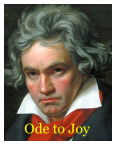

MATH 4051
Theory of Ordinary Differential Equations
2019-20 Spring
https://canvas.ust.hk/courses/30045

Lecture

Time	Tuesdays and Thursdays, 12:00pm-1:20pm (Zoom meeting ID: 959-539-364)
Instructor	**Prof. Frederick Tsz-Ho FONG**
E-mail	frederick.fong@ust.hk
Office	Room 3488, Department of Mathematics

Tutorial

Time	Mondays, 1:30pm-2:20pm (Zoom meeting ID: 157-466-089)
Teaching Assistant	**HUNG Chun Kit**
E-mail	ckhungab@connect.ust.hk
Office	Room 4381

Course Description

Course outline: It is a course on the analytical theory of ordinary differential equations (ODE). We will cover several theoretical aspects of systems of ODE, namely existence and uniqueness, stability, and periodicity. Topics include: contraction mapping theorem, Picard-Lindelöf's existence theorem, finite-time singularity, Grönwall's inequality, uniqueness theorem, Peano's existence theorem, stability of equilibrium points, stable manifold theorem, Lyapunov stability, gradient and Hamiltonian systems, Poincaré-Bendixson Theorem, limit cycles.

Credits: 3

Prerequisites: Students should have workable and solid conceptual knowledge on mathematical analysis (MATH 2033/2043) especially on topics such as uniform convergence. MATH 3033 is recommended for students without MATH 2043. No prior knowledge about *solving* ODEs (MATH 2351/2352) is needed, and can be waived at the discretion of the instructor.

Intended Learning Outcomes (ILOs)

Upon completion of this course, students are expected to:

(1) be able to appreciate the heavy and deep use of analysis in the qualitative studies of ODEs;
(2) further advance the knowledge and skills of mathematical analysis; and
(3) develop logical reasoning and critical thinking skills.

Course Website

Canvas will be used as the course website. The link can be found on top of the page. Lecture notes, homework, solutions, and sample exams will be posted there. Students should visit the course website regularly to check up new announcements and new materials.

Student Learning Resources

References:

(1) Lecture Notes written by Prof. Frederick Fong
(2) Lecture Notes of Stanford Year 1 Honor Calculus 3 taught by Prof. Simon Brendle
(3) *Differential Equations and Dynamical Systems* by Lawrence Perko
(4) *Differential Equations, Dynamical Systems, and an Introduction to Chaos, 3rd Edition* by M. Hirsch, S. Smale, and R. Devaney

GRADING

Homework: There will be about 4 problem sets. Students should submit each homework in form of a clearly written and scanned or a LaTeX-typed PDF on the Canvas system before the deadline. Hard copy is not accepted. A bonus point of 0.25 will be awarded to each homework which is fully LaTeX-typed.

Students can form a group of 1-3 persons to work on each homework, and submit ONE copy of the homework to Canvas. All students in the same group will receive the same score. Students can change groups in different homework.

Examinations: There will be a 3-hour midterm exam, and a 3-hour final exam. Both will be proctored using Zoom conferencing tool. In each exam, you will be given the exam paper through online channels (e.g. E-mail or Canvas) 5 minutes before the start time, and will be given 3 hours to work on the exam. After the 3-hour working time, you will be given about 15 minutes to scan your solutions and submit your exam to Canvas as a PDF. Detail logistic will be announced when the midterm is approaching.

NO discussion or collaboration is allowed in both exams. Students are strictly prohibited from seeking help from any person (whether enrolled in the course or not, except the instructor and TA) during the exam time. Online and offline communication with any person other than the instructor and TA is not allowed. Posting any question on any online forum is also strictly prohibited. After each exam, instructors will schedule oral interviews (through Zoom) with students suspected of academic dishonesty, and with some randomly selected students. Questions related to the exam questions and the student's solutions will be asked to verify the authenticity of the submitted works.

Any form of discussion and collaboration during the exam is a violation of HKUST Academic Honor Code. Severe violations could result in an F grade of the course.

Grading Scheme:

Total score
$= \sup\{\lambda\,\text{homework} + \mu\,\text{midterm} + \nu\,\text{final} : \lambda \in [0, 0.2], \mu \in [0, 0.4], \nu \in [0.4, 0.7], \lambda + \mu + \nu = 1\}.$

Letter Grades: Try to aim at getting a total of 80% or above for A-/A/A+, about 60% or above for B-/B/B+, and about 40% or above for C-/C/C+. Exams in the course will be designed so that they are *disadvantageous* to students without geninue understanding of the course materials, and students with weak background on mathematical analysis. The course will not be graded on a curve.