

PMATH 733: Model Theory and Set Theory      Winter 2015  
Mondays and Wednesdays 2:30–3:45 in MC 2035

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The course is approximately one-third set theory and two-thirds model theory. The set theory will be somewhat naïve (i.e., not formal) and the model theory will be semantic (i.e., no proof theory). There will be a small overlap with PMATH 432/632 (First Order Logic and Computability), but this latter course is neither a pre-requisite nor an anti-requisite. The pre-requisite for this course is a familiarity with algebra: groups, fields, vector spaces (over arbitrary fields), commutative rings (especially polynomial rings over fields).

Lecture notes can be purchased for \$13.16 from Media.doc, MC 2018.

The following reference books are on reserve in the Davis library:  
Set theory: an introduction to independence proofs by K. Kunen and  
Model theory: an introduction by D. Marker.

Here are the topics I hope to cover:

*Set theory* (four weeks): Zermelo-Fraenkel axioms, transfinite induction/recursion, well-orderings and ordinals, the axiom of choice and equivalents, cardinal arithmetic.

*Model theory* (eight weeks): First-order logic (structures, languages, theories), definable sets, the compactness theorem (via ultraproducts) and its consequences, quantifier elimination, algebraic examples (vector spaces, algebraically closed fields, real closed fields), model companions.

There will be five homework assignments worth a total of 35% and a final exam worth 65%. There will be no midterm exam.

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility.

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Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4, <http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm>. When in doubt please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing academic offenses and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the undergraduate associate dean. For information on categories of offenses and types of penalties, students should refer to Policy 71, Student Discipline, <http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm>. For typical penalties check Guidelines for the Assessment of Penalties, <http://www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm>.

Appeals: A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals, <http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm>.

Note for students with disabilities: The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the OPD at the beginning of each academic term.