

GATeek

Senior
GAT ES Modeling**NEW COURSE PROPOSAL**

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Graduate: Level I _____ Level II _____ Undergraduate: X SCHOOL, DEPARTMENT, COLLEGE _____ Earth and Atmospheric Science _____ DATE
29 March 1997

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|--|---|--|
| 1. Course Number 4801 | 2. Hours: <u>Lecture</u> <u>Lab</u> <u>Credit</u> 3 0 3 | 3. Implementation Date Summer 1999 |
| 4. Descriptive Title: Earth System Modeling | | |
| 5. Recommended Abbreviation for Transcript (24 characters including spaces): Earth System Modeling ----- ----- | | |
| 6. Catalog Description (25 words or less): An Introduction to Computer Modeling in Earth System Science. | | |
| 7. Basis: L/G <u> X </u> P/F _____ Audit _____ | | |
| 8. Prerequisites: Knowledge of Fortran Corequisites: | | |
| 9. Has the course been taught as a special topic? No If YES, When? Enrollment: However, this class is the semester extension of the quarter version (4411). | | |

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| 10. Expected Mode of Presentation: | <u>MODE</u> | <u>% OF COURSE</u> |
| | Lecture | 70 |
| | Laboratory - Supervised | 10 |
| | Unsupervised | |
| | Discussion | 10 |
| | Seminar | |
| | Independent Study | |
| | Library Work | |
| | Demonstration | |
| Other (Specify) student presentations | 10 | |
| 11. Planned Frequency of Offering: | <u>Term to be Offered</u> | <u>Expected Enrollment</u> |
| | Fall | 20 |
| | Spring <input checked="" type="checkbox"/> | |
| | Summer | |
| 12. Are you requesting that this course satisfy: Humanities _____ Social Science _____ | | |
| 13. Probable instructor(s) (Please mark with an asterisk any non-tenure track individuals): Dr. Hartley | | |
| 14. Purpose of the course (Relation to Other Courses, Programs, and Curricula): A required course for all EAS undergraduate majors. An excellent course for CEE and Bio majors as well - both have taken it as a quarter course | | |
| 15. Required <input checked="" type="checkbox"/> Elective _____ | | |
| 16. Full Justification of Requests (Please use additional sheet if necessary): Semester-based core EAS course. | | |
| 17. Please attach a topical outline of the course. | | |
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Registrar 1997

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Earth System Modeling

(number of lectures - based on 1.5 hour classes)

I. Computer as a research tool

- a) Accessing the computers (compiling, graphing, etc.) (1 lecture)
- b) Machine epsilon and other errors (1 lecture)

II Numerical Methods - Finite Differences and Stability (3 lectures)

III Modeling Philosophy

- a) Theory vs. Models (1 lecture)
- b) Dimensionality (3 lectures)
- c) Parameterization (1 lecture)
- d) Validation (1 lecture)
- e) Sensitivity studies (1 lecture)

IV Chaos and predictability (2 lectures)

V Specific Applications

- a) Geophysics (3 lectures)
- b) Geochemistry (3 lectures)
- c) Climate Modeling (3 lectures)
- d) Air Quality (3 lectures)

(26 lectures + 2 exams + 2 classes of student presentations = 30 (1.5 hour) lectures = 45 hours)

EAS - 4411 Earth System Modeling Winter Quarter 1997

Instructor:

Professor D. E. Hartley
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Teaching Assistants:

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Office Hours:

By appointment.
Best way to ask questions is by e-mail.

Text:**Required:**

Fortran with Engineering Applications by *Koffman and Friedman*

Suggested: (on reserve at library)

Climate System Modeling (*ed. Trenberth*)

Structured Fortran 77 for Engineers and Scientists by *D. M. Etter*

Course Outline:**I Introduction to modeling:**

Computers as research tools
Machine epsilon
Numerical Methods

II Modeling:

Numerical vs. Analytical
Scales of models (Box model to three dimensions)

III Research Issues:

Parameterizations
Boundary and initial conditions
Examples: Geophysical models, air pollution models, etc.

Grading:

- 30% term project (Paper and presentation)
- 30% problem sets (These will be handed out in class - includes computer excercises, paper critique and peer reviews)
- 20% in-class assignments
- 20% Quiz

Note: Anything turned in late will be marked down.

All work should be your own. Discussions and working groups are beneficial and acceptable as long as each individual performs their own work.

In-class assignments:

In-class you will work in groups of three. All in-class group activities are to be written up and turned in that day.

Problem sets:

Most will require computer programing. A print out of the programs must be turned in with each problem set.

Some will be critiques on papers. This will be discussed in class.

Term Project:

For this project you will be expected to write a model to look at issues and do a literature review on research in the area.

You will be expected to discuss the assumptions made for your simple model and compare your results to those in the literature.

This is to be written up as a term paper - max 10 double spaced pages (figures and references not included in this count).

A proposal is due Jan. 28 (Decide on a topic and write a proposal for how you will study it, what kind of model you plan to write and what you hope to learn about the subject - one page)

The term paper is due Tuesday March 4 - hand in four copies. Peer reviews are due March 11. Final revised paper and responses due March 18.

As part of this project you will also be presenting your final term paper during the last two weeks of classes (15-20 minute presentations).

Important Dates: (may be subject to change)

- Jan. 28: Proposal due
- Jan. 30: Quiz
- Mar. 4: Term Paper Due
- Mar. 11: Reviews Due
- Mar. 18: Final Revised Term Paper Due (+responses to reviewers)
- Mar. 11 - 17: Presentations of term projects