

**Faculty Handbook  
Energy Science and Engineering Program**

**Bredesen Center for Interdisciplinary  
Research and Graduate Education**

**University of Tennessee, Knoxville  
Oak Ridge National Laboratory**

**Revised  
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**Bredesen Center for Interdisciplinary  
Research and Graduate Education  
Faculty Handbook**

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## **The Bredesen Center for Interdisciplinary Research and Graduate Education**

The interdisciplinary doctoral degree in Energy Science and Engineering (ESE) at the University of Tennessee was formed to educate students in energy-related fields that are increasing in importance to the state and the country. The ESE Faculty, based both at the University of Tennessee Knoxville (UTK) and Oak Ridge National Laboratory (ORNL), provide research opportunities in various fields relating to the scientific and engineering challenges in energy supply and usage, including impacts on the environment and climate. The curriculum includes graduate courses designed specifically for the ESE program, but also draws on the graduate offerings of other departments to provide a broad interdisciplinary foundation for the ESE students. This is a program that was initiated by Governor Phil Bredesen and funded by the State Legislature. This degree is administered by the Bredesen Center for Interdisciplinary Research and Graduate Education, which has been established by the University of Tennessee, Knoxville and the Oak Ridge National Laboratory.

Lee Riedinger  
Director, Bredesen Center  
Professor of Physics

## Introduction

The Bredesen Center for Interdisciplinary Research and Graduate Education has developed and offers one of the country's first interdisciplinary PhD programs in energy science and engineering. The Bredesen Center expands the graduate research campus of UTK to include ORNL, greatly increasing research opportunities by combining the educational resources of a comprehensive research university and the research capabilities of a major national laboratory. This teaming arrangement provides expanded opportunities for graduate students in energy-related sciences and engineering, fostering multidisciplinary research, large-scale problem-oriented research projects, innovation and entrepreneurship.

This interdisciplinary degree is a collaborative effort supported by selected faculty in the University of Tennessee's College of Arts and Sciences, the College of Agricultural Sciences and Natural Resources, and the College of Engineering, in addition to research staff of Oak Ridge National Laboratory. These research and educational leaders are appointed as faculty members of the Bredesen Center for Interdisciplinary Research and Graduate Education. Members of the Bredesen Center faculty determine the curriculum and serve as the primary resource for the teaching, research, and mentoring of the students admitted to the program.

The Bredesen Center offers graduate students opportunities to engage in multidisciplinary research while preserving the rigor and depth of a PhD program. In addition, the ESE graduate curriculum is structured to include educational broadening elements that allow the incorporation of study in entrepreneurship, policy, or other energy-related fields. Entrepreneurial aspects of the program include partnership opportunities with the Haslam College of Business at UTK in developing and implementing business plans to accelerate the deployment of new technologies. The Bredesen Center is transformational in engaging graduate students in multidisciplinary projects, large-scale problem-oriented research programs, and science-to-applications research opportunities, enabling scientific breakthroughs and innovative solutions to energy-related challenges.

The University of Tennessee and Oak Ridge National Laboratory are well positioned to establish a prominent faculty in energy-related fields. ORNL has rapidly become the broadest national laboratory in energy-related research and development. Seven areas of research have been chosen as the initial areas of emphasis in the ESE program, and these six areas together address 10 of the grand challenges that our country faces in the energy arena:

- Nuclear energy
  - Close the nuclear fuel cycle
  - Find an inexhaustible source of energy
- Bioenergy and biofuels
  - Develop a new generation of ethanol or other biofuels
- Renewable energy
  - Lower the cost of solar power
- Energy conversion and storage
  - Store alternative energy
  - Design high-mileage cars

- Distributed energy and grid management
  - Modernize the electric grid
  - Reduce energy consumption
- Environmental and climate sciences related to energy
  - Respond to climate change
  - Store carbon emissions
- Transportation

It is anticipated that these areas of emphasis will evolve to always address the most important problems in energy science and engineering. Formal changes to these focus areas are proposed by faculty to the Director, subject to a vote of the entire faculty, and require approval of the Board of Directors.

## **Organization**

The Bredesen Center for Interdisciplinary Research and Graduate Education began in January 2010 when the General Assembly of the State of Tennessee passed legislation authorizing The University of Tennessee to establish an academic unit of The University of Tennessee, Knoxville (UTK) for interdisciplinary research and graduate education in collaboration with Oak Ridge National Laboratory (ORNL).

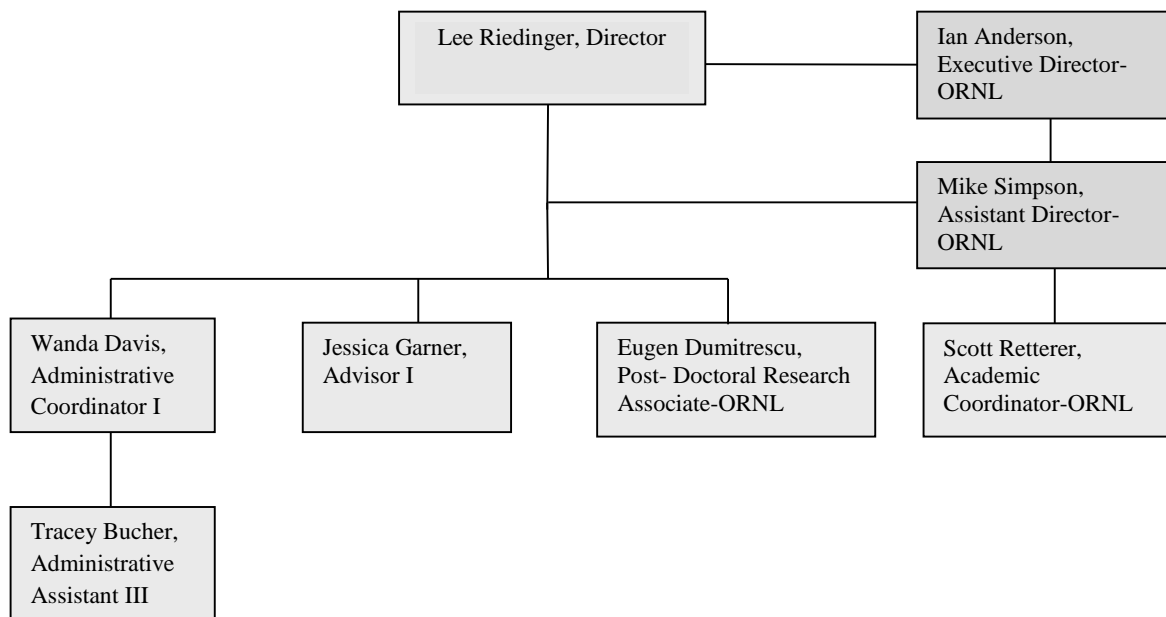
The Bredesen Center is led by a Director (UTK employee) and Assistant Director (ORNL employee) appointed jointly by the UTK Chancellor and ORNL Director. The Director is responsible for day-to-day operations, finances, personnel, appointment of Bredesen Center faculty committees, appointment of Bredesen Center faculty, performance appraisals of Bredesen Center faculty, recruiting and admissions, student life, and relationships with UTK departments and administration. The Assistant Director works with the Director in all the above areas and has primary responsibility for interfacing with ORNL research programs and staff, as well as student placement at ORNL. An Executive Director (ORNL employee) is the primary interface with ORNL management, operations and safety, security, and financial systems. The Director appoints Credentials, Curriculum, Graduate Coordinating, and Strategic Planning committees to assist in administering Bredesen Center programs. An organizational chart is provided in the figure below.

A Board of Directors composed of senior officials at UTK and ORNL oversees the operation of the Bredesen Center. An external advisory board provides independent advice and strengthens relationships with industry and other universities. Bredesen Center faculty are drawn from UTK and ORNL, with common eligibility criteria and appointment processes. Bredesen Center faculty will mentor graduate students, develop and teach courses, develop and submit research and other funding proposals, and serve on Bredesen Center committees including Curriculum, Graduate Coordinating, and Credentials Committees.

Bredesen Center graduate students join interdisciplinary research teams at ORNL and/or UTK that expose them to large-scale problem-oriented research and development, foster their ability to work across disciplinary boundaries, encourage them to approach research problems from new directions, and strengthen their ability to work in teams. Students are encouraged to

develop their research in the context of potential solutions to important national problems, and are given the tools and support to follow an entrepreneurial path consistent with their interests.

### DEPARTMENTAL ORGANIZATIONAL CHART



### Standing Committees

All standing committees are composed of Bredesen Center faculty members selected by the Center Director. The four standing committees are described below.

#### *Credentials Committee*

The main role of the Credentials Committee is to evaluate and approve new additions to the Bredesen Center faculty. UTK and UTIA faculty and ORNL research staff are eligible to apply to join the Bredesen Center faculty using the process described in the Faculty section of this handbook. Faculty candidates transmit their applications through their Department Chair or Division Director to the Center Director. From these applications the Center Director proposes additions to the faculty and transmits the appropriate information to the Credentials Committee for review.

### *Curriculum Committee*

The main role of the Curriculum Committee is to oversee the academic requirements for the Ph.D. in Energy Science and Engineering. This includes the approval of new courses and qualifying exam specifications.

### *Graduate Coordinating Committee*

The Graduate Coordinating Committee focuses on student recruitment and selection. This committee develops guidelines evaluating and selecting students that receive the Bredesen Center Fellowships.

### *Strategic Planning Committee*

The Strategic Planning Committee focuses on the future direction of the program. In particular, this committee is charged with defining the evolution of the research areas of the program in response to advances in science and technology or changes in national priorities.

## **Center Evaluation**

A Bredesen Center Board of Directors is appointed by the UTK Chancellor and ORNL Director to oversee the development and operation of CIRE. The Board will have equal representation from UTK and ORNL. The Bredesen Center Director and Executive Director are ex-officio on the Board. A Bredesen Center External Advisory Committee is appointed by the UTK Chancellor and ORNL Director to provide advice to the Bredesen Center Director and strengthen relationships with industry and universities.

It is these two bodies, the Board of Directors and the External Advisory Committee, that perform regular evaluation of the progress of the center and the PhD program. The Board of Directors evaluates performance relative to established goals on a yearly basis, and an in-depth evaluation of the center and the graduate program is performed every five years. In this major review, the UTK Provost appoints a Program Review Committee in a manner that is consistent with regular reviews performed by that office on all UTK departments and programs. A program review committee is composed of a combination of UTK and outside experts that are commissioned to study the Bredesen Center and the PhD program in detail, reporting their findings to the Provost. This process includes follow-up to be sure that recommendations are adopted and a mid-term update on the progress of the unit before the next major review.

## **Accreditation**

This degree is not subject to accreditation, as there is no accreditation process or body for such an interdisciplinary program.

## Diversity and Access

Graduate students are nationally recruited for this doctoral program in a large annual campaign led by Oak Ridge National Laboratory. Recruiters from ORNL and the Bredesen Center visit many of the top universities across the U.S. and attend job fairs to advertise this ESE doctoral program. Diversity is a strong consideration in this recruitment process.

## Faculty

The Bredesen Center has no dedicated faculty lines. All faculty members are appointed as part-time from the ranks of current UTK faculty and existing research staff at ORNL. All ORNL research staff members and UTK and UT Institute of Agriculture faculty who fulfill the following criteria are eligible to apply for membership to the Bredesen Center faculty:

- Their appointment will substantially benefit the Bredesen Center and its mission.
- They have a strong record of research and leadership accomplishments in the Bredesen Center's mission areas.
- They are willing to commit the required resources (time, student support, expertise, etc.) to the ESE program or other Bredesen Center projects.

High professional standards will be applied in appointing Bredesen Center faculty. Membership of the Bredesen Center faculty is time limited but renewable. The initial appointment is made for five years and renewal appointments are made for five years.

### *Responsibilities of Bredesen Center faculty*

- They should be actively engaged in Bredesen Center activities, which include mentoring, recruiting, teaching, course development, and committee service.
- They should commit to supervising and supporting at least one graduate student at any given time, ensuring timely completion of the PhD.
- They should provide descriptions of research opportunities, dissertation topics, and shorter research projects available in their groups on an annual basis.

Bredesen Center faculty who are not fulfilling these requirements will in general not have their appointment renewed, and can in severe cases be terminated as Bredesen Center faculty prior to the end of their term.

### *Academic titles of Bredesen Center faculty*

Bredesen Center faculty with ORNL as their home institution will hold one of the following three UTK titles of Joint Faculty: Joint Professor, Joint Associate Professor, or Joint Assistant Professor. Bredesen Center Faculty with UTK as their home institution will also hold an ORNL title (examples are Research Associate, Senior Research Associate, etc.). The initial title is determined at the time of the first appointment following the process for appointment of Bredesen Center faculty described below. Bredesen Center faculty can request promotions at the time of renewal. Promotion of Bredesen Center faculty requires recommendation of the



Bredesen Center Director and approval of the Provost. In cases where a faculty member has an appointment within the Bredesen Center and within another degree program, the Bredesen Center Director will coordinate any change in title with the other degree program(s). The criteria for the use of the Joint Faculty titles within the Bredesen Center are given below.

Bredesen Center Joint Faculty Professors are expected to:

1. Hold the doctorate or other terminal degree of the discipline, or present equivalent training and experience appropriate to the particular appointment
2. Be accomplished teachers or mentors of graduate students
3. Have achieved and then maintain a nationally recognized record in disciplinary research, scholarship, and/or creative activity
4. Have achieved and then maintain a record of significant institutional, disciplinary, and/or professional service
5. Serve as mentors to junior colleagues
6. Have normally served as an associate professor for at least five years
7. Have shown beyond doubt that they work well with colleagues, staff, and students in performing their professional responsibilities

Bredesen Center Joint Faculty Associate Professors are expected to:

1. Hold a doctorate or other terminal degree of the discipline, or to present equivalent training and experience as appropriate to the particular appointment
2. Be good teachers or mentors of graduate students
3. Have achieved and then maintain a recognized record in disciplinary research, scholarship, and/or creative activity
4. Have achieved and then maintain a record of institutional, disciplinary, and/or professional service
5. Have normally served as an assistant professor for at least five years
6. Have demonstrated that they work well with colleagues, staff, and students in performing their professional responsibilities

Bredesen Center Joint Assistant Professors are expected to:

1. Hold a doctorate or other terminal degree of the discipline, or to present equivalent training and experience as appropriate to the particular appointment
2. Show promise as teachers or mentors of graduate students
3. Show promise of developing a program in disciplinary research, scholarship, and/or creative activity that is gaining external recognition
4. Have a developing record of institutional, disciplinary, and/or professional service
5. Show evidence that they work well with colleagues, staff, and students in performing their professional responsibilities.

## Bredesen Center Professor of Energy Policy, Planning, and Administration

This faculty designation emphasizes the nature of a faculty member's expected contributions to the Bredesen Center in policy-related areas, as opposed to being the lead advisor for a graduate student in PhD research. Faculty members with this designation are appointed as Assistant, Associate, or Full Professor of Energy Policy, Planning, and Administration and will contribute to the overall mission of the Bredesen Center in various ways.

### *Bredesen Center faculty appointment process*

Requests for initial and renewal appointment as Bredesen Center faculty are submitted to the Bredesen Center's Director.

- ORNL applicants who do not currently have a base appointment within an existing UTK degree-granting unit should submit their application through their ORNL Division Director to the Bredesen Center Assistant Director who will then forward the application to the Bredesen Center Director.
- Faculty applicants whose base faculty appointment is with an existing UTK degree granting unit should submit their application through their department head, who will then forward the application to the Bredesen Center Director.
- All applications will be reviewed by the Bredesen Center Faculty Credentials Committee.
- The Credentials Committee will provide a brief written recommendation concerning the decision of membership application and the proposed appointment level to the Director.
- If a positive recommendation is made by the Credentials Committee, the application is brought to the Bredesen Center faculty for discussion and recommendation, which will require a simple majority of the votes returned. The recommendations of the Credentials Committee and of the current faculty are considered by the Bredesen Center director in forming his/her recommendation, and all three, as well as the appointment level, are forwarded to the Provost for approval by the university.
- The appointment request is required to contain the following elements:
  - A current curriculum vita describing all the professional accomplishments of the applicant
  - Full education history
  - Full employment history
  - Refereed publications
  - Invited and contributed talks
  - External research funding record
  - Teaching experience
  - Student supervision experience
  - Awards and recognition
  - A brief description (one page or less) of the reason(s) for the request and how the applicant fulfills the eligibility criteria

- For the initial appointment a letter of nomination from a current Bredesen Center faculty member or a unit leader at UTK or ORNL

### *Faculty Appointment Renewals*

The Bredesen Center Director will consult with faculty who are eligible for renewal their intent to continue active faculty status. Additionally, the Director will review information related to each faculty member's academic/mentoring activities as well as scholarly research and other scientific activities performed within the review period. Any disputes regarding faculty renewals will be evaluated by the Credentials Committee.

### *Approval to Direct Doctoral Dissertations*

All Bredesen Center faculty members, prior to serving as major professors of PhD students, must be approved by the UTK Graduate Council to direct doctoral dissertations.

All Bredesen Center faculty members, who do not already have this approval and have no prior experience in supervising doctoral thesis research, can initially request a one-time approval or approval to co-direct doctoral dissertations with an approved faculty member.

Each faculty member seeking approval to direct dissertation research should submit an updated Curriculum Vitae to the Bredesen Center Director who will complete a nomination package for consideration by the UTK Graduate School's Credentials Committee.

### *Graduate student cost models for Bredesen Center faculty hosting a student*

Once a Bredesen Center graduate student joins a research group, it is expected that the research mentor will engage in cost sharing of the financial package for the student, partial initially in the first two years and then full coverage thereafter. The following describes the standard cost-sharing model for a student working in an ORNL-based group or a UT-based group.

For students working with an ORNL-based Bredesen Center faculty, the cost sharing follows in general this model.

Year 1:

The ORNL-based faculty pays for 44% of costs (stipend, tuition, insurance) –  $\frac{1}{4}$  of costs in first and second semesters and full cost during the first summer, which equates to  $\frac{1}{4}$  (25%),  $\frac{1}{4}$  (25%) and 1 (100%) as their part = 44% of total first-year costs.

Year 2:

The ORNL-based faculty pays for 63% of costs (stipend, tuition, insurance) –  $\frac{1}{2}$  of costs in first and second semesters, and full costs second summer, which equates to  $\frac{1}{2}$  (50%),  $\frac{1}{2}$  (50%), and 1 (100%) as their part = 63% of total first-year costs.

For students working with a UT-based Bredesen Center faculty, the cost sharing follows in general this model.

Year 1:

The UT-based faculty pays for 25% of costs (stipend, tuition, insurance) – nothing in first and second semesters and 100% costs first summer, which equates to 0, 0, and 1 (100%) as their part = 25% of total first-year costs.

Year 2:

The UT-based faculty pays for 63% of costs (stipend, tuition, insurance) –  $\frac{1}{2}$  of costs in first and second semesters, and full costs second summer, which equates to  $\frac{1}{2}$  (50%),  $\frac{1}{2}$  (50%), and 1 (100%) as their part = 63% of total first-year costs.

All students should be supported by UT-Battelle contracts or UT department funds at 100% starting year 3. For more details please contact the Bredesen Center business office.

## **Graduate Program**

### **Admission Requirements**

In order to be admitted to the PhD program in Energy Science and Engineering, student applicants must fulfill the general admission criteria for the Graduate School of the University of Tennessee, Knoxville. In addition, the student must have a Bachelor of Science degree in either engineering or a scientific field (physics, chemistry, biology, mathematics, computational science, etc.), or the equivalent. Students with other undergraduate degrees may also be admitted on a case-by-case basis by the Bredesen Center Graduate Coordinating Committee. Dependent on the student's background, additional coursework may be required to satisfy co- and prerequisites.

### **Degree Requirements**

This graduate program leads to the Doctor of Philosophy (PhD) degree in Energy Science and Engineering (ESE). A minimum of 72 hours is required beyond the bachelor's degree, exclusive of credit for a Master's degree, and completion of the core requirements, as outlined in the section on Course Requirements. Of this number, a minimum of 24 and up to 36 hours of 600 Doctoral Research and Dissertation and six hours of 600-level coursework at UTK will be required. In addition to coursework, students must pass a qualifying exam, a comprehensive exam, and a final exam which includes the preparation and defense of a dissertation. The

graduate work is performed under the supervision of an advisor/major professor and a graduate committee.

### **Major Professor (Advisor)**

Each graduate student must have an advisor/major professor from the Bredesen Center faculty, who can be either an ORNL or UT based employee. This professor advises the student about course selection, supervises the student's research, and facilitates communication within the degree program and/or student's major department, to other departments, and with the Graduate School relative to requirements. The Assistant Director may act as a temporary advisor the entering during the period in which the student is becoming acquainted with the institutions and determining the focus of research interests. Once the major professor is determined, the major professor and the student together select a doctoral committee. The student is expected to maintain close consultation with the major professor and other members of the graduate committee with regard to progress in the program.

### **Doctoral Committee**

The major professor directs the student's dissertation research and chairs the doctoral committee. The student and major professor identify a doctoral committee composed of at least four faculty members holding the rank of assistant professor or above, three of whom, including the chair, must be approved by the Graduate Council to direct doctoral research. At least one member must be from outside the Bredesen Center faculty. Committee members should be chosen to ensure interdisciplinary breadth. The Bredesen Center Director has oversight responsibility to ensure the interdisciplinary nature of the committee. A doctoral student, in collaboration with the major professor, should begin to form the doctoral committee during the first year of study. Once formed, the doctoral committee, by request of the major professor, will meet annually, at the minimum, with the student to ensure timely progress toward the degree.

### **Admission to Candidacy**

Admission to candidacy indicates that the student has demonstrated ability to do acceptable graduate work and that satisfactory progress has been made toward the degree. This action usually connotes that all prerequisites to admission have been completed and a program of study has been approved.

A student may be admitted to candidacy for the doctoral degree after passing the comprehensive examination and maintaining at least a B average in all graduate coursework. Each student is responsible for filing the Admission to Candidacy form, which lists all graduate courses to be used for the degree, including courses taken at the University of Tennessee or at other institutions prior to admission to the doctoral program. The Admission to Candidacy form is signed by the doctoral committee and the Bredesen Center Director.

## Graduate Student Examinations

This section provides a description of the graduate student examination requirements for the PhD degree program. Three examinations are required as part of the doctoral program: qualifying examination, comprehensive examination, and defense of dissertation examination.

### *Qualifying Exam*

A student must pass the qualifying examination to proceed in the PhD program. The qualifying examination is developed, administered, and graded by the Bredesen Center faculty (or designated subset of the faculty) of the PhD program under the coordination of the Bredesen Center Director. This examination must be taken no later than the end of the first year of ESE graduate studies. Given the research intensive focus of the Energy Science and Engineering doctoral program, it is expected that graduates of this program will possess the skills required to investigate and conduct research on a variety of problems. The qualifying exam will test these skills by challenging students to prepare a professional quality research proposal to address current important questions in energy science and engineering. Late in the spring semester the ESE faculty will present the first-year students a set of problems relating to various topics of energy science and engineering. Each student must select one of these problems and construct a research proposal to thoroughly investigate the problem. The proposal should include an introduction, a background of the problem, the significance of the proposed study, the methodology that would be used to investigate the problem, and references to back up any claims. The proposal should be around 10 pages in length, double-spaced, 12-pt Times New Roman font, and references should follow current APA formatting standards. At the time that problems are made available for selection, a due date for the completed proposals will be announced. **It is the responsibility of the student to organize a time to discuss and defend their proposal to their doctoral committee according to the published deadlines.** Once the committee has made its final decision about the result of the examination, the committee must inform the student and the director of the Bredesen Center. In case of failure, the candidate may appeal to retake the examination through the Bredesen Center Director within 30 days of notification of the result. If the appeal is granted, the student must retake the examination at the next offering. The result of the second examination is final.

### *Comprehensive Examination*

The Comprehensive Examination must be taken prior to admission to candidacy, and is recommended after the second year following entrance into the PhD program. The timing is late enough in a student's academic program to permit most of his/her graduate course work to be covered on the examination, and early enough to permit modification of the student's program based on the results of the exam.

Two requirements must be satisfied before a student takes the Comprehensive Examination:

1. A written Dissertation Proposal, approved by the major professor, must be submitted to each member of the student's Doctoral Committee two weeks prior to the examination.
2. Each member of the student's Doctoral Committee must agree that the student is ready to take the Comprehensive Exam. The committee members will communicate to the major professor when they are satisfied that the student is ready to take the Comprehensive Exam.

The Comprehensive Examination will consist of the student constructing and defending his or her dissertation research proposal to the committee in a format deemed acceptable by the student's Doctoral Committee. Typically, an oral defense is sufficient for this examination, although a written component may be administered at the discretion of the Doctoral Committee.

Once the Comprehensive Examination is passed, the student should file for and be admitted to candidacy. At the discretion of the Doctoral Committee, supplemental reexaminations for the Comprehensive Examination and/or proposed dissertation research may be required. In case of failure, the candidate may not apply for reexamination until the following semester. The result of the second examination is final.

#### *Defense of Dissertation Examination*

A doctoral candidate must pass an oral examination on the dissertation. The dissertation, in the form approved by the major professor, must be distributed to the committee at least two weeks before the examination. The examination must be scheduled through the Office of the University Registrar at least one week prior to the examination and must be conducted in university-approved facilities. The examination is announced publicly and is open to all students and faculty members. The defense of dissertation will be administered by all members of the doctoral committee after completion of the dissertation and all course requirements. This examination must be passed at least two weeks before the date of submission and acceptance of the dissertation by Graduate Student Services. The major professor must submit the results of the defense by the dissertation deadline.

### **Course Requirements**

A minimum of 72 hours is required for the ESE doctoral program, and of this total a minimum of 36 hours of coursework is required beyond the BS degree. **Each student is required to submit their proposed schedule of courses to the Assistant Director, the program Advisor, and their major professor before classes begin each semester.** Students that do not have a major professor should consult with the Assistant Director of the program in order to construct a course schedule that will sufficiently cover subject matter related to the student's desired area of research.

The following minimum curriculum is required of all students:

*Core Curriculum (6 credits)*

ESE 511 and ESE 512, Introduction to Energy Science and Technology (3, 3 credits); (lead instructor plus guest lecturers): Topics include: energy basics; history of energy and society; current and future supply and demand; political and environmental aspects of energy production; energy technologies (fossil fuels, biomass, nuclear fission, nuclear fusion, solar, wind, geothermal); energy conversion, storage, transportation, and distribution; energy efficiency; and innovation.

*Knowledge Breadth Curriculum (6 credits)*

The Knowledge Breadth courses include at least two courses selected from the three following areas:

1. Political, social, legal, ethical and security issues related to energy (3-4 courses, each 3 credits)
2. Entrepreneurship, leadership, and management (3-4 courses, each 3 credits)
3. Environmental and climate sciences related to energy (3-4 courses, each 3 credits)

*Knowledge Specialization Curriculum (15 credits)*

The Knowledge Specialization Curriculum is a deep dive into an area of science or engineering closely related to energy. In consultation with the advisor/major professor, each student must submit a proposed course of study that includes at least 15 credit hours-worth of approved courses. The Bredesen Center Assistant Director reviews and approves proposed courses of study. The course of study for each student must include at least six hours of 600-level advanced courses. Students must also complete an additional six hours of science/technology broadening coursework.

A proposed course of study should focus on one of the seven Bredesen Center themes:

1. Nuclear energy
2. Bioenergy and biofuels
3. Renewable energy
4. Energy conversion and storage
5. Distributed energy and grid management
6. Environmental and climate sciences related to energy
7. Transportation







*Seminar Series (3 credits)*

The ESE 599 seminar series (1 credit) will provide topical seminars related to Bredesen Center research themes or knowledge breadth areas. ESE will be offered each fall and spring semester and students must attend at least three semesters of seminar.





## Departmental Contacts

**Bredesen Center staff**

UT based	ORNL based	
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**Bredesen Center**  
for Interdisciplinary Research and Graduate Education



## About Governor Bredesen



The Bredesen Center is named in honor of Governor Phil Bredesen, who served Tennessee from 2003 to 2011, in recognition of his leadership in education and economic development for the state. In addition to his commitment to the Bredesen Center, Governor Bredesen's vision for capitalizing on the great potential of the UT-ORNL partnership resulted in the UT-ORNL Governor's Chairs program, the UT Biofuels Initiative, the Volunteer State Solar Initiative, and the UT-ORNL Joint Institutes for Computational Sciences, Biological Sciences, and Neutron Sciences.