جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Geophysical Fluid Dynamics I - ErSE 201

Division	Physical Science and Engineering Division
Course Number	ErSE 201
Course Title	Geophysical Fluid Dynamics I
Academic Semester	Spring
Academic Year	2016/2017
Semester Start Date	01/22/2017
Semester End Date	05/18/2017
Class Schedule (Days & Time)	02:30 PM - 04:00 PM | Mon Thu

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Georgiy Lvovich Stenchikov	georgiy.stenchikov@kaust.edu.sa	+966128080265		Al Khawarizmi Building (Bld. #1), Rm. 3115; Ph: 012-808-0265 Office hours: Monday/Thursday: 4-5 pm

Teaching Assistant(s)

Name	Email

Course Information

Comprehensive Course Description	The course includes introductory description of the Earth's climate system, governing equations of mass and momentum conservation, equation of state, thermodynamic equation, wave kinematics, dispersion, group velocity, sound waves, gravity waves, effect of rotation, equations of motion in spherical coordinates, primitive equations, Bussinesq approximation, changing vertical coordinate, asymptotic analysis and scaling, geostrophic balance, thermal wind, static instability.
Course Description from Program Guide	Introductory description of the Eraths climate system, governing equations of mass and momentum conservation, equation of state, thermodynamic equation, wave kinematics, dispersion, group velocity, sound waves, gravity waves, effect of rotation, equations of motion in spherical coordinates, primitive equations, Bussinesq approximation, changing vertical coordinate, asymptotic analysis and scaling, geostrophic balance, thermal wind, static instability, boundary layers in atmosphere and ocean.
Goals and Objectives	To provide a comprehensive introduction in the atmospheric and climate modeling
Required Knowledge	*Basic fluid mechanics and physics knowledge is desirable* *Prerequisite: ME 200, ErSE 203 or consent of instructor*
Reference Texts	**Required Text**: Geoffrey K. Vallis, Atmospheric and Oceanic Fluid Dynamics, 2006 **Reference Texts**: Joseph Pedlosky, Geophysical Fluid Dynamics, 1982 Landau, L. D. and Lifshitz, E. M., Fluid Mechanics, 1987
Method of evaluation	**25.00**% - Final exam **25.00**% - Research Project **25.00**% - Midterm exam **25.00**% - Homework /Assignments

Nature of the assignments	Two home works, research project, midterm and final exams
Course Policies	**Homework** Homework must be handed in at the beginning of class on the appropriate due date listed on the assignment. Late homework will be discounted 10%. Homework over one week late will not be accepted. All work must be shown for full credit. Include an explanation when solving a problem. **Exams** Exams will be given in class and will be open book. Make up exams will only be given in the event of illness or other grave circumstance, or by prior arrangement. **Postings** Copies of the syllabus, homework assignments, and supplemental materials will be available on Black Board. Please check regularly as this material will be updated. **Communication** Communication about the class can be via email, telephone, in writing, in class or during office hours. It is your responsibility that questions or comments about class material reach me in a timely manner. Likewise, it is your responsibility to be informed about lecture material, assignments, announcements, notices, or any other information given out in class.
Additional Information	

Tentative Course Schedule *(Time, topic/emphasis & resources)*		
Week	**Lectures**	**Topic**
1	Mon 01/23/2017 Thu 01/26/2017	Large-Scale Flows, Global Circulation of Atmosphere and Ocean Climate Modeling, Role of Circulation in Climate
2	Mon 01/30/2017 Thu 02/02/2017	Equation of Motion, Lagrangian and Eulerian Approaches Equation of State
3	Mon 02/06/2017 Thu 02/09/2017	Equation of State, continuation Sound Waves
4	Mon 02/13/2017 Thu 02/16/2017	Potential Temperature, Potential Density, and Entropy Thermodynamic Equations
5	Mon 02/20/2017 Thu 02/23/2017	Compressible and Incompressible Flows Home Work 1 Bernoulli's theorem
6	Mon 02/27/2017 Thu 03/02/2017	The Energy Budget, Viscous Effects Equation of Motion in a Rotating Frame of Reference
7	Mon 03/06/2017 Thu 03/09/2017	Equations of Motion in Spherical Coordinates Midterm Exam
8	Mon 03/13/2017 Thu 03/16/2017	Potential Temperature, Potential Density, and Entropy Scaling for Hydrostatic Balance
9	Mon 03/20/2017 Thu 03/23/2017	Changing of Vertical Coordinate Thermal Wind
10	Mon 03/27/2017 Thu 03/30/2017	Bussinesq and Anelastic Approximations, Energetics of Simplified Models Radiation Transport, Main Physical Principles, Radiative Effects of Aerosols and Greenhouse Gases
11	Mon 04/03/2017 Thu 04/06/2017	Spring Break
12	Mon 04/10/2017 Thu 04/13/2017	Static Instability, Gravity Waves, Deep Convection Energetics of Atmosphere, Radiative-convective Equilibrium, Equilibrium and Transient Climate Responses Home Work 2
13	Mon 04/17/2017 Thu 04/20/2017	Radiative-Convective Models Sensitivity Studies Using Radiative Convective Models
14	Mon 04/24/2017 Thu 04/27/2017	Research Project on Radiative-Convective Modeling
15	Mon 05/01/2017 Thu 05/04/2017	Project Presentations
16	Mon 05/08/2017 Thu 05/11/2017	Hierarchy of Climate Models, Global and Regional Modeling, Coupled Ocean-Atmosphere Models Limited Area Models and their Applications, Aerosol and Chemistry Transport Models, Effect of Volcanoes on Climate, Nuclear Winter Studies
17	Mon 05/15/2017 Thu 05/18/2017	Final Exam
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Note

The instructor reserves the right to make changes to this syllabus as necessary.