

MATH 215 (3 Credits) Section 201
Elementary Differential Equations I
Session 2019W Term 2 (Jan–Apr 2020)

Prerequisites. Single-variable integral calculus (one of MATH 101, MATH 103, MATH 105, MATH 121, SCIE 001) and linear algebra (one of MATH 152, MATH 221, MATH 223).

Corequisite. Multi-variable differential calculus (one of MATH 200, MATH 217, MATH 226, MATH 253, MATH 263).

Instructor. Khanh Dao Duc

Office Hours. Mon. 16:00-16:50, Wed.: 11:00-11:50, Fri.: 11:00-11:50

Office Location. Buchanan A104

Contact Details. Drop in to office hours or email kdd@math.ubc.ca for appointment

Course Canvas Page. <https://canvas.ubc.ca/courses/37708>

Instructor's Web Page. <https://kdaoduc.com/math-215//>

Course Structure. Traditional lectures, M W F 10:00–10:50. Notes will be posted after lectures on the instructor's web page.

Course Topics.

1. *First Order Equations and Applications.* Slope fields, existence and uniqueness, separable equations, linear equations by the integrating factor method, autonomous equations, applications to biology and physics, exact equations, Euler's method for numerical approximation.
2. *Second Order Linear Equations and Applications.* Second order linear equations, constant coefficient homogeneous and nonhomogeneous equations, undetermined coefficients, variation of parameters, mechanical vibrations, forced oscillations and resonance.
3. *Systems of First Order Linear Equations.* Systems of first order equations, higher order equations converted to systems, linear systems, constant coefficient homogeneous and nonhomogeneous systems, variation of parameters, phase portraits, matrix exponentials.
4. *Nonlinear Systems.* Critical points and equilibria, linearized stability analysis for autonomous systems, phase portraits, applications to biology and physics.
5. *Laplace Transforms.* Definitions and properties of the Laplace transform and the inverse Laplace transform, partial fractions, solution of initial value problems with discontinuous forcing functions, the Dirac delta and impulse response, convolution.
6. *Numerical Methods.* Truncation error for Euler's method, higher order methods.

Course Textbook. See the course Canvas page.

Learning Outcomes. See the instructor's web page.

Learning Assessment. See the course Canvas page.

Homework assignments that are submitted late are not marked. There are no make-up tests for missed in-class (midterm) tests. If academic concession for a missed homework assignment or in-class (midterm) test is requested by a student and approved by the course instructor, then the marks for the missed component are shifted onto the final examination. Examples of valid reasons include illness and being absent from campus to represent the University, British Columbia or Canada in a competition or performance. Examples of reasons that are not valid include conflicts with personal travel schedules or conflicts with work schedules. **Note that a student who misses the in-class tests and has otherwise not completed a substantial portion of the term work shall not be admitted to the final examination.**

If the final examination is missed, a student can apply for academic concession to their dean or director or their designate (such as an academic advising office). A student's academic performance in a course up to the final examination is taken into consideration in granting deferred examination status (e.g. if a student is already failing then deferred examination status will not be granted). **Note that a conflict with a student's personal travel schedule is not a valid reason for missing the final examination.** A student who misses the final examination for this reason will receive a mark of 0 for the final examination and therefore will fail the course.

For more details on academic concession see the UBC Calendar website <http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,329,0,0>.

University Policies. UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website <https://senate.ubc.ca/policies-resources-support-student-success>.

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