Course Outline for MATH 4982, Advanced Topics in Applied Mathematics

MATH 4982 Advanced Topics in Applied Mathematics (3 units)
Prerequisite: Graduate standing in Mathematics, MATH 306, or MATH 3152; and consent of instructor.

Exploration of advanced topics and problems in applied mathematics. The Class Schedule will list subtitle selected. Repeatable up to 6 units. 3 lectures. Formerly MATH 476

Course Learning Objectives	
1	Solve problems in current areas of applied mathematics.
2	Construct mathematical models including identifying and justifying underlying assumptions.
3	Solve and analyze models using analytical and numerical techniques.
4	Evaluate model results through interpretation of solutions.
5	Analyze open-ended problems using the techniques and skills of mathematical modeling.
6	Develop and evaluate potential research projects.

Expanded Course Content

Textbooks, materials, and/or other resources
The textbooks will be determined by the instructor and will depend on the topic selected. An example is given below on the topic of Geophysical Fluid Dynamics using the book Atmospheric and Oceanic Fluid Dynamics: Fundamentals and Large-Scale Circulation, Second Edition, by Geoffrey K. Vallis.

Week	Readings	Topics of Discussion
1	Introduction, Sections 1.1-1.5	Fundamental equations of motion, mass continuity, momentum equations, equation of state
2	Sections 1.6, 1.8, 1.9	Compressibility, thermodynamics, and sound waves
3	Sections 2.1-2.4	Rotational effects and Boussinesq equations

Week	Readings	Topics of Discussion
4	Sections 2.7, 2.8, 2.10	Hydrostatic and geostrophic balance, static instability
5	Sections 3.1, 3.2, 3.5, 3.7-3.9	Shallow water equations and geostrophic adjustment
6	Sections 4.1-4.4	Vorticity
7	Sections 4.5, 4.6, 5.1	Potential vorticity, geostrophic theory
8	Sections 5.2-5.5, 5.7	Geostrophic theory, Ekman layers
9	Sections 6.4, 6.5, 15.1	Rossby waves
10	Sections 9.5, 9.6	Baroclinic instability
11	Sections 11.1-11.3	Turbulence and Kolmogorov theory
12	Sections 14.1-14.3	Atmospheric overturning, models of the Hadley cell
13	Sections 16.1-16.3	Rossby waves and critical layers
14	Sections 21.5, 21.6	Meridional Overturning Circulation, abyssal flow
15	Sections 22.5-22.9	El Niño/Southern Oscillation

Method of Assessment

The possible methods of assessment are written individual examinations, quizzes, in-class worksheets and presentations, projects, and homework. One or more midterms and a cumulative final exam are required.

Instructional Mode

The instructional mode for this class is face-to-face. This designation means that the essential academic standards of the course require in-class student engagement, and thus remote instruction is not appropriate.