GRADUATE PROGRAM IN FIRE DYNAMICS

ADMINISTERED BY THE DEPARTMENT OF SCIENTIFIC COMPUTING AND THE GEOPHYSICAL FLUID DYNAMICS INSTITUTE (GFDI)

COLLEGE OF ARTS AND SCIENCES

Website: *https://gfdi.fsu.edu/fire-dynamics*
Program Director: Kevin Speer; **Coordinating Committee:** Speer (EOAS/Oceanography), Dewar (EOAS/Oceanography), Hoeflich (Physics), Moore (Mathematics); **Professors:** Beerli (Scientific Computing), Bourassa (EOAS & GFDI), Cai (EOAS & GFDI), Chen (Civil & Environmental Sciences and GFDI), Chicken (Statistics & GFDI), Clarke (EOAS & GFDI), Dewar (EOAS & GFDI), Elsner (Geography & GFDI), Erlebacher, Gunzburger (Scientific Computing), Hart (EOAS), Hoeflich (Physics & GFDI), Huettel (EOAS & GFDI), Liu (EOAS), Meyer-Baese (Scientific Computing), Misra (EOAS), Musslimani (Mathematics & GFDI), Nicholson (EOAS), Ray (EOAS), Peterson, Plewa, Shanbhag, Slice (Scientific Computing), Speer (EOAS & GFDI), Sussman (Mathematics & GFDI), Tawfiq (Civil & Environmental Engineering and GFDI), Ye (EOAS & GFDI); **Associate Professors:** Ahlquist (EOAS), Lemmon (Scientific Computing), Sura (EOAS & GFDI), Wu (EOAS); **Assistant Professors:** Chagnon (EOAS), Collins (Physics & GFDI), Huang (Scientific Computing), Moore (Mathematics & GFDI), Quaife (Scientific Computing & GFDI), Tang (Civil & Environmental Engineering and GFDI), Wang (EOAS), Yaghoobian (Mechanical Engineering and GFDI); **Research Affiliates:** Goodrick (USDA), Hiers, Rowell (Tall Timbers Research Station)

PROGRAM OVERVIEW

The program is about the study of fire in nature as a fluid dynamical phenomenon, with complex physical, chemical, and turbulent interactions with the environment. Our program emphasizes basic mathematical and physical concepts, the application of atmospheric dynamical principles, and supports both laboratory and field experimental inquiry. The program in fire dynamics may be of interest to: physical science and mathematically prepared students who are interested in the environment and natural systems; meteorology students interested in the role of aerosols, particulates, and gases emitted by forest fires and prescribed burning; physics or engineering students desiring to apply their knowledge to combustion in a natural environment; wildland fire experts who desire to further their academic career; computationally oriented students who desire to solve a problem of direct importance to society; and management and agency personnel who deal with the impact of wild land fires.

FACILITIES

Geophysical Fluid Dynamics Institute facilities include a large modern laboratory for hydrodynamics experiments, a colloquium room and reading room (furnished with books and periodicals in fluid dynamics, classical physics, applied mathematics, geophysical sciences, and astrophysical sciences), a photographic and illustrations laboratory, a large modern machine shop, a precision instrument-makers laboratory, and faculty and student offices. Institute facilities also include several precision rotating turntables, a six-meter water channel, convection tanks, temperature controlling systems, general and digital photographic systems, multi-channel data acquisition systems, laser facilities, various machine tools, and other electronic equipment. The institute houses a facility for measuring ocean turbulence as well.

ADMISSION REQUIREMENTS

Note: Please review all University and college-wide degree requirements summarized in the "College of Arts and Sciences" chapter of this *Graduate Bulletin.*

Students must pass the existing admissions procedure for regular GFDI students and be admitted by recommendation of the GFDI Graduate Program Committee. Students are accepted into the program on the basis of their academic record, their Graduate Record Examinations (GRE) and/or Test of English as a Foreign Language (TOEFL) score, and their letters of recommendation. To be admitted, students must have achieved a "B" average (a 3.0 average on 4.0 scale for all upper division work) of their baccalaureate degree (or any graduate degree work they may have taken) and achieved a GRE score at the 50th percentile or better on the verbal section and on the quantitative section. Students expecting to receive financial assistance will need a significantly higher GRE score. Foreign nationals are expected to have a score of 80 or better on the Internet based TOEFL, 6.5 on the IELTS examination or 77 on the MELAB examination.

DOCTORAL DEGREE

The doctoral degree is awarded in recognition of the student's broad knowledge of fire dynamics and the student's ability to do original, independent research in fire dynamics. To complete the requirements for a doctoral degree, the student must 1) complete the requisite course work, 2) satisfactorily complete preliminary examinations for admission to candidacy, 3) choose a major professor and supervisory committee, 4) submit and defend a dissertation prospectus to his/her supervisory committee, and 5) complete independent research culminating in a written dissertation which must be successfully defended to the student's supervisory committee.

COURSEWORK

Major requirements include ISC 5305, ISC 5315, fire dynamics core courses, plus 12 credit hours from elective courses.

FIRE DYNAMICS CORE COURSES:

Special topics courses in collaboration with Tall Timbers Research Station (TTRS), the Jones Ecological Research Center, Apalachicola National Forest, Florida Forest Service, and the US Forest Service (USFS) in Athens, GA. Certification to work in active fireline operations. These will be developed as real classroom courses with letter grades.

GFD 5XXX Intro to Fire Operations (NWCG S-130/S-190) with written project
GFD 5XXX Fire Behavior and Ecology (TTRS, USFS)
GFD 5XXX Fire Dynamics Laboratory (TTRS)
GFD 6925 Geophysical Fluid Dynamics Colloquium (1). (S/U grade only.)
GFD 6935r Seminar (1–2).

ELECTIVE COURSES:

Engineering:

CEG 5125 TBA
CEG 5415 TBA
CEG 5515 TBA
CEG 5635 TBA
ECH 5934r Special Topics in Chemical Engineering (3).
EGM 5456 TBA
EGM 5810 Viscous Fluid Flows (3).
EGM 6845 Turbulent Flows (3).
EML 5422 Fundamentals of Propulsions Systems (3).
ENV 5045 Environmental Systems Analysis (3).

Geological Sciences:

GLY 5425 Tectonics (3).
GLY 5455 Introduction to Geophysics (3).
GLY 5465 Geomechanics (3).
GLY 5575 Coastal Geology (3)
GLY 5826 Numerical Modeling of Groundwater Flow (3).
GLY 5827 Principles of Hydrology (3).
GLY 5868r TBA

Mathematics:

MAD 5708 TBA
MAD 5738 Numerical Solution of Partial Differential Equations I (3)
MAD 5739 Numerical Solution of Partial Differential Equations II (3)
MAD 6408r Advanced Topics in Numerical Analysis (3)
MAP 5207 Optimization (3)
MAP 5217 Calculus of Variations (3)
MAP 5345 Elementary Partial Differential Equations I (3).
MAP 5346 Elementary Partial Differential Equations II (3).
MAP 5423 Complex Variables, Asymptotic Expansions, and Integral Transforms (3).
MAP 5431 Introduction to Fluid Dynamics (3).
MAP 5441 Perturbation Theory (3).
MAP 5512 TBA
MAP 5513 Wave Propagation Theory (3).
MAP 6437r Advanced Topics in Applied Mathematics (3).
MAP 6939r Advanced Seminar in Applied Mathematics (1). (S/U grade only.)

Meteorology:

MET 5311 Advanced Dynamic Meteorology I (3).
MET 5312 Advanced Dynamic Meteorology II (3).
MET 5340r Large-Scale Atmospheric Circulations (3)
MET 5471 Satellite Remote Sensing of Planetary Atmospheres (3)
MET 5541r Dynamical Weather Prediction (3)
MET 6308r Advanced Topics in Dynamical Meteorology (3)
MET 6561r Advanced Topics in Synoptic Meteorology (3)

Oceanography:

OCP 5056 Introduction to Physical Oceanography (3)
OCP 5253 TBA
OCP 5256 Fluid Dynamics: Geophysical Applications (3)
OCP 5285 Dynamic Oceanography (3)
OCP 5551 Physics of the Air-Sea Boundary Layer (3)
OCP 5930r Special Topics in Physical Oceanography (1–3)
OCE 5009L Coastal Oceanography and Marine Field Methods (4)

Physics:

PHY 5246 Theoretical Dynamics (3)
PHY 5346 Electrodynamics A (3).
PHY 5347 Electrodynamics B (3).
PHY 5524 Statistical Mechanics (3)

Statistics:

STA 5106 Computational Methods in Statistics I (3).
STA 5206 Analysis of Variance and Design of Experiments (3).
STA 5326 Distribution Theory and Inference (3).
STA 5327 Statistical Inference (3).

STA 5440 Introductory Probability I (3).
STA 5447 Probability Theory (3).
STA 5807r Topics in Stochastic Processes (3).

Scientific Computing:

ISC 5226 Numerical Methods for Earth and Environmental Sciences (3).
ISC 5227 Survey of Numerical Partial Differential Equations (3).
ISC 5228 Monte Carlo Methods (3).
ISC 5307 Scientific Visualization (3).
ISC 5316 Applied Computational Science II (4).

Note: Course descriptions can be found under the respective departmental listings.