

MATHEMATICS 442/551 A01 FALL 2018-2019 COURSE OUTLINE

Department of Mathematics and Statistics, University of Victoria

Instructor	Dr. Junling Ma (junlingm@uvic.ca)
Office	DTB A536, (250) 721-7442
Office Hours	Mon, Wed, 1:30 – 2:30, or by appointment
Lectures	Mon, Wed, Thu 2:30 – 3:20, CLE C110
Course website	Course materials are available on CourseSpaces (http://coursespaces.uvic.ca)

TEXT There is no official textbook for this course. Lecture notes will be posted online. This course covers selected materials from the following books.

- F. Verhulst. *Nonlinear Differential Equations and Dynamical Systems (2nd Ed.)*.
- J. Guckenheimer and Holmes, *Nonlinear Oscillations, Dynamical Systems, and Bifurcations of Vector Fields*.

PREREQUISITE Math 300 or MATH 335; and Math 342; or permission of the department.

TOPICS

- Existence and uniqueness, Gronwall's inequality
- Linear equations (asymptotically autonomous, periodic)
- Nonlinear systems, flows, and invariance manifolds
- Periodic solutions, Poincaré-Bendixon Theorem
- Stability (linear stability, direct method)
- Bifurcation
- Chaos
- Perturbation Theory

ASSIGNMENTS There will be **six** assignments. They will be posted on CourseSpaces one week before the due date. See the course schedule below for the due dates. Only the highest five will be counted for your grade.

MIDTERM There will be **one in class midterm** on Friday Oct 18. If you have a legitimate reason for missing a midterm, with documentation, please contact your instructor.

FINAL EXAM A three hour final examination will be scheduled by the University during the final exam period.

MARKING SCHEME Midterm 30%; assignments weigh 30%; final examination 40%. **You must pass the final exam to pass the course.**

MISSED COURSE WORK If you miss any assignment with a legitimate reason such as sickness and family emergency, your other assignments will be averaged to make up the 30%. There will be **no** make-up midterm. If you miss the midterm with a legitimate reason, your assignments will weigh 40% and your final exam will weigh 60%.

Off-schedule Final Examinations are not given except in accordance with the regulations on *Illness, Accident or Family Affliction at Exam Time* in the U.Vic. Calendar. Deferred status is granted only for Final Examinations. Students are **strongly** advised **NOT** to make final plans for travel or employment during the examination period since special arrangements will **NOT** be made for examinations that may conflict with such plans. Please note that low cost airline tickets, family reunions, weddings and vacations definitely DO NOT fall under the Calendar regulations for obtaining a deferred final examination.

COURSE SCHEDULE

Week	Date	Sections	Assignments due
1	Sep 5, 6	Introduction, Gronwell's inequality	
2	Sep 10, 12, 13	Existence and Uniqueness Linear Systems	
3	Sep 17, 19, <u>20</u>	Flows, Nonlinear systems	Assignment #1
4	Sep 24, 26, 27	Closed orbits, Poincaré-Bendixon Theorem	
5	Oct 1, 3, <u>4</u>	Peiodic linear systems, Floquet Theorem Asymptotically autonomous linear systems	Assignment #2
6	Oct 8		Thanksgiving
	Oct 10, 11	Linearization	
7	Oct 15, 17	Linear Stability	
	Oct <u>18</u>	Midterm	Assignment #3
8	Oct 22, 24, 25	Stability: direct methods	
9	Oct 29, 31, <u>Nov 1</u>	Bifurcation	Assignment #4
10	Nov 5, 7, 8	Bifurcation	
11	Nov 12, 14	Reading break	
	Nov 15	Bifurcation	Assignment #5
12	Nov 19, 21, <u>22</u>	Chaos	
13	Nov 26, 28, <u>29</u>	Perturbation Thoery	Assignment #6
14	Dec 3, <u>5</u>	Poincaé-Lindstedt Method	

Assignment due dates are underlined.