MATH 716: Mathematical Fluid Dynamics II
Spring 2019 Graduate Course Syllabus

NJIT Academic Integrity Code: All Students should be aware that the Department of Mathematical Sciences takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

COURSE INFORMATION

Course Description: Further development of the ideas of fluid dynamics, with an emphasis on mathematical developments and issues. A selection of topics will be developed in some detail, for example: Stokes flow and low-Reynolds-number hydrodynamics; flow at high Reynolds number and boundary layers; shock waves and hyperbolic systems; dynamics of interfacial flows; hydrodynamic stability; rotating fluids.

Number of Credits: #

Prerequisites: (Prereq).

Course-Section and Instructors

Course-Section	Instructor
Math 716-002	Professor W. Choi

Office Hours for All Math Instructors: Spring 2019 Office Hours and Emails

Recommended Textbooks

- *An Introduction to Fluid Dynamics*, G. K. Batchelor, Cambridge Univ. Press, 1967.
- *A Modern Introduction to the Mathematical Theory of Water Waves*, R. S. Johnson, Cambridge University Press, 1997.
- *Hydrodynamic Stability*, P. G. Drazin & W. H. Reid, Cambridge Univ. Press, 2002.

University-wide Withdrawal Date:The last day to withdraw with a **W** is **Monday, April 8, 2019**. It will be strictly enforced.

POLICIES

DMS Course Policies: All DMS students must familiarize themselves with, and adhere to, the Department of Mathematical Sciences Course Policies, in addition to official university-wide policies. DMS takes these policies very seriously and enforces them strictly.

Grading Policy: The final grade in this course will be determined as follows:

Homework	30%
Midterm Exam	40%
Final Exam	30%

Attendance Policy: Attendance at all classes will be recorded and is **mandatory**. Please make sure you read and fully understand the Math Department's Attendance Policy. This policy will be strictly enforced. AttendanceNote

Exams: There will be two midterm exams held in class during the semester and one comprehensive final exam. Exams are held on the following days:

Midterm Exam	Week 10
Final Exam Period	May 10 - 16, 2019

The final exam will test your knowledge of all the course material taught in the entire course. Make sure you read and fully understand the Math Department's Examination Policy. This policy will be strictly enforced.

Makeup Exam Policy: To properly report your absence from a midterm or final exam, please review and follow the required steps under the DMS Examination Policy found here:

- http://math.njit.edu/students/policies_exam.php

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times.

ADDITIONAL RESOURCES

Accommodation of Disabilities: Disability Support Services (DSS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please contact Chantonette Lyles, Associate Director of Disability Support Services at 973-596-5417 or via email at lyles@njit.edu. The office is located in Fenster Hall, Room 260. A Letter of Accommodation Eligibility from the Disability Support Services office authorizing your accommodations will be required.

For further information regarding self identification, the submission of medical documentation and additional support services provided please visit the Disability Support Services (DSS) website at:

- http://www5.njit.edu/studentsuccess/disability-support-services/

Important Dates (See: Spring 2019 Academic Calendar, Registrar)

Date	Day	Event
January 22, 2019	T	First Day of Classes
February 1, 2019	F	Last Day to Add/Drop Classes
March 17 - 24, 2019	Su - Su	Spring Recess - No Classes, NJIT Open
April 8, 2019	M	Last Day to Withdraw
April 19, 2019	F	Good Friday - No Classes, NJIT Closed
May 7, 2019	T	Friday Classes Meet/ Last Day of Classes
May 8 & 9, 2019	W & R	Reading Days
May 10 - 16, 2019	F - R	Final Exam Period

Course Outline

Week	Topic
Week 1	High Reynolds number flows
Week 2	Vortex dynamics – Equation of vorticity
Week 3	Vortex dynamics - Point vortices
Week 4	Vortex dynamics - Vortex sheets and patches
Week 5	Nonlinear water waves - Deep water
Week 6	Nonlinear water waves - Shallow water
Week 7	Nonlinear water waves - Hyperbolic system
Week 8	Stratified and rotating flows
Week 9	Hydrodynamic Stability – Linear theory and centrifugal instability
Week 10	Hydrodynamic Stability – Inviscid parallel shear flows (Midterm exam)
Week 11	Hydrodynamic Stability – Viscous parallel shear flows
Week 12	Hydrodynamic Stability – Stratified shear flows
Week 13	Hydrodynamic Stability – Unsteady flows
Week 14	Hydrodynamic Stability – Resonant wave interactions
Week 15	Hydrodynamic Stability – Nonlinear theory