-date course listings.

#### Horticultural Science (DE and on-campus sections)

- HS 541 Plant Breeding Methods
- HS 542 Advanced Vegetable Crop Management
- HS 543 Greenhouse and High Tunnel Food Production
- HS 562 Post Harvest Physiology
- HS 590 Special Problems in Horticultural Science (Environmental Nursery Production)
- HS 590 Special Problems in Horticultural Science (Fruit Quality)
- HS 590 Special Problems in Horticultural Science (Introduction to Permaculture)
- HS 590 Special Problems in Horticultural Science (Introduction to Viticulture)
- HS 590 Special Problems in Horticultural Science (Small Fruit Production)
- HS 707 Environmental Stress Physiology
- HS 717 Weed Management Systems

#### Horticultural Science (On-campus sections only)

HS 502 Plant Disease: Methods and Diagnosis HS 525 Advanced Plant Propagation HS 590 Special Problems in Horticultural Science (Horticultural Substrates and Urban Soils) HS 701 Carbohydrate Metabolism and Transport HS 704 Plant Nomenclature HS 705 Physiology of Flowering HS 706 Fruit Development and Postharvest Physiology HS 715 Weed Science Research Techniques HS 716 Weed Biology HS 718 Biological Control of Weeds HS 720 Molecular Biology in Plant Breeding HS 722 Mineral Nutrition In Plants HS 725 Pesticide Chemistry HS 727 Pesticide Behavior and Fate in the Environment HS 731 Physiology of Landscape Plants HS 732 Vegetable Crop Physiology HS 745 Quantitative Genetics in Plant Breeding HS 746 Breeding Methods HS 748 Breeding for Pest Resistance

Any other graduate-level Horticultural Science courses.

#### **Plant Pathology**

PP 502 Plant Disease: Methods and Diagnosis

#### Entomology

ENT 591 Insect Pest Management

#### Soil Science

SSC 440 Geographic Information SSC 470/570 Wetland Soils SSC 532 Soil Microbiology SSC 551 Soil Morphology, Genesis and Classification SSC 562 Environmental Applications of Soil Science

#### **Food Science**

FS 495 Special Topics in Food Science (Good Manufacturing Practices) FS 495 Special Topics in Food Science (Sanitation Standard Opt. Proc.) FS 495 Special Topics in Food Science (Sanitation) FS 495 Special Topics in Food Science (Hazard Analysis/ Risk Assess.) FS 495 Special Topics in Food Science (Microbiology / Microbial Hazards)

#### **Agriculture & Extension Education**

AEE 501 Foundations of Agriculture & Extension Education AEE 521 Program Planning in Agriculture & Extension Education AEE 523 Adult Education in Agriculture

For more information about the Certificate Program and applications materials, please see the <u>Department of Horticultural Science</u> website.

# **Medical Devices (Certificate)**

Dr. Troy Nagle, Coordinator Department of Biomedical Engineering NCSU Box 7115 Phone: 919.515.3578 Email: <u>nagle@ncsu.edu</u>

The Graduate Certificate in Medical Devices is a joint program that links NC State's College of Engineering with the University of North Carolina School of Medicine. The program prepares graduates to conceive and design prototypes for new medical devices, write patent applications, as well as training in market assessment, financing options, etc.

**Admissions:** Students apply online through a website hosted by the Joint UNC-NCSU Department of Biomedical Engineering. The Program Committee evaluates applications using the graduate admissions criteria of the department.

**Requirements:** The program requires a total of 12 credit hours from an approved course list, including two BME advanced medical devices courses (BMS 551 and 552) and two entrepreneurial-oriented business courses.

For more information, see <u>www.bme.ncsu.edu</u>

# Molecular Biotechnology (Certificate Program)

Dr. Susan Carson, Coordinator NCSU Box 7512 Phone: 919.513.0330 Email: <u>sue carson@ncsu.edu</u> Website: <u>http://www.ncsu.edu/biotechnology/</u>

Training in molecular biotechnology is essential for an expanding list of disciplines that have found modern biology-based skills of critical importance in pursuing research goals in areas ranging from microbiology to plant and animal sciences to chemical engineering. The Graduate Certificate Program in Molecular Biotechnology offers an opportunity for individuals educated in the life sciences and related disciplines to gain laboratory-based, hands-on training in many aspects of molecular biotechnology. While this Certificate Program is geared primarily toward non-traditional students who have already entered the workforce, NCSU graduate students with career interests that involve molecular biotechnology are also eligible to apply. Admissions requirements can be viewed at the program website.

The Graduate Certificate Program in Molecular Biotechnology will require a minimum of 12 hours of required and elective courses as listed below:

#### **REQUIRED (5 credits)**

BIT 510 and BIT 510L Core Technologies in Molecular and Cellular Biotechnology (4 credits) BIT 501 Ethical Issues in Biotechnology (1 credit) or an approved research ethics or bioethics course

#### **BIOTECHNOLOGY LABORATORY ELECTIVES (4 credits)**

Two of the following courses and their laboratories (2 credits each):

BIT 562MicroarraysBIT 563FermentationBIT 564Protein PurificationBIT 565Real-time PCR TechniquesBIT 566Animal Cell CultureBIT 567PCR and DNA FingerprintingBIT 568Genome MappingBIT 569RNA Purification and AnalysisBIT 581Plant Transformation and Tissue CultureOther BIT laboratory courses (2 credits) by permission

#### **OTHER ELECTIVES -- CHOOSE ONE (3 credits)**

GN 411 Principles of Genetics
GN 513 Advanced Genetics
MB 714 Microbial Metabolic Regulation
MB(GN) 758 Prokaryotic Molecular Genetics
BO 780 Plant Molecular Biology
BCH 553 Biochemistry of Gene Expression
FS(MB) 725 Fermentation Microbiology
ST(GN) 721 Genetic Data Analysis
GN 701 Molecular Genetics
GN 735 Functional Genomics

CHE 551 Biochemical Engineering

Other courses (400-level or higher) may be considered by special request.

# Nonprofit Management (Certificate Program)

Dr. Richard Clerkin Assistant Professor, Public Administration School of Public and International Affairs Department of Public Administration NCSU Box 8102 Raleigh, NC 27695-8102 Phone: 919.515.5037 Email: rmclerki@ncsu.edu

A Graduate Certificate in Nonprofit Management is available to students, including NC State degree students, who have a Bachelor's degree from an accredited university. The Certificate requires 15 credit hours of course work. The courses are designed to provide the basic management knowledge and skills needed in nonprofit organizations. For applications and a description of program requirements go to http://pa.chass.ncsu.edu/prosStud/gradCert/non-profit.php

## **Nonwovens Science and Technology**

Dr. Pamela Banks-Lee College of Textiles NCSU Box 8301 Phone: 919.515.6581 Email: <u>pam\_banks-lee@tx.ncsu.edu</u>

The certificate program in Nonwovens Science and Technology provides NC State graduate students the opportunity to develop recognized academic credentials in Nonwovens Science and Technology in addition to their major area of graduate study. Provide non-degree graduate level students the opportunity to develop recognized advanced expertise in Nonwovens Science and Technology.

**Required Coursework:** The Graduate Certificate Program in Nonwovens Science and Technology requires a minimum of 15 hours and includes the following courses:

#### Core Courses (6 hours):

TT(NW) 503 Materials, Polymers and Fibers Used in Nonwovens (3 hours) **OR** TMS 762 Physical Properties of Fiber Forming Polymers, Fibers and Fibrous Structures (3 hours) TT(NW) 504 Introduction toNonwovens Products and Processes (3 hours)

#### Advanced Courses (minimum 9 hours)\*:

TT(NW) 505 Advanced Nonwovens Processing (3 hours)

TT(NW) 506 Bonding Principles in Nonwovens (3 hours)

TT(NW) 507 Nonwoven Characterization Methods (3 hours)

TT(NW) 508 Nonwoven Product Development (3 hours)

\*One NC State course (400-level or higher) may be substituted for one of the advanced courses into the program upon agreement between the Certificate Coordinator and the student. The Certificate Coordinator will maintain a list of graduate-level courses appropriate to use as substitutions.

## Program Development in Family Life Education (Certificate Program)

Dr. Karen DeBord Department of Family and Consumer Sciences NCSU Box 7605 Phone: 919.515.9147 Email: <u>karen debord@ncsu.edu</u> or <u>stephanie jones@ncsu.edu</u> Website: <u>www.ces.ncsu.edu/depts/4hfcs/academics/cert/</u>

A Graduate Certificate in Program Development in Family Life Education requires a total of 12 credit hours. Nine credit hours are required courses, with the remaining three credit hours of electives.

#### **Required Courses**

FCS 510 Program Development and Evaluation of Family Life Education Programs (3) FCS 512 Family and Community Partnerships (3) FCS 522 Family Life Education (3)

#### **Electives (minimum of three hours)**

FCS 523 Family Relationships Across the Lifespan (3)
FCS 524 Applications of Gerontology to Family Life Education (3)
FCS 531 Effective Management of Family Resources (3)
FCS 533 Family Dysfunction and Complex Family Issues (3)
FCS 540 Influence of Environments on the Family (3)
FCS 590 Special Topics in Family Life and Parenting Education (Family Communication and Coaching - 3)
FCS 595 Contemporary Issues in Family Life Education (1)

# **Public Policy (Certificate)**

Dr. Thomas Birkland, Coordinator Department of Public Administration NCSU Box 8102 Phone: 919.513.7799 Email: tom birkland@ncsu.edu

Public policy -- the actions of government and its partners in the non-profit and private sectors -- is the keystone of politics and public administration. The creation, adoption, and implementation of public policy is a complex process. It requires skills in analysis, reasoning, and argumentation -- what we call evidence-based policy advocacy. The Graduate Certificate in Public Policy helps you make the most of your skills by providing you with the tools you need to be an effective advocate for realistic, effective, and responsible public policy.

**Admissions:** Students not attending NC State are required to submit transcripts. Current NC State students need not present transcripts, but they must be in good standing. A minimum GPA of 3.0 is required for admission to the program. Provisional admission may be granted for applicants whose GPA is below 3.0. Contact the program director for details.

**Curriculum:** The certificate requires a total of 12 credit hours consisting of Applied Political Economy (PA 509), Public Policy Analysis (PA 511), Public Policy Process (PA 598), and an elective policy or managerial course approved by the program coordinator. Electives may be from virtually any program at NC State, such as history, social sciences, natural resources, agriculture, health, business, or engineering.

**Other Information:** Students who do not have course work in social science statistics will be required to take a statistics course either at the School of Public and International Affairs or a department of the student's choosing, with approval of the program coordinator.

For more information, see www4.ncsu.edu/~tabirkla/documents/ppcert.pdf

# **Renewable Electric Energy Systems (Certificate)**

Dr. Mesut Baran Professor, Electrical and Computer Engineering Partners I 1250 NCSU Box 7571 Raleigh, NC 27695 Phone: 919.515.5081 Email: <u>baran@ncsu.edu</u>

Amy Bailey FREEDM Systems Center Education Program Support Coordinator Phone: 919.513.3435 Fax: 919.513.0405 Email: <u>ahbailey@ncsu.edu</u>

The Graduate Certificate in Renewable Electric Energy Systems provides graduate students with the opportunity to develop expertise in renewable electric energy systems and advanced electric power grid technology in addition to their major area of graduate study.

**Admissions:** Applicants with appropriate background must meet one of the three following requirements:

- be a graduate of an accredited four-year college or university, and have a GPA of at least 3.0 on a 4-point scale in their last 60 credit hours of undergraduate study;
- be a degree student in good standing in an NC State University graduate program; and
- have a Master's degree.

A student may obtain more than one graduate certificate in a different field. Each certificate must have at least nine (9) credit hours that are unique to it.

**Requirements:** The Graduate Certificate in Renewable Electric Energy Systems requires a minimum of 12 hours, including one 3 hour core course and 9 credit hours of electives to be selected from a list that contains relevant courses for the certificate. Students must maintain a minimum overall GPA of B (3.0).

For course and enrollment information please visit <u>http://www.freedm.ncsu.edu/node/152</u>.

## **Technology Entrepreneurship and Commercialization (Certificate)**

Dr. Ted Baker, Coordinator Management, Innovation and Entrepreneurship Phone: 919.513.7943 Email: <u>Ted Baker@ncsu.edu</u> Program Website: <u>mgt.ncsu.edu/index-exp.php/certificates/tec</u>

The certificate in Technology Entrepreneurship and Commercialization (TEC) is a hands-on, projectbased practicum in creating and growing technology-intensive businesses. Graduate students develop knowledge, skills and tools useful for engaging in technology entrepreneurship. We focus on capabilities that are equally relevant to the creation and growth of new ventures or to the creation of innovation within established firms. Students learn and apply a proven structured process (developed at NC State but adopted by many universities and taught on four continents) to evaluate technologies, create and develop product ideas, and construct business proposals to bring technology-based products to market. Students with primarily technical backgrounds and those with primarily business backgrounds gain essential skills in working together productively.

**Admissions Requirements:** Graduate students at NC State must be in good standing. Students not enrolled at NC State must have completed a baccalaureate degree. All students must submit an application to the certificate program which will be reviewed and evaluated by the coordinator. A minimum GPA of 3.0 (in undergraduate and/or prior graduate work) is required for admission to the program. Those with less than a 3.0 may be admitted provisionally. Provisionally admitted students must initially take MBA 570 and earn a grade of B (3.0).

**Program Requirements:** The certificate program requires students to complete twelve (12) credit hours with an overall 3.0 GPA in all certificate courses. Credit toward the certificate in a particular course will be given only if a grade of B- or better is earned in that course. Currently, the three required courses are MBA 570 and MBA/MSE 576 and 577, each of which carries four credit hours. The recommended sequence is 570, 576, 577. All courses in the program must be taken for a letter grade. No transfer credits will be accepted in the program and it must be completed within three years.

# **Textile Brand Management and Marketing (Certificate)**

Dr. Michelle R. Jones, Program Coordinator Department of Textile and Apparel Technology and Management NCSU Box 8301 Raleigh, NC 27695-8301 Phone: 919.515.6561 Email: <u>michelle\_jones@ncsu.edu</u>

The Graduate Certificate Program in Textile Brand Management and Marketing provides graduate students with the opportunity to develop academic credentials in branding fundamentals and theories for a globalized industry and market research while complementing this knowledge with topics of strategic management, product development, supply chain management and technology management. The program also provides non-degree graduate-level students with the opportunity to develop recognized advanced expertise in Textile Brand Management and Marketing.

Admission: Applications must meet one of the following three requirements:

- Be a graduate of an accredited four-year college or university and have a grade point average of at least 3.0 on a 4-point scale in their last 60 credit hours of undergraduate study;
- Be a degree student in good standing in an NC State University graduate program; or
- Have a Master's degree.

Applicants who do not meet the GPA requirements may be admitted professionally based on past work experience as a professional in textiles or a textile related field. Supporting documentation of professional experience in textile should be submitted for provisional admission. Students who are admitted provisionally must earn at least a "B" average in the first three courses of the certificate program in order to obtain full admission into the certificate program.

**Requirements:** A minimum of 15 credit hours is required to complete the certificate program and student must have a minimum 3.0 grade point average on all certificate course work. Transfer credit from other universities is not allowed. All work must be completed in four (4) calendar years, beginning from the time the student begins course work for the Certificate .

For more information, please visit the <u>Textile Technology and Management</u> website.

# **Training and Development (Certificate)**

Dr. Timothy Hatcher Associate Professor and Coordinator Department of Adult and Higher Education Phone: 919.515.6246 FAX: 919.515.4039 Email: <u>tim hatcher@ncsu.edu</u>

The Certificate in Training and Development is a non-degree program for lifelong learning students offered through the Department of Adult and Higher Education at North Carolina State University. Lifelong learning students are those students who are classified by the University as PBS (Postbaccalaureate Studies) for purposes of registration.

The Certificate program consists of a selected set of for-credit courses that are offered in an online format. The courses are selected to offer a cohesive continuing education opportunity for people in training roles in business and industry. This program is designed for the person who has recently advanced into a training position and is without the academic preparation needed or for those choosing to increase their knowledge and skills in training for current or future jobs. The program is not intended for career exploration nor is it a prerequisite for or part of a graduate degree program. The program is made up of a minimum of five 3-credit courses. The student will complete the identified Certificate courses through continuous enrollment (excluding summer sessions) until contract requirements are met. Participants must hold a baccalaureate degree to enroll in the Certificate Program.

Curriculum: The program requires completion on the following five courses.

EAC 580 Designing Instructional Systems in Training and Development EAC 583 Needs Assessment and Task Analysis in Training and Development EAC 584 Evaluating Training Transfer and Effectiveness EAC 586 Methods and Techniques of Training and Development EAC 759 The Adult Learner

Additional NC State courses can be incorporated into the program upon agreement between the program coordinator and the student. For course descriptions, please refer to the NCSU <u>listing of courses</u>.

**Other Information:** All graduate students are expected to either pass the AHE technology competencies through a testing out procedure or to attend a workshop at the beginning of their studies.

For further information, see the <u>Certificate in Training and Development</u> website or the <u>Adult and</u> <u>Higher Education</u> website.

# **Biological Sciences**

There is no separate graduate major in the biological sciences, but both M.S. and Ph.D. degrees are offered in several life science departments and programs of the College of Agriculture and Life Sciences. Interdisciplinary courses applicable to several graduate programs are offered by the Biological Sciences Interdepartmental Program.

## **GRADUATE COURSE**

BIO 510 Advanced Biology for Secondary Teachers BIO(ZO) 518 Experience and the Brain

# **Education [General Courses]**

## **GRADUATE COURSES**

- ED(AEE) 501 Foundations of Agricultural and Extension Education
- ED(AEE) 530 Priority Management in Agricultural and Extension Education
- ED(AEE) 641 Practicum in Agricultural and Extension Education
- ED(AEE) 735 Effective Teaching in Agriculture and Life Sciences
- ED(AEE) 841 Practicum in Agricultural and Extension Education

## **Foreign Languages and Literatures**

Dr. Ruth Gross, Department Head NCSU Box 8106 919.515.2475 (phone) 919.515.6981 (fax) http://sa.ncsu.edu/fl

The Department of Foreign Languages and Literatures offers courses to assist graduate students in preparing to use modern foreign languages in research and advanced study. These courses are not open to undergraduates. The following courses can be audited or taken as credit-only; credits do not apply toward advanced degrees.

FLF 401 French for Graduate Students FLG 401 German for Graduate Students FLS 401 Spanish for Graduate Students

Certification may be obtained in languages not normally taught by the department by contacting Dr. Dudley Marchi. Complete information on graduate student language certification can be found at http://sa.ncsu.edu/fl/gradcert.htm.

# **Multidisciplinary Studies**

#### **GRADUATE COURSES**

MDS 515 Peruvian Amazon Ecology and Ethnology MDS 595 Special Topics in Multidisciplinary Studies MDS 610 Special Topics MDS 685 Master's Supervised Teaching
## **Philosophy and Religious Studies**

Dr. Michael Pendlebury Professor and Department Head NC State Box 8103 Phone: 919.515.6103 Fax: 919.513.4351 Email: <u>mipendle@ncsu.edu</u> Website: <u>http://www.ncsu.edu/chass/philo/</u>

There are no graduate degrees in Philosophy or Religious Studies, but the Department offers a variety of graduate courses in Logic, Philosophy, and Religious Studies. One or more of these courses can be used to enhance many graduate degree programs.

### **GRADUATE COURSES**

LOG 535 Advanced Logic and Metamathematics LOG 537 Model Theoretic Semantics

#### PHILOSOPHY

PHI 501 Kant's Critique of Pure Reason
PHI 515 Life Science Ethics
PHI 520 Global Justice
PHI 522 Philosophical Issues in Environmental ethics
PHI 522 Philosophical Issues in Environmental ethics
PHI 540 The Scientific Method
PHI 545 Philosophy of Biology
PHI 547 Philosophy, Evolution and Human Nature
PHI 575 Ethical Theory
PHI 598 Special Topics in Philosophy
PHI 635 Advanced Independent Study in Philosophy
PHI 798 Advanced Topics in Philosophy
PHI 816 Introduction to Research Ethics

#### **RELIGIOUS STUDIES**

REL 571 Darwinism and Christianity REL 573 Religion, Gender, and Reproductive Technologies

The Department also administers the Graduate Minor in Cognitive Science.

# **Graduate Faculty**

- Abbate, Angelo R, Emeritus Professor, Landscape Architecture
- Abdel Khalik, Hany Samy, Assistant Professor, Nuclear Engineering
- Abdel-Rahman, Nabil Mahmoud, Adjunct Associate Professor, Civil Const & Environ Engineer
- Abney, Mark Ray, Assistant Professor, Entomology
- Aboelfotoh, M. Osama, Research Professor, Materials Sci Engr-Grads&Temps
- Abrams, Charlie F., Professor, Biological And Agricultural En
- Abrams, Robin Fran, Professor, Architecture
- Abt, Karen L, Adjunct Associate Professor, For & Envir Res Acad Research
- Abt, Robert Carroll, Professor, For & Envir Res Acad Research
- Aday, David Derek, Assistant Professor, Biology
- Ade, Harald, Professor, Physics
- Adler, Kenneth B., Professor, Dept Molecular Biomedical Scie
- Adler, William, Professor, Philosophy & Religious Studies
- Afify, Elsayed M., Emeritus Professor, Mechanical & Aerospace Engr
- Agris, Paul F., Professor, Biochemistry
- Agvaanluvsan, Undraa, Adjunct Professor, Physics
- Aiman-Smith, Lynda, Associate Professor, Mgmt, Innovation&Entrepreneur
- Aiyyer, Anantha, Assistant Professor, Marine, Earth And Atmospheric
- Akroyd, Duane, Professor, Educ Leadrshp & Policy Studies
- Albada-Jelgersma, Kelly, Associate Professor, Communication
- Alder, Ruth A., Emeritus Associate Professor, Foreign Languages And Literatu
- Aldige, Virginia M, Distinguished Professor, Sociology & Anthropology
- Alexander, Samuel T., Associate Professor, Electrical & Computer Engr.
- Alexander, Winser E., Professor, Electrical & Computer Engr.
- Allaire, Jason Christopher, Associate Professor, Psychology
- Allen, George C, Research Associate Professor, Horticultural Science
- Allen, Howard Lee, Emeritus Professor, The Forest Nutrition Cooperati
- Allen, Jonathan C., Professor, Food, Bioprocess & Nutrition Sc
- Allen, Nina S, Emeritus Professor, Plant Biology
- Allen, Steven G., Professor, Economics-college Of Managemen
- Alley, Mark L, Clinical Assistant Professor, Dept-Population, Health, Pathobi
- Almond, Glen William, Professor, Dept-Population, Health, Pathobi
- Alonso, Jose Miguel, Associate Professor, Genetics
- Alonso, Silvia T., Emeritus Associate Professor, Foreign Languages And Literatu
- Alsbury, Thomas L., Associate Professor, Educ Leadrshp & Policy Studies
- Alston-Mills, Brenda P, Emeritus Professor, Animal Science
- Amatya, Devendra M, Adjunct Assistant Professor, Biological And Agricultural En
- Ambaras, David R, Associate Professor, History
- Ambrose, John T., Professor, Undergraduate Academic Program

- Amein, Michael, Emeritus Professor, Civil Const & Environ Engineer
- Amendum, Steven J., Assistant Professor, Elementary Education
- Amerson, Henry Van, Emeritus Associate Professor, Biotechnology
- Ames, Natalie R., Associate Professor, Social Work
- Amezquita, Alejandro, Adjunct Assistant Professor, Food, Bioprocess & Nutrition Sc
- Amoozegar, Aziz, Professor, Soil Science
- Anantharamaiah, Nagendra, Research Assistant Professor, Textile Engineering, Chemistry
- Anderson, Dorothy H, Professor, Parks, Recreation & Tourism Mg
- Anderson, Kenneth E, Professor, Poultry Science
- Anderson, Kevin L., Professor, Dept-Population, Health, Pathobi
- Anderson, Norman Dean, Emeritus Professor, Depart Of Math, Science, And T
- Andrady, Anthony L, Adjunct Professor, Chemical & Biomolecular Engr
- Andrews, Janice M, Adjunct Associate Professor, Dept-Population, Health, Pathobi
- Aneja, Viney Pal, Professor, Marine, Earth And Atmospheric
- Anholt, Robert R, William Neal Reynolds Professor, Biology
- Anistratov, Dmitriy Y, Associate Professor, Nuclear Engineering
- Annetta, Leonard, Associate Professor, Depart Of Math, Science, And T
- Anson, Christopher M, Distinguished University Professor, English
- Anton, Ana I, Professor, Computer Science-engr
- Apperson, Charles S., William Neal Reynolds Professor, Entomology
- Apple, J Lawrence, Emeritus Professor, Administration Research Serv
- Arasu, Prema, Professor, Dept Molecular Biomedical Scie
- Arellano, Consuelo, Research Assistant Professor, Statistics
- Arends, James J., Adjunct Professor, Entomology
- Argyropoulos, Dimitris S, Professor, Wood And Paper Science
- Arnold, John F., Emeritus Associate Professor, Curr, Instruc & Counselor Educ
- Arritt, Fletcher M, Assistant Professor, Food, Bioprocess & Nutrition Sc
- Arroway, Pamela J, Teaching Associate Professor, Statistics
- Arumugam, Sankarasubramanian, Assistant Professor, Civil Const & Environ Engineer
- Arya, Satya Pal Singh, Emeritus Professor, Marine, Earth And Atmospheric
- Ash, Sarah L, Associate Professor, Food, Bioprocess & Nutrition Sc
- Ashwell, Christopher M., Associate Professor, Poultry Science
- Ashwell, Melissa Schuster, Associate Professor, Animal Science
- Aspnes, David E, Distinguished University Professor of Physics, Physics
- Atchley, William Reid, William Neal Reynolds Distinguished Professor, Genetics
- Atkins, Clarke E., Professor, Dept of Clinical Sciences
- Atkinson, Maxine P., Professor, Sociology & Anthropology
- Attarian, Aram, Associate Professor, Parks, Recreation & Tourism Mg
- Auerbach, David D., Assistant Professor, Philosophy & Religious Studies
- Aurand, Leonard W., Emeritus Professor, Food, Bioprocess & Nutrition Sc
- Austin, David Franklin, Associate Professor, Philosophy & Religious Studies

- Averre, Charles W, Emeritus Professor, Plant Pathology
- Axtell, Richard C., Emeritus Professor, Entomology
- Aycock, Robert, Emeritus Professor, Plant Pathology
- Ayoub, Mahmoud A., Professor, Fitts Dept Indust & Syst Engr
- Azmy, Yousry Y, Professor, Nuclear Engineering
- Bacheler, Jack S., Professor, Entomology
- Bachmann, Klaus J., Emeritus Professor, Materials Science & Engineering
- Bahler, Dennis R, Associate Professor, Computer Science-engr
- Bailey, Christopher Scott, Assistant Professor, Dept of Clinical Sciences
- Bailey, Donna W, Adjunct Assistant Professor, Adult & Higher Education
- Bailey, John A., Emeritus Professor, Mechanical & Aerospace Engr
- Bailey, Kermit L, Associate Professor, Graphic Design
- Baines, Barbara Joan, Emeritus Professor, English
- Bakalov, Bojko Nentchev, Associate Professor, Mathematics
- Baker, Anne, Associate Professor, English
- Baker, Edward A, Associate Professor, Mgmt, Innovation&Entrepreneur
- Baker, George A, Emeritus Named Distinguished Professor, Moore's Distinguish Award
- Baker, James R., Emeritus Professor, Entomology
- Baker, Meecee M., Adjunct Professor, Agricultural & Extension Educa
- Baker, Rodney B, Clinical Associate Professor, Dept-Population, Health, Pathobi
- Baker, Stanley B, Professor, Curr, Instruc & Counselor Educ
- Baker-Ward, Lynne Elizabeth, Professor, Psychology
- Balaban, John, Professor, English
- Baliga, B. Jayant, Distinguished University Professor, Electrical & Computer Engr.
- Balik, Charles M., Professor, Materials Science & Engineering
- Balint-Kurti, Peter J., USDA Associate Professor, Plant Pathology
- Ball, David S., Emeritus Associate Professor, Economics-college Of Managemen
- Ball, Hershell R., Emeritus Professor, Food, Bioprocess & Nutrition Sc
- Ballinger, Walter Elmer, Emeritus Professor, Horticultural Science
- Ballington, James R., Professor, Horticultural Science
- Banes, Albert J, Professor, Biomedical Program ENG
- Banker, James R., Emeritus Professor, History
- Banks, Alton J, Professor, Chemistry
- Banks, Harvey Thomas, Drexel Professor of Mathematics, Mathematics
- Banks-Lee, Pamela, Associate Professor, Textile Engineering, Chemistry
- Baran, Mesut E, Professor, Electrical & Computer Engr.
- Baran, Perver Korca, Research Associate Professor, Parks, Recreation & Tourism Mg
- Bardon, Robert E, Associate Professor, Extension-forestry General
- Barker, James C., Emeritus Professor, Biological And Agricultural En
- Barker, Roger L., Burlington Industries Professorship of Textile Technology, Textile Engineering, Chemistry
- Barlage, Douglas W, Associate Professor, Electrical & Computer Engr.

- Barlaz, Morton A, Professor, Civil Const & Environ Engineer
- Barletta, Kristin Anne, Associate Professor, Textile & Apparel, Technology
- Barnes, Harold J., Professor, Dept-Population, Health, Pathobi
- Barnes, Jill A, Teaching Associate Professor, Dept Molecular Biomedical Scie
- Barnett, Ortus W, Emeritus Professor, Plant Pathology
- Barnhardt, Robert A, Emeritus Professor, Textile & Apparel, Technology
- Barnhardt, William Wilton, Associate Professor, English
- Barnhart, Huiman X, Adjunct Associate Professor, Statistics
- Barr, Steve H, Professor, Mgmt, Innovation&Entrepreneur
- Barrax, Gerald W., Emeritus Professor, English
- Barrie, Thomas M, Professor, Architecture
- Barthalmus, George Timothy, Emeritus Professor, Undergraduate Academic Program
- Bartlett, James E, Associate Professor, Educ Leadrshp & Policy Studies
- Bartley, Jon W., Professor, Accounting-college Of Manageme
- Bassett, Ross Knox, Associate Professor, History
- Batchelor, Alan D, Research Associate Professor, Engineering Research
- Batchelor, Peter, Emeritus Professor, Architecture
- Bateman, Durward F., Emeritus Professor, Dean's Office CALS
- Batra, Subhash K., Charles A. Cannon Professor, Textile & Apparel, Technology
- Battaglia, Paul R, Assistant Professor, Architecture
- Baugh, John W, Professor, Civil Const & Environ Engineer
- Baughman, Gerald R., Emeritus Associate Professor, Biological And Agricultural En
- Baumer, David L., Professor, Business Management-coll Of Mg
- Baynes, Ronald E, Associate Professor, Dept-Population, Health, Pathobi
- Beal, Candy M, Associate Professor, Curr, Instruc & Counselor Educ
- Bearon, Lucille B, Associate Professor, 4-H Youth Dev & Fam & Cons Sci
- Beasley, Mark S, Deloitte Professor, Accounting-college Of Manageme
- Beck, Keith R., Professor, Textile Engineering, Chemistry
- Beckmann, Robert L., Associate Professor, Plant Biology
- Bedair, Salah M. A., Professor, Electrical & Computer Engr.
- Beers, Burton F., Emeritus Professor, History
- Begeny, John C., Assistant Professor, Psychology
- Behnke, Andrew O, Assistant Professor, 4-H Youth Dev & Fam & Cons Sci
- Beichner, Robert J, Professor, STEM:Science, Tech, Engin, & Math
- Beith, Barry H, Adjunct Associate Professor, Psychology
- Benge, Drinda Elaine, Teaching Assistant Professor, College Of Education
- Bennett, Barbara A, Associate Professor, English
- Bennett, Elizabeth M, Adjunct Assistant Professor, Biology
- Benson, David M., Professor, Plant Pathology
- Benson, Ray B., Research Professor, Materials Science & Engineering
- Beratan, Kathi Kronenfeld, Research Assistant Professor, For & Envir Res Acad Research

- Bereman, Robert D., Emeritus Professor, Chemistry
- Berenson, Sarah B., Professor, Depart Of Math, Science, And T
- Bergey, Paul K, Associate Professor, Business Management-coll Of Mg
- Bergmann, Ben A., Adjunct Associate Professor, For & Envir Res Acad Research
- Bernhard, Richard Harold, Professor, Fitts Dept Indust & Syst Engr
- Bernholc, Jerzy, Drexel Professor of Physics, Physics
- Berube, David Michael, Professor, Communication
- Beute, Marvin K., Emeritus Professor, Plant Pathology
- Bhattacharya, Subhashish, Assistant Professor, Electrical & Computer Engr.
- Bhattacharyya, Bibhut, Professor, Statistics
- Bigelow, Anna Barry, Assistant Professor, Philosophy & Religious Studies
- Bilbro, Griff L., Professor, Electrical & Computer Engr.
- Bilderback, Theodore E., Professor, Horticultural Science
- Bilenkin, Vladimir, Associate Professor, Foreign Languages And Literatu
- Bingham, Charles S., Adjunct Assistant Professor, Educ Leadrshp & Policy Studies
- Bingham, William L., Emeritus Associate Professor, Civil Const & Environ Engineer
- Bird, Carolyn L., Assistant Professor, 4-H Youth Dev & Fam & Cons Sci
- Bird, David M, Professor, Plant Pathology
- Birgand, Francois Philippe, Assistant Professor, Biological And Agricultural En
- Birkenheuer, Adam Joseph, Assistant Professor, Dept of Clinical Sciences
- Birkland, Thomas A, William T. Kretzer Distinguished Professor, Public & International Affairs
- Bishir, John William, Emeritus Professor, Mathematics
- Bishop, Paul Edward, Emeritus USDA Professor, Microbiology
- Bissett, Sally A., Assistant Professor, Dept of Clinical Sciences
- Bitting, Paul F., Associate Professor, Educ Leadrshp & Policy Studies
- Bitzer, Donald L., Distinguished University Research Professor, Computer Science-engr
- Bivins, Jason Caulfield, Associate Professor, Philosophy & Religious Studies
- Bizios, Georgia, Professor, Architecture
- Black, Betty L., Professor, Biology
- Blackley, Brian, Assistant Professor, English
- Blair, Neal Edward, Professor, Marine, Earth And Atmospheric
- Blanchard, Margaret R., Assistant Professor, Depart Of Math, Science, And T
- Bland, George F., Emeritus Associate Professor, Electrical & Computer Engr.
- Blank, Gary B., Associate Professor, For & Envir Res Acad Research
- Blank, Philip E., Emeritus Professor, English
- Blankenship, Sylvia M., Professor, CALS Academic Programs
- Blanton, Richard L., Professor, Univ Honors Prog/Uga
- Blazich, Frank A., Professor, Horticultural Science
- Blikslager, Anthony T, Professor, Dept of Clinical Sciences
- Block, William J., Emeritus Professor, Public & International Affairs
- Bloem, Stephanie, Adjunct Associate Professor, Entomology

- Blondin, John M, Professor, Physics
- Bloomfield, Peter, Professor, Statistics
- Blum, Udo, Emeritus Professor, Plant Biology
- Bobashev, Georgiy, Adjunct Assistant Professor, Statistics
- Bobko, Christopher P, Assistant Professor, Civil Const & Environ Engineer
- Bocarro, Jason N., Associate Professor, Parks, Recreation & Tourism Mg
- Bochinski, Jason Russell, Research Assistant Professor, Physics
- Boettcher, William A, Associate Professor, Public & International Affairs
- Bogan, Arthur E, Adjunct Assistant Professor, Dept-Population, Health, Pathobi
- Bogdanovich, Alexander E., Adjunct Professor, Textile Engineering, Chemistry
- Bohlmann, Jonathan D, Associate Professor, Business Management-coll Of Mg
- Bohnenstiehl, DelWayne R, Assistant Professor, Marine, Earth And Atmospheric
- Boles, Michael A., Associate Professor, Mechanical & Aerospace Engr
- Bolonyai, Agnes, Associate Professor, English
- Bondell, Howard D, Assistant Professor, Statistics
- Bonham, Julia C., Teaching Assistant Professor, History
- Bonner, James C, Associate Professor, Toxicology
- Booker, Fitzgerald L, USDA Professor, Crop Science
- Booker, Matthew Morse, Assistant Professor, History
- Boone, Deborah A, Adjunct Assistant Professor, Agricultural & Extension Educa
- Boone, Edgar J., Emeritus Professor, Adult & Higher Education
- Boone, Kofi Malik, Assistant Professor, Landscape Architecture
- Boos, Dennis D., Professor, Statistics
- Borbye, Lisbeth, Teaching Associate Professor, Graduate School-Dean's Office
- Borden, Robert C., Professor, Civil Const & Environ Engineer
- Borden, Roy H., Professor, Civil Const & Environ Engineer
- Boreman, John G., Adjunct Professor, Biology
- Borkowski, Kazimierz, Research Associate Professor, Physics
- Borski, Russell J, Professor, Biology
- Boss, Charles B., Associate Professor, Chemistry
- Boss, Wendy F., William Neal Reynolds Distinguished Professor, Plant Biology
- Bostick, George W., Emeritus Professor, Agricultural & Extension Educa
- Boston, Rebecca S., William Neal Reynolds Professor, Plant Biology
- Bosworth, Ryan, Assistant Professor, Public & International Affairs
- Bottomley, Laura J, Teaching Assistant Professor, Engineering-Academic Affairs
- Bourham, Mohamed Abdelhay, Professor, Nuclear Engineering
- Bowden, Edmond F., Professor, Chemistry
- Bowen, Sarah K, Assistant Professor, Sociology And Anthropology
- Bowers, Crowell G., Emeritus Professor, Biological And Agricultural En
- Bowles, Tuere A., Assistant Professor, Educ Leadrshp & Policy Studies
- Bowman, Daniel C, Professor, Crop Science

- Boyd, Leon Carl, Professor, Food, Bioprocess & Nutrition Sc
- Boyette, Michael D, Phillip Morris Professor, Biological And Agricultural En
- Boyles, Ryan P, Extension Assistant Professor, Pams-state Climate Office
- Boyter, Henry Alfred, Adjunct Assistant Professor, Textile Engineering, Chemistry
- Bozarth, Cecil C, Associate Professor, Business Management-coll Of Mg
- Bracken, Susan J, Assistant Professor, Educ Leadrshp & Policy Studies
- Braden, Jeffery P, Professor, College Of Humanities & Soc SC
- Bradford, Marianne, Associate Professor, Accounting-college Of Manageme
- Bradley, Julius R., Emeritus Professor, Entomology
- Bradley, Lucy K, Assistant Professor, Horticultural Science
- Brady, Kevin P., Assistant Professor, Educ Leadrshp & Policy Studies
- Braham, Richard Riley, Professor, For & Envir Res Acad Research
- Brake, John Thomas, William Neal Reynolds Distinguished Professor, Poultry Science
- Branch, Kenneth A., Adjunct Assistant Professor, Educ Leadrshp & Policy Studies
- Brandeis, Susan Dowman, Professor, Art and Design
- Brandenburg, Rick Lynn, William Neal Reynolds Professor, Entomology
- Brandt, Jon A, Professor, Ag & Resource Economics
- Branoff, Theodore J, Associate Professor, Depart Of Math, Science, And T
- Branson, Bruce C, Professor, Accounting-college Of Manageme
- Braun, Scott Anthony, Adjunct Associate Professor, Marine, Earth And Atmospheric
- Braunbeck, Helga G, Associate Professor, Foreign Languages And Literatu
- Brazel, Joseph F., Associate Professor, Accounting-college Of Manageme
- Breen, Matthew, Professor, Dept Molecular Biomedical Scie
- Breidt, Frederick, USDA Associate Professor, Food, Bioprocess & Nutrition Sc
- Breitschwerdt, Edward Bealmear, Professor, Dept of Clinical Sciences
- Brenner, Donald W, Kobe Steel Distinguished Professor, Materials Science & Engineering
- Bressler, Eugene H, Professor, Landscape Architecture
- Breuhaus, Babetta Ann, Associate Professor, Dept of Clinical Sciences
- Brewer, Holly, Associate Professor, History
- Brickley, James J, Teaching Associate Professor, Electrical & Computer Engr.
- Bridgwater, Floyd Emmitt, USDA Professor, For & Envir Res Acad Research
- Brill, Earl Downey, Professor, Civil Const & Environ Engineer
- Brim, Charles Aloysius, Emeritus Professor, Crop Science
- Brinson, Kenneth H., Teaching Assistant Professor, Educ Leadrshp & Policy Studies
- Brisson, Robert C., Emeritus Associate Professor, Sociology & Anthropology
- Bristol, David G., Professor, College Of Veterinary Medicine
- Brody, Arnold R., Research Professor, Dept Molecular Biomedical Scie
- Bromley, Peter T, Emeritus Professor, Biology
- Brookins, Craig C, Associate Professor, Psychology
- Brooks, Wayne M., Emeritus Professor, Entomology
- Broome, Stephen W., Professor, Soil Science

- Brothers, Gene Leroy, Associate Professor, Parks, Recreation & Tourism Mg
- Brown, Allan F, Assistant Professor, Horticultural Science
- Brown, Alvin B., Hugh C. Kiger Professorship, Ag & Resource Economics
- Brown, Betsy E., Adjunct Assistant Professor, Provost Office Administration
- Brown, Christopher S, Professor, Ofc of Research & Grad Studies
- Brown, Dennis T, Professor, Biochemistry
- Brown, Henry S., Emeritus Professor, Marine, Earth And Atmospheric
- Brown, James W, Associate Professor, Microbiology
- Brown, John D, Professor, Physics
- Brown, Marvin Luther, Emeritus Professor, History
- Brown, Robert D, Professor, College of Natural Resources
- Brown, Talmage T., Professor, Dept-Population, Health, Pathobi
- Brown-Graham, Anita Rose, Professor, Institute of Emerging Issues
- Brown-Guedira, Gina, USDA Associate Professor, Crop Science
- Brownie, Cavell, Professor, Statistics
- Bruce, Jacklyn A, Assistant Professor, Agricultural & Extension Educa
- Bruck, Robert I., Professor, Plant Pathology
- Bruneau, Arthur Henry, Emeritus Professor, Parks, Recreation & Tourism Mg
- Brunet, James R, Assistant Professor, Public & International Affairs
- Bruno-Barcena, Jose Manuel, Assistant Professor, Microbiology
- Bryan, Robert S., Emeritus Professor, Philosophy & Religious Studies
- Bryant, Alyssa Nicole, Assistant Professor, Educ Leadrshp & Policy Studies
- Bryant, Charles D., Emeritus Associate Professor, CED General Support
- Bryden, Wayne L, Adjunct Professor, Poultry Science
- Buchanan, David R., Emeritus Professor, Textile Engineering, Chemistry
- Buchwalter, David B, Assistant Professor, Toxicology
- Buckel, Jeffrey A., Associate Professor, Biology
- Buckless, Frank A., KPMG Professor, Accounting-college Of Manageme
- Buckner, Gregory D, Associate Professor, Mechanical & Aerospace Engr
- Buhler, Wayne G, Associate Professor, Horticultural Science
- Buie, Timothy W, Assistant Professor, Industrial Design
- Bull, Leonard S, Emeritus Professor, Animal Science
- Bullock, Bronson P, Associate Professor, For & Envir Res Acad Research
- Bumgardner, Carl L., Professor, Chemistry
- Buol, Stanley W., Emeritus Distinguished Professor, Soil Science
- Buongiorno-Nardelli, Marco, Professor, Physics
- Burchell, Michael R, Assistant Professor, Biological And Agricultural En
- Burke, Matthew D, Adjunct Assistant Professor, Chemical & Biomolecular Engr
- Burkey, Kent Oliver, USDA Associate Professor, Crop Science
- Burkholder, Joann M., William Neal Reynolds Professor, Cals Center for Applied Aquati
- Burleson, Gary R, Adjunct Professor, Dept-Population, Health, Pathobi

- Burniston, Ernest E., Emeritus Professor, Mathematics
- Burns, Joseph Charles, USDA Professor, Crop Science
- Burrack, Hannah J, Assistant Professor, Entomology
- Burton, James D., Associate Professor, Horticultural Science
- Burton, Joseph William, USDA Professor, Crop Science
- Busby, Joe R, Teaching Assistant Professor, Depart Of Math, Science, And T
- Butcher, Kenneth Roy, Emeritus Professor, Dairy Records Processing
- Bykova, Marina F., Professor, Philosophy & Religious Studies
- Byrd, Gregory T, Associate Professor, Electrical & Computer Engr.
- Byrd, Medwick V, Teaching Assistant Professor, Wood And Paper Science
- Caddell, Joseph W., Teaching Assistant Professor, History
- Caldwell, Billy E., Emeritus Professor, Crop Science
- Callanan, Roger A., Adjunct Assistant Professor, Undergraduate Academic Program
- Campbell, Jennifer L, Teaching Assistant Professor, Biology
- Campbell, Robert George, Adjunct Professor, For & Envir Res Acad Research
- Campbell, Stephen LaVern, Professor, Mathematics
- Campbell, William V., Emeritus Professor, Entomology
- Canada, John R., Emeritus Professor, Fitts Dept Indust & Syst Engr
- Caner, Mehmet, Professor, Economics-college Of Managemen
- Caner, Turanay, Assistant Professor, Mgmt, Innovation&Entrepreneur
- Cannedy, Allen L, Clinical Assistant Professor, College Of Veterinary Medicine
- Cannon, Ronald Eugene, Adjunct Assistant Professor, Genetics
- Caple, Patricia C., Emeritus Associate Professor, Communication
- Carawan, Roy E., Emeritus Professor, Food, Bioprocess & Nutrition Sc
- Carbone, Ignazio, Associate Professor, Plant Pathology
- Carbonell, Ruben G., Frank Hawkins Kenan Distinguished Professor, BTEC-Biomfg Training Ed Ctr
- Cardinal, Andrea J, Associate Professor, Crop Science
- Cardoza, Yasmin J, Assistant Professor, Entomology
- Carlson, Gerald A., Emeritus Professor, Ag & Resource Economics
- Carlton, Charles Hope, Emeritus Professor, History
- Carmichael, Halbert H., Emeritus Professor, Chemistry
- Carrier, Sarah Jane, Assistant Professor, Elementary Education
- Carroll, Daniel E, Emeritus Professor, Food, Bioprocess & Nutrition Sc
- Carroll, John W, Professor, Philosophy & Religious Studies
- Carroll, Katherine Emma, Assistant Professor, Textile & Apparel, Technology
- Carson, Susan B., Teaching Assistant Professor, Plant Biology
- Cartee, Lianne A., Teaching Associate Professor, Biomedical Program ENG
- Carter, George L, Emeritus Professor, Adult & Higher Education
- Carter, Glenda S., Associate Professor, Depart Of Math, Science, And T
- Carter, Michael P., Professor, Graduate School-Dean's Office
- Carter, Thomas A., Emeritus Professor, Poultry Science

- Carter, Thomas E., USDA Professor, Crop Science
- Caruolo, Edward V., Emeritus Professor, Animal Science
- Carver, Donna K., Associate Professor, Poultry Science
- Casas, Ivan A, Adjunct Professor, Microbiology
- Case, Daniel Troy, Associate Professor, Sociology & Anthropology
- Casey, David S., Adjunct Assistant Professor, Animal Science
- Casey, Warren Michael, Adjunct Associate Professor, Microbiology
- Casper, Jonathan M, Assistant Professor, Parks, Recreation & Tourism Mg
- Cassady, Joseph P., Associate Professor, Animal Science
- Cassel, Donald K., Emeritus Professor, Soil Science
- Cassill, Nancy L, Professor, Textile & Apparel, Technology
- Casstevens, Willa Jeanne, Assistant Professor, Social Work
- Caster, Kenneth, Adjunct Associate Professor, Chemical & Biomolecular Engr
- Catignani, George L., Professor, Food, Bioprocess & Nutrition Sc
- Catts, Glenn P, Research Assistant Professor, For & Envir Res Acad Research
- Cavanagh, John, William Neal Reynolds Professor, Biochemistry
- Cavaroc, Victor V., Emeritus Professor, Marine, Earth And Atmospheric
- Cavin, Ralph K, Adjunct Professor, Electrical & Computer Engr.
- Chabay, Ruth W., Professor, Physics
- Chalcraft, David R, Adjunct Assistant Professor, Biology
- Chamblee, Douglas Scales, Emeritus Professor, Crop Science
- Champion, Larry S, Emeritus Professor, English
- Chandler, Richard E., Emeritus Professor, Mathematics
- Chang, Hou-Min, Emeritus Professor, Wood And Paper Science
- Chang, Simon W., Adjunct Professor, Marine, Earth And Atmospheric
- Chao, Allen C., Emeritus Associate Professor, Civil Const & Environ Engineer
- Chapman, Diane D, Teaching Associate Professor, Adult & Higher Education
- Chapman, Stephen N, Associate Professor, Business Management-coll Of Mg
- Chappell, Kimberly Higgins, Clinical Assistant Professor, Dept of Clinical Sciences
- Charles, John C., Assistant Professor, English
- Charlton, Harvey Johnson, Assistant Professor, Mathematics
- Charney, Joseph J, Adjunct Assistant Professor, Marine, Earth And Atmospheric
- Chen, Feinian, Associate Professor, Sociology & Anthropology
- Chen, Yuang-Sung Al, Professor, Accounting-college Of Manageme
- Cheng, Jay Jiayang, Professor, Biological And Agricultural En
- Chernoff, Neil, Adjunct Professor, Toxicology
- Chertock, Alina Emil, Associate Professor, Mathematics
- Chescheir, George M., Research Associate Professor, Biological And Agricultural En
- Cheshire, Heather Mcrae, Teaching Associate Professor, For & Envir Res Acad Research
- Chiang, Vincent L C, Jordan Family Distinguished Professorship for Natural Resources Innovation, For & Envir Res Acad Research

- Chilton, Mary Dell, Adjunct Professor, Genetics
- Chinn, Mari S, Assistant Professor, Biological And Agricultural En
- Chirkova, Rada Yuryevna, Associate Professor, Computer Science-engr
- Choct, Mingan, Adjunct Professor, Poultry Science
- Chou, Wu-show, Emeritus Professor, Computer Science-engr
- Chow, Mo-Yuen, Professor, Electrical & Computer Engr.
- Christensen, Vern L., Emeritus Professor, Poultry Science
- Chromy, James Raymond, Adjunct Professor, Statistics
- Chu, Moody Ten-Chao, Professor, Mathematics
- Chukwu, Ethelbert N., Emeritus Professor, Mathematics
- Chung, Kwong T., Emeritus Professor, Physics
- Chung, Lung-ock, Professor, Mathematics
- Clapp, Timothy Gladstone, Professor, Textile & Apparel, Technology
- Clark, Aaron, Associate Professor, Depart Of Math, Science, And T
- Clark, Allan C, Associate Professor, Biochemistry
- Clark, Brett L., Assistant Professor, Sociology And Anthropology
- Clark, James W, Emeritus Professor, English
- Clark, Lawrence Mozell, Emeritus Professor, Depart Of Math, Science, And T
- Clark, Robert L., Professor, Economics-college Of Managemen
- Clark, Roger Harrison, Professor, Architecture
- Clarke, Laura I, Associate Professor, Physics
- Classen, John J, Associate Professor, Biological And Agricultural En
- Claxton, Larry D, Adjunct Professor, Textile Engineering, Chemistry
- Clerkin, Richard M, Assistant Professor, Public & International Affairs
- Clifford, William B., Emeritus Professor, Sociology And Anthropology
- Clouse, Steven D, Professor, Horticultural Science
- Cobb, David T., Adjunct Assistant Professor, For & Envir Res Acad Research
- Cobb, Grover Cleveland, Emeritus Associate Professor, Physics
- Cobb, Michael D, Associate Professor, Public & International Affairs
- Coble, Harold D., Emeritus Professor, Crop Science
- Coe, Charles K., Professor, Public & International Affairs
- Coggburn, Jerrell D, Associate Professor, Public & International Affairs
- Cohen, Allen C, Adjunct Professor, Entomology
- Cohen, Jo-Ann D., Professor, College Of Phy & Math Sciences
- Cohen, Paul, Edgar S. Woolard Distinguished Professor, Fitts Dept Indust & Syst Engr
- Colbert, Elizabeth M., Adjunct Assistant Professor, Educ Leadrshp & Policy Studies
- Cole, James L., Emeritus Associate Professor, Psychology
- Collazo, Jaime A., USDI Professor, Biology
- Collazo, Ramon R, Research Assistant Professor, Materials Science & Engineering
- Collins, Patricia W, Clinical Assistant Professor, Psychology
- Collins, William K., Emeritus Named Professor, Crop Science

- Comins, Daniel L., Professor, Chemistry
- Comstock, Gary L, Professor, Philosophy & Religious Studies
- Confrey, Jere, Joseph D. Moore Distinguished Professor, Depart Of Math, Science, And T
- Conkling, Mark A., Adjunct Assistant Professor, Genetics
- Conner, Mark C, Adjunct Associate Professor, For & Envir Res Acad Research
- Conolly, Rory B, Adjunct Professor, Statistics
- Conrad, Hans, Emeritus Professor, Materials Science & Engineering
- Conrad, James M, Adjunct Associate Professor, Electrical & Computer Engr.
- Cook, James W, Emeritus Professor, Physics
- Cooke, James A, Adjunct Assistant Professor, Mechanical & Aerospace Engr
- Cooper, Arthur W., Emeritus Professor, For & Envir Res Acad Research
- Cooper, Paul A, Teaching Associate Professor, Mechanical & Aerospace Engr
- Cooper, Ralph L, Adjunct Professor, Dept Molecular Biomedical Scie
- Cooper, Richard J, Professor, Crop Science
- Cooper, Stuart Leonard, Adjunct Professor, Biomedical Program ENG
- Cooper, William J, Adjunct Professor, Marine, Earth And Atmospheric
- Cope, Will Allen, Emeritus Professor, Crop Science
- Cope, William Gregory, Associate Professor, Toxicology
- Copeland, Billy J., Emeritus Professor, Biology
- Corbett, David Reide, Adjunct Assistant Professor, Marine, Earth And Atmospheric
- Corbin, Frederick Thomas, Emeritus Professor, Crop Science
- Cornwell, John C., Emeritus Professor, Animal Science
- Correa, Maria T, Associate Professor, Dept-Population, Health, Pathobi
- Corson, Peter Burton, Teaching Associate Professor, Mechanical & Aerospace Engr
- Cosco, Nilda Graciela, Research Associate Professor, Design Research
- Coster, John K., Emeritus Professor, CED General Support
- Cotanch, Stephen R., Professor, Physics
- Couch, Nelson, Adjunct Assistant Professor, Fitts Dept Indust & Syst Engr
- Coulston, John Wesley, Adjunct Associate Professor, For & Envir Res Acad Research
- Covington, David H., Associate Professor, English
- Cowen, Peter, Associate Professor, Dept-Population, Health, Pathobi
- Cowger, Christina, USDA Associate Professor, Plant Pathology
- Cowling, Ellis B., Emeritus Professor, College of Natural Resources
- Cox, Chandra D, Associate Professor, Art and Design
- Craig, Elizabeth Ann, Assistant Professor, Communication
- Craig, Lee A, Professor, Economics-college Of Managemen
- Craig, Stephen Bartholomew, Associate Professor, Psychology
- Crawford, Elizabeth M., Emeritus Professor, Sociology & Anthropology
- Creamer, Nancy G, Professor, Horticultural Science
- Cribbins, Paul D., Emeritus Professor, Civil Const & Environ Engineer
- Crickenberger, Roger G., Emeritus Professor, Animal Science

- Crisp, Denise M, Professor, Graphic Design
- Crisp, James E., Associate Professor, History
- Crofton, Kevin M, Adjunct Associate Professor, Toxicology
- Croom, Dan Barry, Associate Professor, Agricultural & Extension Educa
- Croom, Warren J, Professor, Poultry Science
- Crosbie, Christopher James, Assistant Professor, English
- Crossland, Cathy L., Professor, Curr, Instruc & Counselor Educ
- Crouse, David A, Associate Professor, Soil Science
- Crow, Johnny L., Emeritus Assistant Professor, Depart Of Math, Science, And T
- Crowder, Larry B., Adjunct Professor, Biology
- Crowley, Martha L., Assistant Professor, Sociology & Anthropology
- Crozier, Carl R, Professor, Soil Science
- Crumbley, Deidre H, Associate Professor, Interdisciplinary Studies
- Cubbage, Frederick Willis, Professor, For & Envir Res Acad Research
- Cubeta, Marc A, Professor, Plant Pathology
- Cuculo, John A, Emeritus Named Professor, Textile Engineering, Chemistry
- Culbreth Jr, Charles Thomas, Henry A. Foscue Distinguished Professor, Fitts Dept Indust & Syst Engr
- Cullen, John Michael, Professor, Dept-Population, Health, Pathobi
- Cullinan, Douglas A., Professor, Curr, Instruc & Counselor Educ
- Cunningham, Joseph W., Emeritus Professor, Psychology
- Cunningham, Mary K., Associate Professor, Philosophy & Religious Studies
- Cunny, Helen C., Adjunct Professor, Toxicology
- Cuomo, Jerome J, Distinguished Research Professor, Materials Science & Engineering
- Currie, Nancy Jane, Adjunct Associate Professor, Fitts Dept Indust & Syst Engr
- Curtis, Stephanie E., Professor, Genetics
- Czaja, Ronald F, Emeritus Associate Professor, Sociology & Anthropology
- Dai, Huaiyu, Associate Professor, Electrical & Computer Engr.
- Daley, Dennis M., Professor, Public & International Affairs
- Dandridge, Edmund Pendleton, Emeritus Associate Professor, English
- Danehower, David A., Associate Professor, Crop Science
- Daniel, Louis B, Adjunct Assistant Professor, Biology
- Daniels, Harry V, Professor, Biology
- Daniels, Karen E, Assistant Professor, Physics
- Danielsen, Bartley R, Associate Professor, Business Management-coll Of Mg
- Danielson, Leon E., Emeritus Professor, Ag & Resource Economics
- Dannels, Deanna P, Associate Professor, Communication
- Darhower, Mark Anthony, Associate Professor, Foreign Languages And Literatu
- Dasmohapatra, Sudipta, Assistant Professor, Wood And Paper Science
- Daub, Margaret E., William Neal Reynolds Professor, Plant Biology
- Daubert, Christopher R, Professor, Food, Bioprocess & Nutrition Sc
- Davey, Charles Bingham, Emeritus Named Professor, For & Envir Res Acad Research

- Davidian, Marie, William Neal Reynolds Professor, Statistics
- Davidson, Christopher B, Adjunct Assistant Professor, For & Envir Res Acad Research
- Davidson, Michael G., Professor, College Of Veterinary Medicine
- Davies, Eric, Emeritus Professor, Plant Biology
- Davis Jr, Edward Willmore, Emeritus Professor, Computer Science-engr
- Davis, Adam C, Emeritus Associate Professor, Sociology And Anthropology
- Davis, Eric Lee, William Neal Reynolds Professor, Plant Pathology
- Davis, Hawthorne A, Emeritus Associate Professor, Textile & Apparel, Technology
- Davis, Heather A, Assistant Professor, Curr, Instruc & Counselor Educ
- Davis, Jack Parker, USDA Assistant Professor, Food, Bioprocess & Nutrition Sc
- Davis, Jeanine M., Associate Professor, Horticultural Science
- Davis, Jennifer Lynn, Assistant Professor, Dept of Clinical Sciences
- Davis, Jerry M., Emeritus Professor, Marine, Earth And Atmospheric
- Davis, K. Shannon, Associate Professor, College of Mgmt Acad Affairs
- Davis, Lauren Marie Berrings, Adjunct Assistant Professor, Fitts Dept Indust & Syst Engr
- Davis, Meredith Joy, Professor, Graphic Design
- Davis, Robert F., Emeritus Named Professor, Materials Science & Engineering
- Davis, William Rhett, Associate Professor, Electrical & Computer Engr.
- Davis, William Robert, Emeritus Professor, Physics
- Davis-Gardner, Angela Mackie, Professor, English
- Dawes, Gregory A., Professor, Foreign Languages And Literatu
- Dawes, Keith, Teaching Professor, Materials Science & Engineering
- Dayton, Paul A, Associate Professor, Biomedical Program ENG
- De Coster, Stacy M., Associate Professor, Sociology & Anthropology
- De Los Reyes, Francis Lajara, Associate Professor, Civil Const & Environ Engineer
- de Souza e Silva, Adriana Araujo, Assistant Professor, Communication
- Deal, Earl L, Emeritus Professor, Extension-wood & Paper Science
- Dean, Alexander G., Associate Professor, Electrical & Computer Engr.
- Dean, Gregg A, Professor, Dept Molecular Biomedical Scie
- Dean, Lisa Louise, USDA Assistant Professor, Food, Bioprocess & Nutrition Sc
- Dean, Ralph A, William Neal Reynolds Professor, Plant Pathology
- Deans, Andrew Robert, Assistant Professor, Entomology
- DeBord, Karen B, Professor, 4-H Youth Dev & Fam & Cons Sci
- DeCarolis, Joseph F, Assistant Professor, Civil Const & Environ Engineer
- DeCuir-Gunby, Jessica Theresa, Associate Professor, Curr, Instruc & Counselor Educ
- DeFrancesco, Teresa C, Associate Professor, Dept of Clinical Sciences
- Degernes, Laurel A, Associate Professor, Dept of Clinical Sciences
- DeGrand, Alexander J, Emeritus Professor, History
- DeHertogh, August A., Emeritus Professor, Horticultural Science
- Deiters, Alexander, Associate Professor, Chemistry
- Deitz, Lewis L., Emeritus Professor, Entomology

- DeJarnette, Fred R., Professor, Mechanical & Aerospace Engr
- DeJoy, Daniel A., Associate Professor, Communication
- Delcambre, Carla F, Teaching Assistant Professor, Landscape Architecture
- Dellafave, L. Richard, Professor, Sociology & Anthropology
- DeLuca, V. William, Associate Professor, Depart Of Math, Science, And T
- DeMaster, David John, Professor, Marine, Earth And Atmospheric
- Denig, Joseph, Professor, Wood And Paper Science
- Dennis, Robert G, Associate Professor, Biomedical Program ENG
- Denton, Brian, Assistant Professor, Fitts Dept Indust & Syst Engr
- DePerno, Christopher S, Assistant Professor, For & Envir Res Acad Research
- DeSimone, Joseph M, William R. Kenan, Jr. Distinguished Professor of Chemistry, Chemical & Biomolecular Engr
- Despain, Jeffrey Scott, Associate Professor, Foreign Languages And Literatu
- Devetsikiotis, Mihail, Professor, MS Comp Networking-ECE
- Devine, Hugh A., Professor, Parks, Recreation & Tourism Mg
- Devorshak, Christina, Adjunct Assistant Professor, Plant Pathology
- Dewey, Ralph E, Philip Morris Professor, Crop Science
- Dewhirst, Mark W., Adjunct Professor, Dept Molecular Biomedical Scie
- DeWoskin, Robert S, Adjunct Associate Professor, Dept-Population, Health, Pathobi
- Diaz, Lope Max, Associate Professor, Art and Design
- Dickens, James William, USDA Professor, Biological And Agricultural En
- Dickey, David Alan, William Neal Reynolds Professor, Statistics
- Dickey, Michael David, Assistant Professor, Chemical & Biomolecular Engr
- Dicks, Robert S, Associate Professor, English
- Dickson, Gary W, Emeritus Professor, Business Management-coll Of Mg
- Dillard, Emmett Urcey, Emeritus Associate Professor, Animal Science
- Dimitriades, Basil, Adjunct Professor, For & Envir Res Acad Research
- Dix, David J, Adjunct Assistant Professor, Toxicology
- Dixon, Darlene, Adjunct Associate Professor, Dept Molecular Biomedical Scie
- Dobrogosz, Walter J., Emeritus Professor, Microbiology
- Dodsworth, Robin M, Assistant Professor, English
- Doerr, Phillip David, Emeritus Professor, For & Envir Res Acad Research
- Doggett, Wesley Osborne, Emeritus Professor, Physics
- Dole, John M., Professor, Horticultural Science
- Domec, Jean-Christophe, Research Assistant Professor, For & Envir Res Acad Research
- Donaldson, Robert Alan, Professor, Textile & Apparel, Technology
- Dong, Jingyan, Assistant Professor, Fitts Dept Indust & Syst Engr
- Donoso, Pablo Jorge, Adjunct Professor, For & Envir Res Acad Research
- Dorgeloh, Werner Gunther, Adjunct Professor, For & Envir Res Acad Research
- Dorman, David C, Professor, College Of Veterinary Medicine
- Doster, Joseph M., Professor, Nuclear Engineering
- Dougherty, Daniel B., Assistant Professor, Physics

- Dougherty, Phillip M, Adjunct Professor, For & Envir Res Acad Research
- Dow, Thomas A., Dean F. Duncan Distinguished University Professorship in Mechanical Engineering, Mechanical & Aerospace Engr
- Downs, Murray S., Emeritus Professor, Provost's Office
- Downs, Robert Jack, Emeritus Professor, Phytotron
- Doyle, Jon, SAS Institute Distinguished Professor of Computer Science, Computer Science-engr
- Drake, Mary Anne, Professor, Food, Bioprocess & Nutrition Sc
- Dreher, Kevin L, Adjunct Professor, Dept Molecular Biomedical Scie
- Drewes, Donald William, Professor, Psychology
- Driggers, Louis B., Emeritus Professor, Biological And Agricultural En
- Driscoll, Catherine M, Assistant Professor, Philosophy & Religious Studies
- Duckworth, Owen W, Assistant Professor, Soil Science
- Ducoste, Joel, Associate Professor, Civil Const & Environ Engineer
- Dudley, Marc K., Assistant Professor, English
- Dudziak, Donald J., Emeritus Professor, Nuclear Engineering
- Duel-Hallen, Alexandra, Professor, Electrical & Computer Engr.
- Dunn, Joseph C., Emeritus Professor, Mathematics
- Dunn, Patricia C, Professor, 4-H Youth Dev & Fam & Cons Sci
- Dunn, Robert R., Assistant Professor, Biology
- Dunning, Dianne, Clinical Associate Professor, College Of Veterinary Medicine
- Dunphy, Edward James, Professor, Crop Science
- Durant, Jack D., Emeritus Professor, English
- Dutta, Rudra, Associate Professor, Computer Science-engr
- Dvorak, William Stephen, Professor, CAMCORE-Cent Amer & Mex Conif
- Dye, Janice A, Adjunct Associate Professor, Dept of Clinical Sciences
- Dykstra, Michael Jack, Research Professor, Dept-Population, Health, Pathobi
- Eapen, Jacob, Assistant Professor, Nuclear Engineering
- Early, Peter Joseph, Clinical Assistant Professor, Dept of Clinical Sciences
- Earp, Julia B, Associate Professor, Business Management-coll Of Mg
- Easley, James E, Emeritus Professor, Ag & Resource Economics
- Echekki, Tarek, Associate Professor, Mechanical & Aerospace Engr
- Eckerlin, Herbert Martin, Professor, Mechanical & Aerospace Engr
- Edens, Frank W., Professor, Poultry Science
- Edge, Billy L, Professor, Civil Const & Environ Engineer
- Edmisten, Keith L, Professor, Crop Science
- Edmonson, William W., Associate Professor, Electrical & Computer Engr.
- Edwards, Harriett C, Assistant Professor, 4-H Youth Dev & Fam & Cons Sci
- Edwards, Jack Ray, Professor, Mechanical & Aerospace Engr
- Edwards, Linda McMurry, Emeritus Professor, History
- Edwards, Louis Laird, Adjunct Professor, Wood And Paper Science
- Efimenko, Kirill, Research Assistant Professor, Chemical & Biomolecular Engr

- Eggleston, David B, Professor, Marine, Earth And Atmospheric
- Ehm, Margaret G, Adjunct Assistant Professor, Statistics
- Eischen, Jeffrey W., Associate Professor, Mechanical & Aerospace Engr
- Eisemann, Joan, Professor, Animal Science
- Eisen, Eugene, Emeritus Named Professor, Animal Science
- El-Masry, Nadia A, Professor, Materials Science & Engineering
- El-Shafei, Ahmed Mohamed, Assistant Professor, Textile Engineering, Chemistry
- El-Shiekh, Aly H, Emeritus Professor, Textile & Apparel, Technology
- Eling, Thomas Edward, Adjunct Associate Professor, Toxicology
- Elkan, Gerald Hugh, Emeritus Professor, Park Scholars
- Elleman, Thomas S, Emeritus Professor, Nuclear Engineering
- Elliott, Sinikka G, Assistant Professor, Sociology & Anthropology
- Ellison, Donald C, Professor, Physics
- Ellovich, Risa S., Assistant Professor, Sociology & Anthropology
- Ellwood, Eric L., Emeritus Professor, College of Natural Resources
- Elmaghraby, Salah E., Distinguished University Professor of Industrial Engineering for International Competitiveness, Operations Research-engr
- Ely, John F., Emeritus Professor, Civil Const & Environ Engineer
- Emery, Donald Allen, Emeritus Professor, Graduate School-Dean's Office
- Emigh, Ted H., Associate Professor, Genetics
- Endicott, Ronald P, Associate Professor, Philosophy & Religious Studies
- Engell, Miles Dean, Teaching Assistant Professor, Biology
- Engen, Rodney L, Adjunct Associate Professor, Sociology & Anthropology
- Erchul, William P., Professor, Psychology
- Erickson, Edward W., Emeritus Professor, Economics-college Of Managemen
- Ernst, Jeremy Vaughn, Assistant Professor, Depart Of Math, Science, And T
- Esbenshade, Kenneth L., Professor, CALS Academic Programs
- Escuti, Michael James, Assistant Professor, Electrical & Computer Engr.
- Estes, Edmund A., Professor, Ag & Resource Economics
- Estes, Patricia A, Research Associate Professor, Genetics
- Eun, Do Young, Associate Professor, Electrical & Computer Engr.
- Evans, Robert J, Adjunct Assistant Professor, Electrical & Computer Engr.
- Evans, Robert O, Professor, Biological And Agricultural En
- Evans, Timothy Matthew, Assistant Professor, Civil Const & Environ Engineer
- Faber, Brenton D, Professor, English
- Fackler, Paul L., Professor, Ag & Resource Economics
- Fahmy, Abdel A., Emeritus Professor, Materials Science & Engineering
- Fair, Barbara, Assistant Professor, Horticultural Science
- Fang, Shu C., Walter Clark Professor of Industrial Engineering, Fitts Dept Indust & Syst Engr
- Fang, Tiegang, Assistant Professor, Mechanical & Aerospace Engr
- Fantz, Paul R., Emeritus Professor, Horticultural Science

- Farin, Charlotte E, Professor, Animal Science
- Farin, Peter W, Associate Professor, Dept-Population, Health, Pathobi
- Farkas, Brian E, Professor, Food, Bioprocess & Nutrition Sc
- Farr, Angela Celeste, Assistant Professor, Communication
- Farrier, Maurice H., Emeritus Professor, Entomology
- Fathi, Yahya, Professor, Fitts Dept Indust & Syst Engr
- Faulkner, Gary Doyle, Emeritus Associate Professor, Mathematics
- Fauntleroy, Amassa, Professor, Mathematics
- Favorov, Oleg V, Research Associate Professor, Biomedical Program ENG
- Fedkiw, Peter S., Professor, Chemical & Biomolecular Engr
- Feeny, Thomas P., Professor, Foreign Languages And Literatu
- Felder, Richard M., Emeritus Named Professor, Chemical & Biomolecular Engr
- Fellner, Vivek, Associate Professor, Animal Science
- Felts, James Vernon, Adjunct Assistant Professor, Poultry Science
- Ferguson, Scott M, Assistant Professor, Mechanical & Aerospace Engr
- Ferket, Peter R., William Neal Reynolds Professor, Poultry Science
- Fernandez, Gina E, Associate Professor, Horticultural Science
- Ferreira, Davis Fernandes, Adjunct Associate Professor, Biochemistry
- Ferrier, Brad S, Adjunct Associate Professor, Marine, Earth And Atmospheric
- Ferzli, Miriam G, Teaching Assistant Professor, Biology
- Fike, William T, Emeritus Professor, Crop Science
- Findenegg, Gerhard H, Adjunct Professor, Chemical & Biomolecular Engr
- Fine, Howard A, Adjunct Professor, Dept-Population, Health, Pathobi
- Finley, Charles C, Adjunct Associate Professor, Biomedical Program ENG
- Fiscus, Edwin L., USDA Professor, Crop Science
- Fish, Richard E, Associate Professor, Dept of Clinical Sciences
- Fisher, Douglas, Emeritus Professor, Economics-college Of Managemen
- Fisher, John S., Emeritus Professor, Civil Const & Environ Engineer
- Fisher, Loren R, Associate Professor, Crop Science
- Fites, Roger C., Emeritus Professor, Plant Biology
- Fitzgerald, Patrick J, Associate Professor, Art and Design
- Fitzpatrick, Scott Michael, Associate Professor, Sociology & Anthropology
- Flammer, Keven, Professor, Dept of Clinical Sciences
- Flath, David Joseph, Professor, Economics-college Of Managemen
- Fleenor, John W, Adjunct Associate Professor, Psychology
- Fleisher, Lloyd Norman, Professor, Dept Molecular Biomedical Scie
- Fleming, Henry Pridgen, Emeritus USDA Professor, Food, Bioprocess & Nutrition Sc
- Fleming, Jean E., Adjunct Assistant Professor, Adult & Higher Education
- Fleming, Walker James, Adjunct Associate Professor, Biology
- Fletcher, Oscar J, Professor, Dept-Population, Health, Pathobi
- Flick, Anita P, Teaching Assistant Professor, Biology

- Flickinger, Michael Carl, Professor, BTEC-Biomfg Training Ed Ctr
- Flowers, James L., Professor, Agricultural & Extension Educa
- Flowers, James R, Clinical Associate Professor, Dept-Population, Health, Pathobi
- Flowers, William Lucas, Professor, Animal Science
- Floyd, Myron F, Professor, Parks, Recreation & Tourism Mg
- Fodor, Ronald Victor, Professor, Marine, Earth And Atmospheric
- Foegeding, Edward Allen, William Neal Reynolds Distinguished Professor, Food, Bioprocess & Nutrition Sc
- Fogle, Jonathan E., Research Assistant Professor, Dept-Population, Health, Pathobi
- Fonteno, William Charles, Professor, Horticultural Science
- Foote, Vincent, Emeritus Professor, Industrial Design
- Ford, Richard Banbury, Professor, Dept of Clinical Sciences
- Fornaro, Robert Joseph, Professor, Computer Science-engr
- Fornes, Raymond Earl, Professor, College Of Phy & Math Sciences
- Fortner, Brand, Research Professor, Physics
- Fountain, John Crothers, Professor, Marine, Earth And Atmospheric
- Fox, Barbara J., Professor, Curr, Instruc & Counselor Educ
- Fox, Thomas R, Adjunct Associate Professor, For & Envir Res Acad Research
- Frampton, Lewis John, Professor, For & Envir Res Acad Research
- Frank, Steven D, Assistant Professor, Entomology
- Franke, John E., Professor, Mathematics
- Franklin, E. Carlyle, Emeritus Professor, Forestry Small Woodlot
- Franks, Robert Graham, Assistant Professor, Genetics
- Franzen, Stefan, Professor, Chemistry
- Franzon, Paul D., Professor, Electrical & Computer Engr.
- Frederick, Douglas J., Professor, For & Envir Res Acad Research
- Freedman, Leon D., Emeritus Professor, Chemistry
- Freeh, Vincent W, Associate Professor, Computer Science-engr
- Freeman, Harold S., Ciba-Geigy Distinguished Professor, College Of Textiles-dean's Off
- Freeman, McArthur, Assistant Professor, Art and Design
- Frey, Henry C, Professor, Civil Const & Environ Engineer
- Friend, Craig T, Associate Professor, History
- Frink, Neal T., Adjunct Professor, Mechanical & Aerospace Engr
- Fuentes, Montserrat, Associate Professor, Statistics
- Fuller, Frederick J., Professor, Dept-Population, Health, Pathobi
- Fuller, Nicholas Colvin Masi, Adjunct Professor, Physics
- Fulp, Ronald O., Professor, Mathematics
- Funkhouser, Edward T., Associate Professor, College Of Humanities & Soc SC
- Fusarelli, Bonnie C, Associate Professor, Educ Leadrshp & Policy Studies
- Fusarelli, Lance D., Professor, Educ Leadrshp & Policy Studies
- Gabr, Mohammed Awad, Professor, Civil Const & Environ Engineer
- Gadsby, John E., Professor, Dept Molecular Biomedical Scie

- Gallagher, Victoria J, Professor, Communication
- Gallippi, Caterina M, Assistant Professor, Biomedical Program ENG
- Gamcsik, Michael, Associate Professor, Biomedical Program ENG
- Gard, Kevin, Adjunct Assistant Professor, Electrical & Computer Engr.
- Gardner, Randolph G., Emeritus Professor, Horticultural Science
- Gardner, Robin Pierce, Professor, Nuclear Engineering
- Gardner, Sarah Y., Associate Professor, Dept of Clinical Sciences
- Garlich, Jimmy Dale, Emeritus Professor, Poultry Science
- Garoutte, Dennis E., Emeritus Associate Professor, Mathematics
- Garrett, Paul E, Adjunct Associate Professor, Physics
- Garrigan, Shelley E., Assistant Professor, Foreign Languages And Literatu
- Garson, George D, Professor, Public & International Affairs
- Garval, Michael D, Associate Professor, Foreign Languages And Literatu
- Gayles, Joy Gaston, Associate Professor, Educ Leadrshp & Policy Studies
- Geary, Cynthia Waszak, Adjunct Assistant Professor, Adult & Higher Education
- Gebreyes, Wondwossen A, Associate Professor, Dept-Population, Health, Pathobi
- Gehl, Ronald J, Assistant Professor, Soil Science
- Gehringer, Edward F., Associate Professor, Computer Science-engr
- Gelley, Ora, Assistant Professor, English
- Genereux, David Paul, Professor, Marine, Earth And Atmospheric
- Genzer, Jan, Celanese Acetate Professorship in Chemical and Biomolecular Engineering, Chemical & Biomolecular Engr
- Gerard, Mathew P., Clinical Associate Professor, Dept of Clinical Sciences
- Gerig, Thomas Michael, Emeritus Professor, Statistics
- Gerler, Edwin R, Professor, Curr, Instruc & Counselor Educ
- Gernat, Abel G., Adjunct Assistant Professor, Poultry Science
- Gervais, Jean-Philippe, Associate Professor, Ag & Resource Economics
- Getsinger, Kurt D, Adjunct Professor, Crop Science
- Getzen, Forrest W, Emeritus Professor, Chemistry
- Ghashghaei, Troy, Assistant Professor, Dept Molecular Biomedical Scie
- Ghiladi, Reza A, Assistant Professor, Chemistry
- Ghosh, Sujit K, Professor, Statistics
- Ghosh, Tushar K., Professor, Textile Engineering, Chemistry
- Ghoshal, Subhashis, Associate Professor, Statistics
- Ghovanloo, Maysam, Adjunct Assistant Professor, Electrical & Computer Engr.
- Gibson, Gregory C, Adjunct Professor, Genetics
- Gibson, James E, Adjunct Professor, Toxicology
- Giesbrecht, Francis Gerhard, Emeritus Professor, Statistics
- Gilbert, John H., Emeritus Associate Professor, Public & International Affairs
- Gilger, Brian C, Professor, Dept of Clinical Sciences
- Gillan, Douglas J, Professor, Psychology

- Gilliam, James F, Professor, Biology
- Gilliam, James W., Emeritus Named Distinguished Professor, Soil Science
- Gilligan, John G., Professor, Nuclear Engineering
- Gilmartin, David P., Professor, History
- Gilmour, Matthew Ian, Adjunct Assistant Professor, Dept-Population, Health, Pathobi
- Gimeno, Isabel M, Assistant Professor, Dept-Population, Health, Pathobi
- Glass, Joseph Conrad, Emeritus Professor, Adult & Higher Education
- Glazener, Edward Walker, Emeritus Professor, CALS Academic Programs
- Glisson, Tildon H, Emeritus Professor, Electrical & Computer Engr.
- Godfrey, A. Blanton, Joseph D. Moore Professorship of Textile and Apparel Management and Technology, College Of Textiles-dean's Off
- Godwin, John R, Associate Professor, Biology
- Goetze, Alfred John, Emeritus Professor, Electrical & Computer Engr.
- Gold, Harvey J., Emeritus Professor, Statistics
- Goldberg, Richard L., Research Associate Professor, Biomedical Program-Grad Appts
- Goldfarb, Barry, Professor, For & Envir Res Acad Research
- Goldstein, Irving S., Emeritus Professor, Wood And Paper Science
- Goldstein, Joyce Allene, Adjunct Professor, Toxicology
- Golub, Robert, Professor, Physics
- Gomez, Joseph A., Professor, English
- Gomez, Shawn M., Assistant Professor, Biomedical Program ENG
- Gonzalez, Gabriel F., Emeritus Professor, Foreign Languages And Literatu
- Goode, Larry Richard, Adjunct Associate Professor, Civil Const & Environ Engineer
- Goodell, Lora Suzanne, Assistant Professor, Food, Bioprocess & Nutrition Sc
- Gooding, Guy V, Emeritus Professor, Plant Pathology
- Goodman, Major M., William Neal Reynolds Distinguished University Professor, Crop Science
- Goodnight, James Howard, Adjunct Professor, Statistics
- Goodwin, Barry K, William Neal Reynolds Professor, Ag & Resource Economics
- Gookin, Jody L, Assistant Professor, Dept of Clinical Sciences
- Gopalarathnam, Ashok, Associate Professor, Mechanical & Aerospace Engr
- Gordh, Gordon, Adjunct Professor, Entomology
- Gorga, Russell E., Associate Professor, Textile Engineering, Chemistry
- Gorham, Bertha M, Adjunct Associate Professor, Curr, Instruc & Counselor Educ
- Gorman, Christopher B, Professor, Chemistry
- Goshe, Michael B., Associate Professor, Biochemistry
- Gould, Christopher R., Professor, College Of Phy & Math Sciences
- Gould, Fred L., William Neal Reynolds Distinguished Professor, Entomology
- Gould, Richard David, R. J. Reynolds Professor in Mechanical and Aerospace Engineering, Mechanical & Aerospace Engr
- Govoni, John Jeffrey, Adjunct Professor, Biology
- Grable, Lisa L, Adjunct Assistant Professor, The Science House PAMS

- Grabow, Garry L, Associate Professor, Biological And Agricultural En
- Gracz, Hanna, Research Associate Professor, Biochemistry
- Grady, Perry L., Emeritus Professor, Textile Engineering, Chemistry
- Grainger, John J., Teaching Professor, Electrical & Computer Engr.
- Grand, Larry Frank, Professor, Plant Pathology
- Grandage, Arnold H., Emeritus Professor, Statistics
- Grant, Christine S., Professor, College Of Engineering-dean's
- Grant, Edward, Professor, Electrical & Computer Engr.
- Grant, William Cullen, Professor, Biology
- Grappendorf, Heidi L, Assistant Professor, Parks, Recreation & Tourism Mg
- Graves, Alexandria K, Assistant Professor, Soil Science
- Gray, Denis O., Professor, Psychology
- Gray, Leon Earl, Adjunct Professor, Toxicology
- Green, David Patrick, Professor, Food, Bioprocess & Nutrition Sc
- Green, James T, Professor, Crop Science
- Greenberg, Cathryn Hoben, Adjunct Associate Professor, For & Envir Res Acad Research
- Greene, Steven H, Associate Professor, Public & International Affairs
- Greenlee, William F, Adjunct Professor, Toxicology
- Greenstein, Theodore Neuman, Professor, Sociology & Anthropology
- Gregory, James D, Emeritus Professor, For & Envir Res Acad Research
- Gregory, Max E., Emeritus Professor, Food, Bioprocess & Nutrition Sc
- Gremaud, Pierre Alain, Professor, Mathematics
- Grennes, Thomas J., Professor, Economics-college Of Managemen
- Griffin, Clifford E, Associate Professor, Public & International Affairs
- Griffis, Dieter P., Research Associate Professor, Engineering Research
- Grimes, Jesse Lee, Professor, Poultry Science
- Grimmett, Marc Anderson, Assistant Professor, Curr, Instruc & Counselor Educ
- Grimwood, James M., Alumni Distinguished Undergraduate Professor, English
- Grindem, Carol B., Professor, Dept-Population, Health, Pathobi
- Gross, Charlotte, Professor, English
- Gross, Harry D., Emeritus Professor, Crop Science
- Gross, Kevin, Associate Professor, Statistics
- Gross, Ruth Vera, Professor, Foreign Languages And Literatu
- Grossfeld, Robert M., Professor, Biology
- Grossman, Julie Marie, Assistant Professor, Soil Science
- Grouverman, Alexei, Research Associate Professor, Materials Sci Engr-Grads&Temps
- Grove, Thurman L, Emeritus Professor, Biology
- Grozinger, Christina M., Adjunct Associate Professor, Entomology
- Grubb, Brenda Judge, Teaching Assistant Professor, Biology
- Gruehn, Daniel, Assistant Professor, Psychology
- Grunden, Amy Michele, Associate Professor, Microbiology

- Gu, Xiaohui, Assistant Professor, Computer Science-engr
- Guarnieri, Charles Richard, Research Professor, Materials Science & Engineering
- Gubbins, Keith E, Worley H. Clark Distinguished University Professor, Chemical & Biomolecular Engr
- Guddati, Murthy N., Associate Professor, Civil Const & Environ Engineer
- Guerron, Pablo A., Assistant Professor, Economics-college Of Managemen
- Guion, Lisa A, Professor, Agricultural & Extension Educa
- Gumpertz, Marcia Lynn, Professor, Diversity and Inclusion
- Gundogdu, Kenan, Assistant Professor, Physics
- Gunnoe, Thomas Brent, Associate Professor, Chemistry
- Gunter, Christopher, Assistant Professor, Horticultural Science
- Gupta, Abhinav, Associate Professor, Civil Const & Environ Engineer
- Gupta, Ajaya K., Emeritus Professor, Civil Const & Environ Engineer
- Gupta, Bhupender S., Professor, Textile Engineering, Chemistry
- Gurgel, Gisele Candia Passador, Teaching Assistant Professor, BTEC-Biomfg Training Ed Ctr
- Gurgel, Patrick V, Adjunct Assistant Professor, Chemical & Biomolecular C&G
- Gurley, Edward D., Emeritus Associate Professor, Civil Const & Environ Engineer
- Gustke, Larry Douglas, Emeritus Associate Professor, Parks, Recreation & Tourism Mg
- Guy, James S., Professor, Dept-Population, Health, Pathobi
- Gwynn, George Richard, Emeritus USDA Professor, Crop Science
- Haaland, Perry D, Adjunct Professor, Statistics
- Haase, David G., Professor, Physics
- Haddad, Nicholas M, Associate Professor, Biology
- Haenn, Nora M, Associate Professor, Interdisciplinary Studies
- Hafner, Johannes, Assistant Professor, Philosophy & Religious Studies
- Hagler, Winston Murry, Professor, Administration Research Serv
- Haider, Mansoor Abbas, Associate Professor, Mathematics
- Haigler, Candace Hope, Professor, Crop Science
- Hain, Fred P., Professor, Entomology
- Halberstadt, Amy G., Professor, Psychology
- Hale, Francis J., Emeritus Professor, Mechanical & Aerospace Engr
- Hale, Scott A, Professor, Biological And Agricultural En
- Haley, Richard L, Emeritus Assistant Professor, Educ Leadrshp & Policy Studies
- Hall, Alastair R., Professor, Economics-college Of Managemen
- Hall, Anthony Douglas, Adjunct Professor, Psychology
- Hall, Carol K., Camille Dreyfus Distinguished University Professor, Chemical & Biomolecular Engr
- Hall, Charles Edward, Associate Professor, Mechanical & Aerospace Engr
- Hall, George L., Emeritus Professor, Physics
- Hall, Janice S., Visiting Assistant Professor, College Of Education
- Hall, Jodi K, Clinical Assistant Professor, Social Work
- Hallen, Hans D, Professor, Physics
- Halperen, Max, Emeritus Professor, Interdisciplinary Studies

- Halpern, Nicholas, Associate Professor, English
- Hambourger, Robert Michael, Emeritus Associate Professor, Philosophy & Religious Studies
- Hamilton, Paul T, Assistant Professor, Microbiology
- Hamlett, Patrick W, Associate Professor, Interdisciplinary Studies
- Hamme, John Valentine, Emeritus Associate Professor, Materials Science & Engineering
- Hammerberg, Bruce, Professor, Dept-Population, Health, Pathobi
- Hammond, David J, Adjunct Professor, Chemical & Biomolecular Engr
- Hammond, Robert Guthrie, Assistant Professor, Economics-college Of Managemen
- Hamon, Nicholas M., Adjunct Professor, Entomology
- Hamouda, Hechmi, Professor, Textile Engineering, Chemistry
- Hanck, Kenneth W., Professor, Chemistry
- Hancock, Tina U, Professor, Social Work
- Handfield, Robert B, Bank of America Distinguished University Professor, Business Management-coll Of Mg
- Hanel, Rita M, Clinical Assistant Professor, Dept of Clinical Sciences
- Hanley, Linda Kay, William Neal Reynolds Professor, Biochemistry
- Hanna, Adel F, Adjunct Assistant Professor, Marine, Earth And Atmospheric
- Hannrup, Bjorn, Adjunct Assistant Professor, For & Envir Res Acad Research
- Hansen, Arthur P., Emeritus Professor, Food, Bioprocess & Nutrition Sc
- Hansen, Bernard, Associate Professor, Dept of Clinical Sciences
- Hansen, Donald Joseph, Emeritus Assistant Professor, Mathematics
- Hansen, Gary R, Assistant Professor, Animal Science
- Hanson, Dana J., Associate Professor, Food, Bioprocess & Nutrition Sc
- Hanson, Durwin M., Emeritus Professor, CED General Support
- Hanson, John M, Emeritus Distinguished University Professor, Civil Const & Environ Engineer
- Hanson, Warren D., Emeritus Professor, Genetics
- Harazin, William Dennis, Adjunct Associate Professor, Textile & Apparel, Technology
- Hardie, Elizabeth Mills, Professor, Dept of Clinical Sciences
- Hardin, Charles C., Associate Professor, Biochemistry
- Hardin, James W, Emeritus Professor, Plant Biology
- Hardy, David H, Adjunct Assistant Professor, Soil Science
- Harfoush, Khaled Abdel Hamid, Associate Professor, Computer Science-engr
- Harmon, Russell S, Adjunct Professor, Marine, Earth And Atmospheric
- Harms, Craig A, Associate Professor, Dept of Clinical Sciences
- Harper, James D, Emeritus Professor, Entomology
- Harrell, Cleon W, Emeritus Associate Professor, Economics-college Of Managemen
- Harrell, Robert J, Adjunct Associate Professor, Animal Science
- Harrington, Charles D, Adjunct Associate Professor, Marine, Earth And Atmospheric
- Harris, Gabriel Keith, Assistant Professor, Food, Bioprocess & Nutrition Sc
- Harris, James R., Emeritus Professor, Poultry Science
- Harris, William C., Emeritus Professor, History
- Harrison, Antony Howard, Distinguished University, English

- Harrolle, Michelle G, Assistant Professor, Parks, Recreation & Tourism Mg
- Harrysson, Ola Lars Anders, Associate Professor, Fitts Dept Indust & Syst Engr
- Hart, Clarence, Emeritus Professor, Wood And Paper Science
- Hart, Franklin D., Emeritus Professor, Ofc of Research & Grad Studies
- Hart, Peter Wayne, Adjunct Associate Professor, Wood And Paper Science
- Hartwig, Robert E., Professor, Mathematics
- Harvey, Raymond W., Emeritus Professor, Animal Science
- Harwood, Karey Alison, Assistant Professor, Philosophy & Religious Studies
- Haskett, Mary E, Professor, Psychology
- Hassan, Awatif E, Emeritus Professor, For & Envir Res Acad Research
- Hassan, Hassan A., Professor, Mechanical & Aerospace Engr
- Hassan, Hosni Moustafa, Professor, Microbiology
- Hassan, Tasnim, Associate Professor, Civil Const & Environ Engineer
- Hatch, Luther Upton, Research Professor, Ag & Resource Economics
- Hatcher, Timothy G, Associate Professor, Educ Leadrshp & Policy Studies
- Hauck, Marlene L, Associate Professor, Dept of Clinical Sciences
- Haugh, Jason M, Associate Professor, Chemical & Biomolecular Engr
- Hauser, Elizabeth R, Adjunct Associate Professor, Statistics
- Hauser, John R., Emeritus Named Professor, Electrical & Computer Engr.
- Hauser, Peter J, Professor, Textile Engineering, Chemistry
- Havell, Edward A, Research Professor, Dept-Population, Health, Pathobi
- Havenstein, Gerald B., Professor, Poultry Science
- Havlin, John L, Professor, Soil Science
- Havner, Kerry S., Emeritus Professor, Civil Const & Environ Engineer
- Hawari, Ayman I, Professor, Nuclear Engineering
- Hawkins, Eleanor C, Professor, Dept of Clinical Sciences
- Hawkins, Mary Beth, Teaching Assistant Professor, Biology
- Haynie, William J, Professor, Depart Of Math, Science, And T
- Hazel, Dennis W., Associate Professor, Extension-forestry General
- He, Lin, Assistant Professor, Chemistry
- He, Ruoying, Associate Professor, Marine, Earth And Atmospheric
- Headen, Alvin E., Associate Professor, Economics-college Of Managemen
- Healey, Christopher Graham, Associate Professor, Computer Science-engr
- Heatwole, Harold F, Professor, Biology
- Heber, Steffen, Assistant Professor, Computer Science-engr
- Heck, Walter Webb, Emeritus USDA Professor, Administration Research Serv
- Hedlund, Kye S., Adjunct Associate Professor, Entomology
- Heggen-Peay, Cherilyn L, Adjunct Assistant Professor, Poultry Science
- Heimbach, Clinton L., Emeritus Professor, Civil Const & Environ Engineer
- Heiniger, Ronnie William, Professor, Crop Science
- Heise, Ryan J, Adjunct Assistant Professor, Biology

- Heitman, Joshua L, Assistant Professor, Soil Science
- Heitmann, John A, Professor, Wood And Paper Science
- Helminck, Aloysius G, Professor, Mathematics
- Hemenway, Cynthia L, Professor, Biochemistry
- Henard, David H, Associate Professor, Business Management-coll Of Mg
- Henderson, Karla Ann, Professor, Parks, Recreation & Tourism Mg
- Henderson, Warren R., Emeritus Professor, Horticultural Science
- Henderson, Wesley, Assistant Professor, Chemical & Biomolecular Engr
- Hentz, Forrest Clyde, Professor, Chemistry
- Herbert, David A, Adjunct Associate Professor, Entomology
- Hergeth, Helmut H, Associate Professor, Textile & Apparel, Technology
- Hernandez, Raquel, Research Associate Professor, Biochemistry
- Herring, William O, Adjunct Professor, Animal Science
- Hersh, Patricia L, Associate Professor, Mathematics
- Hersh, Solomon P., Emeritus Named Professor, Textile Engineering, Chemistry
- Hess, George R., Associate Professor, For & Envir Res Acad Research
- Hess, Paul R, Assistant Professor, Dept of Clinical Sciences
- Hess, Thomas M., Professor, Psychology
- Hessling, Peter A, Teaching Assistant Professor, Educ Leadrshp & Policy Studies
- Hester, M Thomas, Distinguished Professor, English
- Hesterberg, Dean L, Professor, Soil Science
- Hibbard, James Patrick, Professor, Marine, Earth And Atmospheric
- Hicks, Gregory E., Adjunct Assistant Professor, Educ Leadrshp & Policy Studies
- Hightower, Joseph E, USDI Professor, Biology
- Hill, David Brian, Assistant Professor, Architecture
- Hillmann, Ruediger C., Emeritus Associate Professor, Entomology
- Hinesley, Lewis E., Professor, Horticultural Science
- Hinestroza, Juan Paulo, Adjunct Assistant Professor, Chemical & Biomolecular Engr
- Hinks, David, Professor, Textile Engineering, Chemistry
- Hinshaw, Jeffrey M., Associate Professor, Biology
- Hoban, Thomas Jefferson, Professor, Sociology And Anthropology
- Hobbs, Alexander Owens, Adjunct Assistant Professor, Solar Center
- Hobbs, Heidi H, Associate Professor, Public & International Affairs
- Hobbs, Joseph Patrick, Emeritus Professor, History
- Hobgood, Thomas N, Emeritus Professor, Administration Extension Ser
- Hodge, Gary Ray, Professor, CAMCORE-Cent Amer & Mex Conif
- Hodge, George Lawrence, Associate Professor, Textile Engineering, Chemistry
- Hodges, Charles S, Visiting Professor, Plant Pathology
- Hodgson, Ernest, Emeritus Professor, Toxicology
- Hodgson, Thom Joel, James T. Ryan Distinguished Professor of Industrial Engineering and Furniture Manufacturing, Fitts Dept Indust & Syst Engr

- Hodgson, Thomas H., Emeritus Professor, Mechanical & Aerospace Engr
- Hoenig, John M, Adjunct Professor, Statistics
- Hofelt, Christopher Scott, Teaching Assistant Professor, Toxicology
- Hoffman, Jacquelyn Beth, Assistant Professor, Poultry Science
- Hoffmann, William A, Assistant Professor, Plant Biology
- Hoit, Marc I, Professor, VC for Off of Info Technology
- Holcomb, Lori B., Assistant Professor, Curr, Instruc & Counselor Educ
- Holden, Debra J., Adjunct Assistant Professor, Psychology
- Holland, James B, USDA Professor, Crop Science
- Hollebrands, Karen Flanagan, Associate Professor, Depart Of Math, Science, And T
- Holley, Daniel L, Emeritus Professor, For & Envir Res Acad Research
- Holley, Grant L, Adjunct Assistant Professor, College Of Education
- Holley, Linda T., Emeritus Professor, English Biweekly
- Hollmann, Thomas, Assistant Professor, Business Management-coll Of Mg
- Holmes, Thomas P, Adjunct Professor, For & Envir Res Acad Research
- Holthausen, Duncan M., Emeritus Professor, Economics-college Of Managemen
- Holton, William C., Research Professor, Electrl & Comp Engr Grad & Temp
- Holtzman, Abraham, Emeritus Professor, Public & International Affairs
- Honeycutt, Ronald L, Adjunct Assistant Professor, Elementary Education
- Honeycutt, Thomas Lynn, Associate Professor, Computer Science-engr
- Hong, Hoon, Professor, Mathematics
- Hooker, Deborah A., Assistant Professor, English
- Hooker, Willard E., Professor, Horticultural Science
- Hooper, Percy Rivera, Associate Professor, Industrial Design
- Hoover, Maurice William, Emeritus Professor, Food, Bioprocess & Nutrition Sc
- Hoover, Michael T., Professor, Soil Science
- Hopfenberg, Harold B., Emeritus Named Professor, Chemical & Biomolecular Engr
- Hopkins, Brinton Alden, Professor, Animal Science
- Hopkins, Thomas Sawyer, Research Professor, Marine, Earth And Atmospheric
- Horie, Yasuyuki, Emeritus Professor, Civil Const & Environ Engineer
- Horowitz, Jonathan M, Associate Professor, Dept Molecular Biomedical Scie
- Horton, Horace R, Emeritus Named Distinguished Professor, Biochemistry
- Hoss, Donald Earl, Adjunct Professor, Biology
- Howard, Kristina Elaine, Research Assistant Professor, Dept Molecular Biomedical Scie
- Hoyt, Greg D., Professor, Soil Science
- Hsiang, Simon M, Associate Professor, Fitts Dept Indust & Syst Engr
- Hsiao, Henry, Professor, Biomedical Program ENG
- Hu, Jianxin, Visiting Assistant Professor, PhD in Design
- Hu, Shuijin, Associate Professor, Plant Pathology
- Huang, Alex Qin, Progress Energy Distinguished Professor in Electrical and Computer Engineering, Electrical & Computer Engr.

- Huang, Jeng Sheng, Professor, Plant Pathology
- Hubbe, Martin A, Buckman Professor, Wood And Paper Science
- Hubbell, Bryan J, Adjunct Assistant Professor, Ag & Resource Economics
- Hubisz, John L, Adjunct Professor, Physics
- Hudson, Lola C., Professor, Dept Molecular Biomedical Scie
- Hudson, Peyton B, Emeritus Associate Professor, Textile & Apparel, Technology
- Hudson, Samuel Mack, Professor, Textile Engineering, Chemistry
- Huffman, Lois E, Adjunct Assistant Professor, Curr, Instruc & Counselor Educ
- Huffman, Paul R, Professor, Physics
- Huffman, Rodney L., Associate Professor, Biological And Agricultural En
- Hughes, Brian L, Professor, Electrical & Computer Engr.
- Hughes-Oliver, Jacqueline M., Professor, Statistics
- Hummer, Joseph E, Professor, Civil Const & Environ Engineer
- Humphrey, David Gene, Adjunct Assistant Professor, Fitts Dept Indust & Syst Engr
- Humphries, Ervin G., Emeritus Professor, Biological And Agricultural En
- Hunt, Louis David, Adjunct Assistant Professor, EMAS-Enrollment Mgt & Services
- Hunt, William F, Associate Professor, Biological And Agricultural En
- Huntington, Gerald B, Professor, Animal Science
- Hurban, Patrick, Adjunct Assistant Professor, Genetics
- Hyman, David N., Professor, Economics-college Of Managemen
- Hyman, Michael R, Associate Professor, Microbiology
- Iafrate, Gerald J., Adjunct Professor, Electrl & Comp Engr Grad & Temp
- liames, John S, Adjunct Assistant Professor, For & Envir Res Acad Research
- Ingram, Jason Wade, Assistant Professor, Communication
- Inoue, Atsushi, Professor, Ag & Resource Economics
- Ipsen, Ilse, Professor, Mathematics
- Irving, Douglas Lee, Assistant Professor, Materials Science & Engineering
- Isik, Fikret, Research Associate Professor, Tree Improvement Cooperative
- Isleib, Thomas G., Professor, Crop Science
- Ison, Elon Ayinde, Assistant Professor, Chemistry
- Israel, Daniel Wesley, Emeritus Professor, Soil Science
- Istook, Cynthia L, Associate Professor, Textile & Apparel, Technology
- Ito, Kazufumi, Professor, Mathematics
- Ives, Robert Lawrence, Adjunct Professor, Mathematics
- Ivors, Kelly L., Assistant Professor, Plant Pathology
- Ivy, Julie Simmons, Assistant Professor, Fitts Dept Indust & Syst Engr
- Iyer, S. Purushothaman, Adjunct Professor, Computer Science-engr
- Jablonski, Margaret Ann, Adjunct Assistant Professor, Adult & Higher Education
- Jackl, Andrew Wayne, Adjunct Assistant Professor, Educ Leadrshp & Policy Studies
- Jackson, David Michael, Adjunct Professor, Entomology
- Jackson, Denis Sherald, Adjunct Assistant Professor, McKimmon Ctr-Ext & Cont Ed/NCR

- Jackson, Steven D, Teaching Associate Professor, Integrated Manufacturing Sys E
- Jackson, Walter Anderson, Associate Professor, History
- Jaeger, Audrey J., Associate Professor, Educ Leadrshp & Policy Studies
- Jahn, Larry G., Emeritus Professor, Wood And Paper Science
- Jaimes, Hector A, Associate Professor, Foreign Languages And Literatu
- Jakes, Susan S, Extension Assistant Professor, Psychology
- Jameel, Hasan, Elis and Signe Olsson Professorship, Wood And Paper Science
- James, April Lynda, Assistant Professor, For & Envir Res Acad Research
- Jameson, Jessica K, Associate Professor, Communication
- Janet, Jason A., Adjunct Assistant Professor, Integrated Manufacturing Sys E
- Jang, Carey, Adjunct Associate Professor, Marine, Earth And Atmospheric
- Janowitz, Gerald S., Professor, Marine, Earth And Atmospheric
- Jasper, Warren J, Professor, Textile Engineering, Chemistry
- Jayaratne, Koralalage Sunil Upali, Assistant Professor, Agricultural & Extension Educa
- Jaykus, Lee-Ann, Professor, Food, Bioprocess & Nutrition Sc
- Jeffries, Micha Jennine, Assistant Professor, Elementary Education
- Jenkins, Alvin W, Emeritus Professor, Physics
- Jenkins, David M., Professor, Personal Org. Development
- Jennings, Gregory D., Professor, Biological And Agricultural En
- Jennings, Katherine Mary, Research Assistant Professor, Horticultural Science
- Jennings, Michael Dean, Adjunct Assistant Professor, Landscape Architecture
- Jesmok, Gary J., Adjunct Professor, Dept Molecular Biomedical Scie
- Jett, Jackson Bates, Professor, College of Natural Resources
- Jetton, Robert M, Research Assistant Professor, CAMCORE-Cent Amer & Mex Conif
- Ji, Chueng Ryong, Professor, Physics
- Jiang, Xuxian, Assistant Professor, Computer Science-engr
- Jin, Bongil, Associate Professor, Industrial Design
- Jing, Naihuan, Professor, Mathematics
- Joffe, Sharon Lynne, Teaching Assistant Professor, English
- Johnson, Arthur Richard, Adjunct Professor, Mechanical & Aerospace Engr
- Johnson, Cynthia Wolf, Adjunct Assistant Professor, Adult & Higher Education
- Johnson, Marc Thomas Jewell, Assistant Professor, Plant Biology
- Johnson, Mark A, Associate Professor, Materials Science & Engineering
- Johnson, Melissa A, Associate Professor, Communication
- Johnson, Richard R., Emeritus Professor, Mechanical & Aerospace Engr
- Johnson, Sidney T, Adjunct Assistant Professor, Curr, Instruc & Counselor Educ
- Johnson, Sue Ellen, Assistant Professor, Crop Science
- Johnson, Thomas, Emeritus Professor, Ag & Resource Economics
- Johnson, William H., Emeritus Professor, Biological And Agricultural En
- Johnson, William L, Emeritus Professor, Animal Science

- Johnston, David W., Edward I. Weisiger Distinguished Professor in Construction Engineering and Management, Civil Const & Environ Engineer
- Johnston, Karen L., Emeritus Professor, Physics
- Joines, Jeffrey Allen, Associate Professor, Textile Engineering, Chemistry
- Joines, Sharon Melissa Bennett, Assistant Professor, Industrial Design
- Jones, Charles P., Edwin Gill Professor of Business Management, Business Management-coll Of Mg
- Jones, David W.W., Assistant Professor, Agricultural & Extension Educa
- Jones, Edwin John, Professor, Administration Extension Ser
- Jones, Guy Langston, Emeritus Professor, Crop Science
- Jones, James R., Emeritus Professor, Animal Science
- Jones, Lawrence Keith, Emeritus Professor, Curr, Instr & Counselor Ed-CED
- Jones, Melissa Gail, Professor, Depart Of Math, Science, And T
- Jones, Michelle R, Associate Professor, Textile & Apparel, Technology
- Jones, Ronald K, Emeritus Professor, Plant Pathology
- Jones, Samuel L, Professor, Dept of Clinical Sciences
- Jones, Victor A., Emeritus Professor, Food, Bioprocess & Nutrition Sc
- Jordan, Chad Victor, Teaching Assistant Professor, Plant Biology
- Jordan, David L, Professor, Crop Science
- Jordan, Edwin C, Adjunct Assistant Professor, College of Design
- Jordan, William J., Professor, Communication
- Jorgenson, Andrew K, Assistant Professor, Sociology And Anthropology
- Joseph, Eric Andrew, Adjunct Professor, Physics
- Jou, Yih Liang, Adjunct Assistant Professor, Electrical & Computer Engr.
- Joyner, Charles Edward, Professor, Art and Design
- Jur, Jesse Stephen, Research Assistant Professor, Chemical & Biomolecular Engr
- Kaber, David B, Professor, Fitts Dept Indust & Syst Engr
- Kahn, Joseph Stephan, Emeritus Professor, Biochemistry
- Kalat, James W., Professor, Psychology
- Kalinga, Owen J, Professor, History
- Kaltofen, Erich L, Professor, Mathematics
- Kamprath, Eugene J., Emeritus Named Distinguished Professor, Soil Science
- Kamykowski, Daniel, Professor, Marine, Earth And Atmospheric
- Kandilov, Ivan Todorov, Assistant Professor, Ag & Resource Economics
- Kang, Jaewoo, Adjunct Assistant Professor, Computer Science-engr
- Kang, Min Jeong, Associate Professor, Mathematics
- Kang, Wooseong, Assistant Professor, Business Management-coll Of Mg
- Kanters, Michael A, Associate Professor, Parks, Recreation & Tourism Mg
- Kaplan, Norman L, Adjunct Professor, Statistics
- Kasal, Bohumil, Adjunct Professor, Wood And Paper Science
- Kasichainula, Jagannadham, Associate Professor, Materials Science & Engineering
- Kasworm, Carol Edith, Professor, Adult & Higher Education

- Kathariou, Sophia, Professor, Food, Bioprocess & Nutrition Sc
- Katz, Susan M, Associate Professor, English
- Katzin, Gerald H., Emeritus Professor, Physics
- Kay, Michael G., Associate Professor, Fitts Dept Indust & Syst Engr
- Kearney, Richard Craig, Professor, Public & International Affairs
- Kebschull, Harvey G., Emeritus Associate Professor, Public & International Affairs
- Keene, Bruce W, Professor, Dept of Clinical Sciences
- Keene, Karen Allen, Assistant Professor, Depart Of Math, Science, And T
- Kelley, Blair Lynne Murphy, Associate Professor, History
- Kelley, Carl Timothy, Drexel Professor of Mathematics, Mathematics
- Kelley, John H, Research Associate Professor, Physics
- Kelley, Patricia H, Adjunct Professor, Biology
- Kelley, Stephen S, Professor, Wood And Paper Science
- Kellison, Robert C., Emeritus Professor, For & Envir Res Acad Research
- Kellner, Hans Dodds, Professor, English
- Kelly, John Rivard, Emeritus Professor, Foreign Languages And Literatu
- Kelly, Myron W., Professor, Wood And Paper Science
- Kelly, Robert M, ALCOA Professor of Chemical Engineering, Chemical & Biomolecular Engr
- Keltie, Richard F., Professor, College Of Engineering-dean's
- Kennedy, George G., William Neal Reynolds Distinguished Professor, Entomology
- Kennedy-Stoskopf, Suzanne, Research Professor, Dept of Clinical Sciences
- Kessel, John J., Professor, English
- Kessler, Sanford H., Associate Professor, Public & International Affairs
- Keys, Robert Dean, Emeritus Associate Professor, Crop Science
- Keyton, Joann, Professor, Communication
- Khachatoorian, Haig, Professor, Industrial Design
- Khaledi, Morteza, Professor, Chemistry
- Khan, Saad A, Alcoa Professor of Chemical and Biomolecular Engineering, Chemical & Biomolecular Engr
- Khater, Akram F, Associate Professor, History
- Kheyfets, Arkady, Professor, Mathematics
- Khorram, Siamak, Professor, Center for Earth Observation
- Khosla, Narendra P., Professor, Civil Const & Environ Engineer
- Kick, Edward Lee, Professor, Sociology And Anthropology
- Kilara, Arun, Adjunct Professor, Food, Bioprocess & Nutrition Sc
- Kilpatrick, Peter K., Adjunct Professor, Chemical & Biomolecular Engr
- Kim, Chong S, Adjunct Professor, Mechanical & Aerospace Engr
- Kim, Jung Hyoun, Adjunct Associate Professor, Electrical & Computer Engr.
- Kim, Ki Wook, Professor, Electrical & Computer Engr.
- Kim, Mi Gyung, Associate Professor, History
- Kim, Sung Woo, Associate Professor, Animal Science
- Kim, Yongbaek, Assistant Professor, Dept-Population, Health, Pathobi

- Kim, Youngsoo R, Professor, Civil Const & Environ Engineer
- Kimbell, Julia S, Adjunct Assistant Professor, Statistics
- Kimberley, Michael M., Associate Professor, Marine, Earth And Atmospheric
- Kimler, William C., Associate Professor, History
- Kincheloe, Henderson Grady, Emeritus Professor, English
- King, Doris E., Emeritus Professor, History
- King, John S, Associate Professor, Rooted Cutting Program
- King, Margaret Fontaine, Emeritus Associate Professor, English
- King, Martin William, Professor, Textile Engineering, Chemistry
- King, Russell E., Professor, Fitts Dept Indust & Syst Engr
- Kinsella, William J, Associate Professor, Communication
- Kirby, Barbara Malpiedi, Professor, CALS Academic Programs
- Kirby, Sarah D, Associate Professor, 4-H Youth Dev & Fam & Cons Sci
- Kirkman, Adrianna G., Professor, College of Natural Resources
- Kirkpatrick, Gary Jay, Adjunct Assistant Professor, Marine, Earth And Atmospheric
- Kiserow, Douglas J, Adjunct Professor, Chemical & Biomolecular Engr
- Kistler, Mark J., Assistant Professor, Agricultural & Extension Educa
- Kiwanuka-Tondo, James, Associate Professor, Communication
- Klaenhammer, Todd Robert, William Neal Reynolds Distinguished University Professor, Food, Bioprocess & Nutrition Sc
- Klang, Eric Carl, Associate Professor, Mechanical & Aerospace Engr
- Kleiman, Glenn Marshall, Professor, Friday Institute
- Klein, Katherine W., Emeritus Associate Professor, Psychology
- Kleinstreuer, Clement, Professor, Mechanical & Aerospace Engr
- Kleiss, Harold J., Professor, Soil Science
- Kloos, Wesley Edwin, Emeritus Professor, Genetics
- Knappe, Detlef R, Professor, Civil Const & Environ Engineer
- Knisley, Steve B, Professor, Biomedical Program-Grad Appts
- Knoeber, Charles Robert, Professor, Economics-college Of Managemen
- Knopp, James Arthur, Associate Professor, Biochemistry
- Knowles, A Sidney, Emeritus Professor, English
- Knowles, Charles Ernest, Emeritus Associate Professor, Mar, Earth & Atmos Sci Grad-Tm
- Koch Jr, Frank H, Research Assistant Professor, For & Envir Res Acad Research
- Koch, Carl C., Kobe Steel Distinguished Professor, Materials Science & Engineering
- Kochersberger, Robert C., Associate Professor, English
- Kochtcheeva, Lada Vyacheslavovna, Assistant Professor, Public & International Affairs
- Koci, Matthew D., Assistant Professor, Poultry Science
- Kocurek, Michael J, Professor, Wood And Paper Science
- Koenning, Stephen R, Research Associate Professor, Plant Pathology
- Kogan, Irina Aleksandrovna, Associate Professor, Mathematics
- Kolar, Praveen, Assistant Professor, Biological And Agricultural En

- Kolb, John Ronald, Emeritus Professor, Depart Of Math, Science, And T
- Kolbas, Robert Michael, Professor, Electrical & Computer Engr.
- Konsler, Thomas R., Emeritus Professor, Horticultural Science
- Koonce, Benjamin Granade, Emeritus Professor, English
- Korach, Kenneth S, Adjunct Professor, Toxicology
- Kordick, Stephanie, Adjunct Assistant Professor, Dept-Population, Health, Pathobi
- Kornegay, Julia L, Professor, Horticultural Science
- Kosenko, Kama A, Assistant Professor, Communication
- Kosinski, Andrzej S, Adjunct Associate Professor, Statistics
- Kotek, Richard, Associate Professor, Textile Engineering, Chemistry
- Kotula, Paul G, Adjunct Associate Professor, Materials Science & Engineering
- Kouri, Richard E, Professor, Mgmt, Innovation&Entrepreneur
- Kowalsky, Mervyn J, Professor, Civil Const & Environ Engineer
- Kramer, Jonathan Charles, Teaching Professor, Music
- Kraus, Helen Tyler, Assistant Professor, Horticultural Science
- Krause, Wendy E., Associate Professor, Textile Engineering, Chemistry
- Krawczyk, Katherine A, Professor, Accounting-college Of Manageme
- Krim, Hamid, Professor, Electrical & Computer Engr.
- Krim, Jacqueline, Professor, Physics
- Krings, Alexander, Extension Assistant Professor, Plant Biology
- Kriz, George James, Emeritus Professor, Administration Research Serv
- Kronberg, Charles L., Adjunct Assistant Professor, Psychology
- Krotee, March Lee, Professor, Physical Education
- Krueger, Kenneth K., Adjunct Professor, Poultry Science
- Krute, Linda D, Adjunct Assistant Professor, College Of Engineering-dean's
- Kuehn, Richard T., Adjunct Assistant Professor, Electrical & Computer Engr.
- Kuhr, Ronald J., Emeritus Professor, Entomology
- Kullman, Seth William, Assistant Professor, Toxicology
- Kuraparthy, Vasu, Assistant Professor, Crop Science
- Kuznetsov, Andrey Valerevich, Professor, Mechanical & Aerospace Engr
- Kwak, Thomas J, USDI Professor, Biology
- Kwanyuen, Prachuab, USDA Associate Professor, Crop Science
- Laarman, Jan G., Adjunct Professor, For & Envir Res Acad Research
- Labate, Demetrio, Associate Professor, Mathematics
- Lackey, Carolyn Jean, Emeritus Professor, Family And Consumer Sciences
- Lackmann, Gary M., Professor, Marine, Earth And Atmospheric
- Lada, Thomas J., Professor, Mathematics
- Lado, Fred, Emeritus Professor, Physics
- Laffitte, Bryan W, Associate Professor, Industrial Design
- Laing, Arlene G, Adjunct Associate Professor, Marine, Earth And Atmospheric
- Lakin, Kenneth R., Adjunct Associate Professor, Entomology

- Lalush, David S, Associate Professor, Biomedical Program ENG
- Lamar, Traci Ann May, Associate Professor, Textile & Apparel, Technology
- Lamb, Harold Henry, Professor, Chemical & Biomolecular Engr
- Lamont, Margaret Elizabeth, Assistant Professor, English
- Lancia, Richard Angelo, Professor, For & Envir Res Acad Research
- Lane, Sharolyn A., Associate Professor, Psychology
- Laney, Reid W, Adjunct Assistant Professor, Biology
- Langenbach, Robert J., Adjunct Professor, Toxicology
- Langfelder, Leonard J., Emeritus Professor, Marine, Earth And Atmospheric
- Lanier, Tyre C., Professor, Food, Bioprocess & Nutrition Sc
- Lankford, Jesse Raymond, Adjunct Associate Professor, History
- Lapp, John S., Professor, Economics-college Of Managemen
- Lari, Pooneh, Teaching Assistant Professor, Educ Leadrshp & Policy Studies
- Larick, Duane K., Professor, Graduate School-Dean's Office
- Lascelles, Duncan X., Associate Professor, Dept of Clinical Sciences
- Lassiter, Charles A., Emeritus Professor, Animal Science
- Laster, Scott M., Professor, Microbiology
- Lau, Christopher S, Adjunct Professor, Dept Molecular Biomedical Scie
- Laux, Dorianne Louise, Professor, English
- Lavelle, Jerome Philip, Teaching Associate Professor, College Of Engineering-dean's
- Lavery, John, Adjunct Professor, Mathematics
- Lavopa, Anthony J., Emeritus Professor, History
- Law, Jerry M, Professor, Dept-Population, Health, Pathobi
- Lazzati, Davide, Assistant Professor, Physics
- Lazzi, Gianluca, Professor, Electrical & Computer Engr.
- Lea, Russell, Emeritus Professor, For & Envir Res Acad Research
- Leach, James Woodrow, Professor, Mechanical & Aerospace Engr
- Leach, Monica Terrell, Assistant Professor, EMAS-Enrollment Mgt & Services
- Leath, Steven, Professor, Plant Pathology
- Leavens, Teresa Lynette, Research Assistant Professor, Dept-Population, Health, Pathobi
- LeBlanc, Gerald Andre, Professor, Toxicology
- Leblebicioglu, Asli, Assistant Professor, Economics-college Of Managemen
- Lebude, Anthony V, Assistant Professor, Horticultural Science
- Lecce, James Giacomo, Emeritus Named Professor, Animal Science
- Leduc, Sharon K, Adjunct Professor, Marine, Earth And Atmospheric
- Lee, Dean J., Associate Professor, Physics
- Lee, Hollylynne Stohl, Associate Professor, Depart Of Math, Science, And T
- Lee, Hoon Joo, Assistant Professor, Textile & Apparel, Technology
- Lee, Jasper S, Adjunct Professor, Agricultural & Extension Educa
- Lee, Jeffrey Scott, Adjunct Professor, Architecture
- Lee, John Kelly, Associate Professor, Curr, Instruc & Counselor Educ

- Lee, Joshua Alexander, Emeritus Professor, Crop Science
- Lee, Susanna M, Assistant Professor, History
- Lee, Yong-Hwan, Adjunct Associate Professor, Plant Pathology
- Lee, Yuan-Shin, Professor, Fitts Dept Indust & Syst Engr
- Leidy, Ross Bennett, Emeritus Professor, Toxicology
- Leiter, Jeffrey Carl, Professor, Sociology & Anthropology
- Leith, Carlton James, Emeritus Professor, Marine, Earth And Atmospheric
- Leithold, Elana L., Professor, Marine, Earth And Atmospheric
- Lemaster, Richard L, Research Professor, Wood And Paper Science
- Leming, Michael Lloyd, Associate Professor, Civil Const & Environ Engineer
- Lester II, James C, Professor, Computer Science-engr
- Leung, Yu-Fai, Associate Professor, Parks, Recreation & Tourism Mg
- Levenbook, Barbara B., Associate Professor, Philosophy & Religious Studies
- Levere, Thomas E., Emeritus Professor, Psychology
- Levin, Harold D., Associate Professor, Philosophy & Religious Studies
- Levine, Jay F., Professor, Dept-Population, Health, Pathobi
- Levings, Charles S, Emeritus Named Distinguished Professor, Genetics
- Levy, Michael G., Professor, Dept-Population, Health, Pathobi
- Lewbart, Gregory A, Professor, Dept of Clinical Sciences
- Lewis, Ramsey S, Assistant Professor, Crop Science
- Lewis, William M., Emeritus Professor, Crop Science
- Lewitus, Alan J, Adjunct Assistant Professor, Marine, Earth And Atmospheric
- Ley, David H., Professor, Dept-Population, Health, Pathobi
- Li, Bailian, Professor, Office of Int'l Affairs-OIA
- Li, Lexin, Assistant Professor, Statistics
- Li, Yi-Ju, Adjunct Assistant Professor, Statistics
- Li, Zhilin, Professor, Mathematics
- Lichtenwalner, Dan J, Research Assistant Professor, Materials Science & Engineering
- Liebl, Rex, Adjunct Professor, Crop Science
- Ligon, James M, Adjunct Associate Professor, Microbiology
- Lila, Mary Ann, Professor, Kannapolis Research
- Lilley, Stephen C., Associate Professor, Sociology And Anthropology
- Lilly, John P., Emeritus Associate Professor, Soil Science
- Lim, Phooi K., Professor, Chemical & Biomolecular Engr
- Lin, Weili, Professor, Biomedical Program ENG
- Lin, Xiao B., Professor, Mathematics
- Linak, William, Adjunct Professor, Mechanical & Aerospace Engr
- Lindbo, David L, Professor, Soil Science
- Linder, Keith E, Clinical Assistant Professor, Dept-Population, Health, Pathobi
- Lindsay, Edwin Keith, Teaching Assistant Professor, Parks, Recreation & Tourism Mg
- Lindsey, Jonathan S, Glaxo Distinguished University Professor of Chemistry, Chemistry
- Lindstrom, Richard M, Adjunct Professor, Nuclear Engineering
- Linker, Harry M., Emeritus Professor, Crop Science
- Linnehan, Richard, Visiting Assistant Professor, Dept of Clinical Sciences
- Linnerud, Ardell Chester, Emeritus Associate Professor, Statistics
- Lisk, Thomas D, Professor, English
- List, George F, Professor, Civil Const & Environ Engineer
- Litaker, Richard Wayne, Adjunct Associate Professor, Dept of Clinical Sciences
- Little, Trevor J., Professor, Textile & Apparel, Technology
- Littlejohn, Michael A., Emeritus Professor, Electrical & Computer Engr.
- Liu, Hsiao-Ching, Associate Professor, Animal Science
- Liu, Jing-pu, Associate Professor, Marine, Earth And Atmospheric
- Liu, Min, Assistant Professor, Civil Const & Environ Engineer
- Liu, Xun, Assistant Professor, Electrical & Computer Engr.
- Livingston, David P, USDA Professor, Crop Science
- Lloyd, Alun Lewis, Professor, Mathematics
- Loboa-Polefka, Elizabeth Grace, Associate Professor, Biomedical Program ENG
- Locke, Don C., Emeritus Professor, Curr, Instr & Counselor Ed-CED
- Locklear, Eddie Lee, Associate Professor, 4-H Youth Dev & Fam & Cons Sci
- Loeppert, Richard Henry, Emeritus Professor, Chemistry
- Loftis, David L, Adjunct Associate Professor, For & Envir Res Acad Research
- Lomax, Terri Lynn, Professor, Ofc of Research & Grad Studies
- Lommel, Steven, William Neal Reynolds Professor, Administration Research Serv
- Long, Raymond Carl, Emeritus Professor, Crop Science
- Longmuir, Ian S., Emeritus Professor, Biochemistry
- Loomis, Michael R, Adjunct Assistant Professor, Dept of Clinical Sciences
- Lorenzen, Marce D., Assistant Professor, Entomology
- Losordo, Thomas M., Professor, Biological And Agricultural En
- Louws, Frank J, Professor, Plant Pathology
- Lowrey, Austin S, Emeritus Professor, Graphic Design
- Lu, Wenbin, Associate Professor, Statistics
- Lu, Wenchang, Research Associate Professor, Physics
- Lubischer, Jane L., Teaching Assistant Professor, Biology
- Lubkin, Sharon R, Professor, Mathematics
- Lucas, Carol N, Emeritus Professor, Biomedical Program-Grad Appts
- Lucas, Debra Jan, Teaching Assistant Professor, Curr, Instruc & Counselor Educ
- Lucas, Leon T, Emeritus Professor, Plant Pathology
- Lucia, Lucian A, Associate Professor, Wood And Paper Science
- Luckadoo, Deborah C, Adjunct Assistant Professor, Campus Activities
- Luckadoo, Timothy R, Adjunct Assistant Professor, Univ Housing AVC Operations
- Lucovsky, Gerald, Distinguished University Professor of Physics, Physics
- Luginbuhl, Geraldine, Professor, CALS Academic Programs

- Luginbuhl, James E., Emeritus Professor, Psychology
- Luginbuhl, Jean M, Professor, Crop Science
- Luh, Jiang, Emeritus Professor, Mathematics
- Lukic, Srdjan Miodrag, Assistant Professor, Electrical & Computer Engr.
- Lunardi, Leda, Professor, Electrical & Computer Engr.
- Luo, Hong, Associate Professor, Mechanical & Aerospace Engr
- Luo, Ren-Chyuan, Adjunct Professor, Electrical & Computer Engr.
- Luo, Tzy-Jiun Mark, Assistant Professor, Materials Science & Engineering
- Lupton-Smith, Helen S, Clinical Assistant Professor, Curr, Instruc & Counselor Educ
- Luria, Keith Phillip, Professor, History
- Lutz, Michael W, Adjunct Assistant Professor, Statistics
- Lyons, Kevin M, Professor, Mechanical & Aerospace Engr
- Lytle, Charles F., Emeritus Professor, Biology
- Ma, Xiaosong, Associate Professor, Computer Science-engr
- Mabrito, Robert Alan, Assistant Professor, Philosophy & Religious Studies
- Macdonald, Jeffrey M, Associate Professor, Biomedical Program ENG
- MacKay, Trudy F., William Neal Reynolds Distinguished Professor of Genetics, Genetics
- Mackenzie, John M, Professor, Microbiology
- MacKethan, Lucinda H., Professor, English
- MacNair, Douglas J, Adjunct Assistant Professor, Ag & Resource Economics
- Magallanes, Fernando H., Associate Professor, Landscape Architecture
- Maggard, Paul Anthony, Assistant Professor, Chemistry
- Maggi, Ricardo G., Research Assistant Professor, Dept of Clinical Sciences
- Magill, Michele M., Associate Professor, Foreign Languages And Literatu
- Maguire, Rory O, Adjunct Assistant Professor, Poultry Science
- Mahaffey, James W., Professor, Genetics
- Mahinthakumar, Gnanamanikam, Associate Professor, Civil Const & Environ Engineer
- Maier, Chris A, Adjunct Assistant Professor, For & Envir Res Acad Research
- Main, Charles E., Emeritus Professor, Plant Pathology
- Mainland, Charles Michael, Emeritus Professor, Horticultural Science
- Malarkey, David E, Adjunct Assistant Professor, Dept-Population, Health, Pathobi
- Malecha, Marvin J, Professor, College of Design
- Mallette, Bruce Ingram, Adjunct Associate Professor, Adult & Higher Education
- Maloney, Alan P, Extension Associate Professor, Friday Institute
- Maltecca, Christian, Assistant Professor, Animal Science
- Manfra, Meghan McGlinn, Assistant Professor, Curr, Instruc & Counselor Educ
- Mansmann, Richard A., Clinical Professor, Dept of Clinical Sciences
- Marcellin, Denis J, Professor, Dept of Clinical Sciences
- Marchi, Dudley M., Associate Professor, Foreign Languages And Literatu
- Margolis, Stephen E., Professor, Economics-college Of Managemen
- Mari, Jorge, Associate Professor, Foreign Languages And Literatu

- Maria, Jon-Paul, Associate Professor, Materials Science & Engineering
- Mariani, Christopher L., Assistant Professor, Dept of Clinical Sciences
- Markham, Stephen K, Associate Professor, Mgmt, Innovation&Entrepreneur
- Marks, Steven L, Clinical Associate Professor, Dept of Clinical Sciences
- Marlin, Joe A., Emeritus Professor, Mathematics
- Marra, Michele C, Professor, Ag & Resource Economics
- Marshall, David S., USDA Professor, Plant Pathology
- Marshall, Patricia L, Professor, Curr, Instruc & Counselor Educ
- Martin, David W, Professor, Psychology
- Martin, Donald Eugene Kemp, Associate Professor, Statistics
- Martin, Eden R, Adjunct Assistant Professor, Statistics
- Martin, James D, Professor, Chemistry
- Martin, Linda D, Assistant Professor, Chemistry
- Martin, Michael Patrick, Assistant Professor, Dept-Population, Health, Pathobi
- Martin, Pamela Paulette, Associate Professor, Psychology
- Martin, Robert H, Professor, Mathematics
- Masnari, Nino A., Distinguished Professor of Computer and Electrical Engineering, College Of Engineering-dean's
- Mathews, Kyle G, Associate Professor, Dept of Clinical Sciences
- Mathies, Laura Denise, Assistant Professor, Genetics
- Matthews, Brian, Teaching Assistant Professor, Depart Of Math, Science, And T
- Matthews, Daniel W, Emeritus Associate Professor, 4-H Youth Dev & Fam & Cons Sci
- Mattos, Carla, Associate Professor, Biochemistry
- Matzen, Vernon C., Professor, Civil Const & Environ Engineer
- Matzinger, Dale F., Emeritus Professor, Genetics
- Maxa, Edward L., Associate Professor, 4-H Youth Dev & Fam & Cons Sci
- Maxwell, Earl S., Professor, Biochemistry
- May, Leila S, Associate Professor, English
- Mayhorn, Christopher B., Associate Professor, Psychology
- Maze, Benoit, Research Assistant Professor, Textile Engineering, Chemistry
- Mazzoleni, Andre P, Associate Professor, Mechanical & Aerospace Engr
- McAllister, David Franklin, Emeritus Professor, Computer Science-engr
- McArtney, Steven J, Associate Professor, Horticultural Science
- McCall, Patricia Lou, Professor, Sociology & Anthropology
- McCants, Charles B., Emeritus Professor, International Agriculture
- McCarter, James B, Adjunct Associate Professor, For & Envir Res Acad Research
- McCarty, Gregory S, Assistant Professor, Biomedical Program ENG
- McClain, James B, Adjunct Professor, Chemical & Biomolecular Engr
- McClellan-Green, Patricia Dayle, Research Assistant Professor, Toxicology
- McClelland, Jacquelyn W., Professor, 4-H Youth Dev & Fam & Cons Sci
- McClure, William F., Emeritus Professor, Biological And Agricultural En
- McConnell, David A, Professor, Marine, Earth And Atmospheric

- McCord, Marian G, Associate Professor, Textile Engineering, Chemistry
- McCorkle, Jill C, Professor, English
- McCreery, John K, Associate Professor, Business Management-coll Of Mg
- McCulloch, Allison Waling, Assistant Professor, Depart Of Math, Science, And T
- McCulloch, Scott David, Assistant Professor, Toxicology
- McDermed, Elizabeth A., Emeritus Associate Professor, Mgmt, Innovation&Entrepreneur
- McDonald, Steven J, Assistant Professor, Sociology & Anthropology
- McElroy, Michael B., Associate Professor, Economics-college Of Managemen
- McFeeters, Roger Floyd, USDA Professor, Food, Bioprocess & Nutrition Sc
- McGahan, Mary C., Professor, Dept Molecular Biomedical Scie
- McGowan, Herle M, Assistant Professor, Statistics
- McGraw, Darryl Dana, Adjunct Assistant Professor, Adult & Higher Education
- McHale, Melissa R, Assistant Professor, For & Envir Res Acad Research
- McIlwee, John C., Adjunct Assistant Professor, University Theatre
- McIntyre, Ellen, Professor, Elementary Education
- McKeand, Steven Edward, Professor, Tree Improvement Cooperative
- McKenzie, Wendell Herbert, Emeritus Professor, Genetics
- McKerrow, Alexa J, Adjunct Assistant Professor, Biology
- McKinney, Thearon T., Professor, 4-H Youth Dev & Fam & Cons Sci
- McLaughlin, Anne Collins, Assistant Professor, Psychology
- McLaughlin, Gail C., Professor, Physics
- McLaughlin, Richard A, Professor, Soil Science
- McMillan, William Owen, Associate Professor, Genetics
- McMullen, Richard J., Assistant Professor, Dept of Clinical Sciences
- McNeill, John J., Emeritus Associate Professor, Animal Science
- McNelis, David N, Adjunct Professor, Nuclear Engineering
- McNinch, Jesse E., Adjunct Assistant Professor, Marine, Earth And Atmospheric
- McNulty, Steven George, USDA Assistant Professor, For & Envir Res Acad Research
- McRae, David S., Emeritus Professor, Mechanical & Aerospace Engr
- McTague, John Paul, Adjunct Professor, For & Envir Res Acad Research
- Meade, Adam Wesley, Associate Professor, Psychology
- Medhin, Negash G., Professor, Mathematics
- Meeker, Rick B., Adjunct Professor, Dept Molecular Biomedical Scie
- Megalos, Mark Arthur, Extension Assistant Professor, Extension-forestry General
- Mehlenbacher, Bradley S, Associate Professor, Educ Leadrshp & Policy Studies
- Meilleur, Flora, Assistant Professor, Biochemistry
- Melander, Christian Corey, Assistant Professor, Chemistry
- Melechko, Anatoli V, Associate Professor, Materials Science & Engineering
- Mell, Julie L, Assistant Professor, History
- Mellen-Charron, Katherine, Assistant Professor, History
- Melton, Thomas A., Professor, Administration Extension Ser

- Memory, Jasper D., Emeritus Professor, Physics
- Mente, Peter L, Associate Professor, Biomedical Program ENG
- Mercer, Daniel Evan, Adjunct Professor, For & Envir Res Acad Research
- Merrick, Bruce Alexander, Adjunct Associate Professor, Toxicology
- Mershon, Donald H., Professor, Psychology
- Mertz, John P, Associate Professor, Foreign Languages And Literatu
- Meskhidze, Nicholas, Assistant Professor, Marine, Earth And Atmospheric
- Messura, Mark Alan, Adjunct Professor, Textile & Apparel, Technology
- Meuten, Donald J., Professor, Dept-Population, Health, Pathobi
- Meyer, Carl, Professor, Mathematics
- Meyer, John R., Professor, Entomology
- Meyers, Walter E., Emeritus Professor, English
- Michael, Joan J, Professor, Psychology
- Michielsen, Stephen, Associate Professor, Textile Engineering, Chemistry
- Michnowicz, James Casimir, Assistant Professor, Foreign Languages And Literatu
- Mickael, Medhat Wahba, Adjunct Professor, Nuclear Engineering
- Mickle, James E., Associate Professor, Plant Biology
- Middleton, Teena F, Adjunct Assistant Professor, Poultry Science
- Mila, Asimina Leonidas, Assistant Professor, Plant Pathology
- Milholland, Robert D., Emeritus Professor, Plant Pathology
- Militello, Matthew Carl, Assistant Professor, Educ Leadrshp & Policy Studies
- Milla-Lewis, Susana Rita, Assistant Professor, Crop Science
- Miller, Carolyn Rae, SAS Institute Distinguished Professor of Rhetoric and Technical Communication, English
- Miller, Eric S., Professor, Microbiology
- Miller, Grady L., Professor, Crop Science
- Miller, Grover C, Emeritus Professor, Biology
- Miller, Howard George, Emeritus Professor, Psychology
- Miller, John M., Professor, Biology
- Miller, Thomas Kenan, McPherson Family Distinguished Professor of Engineering Entrepreneurship, DELTA
- Miller, W J, Assistant Professor, English
- Miller, William Laubach, William Neal Reynolds Distinguished Professor of Biochemistry, Biochemistry
- Miller-Cochran, Susan K, Associate Professor, English
- Mink, James Walter, Adjunct Professor, Electrical & Computer Engr.
- Minogue, James, Assistant Professor, Elementary Education
- Minsky, Lauren Nauta, Assistant Professor, History
- Misra, Kailash Chandra, Professor, Mathematics
- Misra, Veena, Professor, Electrical & Computer Engr.
- Mitas, Lubos, Professor, Physics
- Mitasova, Helena, Associate Professor, Marine, Earth And Atmospheric
- Mitchell, Anne W, Associate Professor, History
- Mitchell, Gary E., Professor, Physics

- Mitchell, Karlyn, Associate Professor, Business Management-coll Of Mg
- Mitchell, Philip H, Associate Professor, Wood And Paper Science
- Mitchell, Roger Emmit, Associate Professor, Psychology
- Mitchell, Tony L, Teaching Associate Professor, Engineering-Academic Affairs
- Moazed, Khosrow L., Emeritus Professor, Materials Science & Engineering
- Mochrie, Richard Douglas, Emeritus Professor, Animal Science
- Mock, Gary N., Emeritus Professor, Textile Engineering, Chemistry
- Moeser, Adam James, Assistant Professor, Dept-Population, Health, Pathobi
- Mohamed, Mansour H., Emeritus Distinguished Professor, Textile Engineering, Chemistry
- Monaco, Malina K., Adjunct Assistant Professor, College Of Education
- Monaco, Thomas J., Emeritus Professor, Horticultural Science
- Monahan, John F., Professor, Statistics
- Moneta, Larry, Adjunct Assistant Professor, Adult & Higher Education
- Monks, David W., Professor, Administration Research Serv
- Montalvo, Antonio J, Adjunct Assistant Professor, Electrical & Computer Engr.
- Monteiro, Nancy, Professor, Dept of Clinical Sciences
- Montgomery, Terry G, Adjunct Associate Professor, Textile Engineering, Chemistry
- Montoya-Weiss, Mitzi M, Zelnak Professor of Marketing Innovation, Business Management-coll Of Mg
- Moog, Robert S., Associate Professor, Public & International Affairs
- Moon, Sangkil, Associate Professor, Business Management-coll Of Mg
- Moore, Catherine E., Emeritus Associate Professor, English
- Moore, Charles Lee, Emeritus Professor, Ag & Resource Economics
- Moore, Frank Harper, Emeritus Professor, English
- Moore, Gary E., Professor, Agricultural & Extension Educa
- Moore, Harry B, Emeritus Professor, Entomology
- Moore, Jeannette A, Associate Professor, Animal Science
- Moore, Jessica L, Assistant Professor, Communication
- Moore, Kathryn M., Professor, Adult & Higher Education
- Moore, Marguerite Murray, Associate Professor, Textile & Apparel, Technology
- Moore, Robin C., Professor, Landscape Architecture
- Moore, Roger Louis, Associate Professor, Parks, Recreation & Tourism Mg
- Moore, Ronald F., Adjunct Assistant Professor, Textile Engineering, Chemistry
- Moore, Susan Elizabeth, Extension Associate Professor, For & Envir Res Acad Research
- Moorman, Christopher E, Associate Professor, Fisheries and Wildlife Program
- Morant, Tamah Chesney, Teaching Assistant Professor, Economics-college Of Managemen
- Moreland, Charles G., Emeritus Professor, Ofc of Research & Grad Studies
- Moreland, Donald Edwin, Emeritus USDA Professor, Crop Science
- Morgan, Paul H, Adjunct Professor, Statistics
- Morillo, John D, Associate Professor, English
- Morrill, Melinda Sandler, Research Assistant Professor, Economics-college Of Managemen
- Morrill, Thayer Stephen, Assistant Professor, Economics-college Of Managemen

- Morris, Arthur S, Adjunct Assistant Professor, Electrical & Computer Engr.
- Morrison, John M., Adjunct Assistant Professor, Marine, Earth And Atmospheric
- Morrow, William M, Professor, Animal Science
- Motsinger, Alison Anne, Assistant Professor, Statistics
- Mott, Ralph Lionel, Emeritus Professor, Plant Biology
- Mowat, J. Richard, Professor, Physics
- Moxley, Robert Lonnie, Emeritus Professor, Sociology And Anthropology
- Moyer, James W., Professor, Plant Pathology
- Mozdziak, Paul Edward, Associate Professor, Poultry Science
- Muddiman, David C, Professor, Chemistry
- Mueller, James Paul, Professor, Crop Science
- Mueller, Rainer Frank, Associate Professor, Computer Science-engr
- Mulligan, James C., Emeritus Professor, Mechanical & Aerospace Engr
- Mulvey, Paul W, Associate Professor, Mgmt, Innovation&Entrepreneur
- Munana, Karen R, Associate Professor, Dept of Clinical Sciences
- Murphy, Joseph Paul, Professor, Crop Science
- Murray, Raymond L., Emeritus Professor, Nuclear Engineering
- Murty, Korukonda Linga, Professor, Nuclear Engineering
- Muse, Spencer V, Professor, Statistics
- Mustian, Robert David, Emeritus Professor, Agricultural & Extension Educa
- Muth, John F, Associate Professor, Electrical & Computer Engr.
- Myburg, Alexander A, Adjunct Assistant Professor, For & Envir Res Acad Research
- Myers, Richard M., Emeritus Professor, Animal Science
- Mykyta, Larysa Anna, Associate Professor, Foreign Languages And Literatu
- Nacoste, Rupert W., Professor, Psychology
- Nadelman, Martin H, Adjunct Assistant Professor, Adult & Higher Education
- Naderman, George C, Emeritus Associate Professor, Soil Science
- Nagel, Robert T., Professor, Mechanical & Aerospace Engr
- Nagle, H Troy, Professor, Electrical & Computer Engr.
- Nalepa, Christine, Adjunct Associate Professor, Entomology
- Narayan, Jagdish, John C. C. Fan Family Distinguished Professor of Materials Science and Engineering, Materials Science & Engineering
- Narayan, Roger Jagdish, Professor, Biomedical Program ENG
- Nascone-Yoder, Nanette M, Assistant Professor, Dept Molecular Biomedical Scie
- Nassar-McMillan, Sylvia C., Associate Professor, Curr, Instruc & Counselor Educ
- Nau, James M., Professor, Civil Const & Environ Engineer
- Neal, Joseph C, Professor, Horticultural Science
- Neel, Jennifer A, Assistant Professor, Dept-Population, Health, Pathobi
- Nelson, Larry Alan, Emeritus Professor, Statistics
- Nelson, Paul V., Emeritus Professor, Horticultural Science
- Nelson, Stacy Arnold Charles, Associate Professor, For & Envir Res Acad Research

- Nemanich, Robert J., Professor, Physics
- Netherland, Michael D, Adjunct Associate Professor, Crop Science
- Neunzig, Herbert H., Emeritus Professor, Entomology
- Neupert, Shevaun D., Assistant Professor, Psychology
- Nevzorov, Alexander A, Assistant Professor, Chemistry
- Newcom, Douglas Wyatt, Adjunct Assistant Professor, Animal Science
- Newman, Slater Edmund, Emeritus Professor, Psychology
- Newmark, Craig M., Associate Professor, Economics-college Of Managemen
- Nfah-Abbenyi, Juliana Makuchi, Professor, English
- Ngaile, Gracious, Associate Professor, Mechanical & Aerospace Engr
- Nichols, Elizabeth Guthrie, Associate Professor, Environmental Technology
- Nickel, Paul A., Emeritus Professor, Mathematics
- Niedzlek-Feaver, Marianne, Associate Professor, Biology
- Nielsen, Dahlia M., Research Assistant Professor, Genetics
- Nielsen, Larry Andrew, Professor, For & Envir Res Acad Research
- Nietfeld, John Leith, Associate Professor, Curr, Instruc & Counselor Educ
- Nilsson, Arne, Professor, Electrical & Computer Engr.
- Nilsson, Urban Jan, Adjunct Assistant Professor, For & Envir Res Acad Research
- Ning, Peng, Associate Professor, Computer Science-engr
- Niyogi, Devdutta S, Adjunct Assistant Professor, Marine, Earth And Atmospheric
- Noble, Richard L., Emeritus Professor, Biology
- Noga, Edward J., Professor, Dept of Clinical Sciences
- Noori, Mohammad N., Adjunct Professor, Mechanical & Aerospace Engr
- Noormets, Asko, Research Assistant Professor, For & Envir Res Acad Research
- Nordone, Shila Kapil, Research Assistant Professor, Dept Molecular Biomedical Scie
- Norris, Larry Keith, Associate Professor, Mathematics
- Norwood, Karen S., Associate Professor, Depart Of Math, Science, And T
- Novak, Bruce M, Howard J. Schaffer Distinguished Professor of Chemistry, Chemistry
- Novak, Vera, Adjunct Assistant Professor, Mathematics
- Nowell, Branda L, Assistant Professor, Public & International Affairs
- Nunnally, Stephens W., Emeritus Professor, Civil Const & Environ Engineer
- Nuttle, Henry Lee, Teaching Professor, Fitts Dept Indust & Syst Engr
- Nychka, Douglas W, Adjunct Professor, Statistics
- O'Brien, Gail W, Emeritus Professor, History
- O'Brien, Terrance P, Professor, Curr, Instruc & Counselor Educ
- O'Connell, Michael, Adjunct Assistant Professor, Statistics
- O'Neal, William G., Adjunct Professor, Textile Engineering, Chemistry
- O'Sullivan, Elizabeth, Associate Professor, Public & International Affairs
- Oberhardt, Bruce J, Adjunct Professor, Biomedical Program ENG
- Oblinger, Diana G, Adjunct Professor, Crop Science
- Oblinger, James Leslie, Professor, Food, Bioprocess & Nutrition Sc

- Ocko, Jonathan K., Professor, History
- Odle, Jack, William Neal Reynolds Professor, Animal Science
- Odom, Janice E, Adjunct Assistant Professor, Caldwell-Fellows Program
- Ogan, Kemafor, Assistant Professor, Computer Science-engr
- Ojiambo, Peter, Assistant Professor, Plant Pathology
- Olby, Natasha J, Associate Professor, Dept of Clinical Sciences
- Oleksiak, Marjorie Frances, Adjunct Assistant Professor, Toxicology
- Olf, Heinz G., Emeritus Professor, Wood And Paper Science
- Oliver, Kevin M, Assistant Professor, Curr, Instruc & Counselor Educ
- Oliver-Hoyo, Maria Teresa, Associate Professor, Chemistry
- Olivry, Thierry J, Professor, Dept of Clinical Sciences
- Ollis, D F, Distinguished Professor, Chemical & Biomolecular Engr
- Olsen, Donna J., Adjunct Assistant Professor, Educ Leadrshp & Policy Studies
- Olson, Jonathan W, Associate Professor, Microbiology
- Olsson, Mats, Adjunct Professor, For & Envir Res Acad Research
- Oltmans, Arnold W., Associate Professor, Ag & Resource Economics
- Olufsen, Mette, Associate Professor, Mathematics
- Oneal, John B, Emeritus Professor, Engineering-Academic Affairs
- Opperman, Charles H., Professor, Plant Pathology
- Orgeron, Devin A., Associate Professor, English
- Orgeron, Marsha Gabrielle, Associate Professor, English
- Orndorff, Paul E., Professor, Dept-Population, Health, Pathobi
- Orr, David B, Associate Professor, Entomology
- Orr, Miriam E, Professor, English
- Ort, Jon F., Professor, Administration Extension Ser
- Ort, Thomas W, Assistant Professor, History
- Osborne, Jason A., Associate Professor, Statistics
- Osborne, Jason W, Associate Professor, Curr, Instruc & Counselor Educ
- Osborne, Kathy M., Clinical Assistant Professor, Social Work
- Osborne, Susan S, Associate Professor, Curr, Instruc & Counselor Educ
- Osburn, Carlton M., Emeritus Professor, Electrical & Computer Engr.
- Osburn, Christopher Lee, Assistant Professor, Marine, Earth And Atmospheric
- Osmond, Deanna L, Professor, Soil Science
- Otto, Luther B., Emeritus Distinguished Professor, Sociology And Anthropology
- Otvos, James D, Adjunct Professor, Biochemistry
- Overbay, Amy S, Research Assistant Professor, Curr, Instruc & Counselor Educ
- Overton, Margery F., Professor, Civil Const & Environ Engineer
- Oviedo-Rondon, Edgar Orlando, Assistant Professor, Poultry Science
- Oxenham, William, Lineberger Chair in Yarn Manufacturing, College Of Textiles-dean's Off
- Ozturk, Hatice Orun, Teaching Associate Professor, Biomedical Program ENG
- Ozturk, Mehmet Cevdet, Professor, Electrical & Computer Engr.

- Packer, Jeremy, Associate Professor, Communication
- Padilla, Arthur, Professor, Mgmt, Innovation&Entrepreneur
- Paesler, Michael, Professor, Physics
- Pagach, Donald P, Professor, Accounting-college Of Manageme
- Page, Lavon Barry, Emeritus Associate Professor, Mathematics Grads & Temps
- Palmour, Hayne, Emeritus Professor, Materials Science & Engineering
- Palmquist, Raymond B., Professor, Economics-college Of Managemen
- Pang, Tao, Associate Professor, Mathematics
- Panthee, Dilip Raj, Assistant Professor, Horticultural Science
- Pantula, Sastry G., Professor, Statistics
- Pao, Chia Ven, Emeritus Professor, Mathematics
- Papich, Mark G, Professor, Dept Molecular Biomedical Scie
- Parcel, Toby L, Professor, Sociology & Anthropology
- Pardue, Samuel Lloyd, Professor, Poultry Science
- Park, John C., Associate Professor, Depart Of Math, Science, And T
- Park, Sunkyu, Assistant Professor, Wood And Paper Science
- Parker, Charles A., Emeritus Professor, Communication
- Parker, George W., Emeritus Associate Professor, Physics
- Parker, Matthew David, Associate Professor, Marine, Earth And Atmospheric
- Parker, Michael L., Associate Professor, Horticultural Science
- Parker, Samuel Thomas, Professor, History
- Parkhurst, Carmen R., Emeritus Professor, Poultry Science
- Parks, Leo W., Emeritus Professor, Microbiology
- Parks, Lisa D, Teaching Associate Professor, Biology
- Parrillo-Chapman, Lisa Lynne, Assistant Professor, Textile & Apparel, Technology
- Parrish, Erin Dodd, Adjunct Associate Professor, Textile & Apparel, Technology
- Parsons, Eileen C, Assistant Professor, Depart Of Math, Science, And T
- Parsons, Gregory N, Alcoa Professor of Chemical and Biomolecular Engineering, Chemical & Biomolecular Engr
- Pasquinelli, Melissa, Assistant Professor, Textile Engineering, Chemistry
- Pasten, Jose Agustin, Associate Professor, Foreign Languages And Literatu
- Patisaul, Heather B., Assistant Professor, Biology
- Pattanayak, Subhrendu, Adjunct Associate Professor, For & Envir Res Acad Research
- Patterson, Robert P., Professor, Crop Science
- Pattison, Jeremy A, Assistant Professor, Horticultural Science
- Patty, Richard R., Emeritus Professor, Physics
- Paur, Sandra, Associate Professor, Mathematics
- Pawlak, Joel J., Associate Professor, Wood And Paper Science
- Payne, Gary A., William Neal Reynolds Professor, Plant Pathology
- Payton, Fay C, Associate Professor, Business Management-coll Of Mg
- Peace, Robert Lynn, Professor, Accounting-college Of Manageme
- Peacock, Charles H., Professor, Crop Science

- Pearce, Douglas K., Professor, Economics-college Of Managemen
- Pearl, Thomas P., Assistant Professor, Physics
- Pearson, Richard G., Emeritus Professor, Psychology
- Pearson, Ronald G., Emeritus Professor, Wood And Paper Science
- Peasley, Donald D, Adjunct Assistant Professor, Agricultural & Extension Educa
- Peck, Emily Mann, Adjunct Professor, Mathematics
- Peedin, Gerald Franklin, Emeritus Named Professor, Crop Science
- Peel, Judy C., Professor, Parks, Recreation & Tourism Mg
- Pelletier, Denis, Associate Professor, Economics-college Of Managemen
- Pendlebury, Michael John, Professor, Philosophy & Religious Studies
- Penick, John E, Emeritus Professor, Depart Of Math, Science, And T
- Pennell, Joan T, Professor, Ctr Fam & Community Engagement
- Pennington, Robin, Assistant Professor, Accounting-college Of Manageme
- Penrose, Ann M., Professor, English
- Peralta, Perry N, Associate Professor, Wood And Paper Science
- Perera, Imara Y, Research Assistant Professor, Plant Biology
- Peretti, Steven W., Associate Professor, Chemical & Biomolecular Engr
- Perez de Leon, Adalberto A, Adjunct Associate Professor, Entomology
- Perez Diaz, Ilenys Muniz, USDA Assistant Professor, Food, Bioprocess & Nutrition Sc
- Perkins, John N., Emeritus Professor, Mechanical & Aerospace Engr
- Perkins-Veazie, Penelope M, Professor, Horticultural Science
- Perros, Harilaos George, Professor, Computer Science-engr
- Perros, Helen C., Teaching Assistant Professor, History
- Perry, Jerome J., Emeritus Professor, Microbiology
- Peszlen, Ilona Maria, Associate Professor, Wood And Paper Science
- Peters, Kara Jo, Associate Professor, Mechanical & Aerospace Engr
- Peterson, Markus Nils, Assistant Professor, For & Envir Res Acad Research
- Peterson, Richard Eric, Emeritus Associate Professor, Depart Of Math, Science, And T
- Peterson, Wilbur Carroll, Emeritus Associate Professor, Electrical & Computer Engr.
- Petitte, James N, Professor, Poultry Science
- Petters, Markus Dirk Jan, Assistant Professor, Marine, Earth And Atmospheric
- Petters, Robert M., Professor, Animal Science
- Pettitt, John M, Adjunct Assistant Professor, Adult & Higher Education
- Petty, Ian T, Professor, Microbiology
- Phaneuf, Daniel J, Professor, Ag & Resource Economics
- Pharr, David Mason, Emeritus Professor, Horticultural Science
- Phelan, Jennifer N, Adjunct Assistant Professor, For & Envir Res Acad Research
- Philbrick, C Russell, Research Professor, Marine, Earth And Atmospheric
- Phillips, Richard B., Adjunct Professor, Wood And Paper Science
- Phillips, Shannon Elizabeth, Assistant Professor, Animal Science
- Phillips, Sharon Baker, Adjunct Assistant Professor, Marine, Earth And Atmospheric

- Phister, Trevor Gardner, Assistant Professor, Food, Bioprocess & Nutrition Sc
- Picart, Jose' A, Professor, College Of Education
- Piedrafita Iglesias, Santiago J, Associate Professor, Graphic Design
- Piedrahita, Jorge A, Professor, Dept Molecular Biomedical Scie
- Pierce, Christine M., Professor, Philosophy & Religious Studies
- Pierce, Marcela, Assistant Professor, Plant Biology
- Pietrafesa, Leonard J., Professor, Marine, Earth And Atmospheric
- Piggott, Nicholas E, Professor, Ag & Resource Economics
- Pilkington, Dwain H., Emeritus Professor, Food, Bioprocess & Nutrition Sc
- Pisano, Etta D, Professor, Biomedical Program ENG
- Place, Wayne, Professor, Architecture
- Plume, Vita Karina, Associate Professor, Art and Design
- Poindexter, Julius C, Associate Professor, Business Management-coll Of Mg
- Poling, Edward B., Professor, Horticultural Science
- Pollock, Kenneth Hugh, Professor, Biology
- Pond, Samuel B., Associate Professor, Psychology
- Ponder, Gerald Ashton, Professor, College Of Education
- Poore, Matt H, Professor, Animal Science
- Pop, Margareta Maria, Assistant Professor, Elementary Education
- Pope, Carol A., Professor, Curr, Instruc & Counselor Educ
- Potter, Kevin M, Research Assistant Professor, For & Envir Res Acad Research
- Poulton, Bruce R., Emeritus Professor, Curr, Instruc & Counselor Educ
- Pourdeyhimi, Behnam, William A. Klopman Distinguished Professor, College Of Textiles-dean's Off
- Powell, Merle A, Emeritus Professor, Horticultural Science
- Powell, Nancy C., Associate Professor, Textile & Apparel, Technology
- Powell, Nathaniel T., Emeritus Named Professor, Plant Pathology
- Powell, Roger A., Emeritus Professor, Biology
- Prak, Anco L., Emeritus Named Professor, Fitts Dept Indust & Syst Engr
- Pramaggiore, Maria T, Professor, English
- Prater, John T., Adjunct Professor, Materials Science & Engineering
- Prestemon, Jeffrey P, Adjunct Associate Professor, For & Envir Res Acad Research
- Preston, Robert J, Adjunct Professor, Toxicology
- Prioli, Carmine A., Professor, English
- Pritchard, Donald Edward, Adjunct Professor, Animal Science
- Pritchard, Ruie J., Professor, Curr, Instruc & Counselor Educ
- Proctor, Charles H., Emeritus Professor, Statistics
- Proctor, Dalton R, Emeritus Professor, 4-H Youth Dev & Fam & Cons Sci
- Purrington, Suzanne Townsend, Emeritus Professor, Chemistry
- Purugganan, Michael D, Adjunct Professor, Genetics
- Putcha, Mohan Sastri, Professor, Mathematics
- Qu, Rongda, Professor, Crop Science

- Quay, Thomas Lavelle, Emeritus Professor, Biology
- Quesenberry, Charles P., Emeritus Professor, Statistics
- Quint, Stephen R, Research Associate Professor, Biomedical Program ENG
- Rabiei, Afsaneh, Associate Professor, Mechanical & Aerospace Engr
- Rahman, M. Shamimur, Professor, Civil Const & Environ Engineer
- Rajala, Sarah Ann, Emeritus Professor, College Of Engineering-dean's
- Raleigh, James A., Adjunct Professor, Dept Molecular Biomedical Scie
- Ralls, Robert Scott, Adjunct Professor, Adult & Higher Education
- Raman, Sethu, Professor, Marine, Earth And Atmospheric
- Ramasubramanian, Melur K, Professor, Mechanical & Aerospace Engr
- Ramsay, Robert Todd, Emeritus Associate Professor, Mathematics
- Rand, J. Patrick, Professor, Architecture
- Ranjithan, Sanmugavadivel, Professor, Civil Const & Environ Engineer
- Ranney, Thomas G., Professor, Horticultural Science
- Rao, Balaji M, Assistant Professor, Chemical & Biomolecular Engr
- Rao, S. Trivikrama, Adjunct Professor, Marine, Earth And Atmospheric
- Rappa, Michael A, Alan T. Dickson Distinguished University Professor, Advanced Analytics
- Rasdorf, William John, Professor, Civil Const & Environ Engineer
- Raub, Cymbre Quincy, Associate Professor, Industrial Design
- Raubenheimer, Carol Dianne, Adjunct Assistant Professor, Engineering-Academic Affairs
- Rawdanowicz, Thomas A., Research Assistant Professor, Materials Science & Engineering
- Rawlings, John Oren, Emeritus Professor, Statistics
- Ray, Tracey E, Adjunct Assistant Professor, Multicultural Student Affairs
- Raymond, Dana Gordon, Associate Professor, Art and Design
- Rea, Phillip Stanley, Emeritus Professor, Parks, Recreation & Tourism Mg
- Reading, Nathan P, Assistant Professor, Mathematics
- Reaser, Jeffrey Leo, Assistant Professor, English
- Reavis, Dick J, Assistant Professor, English
- Rebach, Steve, Research Professor, Sea Grant Program
- Reberg-Horton, Samuel Christopher, Assistant Professor, Crop Science
- Redding, W Rich, Clinical Associate Professor, Dept of Clinical Sciences
- Redfield, Wendeline H, Associate Professor, Architecture
- Reeber, Robert R, Adjunct Professor, Materials Science & Engineering
- Reeves, Douglas Stephen, Professor, Computer Science-engr
- Regan, Thomas H., Emeritus Professor, Philosophy & Religious Studies
- Reich, Brian J, Assistant Professor, Statistics
- Reichard, Donald L., Adjunct Assistant Professor, Adult & Higher Education
- Reid, Jeffrey Clinton, Adjunct Associate Professor, Marine, Earth And Atmospheric
- Reid, Traciel V., Associate Professor, Public & International Affairs
- Reiland, Thomas W., Associate Professor, Statistics
- Reiman, Alan J., Associate Professor, Curr, Instruc & Counselor Educ

- Reisig, Dominic Duane, Assistant Professor, Entomology
- Reisman, Arnold, Emeritus Professor, Electrical & Computer Engr.
- Rejesus, Roderick M., Assistant Professor, Ag & Resource Economics
- Ren, Peifeng, Adjunct Assistant Professor, Dept Molecular Biomedical Scie
- Renkow, Mitchell Adam, Professor, Ag & Resource Economics
- Reynolds Jr, Claude Lewis, Teaching Assistant Professor, Materials Science & Engineering
- Reynolds, Peter J, Adjunct Professor, Physics
- Reynolds, Stephen P., Professor, Physics
- Rhee, Injong, Professor, Computer Science-engr
- Rhodes, Donald R., Emeritus Distinguished University Professor, Electrical & Computer Engr.
- Rice, Arthur R, Professor, Landscape Architecture
- Rice, James A., Professor, Biology
- Rich, Samantha Anne Rozier, Assistant Professor, Parks, Recreation & Tourism Mg
- Richardson, Frances M., Emeritus Professor, College Of Engineering-dean's
- Richardson, Robert Jeryl, Assistant Professor, Crop Science
- Riddle, John M., Emeritus Professor, History
- Ridgeway, Don L., Emeritus Professor, Statistics
- Rieder, David M, Assistant Professor, English
- Rieder, Kathleen Callahan, Teaching Associate Professor, Art and Design
- Riehn, Robert, Assistant Professor, Physics
- Rifki, Fatih A., Emeritus Professor, Architecture
- Rigsbee, James M, Professor, Materials Science & Engineering
- Riitters, Kurt H, Adjunct Professor, For & Envir Res Acad Research
- Rindos, Andrew J, Adjunct Assistant Professor, Electrical & Computer Engr.
- Riordan, Allen J., Emeritus Associate Professor, Marine, Earth And Atmospheric
- Risley, John S., Professor, Physics
- Ristaino, Jean B., Professor, Plant Pathology
- Ritchie, David F., Professor, Plant Pathology
- Riviere, Jim E., Burroughs Wellcome Professor of Pharmacology, Dept-Population, Health, Pathobi
- Rizkalla, Sami, Distinguished Professor of Civil Engineering, Civil Const & Environ Engineer
- Ro, Paul I, Professor, Mechanical & Aerospace Engr
- Robarge, Wayne P., Professor, Soil Science
- Roberson, Gary T, Associate Professor, Biological And Agricultural En
- Roberts, George W., Emeritus Professor, College Of Engineering-dean's
- Roberts, John F, Emeritus Professor, Biology
- Roberts, Malcolm C., Professor, Dept-Population, Health, Pathobi
- Roberts, Michael J., Assistant Professor, Ag & Resource Economics
- Roberts, Stephen Dean, A. Doug Allison Distinguished Professor, Fitts Dept Indust & Syst Engr
- Roberts, William L, Professor, Mechanical & Aerospace Engr
- Robertson, Dominique, Professor, Plant Biology
- Robertson, Ian Douglas, Clinical Associate Professor, Dept Molecular Biomedical Scie

- Robertson, Robert L., Emeritus Professor, Entomology
- Robinson, Mendel L, Emeritus Associate Professor, Textile & Apparel, Technology
- Robison, Daniel Julian, Professor, College of Natural Resources
- Robison, Odis Wayne, Professor, Animal Science
- Rodas, Daniel J, Adjunct Assistant Professor, Adult & Higher Education
- Rodman, Robert David, Professor, Computer Science-engr
- Rodriguez, Jesus, Associate Professor, Mathematics
- Rodriguez-Puebla, Marcelo, Associate Professor, Dept Molecular Biomedical Scie
- Roe, Richard M., William Neal Reynolds Distinguished Professor, Entomology
- Roe, Simon C, Professor, Dept of Clinical Sciences
- Roelle, Paul A., Adjunct Assistant Professor, Marine, Earth And Atmospheric
- Rogers, John, Adjunct Professor, Dept Molecular Biomedical Scie
- Rohrbach, Roger P., Emeritus Professor, Biological And Agricultural En
- Roise, Joseph Peter, Professor, For & Envir Res Acad Research
- Rojas, Orlando Jose, Associate Professor, Wood And Paper Science
- Roland, Christopher M, Professor, Physics
- Rollins, Yvonne B., Professor, Foreign Languages And Literatu
- Rose, Robert B., Associate Professor, Biochemistry
- Ross, Ann Helen, Associate Professor, Sociology & Anthropology
- Ross, John Paul, Emeritus Professor, Plant Pathology
- Rossetti, Christian L, Assistant Professor, Business Management-coll Of Mg
- Rotenberg, Eric, Associate Professor, Electrical & Computer Engr.
- Rothenberg, Lori Fay, Extension Associate Professor, Textile Extension Short Cour
- Rotunno, Richard, Adjunct Professor, Marine, Earth And Atmospheric
- Rouphail, Nagui M, Professor, Institute For Trans Research &
- Roush, William B, Adjunct Professor, Poultry Science
- Rouskas, Georgios, Professor, Computer Science-engr
- Rowe, John E, Research Professor, Physics
- Royster, Larry H., Emeritus Professor, Mechanical & Aerospace Engr
- Rozgonyi, George A., Professor, Materials Science & Engineering
- Rubilar, Rafael Alejandro, Adjunct Assistant Professor, The Forest Nutrition Cooperati
- Rubin, Albert Robert, Emeritus Professor, Biological And Agricultural En
- Rubin, Eva R., Emeritus Professor, Public & International Affairs
- Rufty, Rebeca C., Professor, Graduate School-Dean's Office
- Rufty, Thomas W, Bayer Environmental Science Professor of Sustainable Development, Crop Science
- Rushing, John E., Professor, Food, Bioprocess & Nutrition Sc
- Russell, Burton Lester, Emeritus Associate Professor, Communication
- Russell, Dale A, Emeritus Research Professor, Marine, Earth And Atmospheric
- Russell, Phillip E., Research Professor, Materials Science & Engineering
- Rust, Jon Paul, Professor, Textile Engineering, Chemistry
- Sabornie, Edward J., Professor, Curr, Instruc & Counselor Educ

- Sack, Ronald H., Professor, History
- Safley, Charles D., Professor, Ag & Resource Economics
- Safley, Lawson M, Adjunct Professor, Biological And Agricultural En
- Safrit, Roger Dale, Professor, 4-H Youth Dev & Fam & Cons Sci
- Sagui, Maria C, Professor, Physics
- Saker, Korinn Edna, Associate Professor, Dept Molecular Biomedical Scie
- Saloni, Daniel Erique, Assistant Professor, Wood And Paper Science
- Salstad, M. Louise, Emeritus Associate Professor, Foreign Languages And Literatu
- Samatova, Nagiza Faridovna, Associate Professor, Computer Science-engr
- Sanchez, Felipe Garza, Adjunct Assistant Professor, For & Envir Res Acad Research
- Sandeep, K P, Professor, Food, Bioprocess & Nutrition Sc
- Sanders, Michael G., Adjunct Associate Professor, Psychology
- Sanders, Timothy H, USDA Professor, Food, Bioprocess & Nutrition Sc
- Sang, Shengmin, Adjunct Assistant Professor, Food, Bioprocess & Nutrition Sc
- Sanii, Ezat, Emeritus Associate Professor, Fitts Dept Indust & Syst Engr
- Sannes, Philip L., Professor, Dept Molecular Biomedical Scie
- Santiso, Erik Emilio, Adjunct Assistant Professor, Chemical & Biomolecular Engr
- Sargent, Frank D., Emeritus Professor, Animal Science
- Saucier, Walter Joseph, Emeritus Professor, Marine, Earth And Atmospheric
- Savage, Carla Diane, Professor, Computer Science-engr
- Saveliev, Alexei V., Associate Professor, Mechanical & Aerospace Engr
- Sawhney, Man M., Emeritus Professor, College Of Humanities & Soc SC
- Sawyers, Roby B, Professor, Accounting-college Of Manageme
- Scales, Alice Y, Teaching Assistant Professor, Depart Of Math, Science, And T
- Scandalios, John G., Emeritus Professor, Genetics
- Scattergood, Ronald O, Professor, Materials Science & Engineering
- Scearce, J Mark, Teaching Professor, Music
- Schaefer, Thomas M, Professor, Physics
- Schaffer, Henry E, Emeritus Professor, Genetics
- Schaffer, Kristen J, Associate Professor, Architecture
- Schal, Coby J, Blanton J. Whitmire Professor of Structural Pest Management, Entomology
- Schanz, Stephen J, Teaching Associate Professor, Mgmt, Innovation&Entrepreneur
- Scharton, Terry D, Adjunct Professor, Mechanical & Aerospace Engr
- Schecter, Stephen, Professor, Mathematics
- Schetzina, Jan F., Professor, Physics
- Schiller, Anne L, Adjunct Professor, Sociology & Anthropology
- Schlenger, William, Adjunct Professor, Psychology
- Schlosser, Paul M, Adjunct Professor, Mathematics
- Schmid, David Neil, Assistant Professor, Philosophy & Religious Studies
- Schoen, LaTefy, Teaching Assistant Professor, Educ Leadrshp & Policy Studies
- Schoen, Martin, Adjunct Professor, Chemical & Biomolecular Engr

- Scholle, Frank, Assistant Professor, Microbiology
- Schrag, Robert Laurence, Professor, Communication
- Schramme, Michael, Associate Professor, Dept of Clinical Sciences
- Schreiner, Anton F., Emeritus Professor, Chemistry
- Schrimper, Ronald A., Emeritus Professor, Ag & Resource Economics
- Schroeder, Bastian Jonathan, Adjunct Assistant Professor, Institute For Trans Research &
- Schroeder-Moreno, Michelle Shawn, Assistant Professor, Crop Science
- Schuler, Jamie L, Adjunct Assistant Professor, Hardwood Cooperative
- Schulman, Michael D., William Neal Reynolds Professor, Sociology And Anthropology
- Schulte, Ann C, Professor, Psychology
- Schultheis, Jonathan R., Professor, Horticultural Science
- Schurig, David, Assistant Professor, Electrical & Computer Engr.
- Schwalbe, Michael L., Professor, Sociology & Anthropology
- Schwartz, Justin, Kobe Steel Distinguished Professor, Materials Science & Engineering
- Schwartz, Steven J., Emeritus Professor, Food, Bioprocess & Nutrition Sc
- Schweitzer, Mary Higby, Associate Professor, Marine, Earth And Atmospheric
- Scotford, Martha, Professor, Graphic Design
- Scroggs, Jeffrey Scott, Associate Professor, Mathematics
- Seagondollar, Lewis W., Emeritus Professor, Physics
- Seater, John J., Professor, Economics-college Of Managemen
- Sederoff, Heike Inge Ada, Assistant Professor, Plant Biology
- Sederoff, Ron Ross, Edwin F. Conger Distinguished Professor of Forestry and Environmental Resources, Biotechnology
- Sedransk, Nell, Research Professor, Statistics
- See, Miles T, Professor, Animal Science
- Seelecke, Stefan, Associate Professor, Mechanical & Aerospace Engr
- Selgrade, James Francis, Professor, Mathematics
- Selgrade, Maryjane K, Adjunct Professor, Toxicology
- Seltmann, Heinz, Emeritus Professor, Crop Science
- Semazzi, Fredrick H, Professor, Marine, Earth And Atmospheric
- Seneca, Ernest D., Emeritus Professor, Plant Biology
- Sequeira, Ron A., Adjunct Associate Professor, Entomology
- Seracino, Rudolf, Associate Professor, Civil Const & Environ Engineer
- Serow, Robert C., Professor, Educ Leadrshp & Policy Studies
- Setzer, Rhyne Woodrow, Adjunct Professor, Statistics
- Setzer, Sharon M., Associate Professor, English
- Severin, Laura R., Professor, English
- Seyam, Abdel-fattah Mohamed, Professor, Textile & Apparel, Technology
- Shaffer, Carleen Johnson, Adjunct Assistant Professor, Educ Leadrshp & Policy Studies
- Shah, Sanjay Bikram, Associate Professor, Biological And Agricultural En
- Shamey, Renzo, Associate Professor, Textile Engineering, Chemistry

- Shane, Simon M., Adjunct Professor, Poultry Science
- Shannon, Steven Christopher, Associate Professor, Nuclear Engineering
- Sharma, Ratna Rani, Assistant Professor, Biological And Agricultural En
- Shaw, Ping-Tung, Associate Professor, Marine, Earth And Atmospheric
- Shea, Damian, Professor, Biology
- Shear, Theodore Henry, Associate Professor, For & Envir Res Acad Research
- Shearer, Michael, Professor, Mathematics
- Shearon, Ronald Wilson, Professor, Agricultural & Extension Educa
- Sheets, Thomas J., Emeritus Professor, Toxicology
- Sheldon, Brian W., Emeritus Professor, Poultry Science
- Shelley, Rowland M, Adjunct Associate Professor, Biology
- Sheppard, John Douglas, Professor, Food, Bioprocess & Nutrition Sc
- Sherk, Julieta Trevino, Assistant Professor, Horticultural Science
- Sherman, Barbara Lynn, Clinical Associate Professor, Dept of Clinical Sciences
- Sherry, Barbara, Professor, Dept Molecular Biomedical Scie
- Shertzer, Kyle W, Adjunct Assistant Professor, Biology
- Sherwood, Bruce A., Research Professor, Physics Grads & Temps
- Shew, Barbara B., Research Assistant Professor, Plant Pathology
- Shew, Howard D., Philip Morris Professor, Plant Pathology
- Shi, Wei, Associate Professor, Soil Science
- Shiffler, Donald A, Research Associate Professor, Nonwovens Institute
- Shih, Jason C., Emeritus Professor, Poultry Science
- Shim, Eunkyoung, Research Assistant Professor, Textile Extension Short Cour
- Shimura, Fumio, Adjunct Professor, Materials Science & Engineering
- Shoemaker, Paul B., Emeritus Professor, Plant Pathology
- Shore, Scott Harold, Adjunct Associate Professor, Microbiology
- Showers, William J., Professor, Marine, Earth And Atmospheric
- Shultz, David A, Professor, Chemistry
- Sichitiu, Mihail L, Associate Professor, MS Comp Networking-ECE
- Siciliano, Paul David, Associate Professor, Animal Science
- Siderelis, Chrys D., Professor, Parks, Recreation & Tourism Mg
- Siewert, Charles Edward, Professor, Mathematics
- Sikes, Michael L., Assistant Professor, Microbiology
- Silber, Robert, Emeritus Associate Professor, Mathematics
- Silliman, Benjamin, Associate Professor, 4-H Youth Dev & Fam & Cons Sci
- Sills, Erin Odonnell, Associate Professor, For & Envir Res Acad Research
- Sills, Robert C., Adjunct Associate Professor, Dept-Population, Health, Pathobi
- Silverberg, Lawrence Michael, Professor, Mechanical & Aerospace Engr
- Silverman, Jules, Charles G. Wright, Entomology
- Silverstein, Jack William, Professor, Mathematics
- Simmons, Otto D, Research Assistant Professor, Biological And Agricultural En

- Simmons, Patricia E, Professor, Depart Of Math, Science, And T
- Simons, Theodore R, USDI Professor, Biology
- Simpson, Robert M, Adjunct Professor, Dept-Population, Health, Pathobi
- Simunovic, Josip, Research Associate Professor, Food, Bioprocess & Nutrition Sc
- Sinclair, Geoffrey Allan, Adjunct Assistant Professor, Marine, Earth And Atmospheric
- Sinclair, Thomas R, Adjunct Professor, Crop Science
- Singer, Michael F., Professor, Mathematics
- Singh, Munindar P, Professor, Computer Science-engr
- Siopes, Thomas David, Professor, Poultry Science
- Sirdeshmukh, Deepak, Assistant Professor, Business Management-coll Of Mg
- Sirota, Brent S, Assistant Professor, History
- Sisler, Edward C., Professor, Biochemistry
- Sitar, Zlatko, Kobe Steel Distinguished Professor, Materials Science & Engineering
- Sivaramakrishnan, Kartik Krishnan, Adjunct Assistant Professor, Mathematics
- Skaggs, Richard W., William Neal Reynolds Distinguished Professor of Biological and Agricultural Engineering, Biological And Agricultural En
- Skroch, Walter A., Emeritus Professor, Horticultural Science
- Slatta, Richard Wayne, Professor, History
- Slenning, Barrett D, Associate Professor, Dept-Population, Health, Pathobi
- Sliwinska-Bartowiak, Malgorzata, Adjunct Professor, Chemical & Biomolecular Engr
- Small, Judy Jo, Emeritus Professor, English
- Smallwood, James E., Professor, Dept Molecular Biomedical Scie
- Smart, Robert Charles, Professor, Toxicology
- Smetana, Frederick O., Emeritus Professor, Mechanical & Aerospace Engr
- Smialowicz, Ralph J, Adjunct Associate Professor, Dept-Population, Health, Pathobi
- Smirnov, Alexej I., Professor, Chemistry
- Smirnova, Tatyana I., Assistant Professor, Chemistry
- Smith McKoy, Sheila, Associate Professor, English
- Smith, Carl B., Cone Mills Professorship of Textile Chemistry, Textile Engineering, Chemistry
- Smith, Charles Eugene, Associate Professor, Statistics
- Smith, Craig Allen, Professor, Communication
- Smith, Donald E., Emeritus Professor, Biology
- Smith, Douglas Paul, Associate Professor, Poultry Science
- Smith, Frank J., Professor, Psychology
- Smith, Gary W., Associate Professor, Textile & Apparel, Technology
- Smith, Geoffrey W, Associate Professor, Dept-Population, Health, Pathobi
- Smith, J C, Emeritus Associate Professor, Civil Const & Environ Engineer
- Smith, James H, Adjunct Assistant Professor, Agricultural & Extension Educa
- Smith, James Russell, Teaching Assistant Professor, Curr, Instruc & Counselor Educ
- Smith, James W., Adjunct Associate Professor, Entomology
- Smith, Lee, Emeritus Professor, English

- Smith, Ralph Conover, Professor, Mathematics
- Smith, V. Kerry, UNIVERSITY DISTINGUISHED PROFESSOR, Ag & Resource Economics
- Smith, William A, Emeritus Professor, Fitts Dept Indust & Syst Engr
- Smith, William David, Phillip Morris Professor, Crop Science
- Smith, William R, Associate Professor, Sociology & Anthropology
- Smoot, Jean J, Emeritus Professor, English
- Smoukov, Stoyan, Research Assistant Professor, Chemical & Biomolecular Engr
- Smyth, Thomas J., Professor, Soil Science
- Sneed, Ronald E., Emeritus Professor, Biological And Agricultural En
- Snyder, Samuel S, Associate Professor, College Of Education
- Snyder, Wesley E., Professor, Electrical & Computer Engr.
- Solihin, Yan, Associate Professor, Electrical & Computer Engr.
- Solomon, Daniel L., Professor, College Of Phy & Math Sciences
- Sombers, Leslie A, Assistant Professor, Chemistry
- Sonenshine, Daniel E, Adjunct Professor, Entomology
- Sood, Avneet, Adjunct Assistant Professor, Nuclear Engineering
- Sorensen, Kenneth A., Emeritus Professor, Entomology
- Sorenson, Clyde E, Professor, Entomology
- Soroos, Marvin Stanley, Emeritus Professor, Public & International Affairs
- Sorrell, Furman Y, Emeritus Professor, Mechanical & Aerospace Engr
- Sosinski, Bryon R, Associate Professor, Horticultural Science
- Sosower, Mark L., Distinguished Professor, Foreign Languages And Literatu
- Southern, Phillip S., Emeritus Professor, Entomology
- Sowell, Robert Seago, Professor, Graduate School-Dean's Office
- Spafford, Anne McCombe, Associate Professor, Horticultural Science
- Spayd, Sara E, Professor, Horticultural Science
- Spears, Janet F, Professor, Crop Science
- Spears, Jerry Wayne, Professor, Animal Science
- Spencer, Stephanie Laine, Associate Professor, History
- Spiker, Steven L., Professor, Genetics
- Spires, Hiller A, Professor, Curr, Instruc & Counselor Educ
- Spivey, James J, Adjunct Professor, Chemical & Biomolecular Engr
- Spontak, Richard J, Professor, Chemical & Biomolecular Engr
- Spooner, Jean, Extension Professor, Biological And Agricultural En
- Sprinthall, Norman A, Emeritus Professor, Curr, Instr & Counselor Ed-CED
- Spurr, Harvey Wesley, Emeritus USDA Professor, Plant Pathology
- St. Amant, Robert A, Associate Professor, Computer Science-engr
- Stadelmaier, Hans H, Emeritus Professor, Materials Science & Engineering
- Stafford, Thomas Hugh, Adjunct Assistant Professor, Student Affairs VC Office &
- Stage, Scott Andrew, Associate Professor, Psychology
- Stahl, Chad Harmon, Associate Professor, Animal Science

- Staicu, Ana-Maria, Assistant Professor, Statistics
- Stalker, Harold T, Professor, Crop Science
- Stallmann, Matthias F.M., Professor, Computer Science-engr
- Stam, Ephraim, Emeritus Professor, Nuclear Engineering
- Stanko, Michael A, Assistant Professor, Business Management-coll Of Mg
- Stape, Jose Luiz, Associate Professor, The Forest Nutrition Cooperati
- Stark, Charles R, Assistant Professor, Poultry Science
- Starnes, Wayne C, Adjunct Assistant Professor, Dept-Population, Health, Pathobi
- Steel, Robert George, Emeritus Professor, Statistics
- Steele, Brooke Noelani, Assistant Professor, Biomedical Program ENG
- Steelman, Toddi Angela, Associate Professor, For & Envir Res Acad Research
- Steer, Michael B., Lampe Professor of Electrical and Computer Engineering, Electrical & Computer Engr.
- Stefanski, Leonard A., Professor, Statistics
- Stein, Allen Frederick, Professor, English
- Stein, Sarah R, Associate Professor, Communication
- Stejskal, Edward O., Emeritus Professor, Chemistry
- Stephen, Roland F, Associate Professor, Institute of Emerging Issues
- Stephenson, James L., Adjunct Assistant Professor, Microbiology
- Stewart, Ralsa Marshall, Associate Professor, 4-H Youth Dev & Fam & Cons Sci
- Stewart, Tony K., Professor, Philosophy & Religious Studies
- Stewart, William James, Professor, Computer Science-engr
- Stiff, Lee V., Professor, Depart Of Math, Science, And T
- Stikeleather, Larry F., Professor, Biological And Agricultural En
- Stiles, Phillip J, Emeritus Professor, Physics Grads & Temps
- Stinner, Ronald Edwin, Professor, Integrated Pest Mgmt-Research
- Stinson, Timothy Linwood, Assistant Professor, English
- Stitzinger, Ernest Lester, Professor, Mathematics
- Stoddard, Edward F., Emeritus Associate Professor, Marine, Earth And Atmospheric
- Stokely, Matthew H., Adjunct Associate Professor, Nuclear Engineering
- Stoll, Regina, Adjunct Associate Professor, Fitts Dept Indust & Syst Engr
- Stomp, Anne Marie, Associate Professor, Major Research Univ Funds-for
- Stone, Eric A, Assistant Professor, Statistics
- Stone, John R., Professor, Civil Const & Environ Engineer
- Storberg-Walker, Julia, Assistant Professor, Educ Leadrshp & Policy Studies
- Stoskopf, Michael K., Professor, Dept of Clinical Sciences
- Straus, Stephen K, Extension Assistant Professor, Public & International Affairs
- Strenkowski, John S., Professor, Mechanical & Aerospace Engr
- Struble, Raimond A., Emeritus Distinguished University Professor, Mathematics
- Struett, Michael John, Assistant Professor, Public & International Affairs
- Stuart, Bryan Lynn, Adjunct Assistant Professor, Biology
- Stubbs, Harriett S, Research Associate Professor, Dept Of Math & Science Educ -

- Stuber, Charles William, Emeritus USDA Professor, Genetics
- Stuckey, William C, Emeritus Professor, Textile & Apparel, Technology
- Stucky, Jon M., Professor, Plant Biology
- Stumpf, Mitzi Nichole, Extension Assistant Professor, 4-H Youth Dev & Fam & Cons Sci
- Suggs, Charles W., Emeritus Professor, Biological And Agricultural En
- Suh, Moon Won, Professor, Textile & Apparel, Technology
- Suiter, Karl Arthur, Adjunct Assistant Professor, Integrated Pest Mgmt-Research
- Sullivan, Craig V., William Neal Reynolds Professor, Biology
- Sullivan, Gene A., Emeritus Professor, Crop Science
- Sullivant, Seth M., Assistant Professor, Mathematics
- Sumner, Emmett A, Assistant Professor, Civil Const & Environ Engineer
- Sun, Ge, USDA Associate Professor, Southern Global Change Program
- Sun, Wenguang, Assistant Professor, Statistics
- Surh, Gerald, Associate Professor, History
- Suter, Steven E, Assistant Professor, Dept of Clinical Sciences
- Sutton, Rhonda S. Craver, Adjunct Assistant Professor, Graduate School-Dean's Office
- Sutton, Turner Bond, Professor, Plant Pathology
- Swaisgood, Harold E., Emeritus Distinguished Professor, Food, Bioprocess & Nutrition Sc
- Swallow, William H., Emeritus Professor, Statistics
- Swanson, Clifford Richard, Associate Professor, Dept Molecular Biomedical Scie
- Swarts, Jason, Associate Professor, English
- Swartzel, Kenneth R., William Neal Reynolds Distinguished Professor, Dean's Office CALS
- Swink, Rodney Leon, Adjunct Professor, Landscape Architecture
- Swiss, James E., Associate Professor, Public & International Affairs
- Switzer, William Lawrence, Associate Professor, Chemistry
- Sykes, Larry M, Adjunct Professor, Biological And Agricultural En
- Sylla, Edith D., Emeritus Professor, History
- Szanto, Agnes, Associate Professor, Mathematics
- Sztajn, Paola, Professor, Elementary Education
- Taheri, Javad, Research Associate Professor, Fitts Dept Indust & Syst Engr
- Tai, Eiko, Professor, Foreign Languages And Literatu
- Taj, Afroz Naqvi, Associate Professor, Foreign Languages And Literatu
- Taliaferro, Jocelyn DeVance, Associate Professor, Social Work
- Tallury, Shyamalrau P, Research Assistant Professor, Crop Science
- Tarpy, David R., Associate Professor, Entomology
- Tate, Lloyd Patrick, Professor, Dept of Clinical Sciences
- Tayebali, Akhtarhusein A, Associate Professor, Civil Const & Environ Engineer
- Taylor, Andrew J, Professor, Public & International Affairs
- Taylor, Eileen Z, Assistant Professor, Accounting-college Of Manageme
- Taylor, Laura O., Professor, Ag & Resource Economics
- Taylor, Raymond G, Emeritus Professor, Educ Leadrshp & Policy Studies

- Tector, John O., Associate Professor, College of Design
- Temple, William F., Assistant Professor, Graphic Design
- Terry, Stephen D, Extension Assistant Professor, Mech & Aerospace Engr Contract
- Tesar, Paul, Professor, Architecture
- Thakur, Siddhartha, Assistant Professor, Dept-Population, Health, Pathobi
- Tharp, Alan Lee, Professor, Computer Science-engr
- Thayer, Paul W, Emeritus Professor, CED General Support
- Theil, Elizabeth C., Emeritus Professor, Biochemistry
- Theil, Michael Herbert, Emeritus Professor, Textile Engineering, Chemistry
- Theuer, Richard C., Adjunct Professor, Food, Bioprocess & Nutrition Sc
- Theyson, Thomas W, Adjunct Professor, Textile & Apparel, Technology
- Thies-Sprinthall, Lois M, Emeritus Associate Professor, Curr, Instruc & Counselor Educ
- Thigpen, John F, Adjunct Associate Professor, Sea Grant Program
- Thomas, Carrie J, Research Associate Professor, Marine, Earth And Atmospheric
- Thomas, Erik R, Professor, English
- Thomas, Judith F., Emeritus Professor, Plant Biology
- Thomas, Melvin E, Associate Professor, Sociology & Anthropology
- Thomas, Richard J, Emeritus Professor, Wood And Paper Science
- Thompson, Alton, Adjunct Professor, Sociology And Anthropology
- Thompson, Donald B, Research Associate Professor, Thermal Protection & Comfort C
- Thompson, Donald L., Emeritus USDA Professor, Crop Science
- Thompson, Elizabeth Alison, Visiting Professor, Statistics
- Thompson, Jeffrey Ray, Teaching Associate Professor, Statistics
- Thompson, Jon F, Professor, English
- Thompson, Lori Foster, Associate Professor, Psychology
- Thompson, Maxine S, Associate Professor, Sociology & Anthropology
- Thompson, William F., University Research Professor, Plant Biology
- Thomson, Randy J., Associate Professor, College Of Humanities & Soc SC
- Thorne, Jeffrey L, Professor, Genetics
- Thornton, Courtney H, Adjunct Assistant Professor, Educ Leadrshp & Policy Studies
- Thrall, Donald E., Professor, Dept Molecular Biomedical Scie
- Threadgill, David W, Professor, Genetics
- Threadgill, Deborah S, Assistant Professor, Microbiology
- Thuente, David J., Professor, Computer Science-engr
- Thuente, Mary Helen, Professor, English
- Thurman, Walter N., William Neal Reynolds Professor, Ag & Resource Economics
- Tilley, David R., Emeritus Professor, Physics
- Tilotta, David C, Associate Professor, Wood And Paper Science
- Timothy, David H., Emeritus Professor, Crop Science
- Ting, Siu-Man, Associate Professor, Curr, Instruc & Counselor Educ
- Tittle, Charles Ray, Goodnight-Glaxo Wellcome Endowed Chair, Sociology & Anthropology

- Tobia, Abraham J, Adjunct Professor, Toxicology
- Tolson, Robert H, Research Professor, Mechanical & Aerospace Engr
- Tomas, Stacy R, Assistant Professor, Parks, Recreation & Tourism Mg
- Tomasino, Charles, Emeritus Professor, Textile Engineering, Chemistry
- Tomlinson, James D, Research Associate Professor, Design Research
- Tommerdahl, Mark A, Associate Professor, Biomedical Program-Grad Appts
- Tompkins, Mary B, Professor, Dept-Population, Health, Pathobi
- Tompkins, Wayne, Professor, Dept-Population, Health, Pathobi
- Tonelli, Alan E, INVISTA Professor of Fiber and Polymer Chemistry, Textile Engineering, Chemistry
- Tong, Quansong, Adjunct Assistant Professor, Marine, Earth And Atmospheric
- Tonkonogy, Susan, Associate Professor, Dept-Population, Health, Pathobi
- Toole, William B., Emeritus Professor, College Of Humanities & Soc SC
- Toplikar, Susan Margaret, Associate Professor, Art and Design
- Tornatzky, Louis G, Adjunct Professor, Psychology
- Townsend, David M, Assistant Professor, Mgmt, Innovation&Entrepreneur
- Townsend, J K, Professor, Electrical & Computer Engr.
- Townsend, Scott, Associate Professor, Graphic Design
- Tracy, Joseph B., Assistant Professor, Materials Science & Engineering
- Tran, Hien Trong, Professor, Mathematics
- Tredway, Lane Patrick, Associate Professor, Plant Pathology
- Trew, Robert James, Alton and Mildred Lancaster Distinguished Professor, Microelectronics Research Cent
- Triantaphyllou, A C, Emeritus Professor, Genetics
- Triantaphyllou, Hedwig Hirschm, Emeritus Professor, Plant Pathology
- Troyer, James R., Emeritus Professor, Plant Biology
- Truong, Van Den, USDA Associate Professor, Food, Bioprocess & Nutrition Sc
- Trussell, Henry J., Professor, Electrical & Computer Engr.
- Tschirhart, Mary, Professor, Institute for Nonprofits
- Tsiatis, Anastasios A, Drexel Professor of Statistics, Statistics
- Tsoulouhas, Theofanis C, Professor, Economics-college Of Managemen
- Tsuji, Jun, Associate Professor, Toxicology
- Tsuji, Yoshiaki, Associate Professor, Toxicology
- Tsynkov, Semyon Victor, Associate Professor, Mathematics
- Tu, Juei Feng, Professor, Mechanical & Aerospace Engr
- Tuck, James, Assistant Professor, Electrical & Computer Engr.
- Tucker, Paul Arthur, Emeritus Professor, Textile Engineering, Chemistry
- Tucker, William P., Emeritus Professor, Chemistry
- Tung, Chi C., Emeritus Professor, Civil Const & Environ Engineer
- Turinsky, Paul J., Professor, Nuclear Engineering
- Turner, James Edward, Extension Assistant Professor, Animal Science
- Turner, Lynn G., Professor, Food, Bioprocess & Nutrition Sc
- Tyler, Beverly B, Associate Professor, Mgmt, Innovation&Entrepreneur

- Tyler, Richard E, Adjunct Assistant Professor, Counseling Center
- Tzeng, Jung-Ying, Assistant Professor, Statistics
- Uknes, Scott J, Adjunct Assistant Professor, Genetics
- Ullrich, David F., Emeritus Associate Professor, Mathematics
- Umbach, Paul David, Associate Professor, Educ Leadrshp & Policy Studies
- Underwood, Herbert A., Professor, Biology
- Uni, Zehava, Adjunct Professor, Poultry Science
- Unrath, Claude R., Emeritus Professor, Horticultural Science
- Upchurch, Robert G., USDA Associate Professor, Plant Pathology
- Uzsoy, Reha, Clifton A. Anderson Distinguished Professor, Fitts Dept Indust & Syst Engr
- Vaden, Shelly L., Professor, Dept of Clinical Sciences
- Vahedi Tafreshi, Hooman, Adjunct Assistant Professor, Textile Engineering, Chemistry
- van der Vaart, Donald Robert, Adjunct Associate Professor, Civil Const & Environ Engineer
- Van Der Wiele, Cynthia F, Adjunct Assistant Professor, For & Envir Res Acad Research
- van Kempen, Theo A, Adjunct Professor, Animal Science
- van Zanten, John H., Teaching Assistant Professor, BTEC-Biomfg Training Ed Ctr
- Van Zyl, Leonel Merwe, Adjunct Assistant Professor, For & Envir Res Acad Research
- Vandenbergh, John G., Emeritus Professor, Biology
- VanDerVeer, Hendrik W, Adjunct Associate Professor, Biology
- VanDerWall, William J., Emeritus Assistant Professor, Depart Of Math, Science, And T
- VanDuyn, John W., Emeritus Named Professor, Entomology
- VanDyke, C Gerald, Professor, Plant Biology
- VanHeugten, Eric, Professor, Animal Science
- Vargo, Edward L, Professor, Entomology
- Varnado, Terri E, Assistant Professor, Depart Of Math, Science, And T
- Vasu, Ellen S., Professor, Curr, Instruc & Counselor Educ
- Vasu, Michael L., Associate Professor, Public & International Affairs
- Vaughan, George B, Emeritus Professor, Adult & Higher Education
- Veal, Matthew W, Assistant Professor, Biological And Agricultural En
- Velev, Orlin Dimitrov, INVISTA Professorship in Chemical and Biomolecular Engineering, Chemical & Biomolecular Engr
- Venditti, Richard A, Professor, Wood And Paper Science
- Vepraskas, Michael John, William Neal Reynolds Professor, Soil Science
- Verghese, Kuruvilla, Emeritus Professor, Nuclear Engineering
- Veronese, Paola, Assistant Professor, Plant Pathology
- Veronesi, Belllina, Adjunct Associate Professor, Toxicology
- Vick, Candace Goode, Associate Professor, Parks, Recreation & Tourism Mg
- Vickery, Kenneth P., Professor, History
- Vilches, Elvira Lopez, Associate Professor, Foreign Languages And Literatu
- Vincent, Kenneth S., Professor, History
- Viniotis, Ioannis, Professor, Electrical & Computer Engr.

- Vlcek, Petr, Adjunct Professor, Chemical & Biomolecular Engr
- Voiland, Michael P, Adjunct Associate Professor, Sea Grant Program
- von Haefen, Roger H., Associate Professor, Ag & Resource Economics
- Vouk, Mladen A, Professor, Computer Science-engr
- Vukina, Tomislav, Professor, Ag & Resource Economics
- Wade, Robert W, Teaching Assistant Professor, Parks, Recreation & Tourism Mg
- Wages, Dennis P., Professor, Dept-Population, Health, Pathobi
- Wagger, Michael G., Professor, Soil Science
- Wahl, George H., Professor, Chemistry
- Wahls, Harvey E., Emeritus Professor, Civil Const & Environ Engineer
- Waites, Cheryl C, Associate Professor, Social Work
- Walden, Michael L., William Neal Reynolds Distinguished Professor, Ag & Resource Economics
- Waldvogel, Michael Gerard, Extension Associate Professor, Entomology
- Walek, Mary L., Emeritus Associate Professor, Sociology & Anthropology
- Walgenbach, James F., Professor, Entomology
- Walker, Glenn M, Assistant Professor, Biomedical Program ENG
- Walker, John T, Adjunct Assistant Professor, Soil Science
- Walker, Mark D, Associate Professor, Business Management-coll Of Mg
- Wall, John N., Professor, English
- Wallace, Andrew Daniel, Assistant Professor, Toxicology
- Wallace, James M., Associate Professor, Sociology & Anthropology
- Walsh, Rebecca Ann, Assistant Professor, English
- Walsh, Stephen J, Teaching Associate Professor, Electrical & Computer Engr.
- Walter, William M., Emeritus USDA Professor, Food, Bioprocess & Nutrition Sc
- Wan, Jan-Ru, Assistant Professor, Art and Design
- Wang, Huixia, Assistant Professor, Statistics
- Wang, Lingjuan, Assistant Professor, Biological And Agricultural En
- Wang, Wenye, Associate Professor, MS Comp Networking-ECE
- Wang, Xiaogang, Adjunct Associate Professor, Electrical & Computer Engr.
- Ward, Donn R., Professor, Food, Bioprocess & Nutrition Sc
- Ward, Thomas, Assistant Professor, Mechanical & Aerospace Engr
- Warner, John Christopher, Adjunct Associate Professor, Marine, Earth And Atmospheric
- Warr, Richard S, Associate Professor, Business Management-coll Of Mg
- Warren, Catherine A, Associate Professor, English
- Warren, Sarah Timberlake, Associate Professor, For & Envir Res Acad Research
- Warsing, Donald P, Associate Professor, Business Management-coll Of Mg
- Waschka, Rodney Anthony, Professor, Interdisciplinary Studies
- Washburn, Brian Eric, Adjunct Assistant Professor, Wood And Paper Science
- Washburn, Steven Paul, Professor, Animal Science
- Wasik, John L., Emeritus Professor, Statistics
- Waters, Richard D., Assistant Professor, Communication

- Waters, William M., Emeritus Associate Professor, Depart Of Math, Science, And T
- Watkins, Karen Yvonne, Teaching Assistant Professor, Social Work
- Watson, Benjamin Allen, Associate Professor, Computer Science-engr
- Watson, David W, Professor, Entomology
- Watson, Gerald F., Emeritus Associate Professor, Marine, Earth And Atmospheric
- Watson, Larry W., Emeritus Associate Professor, Depart Of Math, Science, And T
- Wear, David N, Adjunct Professor, For & Envir Res Acad Research
- Weber, Jerome B., Emeritus Professor, Crop Science
- Wechsberg, Wendee M, Adjunct Associate Professor, Psychology
- Wechsler, Monroe S, Adjunct Professor, Nuclear Engineering
- Weeks, Willard Wesley, Emeritus Professor, Crop Science
- Weems, Kimberly S., Teaching Associate Professor, Statistics
- Wegmann, Karl William, Assistant Professor, Marine, Earth And Atmospheric
- Wehner, Todd Craig, Professor, Horticultural Science
- Wehring, Bernard William, Research Professor, Nuclear Reactor Program
- Weinhold, Paul S, Research Associate Professor, Biomedical Program ENG
- Weisel, Deborah Lamm, Teaching Assistant Professor, Public & Internt'l Affairs Res
- Weiss, Ira R, Professor, Dean's Office-college Of Manag
- Weissinger, Arthur K., Emeritus Professor, Crop Science
- Weisz, P Randall, Professor, Crop Science
- Welby, Charles W., Emeritus Professor, Marine, Earth And Atmospheric
- Welch, Milton Lamont, Assistant Professor, English
- Wellman, J D, Professor, Parks, Recreation & Tourism Mg
- Wells, J C, Emeritus Professor, Plant Pathology
- Wells, Janice G, Assistant Professor, Social Work
- Wells, Randy, Professor, Crop Science
- Welsch, Frank, Adjunct Professor, Dept Molecular Biomedical Scie
- Wenig, Robert E., Emeritus Associate Professor, Depart Of Math, Science, And T
- Weninger, Keith R., Associate Professor, Physics
- Wentworth, Thomas R., Professor, Plant Biology
- Werner, Dennis J., J.C. Raulston Distinguished Professor, Horticultural Science
- Wernsman, Earl A., Emeritus Named Distinguished Professor, Crop Science
- Wertz, Dennis W., Associate Professor, Chemistry
- Wesler, Oscar, Emeritus Professor, Statistics
- Wessels, Walter J., Professor, Economics-college Of Managemen
- West, Harry C., Emeritus Associate Professor, English
- Westerman, Philip W., Professor, Biological And Agricultural En
- Westmoreland, Phillip R, Professor, Chemical & Biomolecular Engr
- Whang, Hyun Suk, Adjunct Assistant Professor, Textile Engineering, Chemistry
- Whangbo, Myung H., Professor, Chemistry
- Wheatley, John H., Emeritus Associate Professor, Depart Of Math, Science, And T

- Wheeler, Elisabeth A., Emeritus Professor, Wood And Paper Science
- Wheeler, Mary Elizabeth, Emeritus Professor, History
- Whetten, Ross W., Associate Professor, Biotechnology
- Whipker, Brian E, Professor, Horticultural Science
- Whisnant, Charles S, Associate Professor, Animal Science
- Whitacre, Michael David, Associate Professor, Dept of Clinical Sciences
- Whitaker, Thomas B., Emeritus Professor, Biological And Agricultural En
- White, Jeffery L., Associate Professor, Chemistry
- White, Jeffrey G., Associate Professor, Soil Science
- White, Mark W., Associate Professor, Electrical & Computer Engr.
- White, Raymond Cyrus, Emeritus Professor, Chemistry
- White, Robert E., Professor, Mathematics
- Whitfill, Craig E, Adjunct Associate Professor, Poultry Science
- Whitten, Jerry Lynn, Professor, Chemistry
- Wiebe, Eric N, Associate Professor, Depart Of Math, Science, And T
- Wiegmann, Brian M, Professor, Entomology
- Wieland, Bruce W, Adjunct Associate Professor, Nuclear Engineering
- Wiener, Russell W, Adjunct Associate Professor, Marine, Earth And Atmospheric
- Wiese, Dennis Eugene, Adjunct Assistant Professor, Educ Leadrshp & Policy Studies
- Wiley, Stephen B, Associate Professor, Communication
- Wilk, John C, Emeritus Professor, Animal Science
- Wilkerson, Gail G., Professor, Crop Science
- Wilkinson, Richard R., Emeritus Professor, Landscape Architecture
- Williams, Billy M, Associate Professor, Civil Const & Environ Engineer
- Williams, Charles Michael, Professor, Poultry Science
- Williams, Christopher J., Adjunct Assistant Professor, Poultry Science
- Williams, Cranos M, Assistant Professor, Electrical & Computer Engr.
- Williams, James O., Emeritus Professor, Public & International Affairs
- Williams, Laurel E, Associate Professor, Dept of Clinical Sciences
- Williams, Laurie A, Associate Professor, Computer Science-engr
- Williams, Linda R., Clinical Associate Professor, Social Work
- Williams, Mary Camero, Emeritus Professor, English
- Williams, Paul F., Professor, Accounting-college Of Manageme
- Williams, Porter, Emeritus Professor, English
- Williams, Saundra W, Adjunct Assistant Professor, Adult & Higher Education
- Williamson, John D, Associate Professor, Horticultural Science
- Willits, Daniel H., Professor, Graduate School-Dean's Office
- Wilson, Beth Evelyn, Associate Professor, Parks, Recreation & Tourism Mg
- Wilson, Elizabeth B, Associate Professor, Agricultural & Extension Educa
- Wilson, James Reed, Professor, Fitts Dept Indust & Syst Engr
- Wilson, John Michael, Adjunct Assistant Professor, Electrical & Computer Engr.

- Wilson, Lorenzo G., Professor, Horticultural Science
- Wilson, Mark A, Associate Professor, Psychology
- Wilson, Richard Ferrol, USDA Professor, Crop Science
- Wimberley, Ronald C., William Neal Reynolds Distinguished Professor, Sociology And Anthropology
- Winchester, Samuel Clyde, Emeritus Named Professor, Textile & Apparel, Technology
- Wineland, Michael J., Professor, Poultry Science
- Winner, William E, Professor, For & Envir Res Acad Research
- Winston, Hubert, Extension Associate Professor, Chemical & Biomolecular Engr
- Wise, Farrell C, Adjunct Assistant Professor, Horticultural Science
- Wise, George Herman, Emeritus Professor, Animal Science
- Wiseman, Angela Michelle, Assistant Professor, Elementary Education
- Wiser, Edward Hempstead, Emeritus Professor, Biological And Agricultural En
- Wishy, Bernard W., Emeritus Professor, History
- Witt, Mary Ann, Emeritus Professor, Foreign Languages And Literatu
- Wogalter, Michael S, Professor, Psychology
- Wohlgenant, Michael K., William Neal Reynolds Distinguished Professor, Ag & Resource Economics
- Wolcott, Donna Lee, Emeritus Associate Professor, Marine, Earth And Atmospheric
- Wolcott, Thomas G., Professor, Marine, Earth And Atmospheric
- Wolfe, Barbara A., Adjunct Assistant Professor, Dept of Clinical Sciences
- Wolfinger, Russell D., Adjunct Professor, Statistics
- Wolford, Tonya E, Assistant Professor, Foreign Languages And Literatu
- Wolfram, Walter A, William C. Friday Distinguished University Professorship, English
- Wollenzien, Paul L, Professor, Biochemistry
- Woodard, Roger, Teaching Associate Professor, Statistics
- Woolard, Dwight L, Adjunct Professor, Electrical & Computer Engr.
- Wormsley, William E, Teaching Associate Professor, Sociology & Anthropology
- Worsham, Arch D., Emeritus Professor, Crop Science
- Wortman, Jimmie J, Emeritus Professor, Electrical & Computer Engr.
- Wossink, Grada A, Professor, Ag & Resource Economics
- Wright, Charles Gerald, Emeritus Professor, Entomology
- Wright, Ruth Lorraine, Associate Professor, Accounting-college Of Manageme
- Wu, Fen, Associate Professor, Mechanical & Aerospace Engr
- Wu, Yichao, Assistant Professor, Statistics
- Wurman, Peter R., Adjunct Associate Professor, Computer Science-engr
- Wust, Valerie Ann, Assistant Professor, Foreign Languages And Literatu
- Wyer, Mary B, Associate Professor, Psychology
- Wynne, Johnny Calvin, R. J. Reynolds Tobacco Company Professor, Dean's Office CALS
- Wynne, Randolph H, Adjunct Associate Professor, For & Envir Res Acad Research
- Xi, Lin, Research Assistant Professor, Animal Science
- Xia, Xin Rui, Research Assistant Professor, Dept-Population, Health, Pathobi
- Xiang, Qiu Yun, Associate Professor, Plant Biology

- Xie, Deyu, Assistant Professor, Plant Biology
- Xie, Lian, Professor, Marine, Earth And Atmospheric
- Xie, Tao, Assistant Professor, Computer Science-engr
- Yamamoto, Yuri Takeshima, Adjunct Assistant Professor, For & Envir Res Acad Research
- Yelverton, Fred H., Professor, Crop Science
- Yencho, George C, Professor, Horticultural Science
- Yim, Man-Sung, Associate Professor, Nuclear Engineering
- Yingling, Yaroslava G, Assistant Professor, Materials Science & Engineering
- Yoder, Jeffrey A., Assistant Professor, Dept Molecular Biomedical Scie
- York, Alan Clarence, Emeritus Named Professor, Crop Science
- Young, Albert R., Professor, Physics
- Young, Carl A, Associate Professor, Curr, Instruc & Counselor Educ
- Young, Eric, Professor, Administration Research Serv
- Young, Greggry S, Associate Professor, Mgmt, Innovation&Entrepreneur
- Young, James H., Emeritus Professor, Biological And Agricultural En
- Young, Robert E., Professor, Fitts Dept Indust & Syst Engr
- Young, Robert M, Associate Professor, Computer Science-engr
- Young, Robert V., Professor, English
- Young, Sidney S, Adjunct Professor, Statistics
- Young, Tamara V., Assistant Professor, Educ Leadrshp & Policy Studies
- Youssef, Mohamed A, Assistant Professor, Biological And Agricultural En
- Yu, Donna G, Teaching Associate Professor, Electrical & Computer Engr.
- Yu, Jie, Assistant Professor, Civil Const & Environ Engineer
- Yu, Ting, Associate Professor, Computer Science-engr
- Yuan, Fuh-Gwo, Professor, Mechanical & Aerospace Engr
- Yuter, Sandra E., Associate Professor, Marine, Earth And Atmospheric
- Zagacki, Kenneth S., Professor, Communication
- Zahn, Margaret A, Professor, Sociology & Anthropology
- Zavada, John M, Research Professor, Electrl & Comp Engr Grad & Temp
- Zeldin, Darryl C, Adjunct Professor, Toxicology
- Zeng, Shaobang, William Neal Reynolds Professor, Statistics
- Zenkov, Dmitry Valerievich, Associate Professor, Mathematics
- Zering, Kelly D., Associate Professor, Ag & Resource Economics
- Zhang, Daowen, Associate Professor, Statistics
- Zhang, Hao, Assistant Professor, Statistics
- Zhang, Xiangwu, Assistant Professor, Textile Engineering, Chemistry
- Zhang, Yang, Professor, Marine, Earth And Atmospheric
- Zhang, Zhe, Research Associate Professor, Mech & Aerospace Engr Contract
- Zhao, Jing, Assistant Professor, Business Management-coll Of Mg
- Zheng, Xiaoyong, Assistant Professor, Ag & Resource Economics
- Zhirnov, Victor, Adjunct Associate Professor, Materials Science & Engineering

- Zhu, Yong, Assistant Professor, Mechanical & Aerospace Engr
- Zhu, Yuntian T, Professor, Materials Science & Engineering
- Zia, Paul Z, Emeritus Distinguished University Professor, Civil Const & Environ Engineer
- Zikry, Mohammed A, Professor, Mechanical & Aerospace Engr
- Zobel, Bruce J., Emeritus Professor, For & Envir Res Acad Research
- Zonderman, David Aaron, Professor, History
- Zorner, Paul S., Adjunct Professor, Horticultural Science
- Zorowski, Carl F., Emeritus Named Professor, Engineering Online
- Zublena, Joseph P.J., Professor, Administration Extension Ser
- Zuckerman, Gilroy J., Associate Professor, Accounting-college Of Manageme
- Zuiches, James J, Professor, Ext, Engagement & Econ Develop

## **NC State Policies**

North Carolina State University is committed to academic integrity, and all students are required to adhere to the <u>NC State Code of Student Conduct</u>. Individual policies on conduct, including those listed below, are posted on <u>University Policies, Regulations, and Rules (PRRs)</u>.

University Patent Procedures Grievance Procedures for Graduate Students Code of Student Conduct Academic Integrity Policy on Illegal Drugs Sexual Harassment Policy Racial Harassment Policy University Copyright Procedures

#### **Equal Opportunity and Non-Discrimination**

It is the policy of the State of North Carolina to provide equality of opportunity in education and employment for all students and employees. Accordingly, the university does not practice or condone unlawful discrimination in any form against students, employees or applicants on the basis of race, color, religion, creed, sex, national origin, age, disability or veteran status. Nor does the university allow discrimination on the basis of sexual orientation with respect to internal university matters that do not contravene federal or state law and that do not interfere with the University's relationships with outside organizations, including the federal government, the military, ROTC, and private employers. [NOTE: The NC State University equal opportunity and nondiscrimination policy includes transsexual individuals within the policy's prohibitions against discrimination on the basis of sex. This includes actual or perceived gender identity and gender expression. See <u>Price Waterhouse v. Hopkins</u>, 490 U.S. 228 (1989); <u>Smith v. City of Salem</u>, 378 F.3d 566 (6th Circ. 2004).] Retaliation against any person complaining of discrimination is in violation of federal and state law and North Carolina State University policy, and will not be tolerated.

#### **Unlawful Harassment**

Harassment based upon race, color, religion, creed, sex, national origin, veteran status, age, or disability is a form of discrimination in violation of federal and state law and North Carolina State University policy and will not be tolerated. It is the internal policy of North Carolina State University to prohibit harassment on the basis of sexual orientation. Retaliation against any person complaining of harassment is in violation of federal and state law and North Carolina State University policy, and will not be tolerated. North Carolina State University will respond promptly to all complaints of harassment and retaliation. Violation of this policy can result in serious disciplinary action up to and including expulsion for students or discharge for employees.

Every individual is encouraged, and should feel free, to seek assistance, information and guidance from his/her supervisor, the <u>Office for Equal Opportunity</u>, the <u>Office of Student Conduct</u> or the <u>Employees</u> <u>Relations</u> section of Human Resources. For additional information, contact: Office for Equal Opportunity, 1 Holladay Hall, Box 7530, North Carolina State University, Raleigh, NC 27695-7530,

Phone: (919) 513-1234 or 515-3148.

#### **Disability Services Office**

Individuals desiring reasonable accommodations for their documented disabilities should contact the <u>Disability Services Office</u> (DSO), Suite 1900, Student Health Center, 2815 Cates Avenue, (919) 515-7653 (Voice), (919) 515-8830 (TTY). Services and accommodations are provided based on an individual's documented needs and are determined in consultation with the individual and a DSO representative. For students, such requests should be made far in advance of registration deadlines to ensure timely services and accommodations. DSO will maintain appropriate confidentiality of records and communication regarding disability.

### **Other Resources**

The following resources are not only essential components of graduate education at NC State, but can also enhance the graduate experience. Each college has a wealth of material about their specific facilities. Additional information is also available in the <u>New Student Survival Guide</u>.

Graduate Calendar Graduate Student Association Health Services Housing Information Technology Division NCSU Libraries Map of the Campus Office of Faculty Development Preparing Future Leaders Programs Research Centers Schedule of Required Documents

# 8 *#* Archives

Incoming students are governed by the rules and regulations in force the semester they are accepted into a program. Previous Graduate Catalogs can be downloaded in PDF format here.

Graduate Catalog (2008-2009) Graduate Catalog (2007-2008) Graduate Catalog (Spring 2007) Graduate Catalog (Fall 2006) Graduate Catalog (Spring 2006) Graduate Catalog (Fall 2005) Graduate Catalog (Spring 2005) Graduate Catalog (Fall 2004) Graduate Catalog (Spring 2004) Graduate Catalog (Fall 2003)