ENGPHYS 2P04
Computational Mechanics: Statics
Undergraduate Studies
Fall 2025
Course Outline

Current as of Fri 2025-08-29 13:16:29; see the A2L for the most up-to-date version of this document

Instructor Office Hours and Contact Information

Dr. Matt Minnick
BSB/B106
minnick@mcmaster.ca
ext. 24546

Office Hours:
Wednesday - 10:30 and 12:30
Friday - 12:30
Or by appointment

Teaching Assistant Office Hours and Contact Information

See A2L for TA info

Course Website/Alternate Methods of Communication

The primary method of communication will be

1. Avenue To Learn (A2L, http://avenue.mcmaster.ca/) news postings for announcements - make sure to set your A2L email settings so it emails these to you.
2. MS Teams ("Course Forum") posts for questions about content or admin things anyone else might want to know about too.
3. Email for individual messages.

Class Format

Course Dates: 3 Sep 2025 - 3 Dec 2025
Units: 4
Course Delivery Mode: All classes are in-person
Course Description: Classical mechanics topics including static equilibrium, machines and trusses, determinacy, force and bending moment diagrams, elasticity, shear, principal stresses, tensors, Voigt notation, flexure, and torsion. Course topics are explored analytically and computationally using finite element method and computer algebra system software. Three lectures, one lab (two hours); first term
Prerequisite(s): PHYSICS 1D03 and credit or registration in MATH 2Z03. Registration in ENGPHYS 2CD4 is recommended.
Antirequisite(s): CIVENG 2P04, ENGINEER 2P04, MECHENG 2P04

The course is scheduled as follows:

• C01: lecture	MoWe	11:30 – 12:20	
	Fr	13:30 – 14:20	see Mosaic for location
• L01: lab	Tu	14:30 – 17:20	see Mosaic for location
• L02: lab	Th	14:30 – 17:20	see Mosaic for location
• L03: lab	Fr	14:30 – 17:20	see Mosaic for location

Lectures will be recorded and posted shortly afterwards on A2L via echo360.

Note: same format for 2CD4 and 2P04, just on different (but complementary) topics

The course is organized as follows
Resources:
-Lecture notes & examples (online)
-Question bank
-Select course videos explaining past versions of the notes & some practice problems (on YouTube)

To maximize your success, you should:

1. Regularly review the Teams page and A2L for new information and participate in the learning community they establish by asking (and where possible, answering) questions there,
2. Treat your computer (and classmates) with love and respect,
3. Be enthusiastic about the material, and envision wild success with your attempts to learn it,
4. Review the notes and textbook sections prior to the live lecture,
5. Show up to the live lecture on time and ready to work through the problems along with me (i.e., equipped with your computer setup to work through practice problems for the topic),
6. Study the content with your peers,
7. Aim to understand before you memorize,
8. Reflect on problems after you get the answer, and
9. Reflect on topics to summarize key points, then review and use these summaries throughout the course to build up & refine your formula sheet.

COURSE INTENDED LEARNING OUTCOMES

Upon successful completion of the course, you will be able to:

1. Explain a variety of core principles in dynamics, and tackle a variety of problems that apply these principles (see each topic's notes for ILOs of that topic)
2. Use a computer algebra system (Maple) to solve a variety of physics and math problems
3. Use commercial numerical methods software (FlexPDE) to solve nonlinear dynamics problems

ACCREDITATION LEARNING OUTCOMES

The Canadian Engineering Accreditation Board (CEAB) is a division of Engineers Canada and is responsible for accrediting undergraduate engineering programs across Canada. Accreditation by the CEAB ensures that the engineering programs meet a national standard of quality and cover essential educational requirements. Graduate Attributes are a set of qualities and skills that the CEAB expects engineering graduates to possess. These attributes are a benchmark for the learning outcomes of accredited engineering programs. This section lists the Graduate Attribute Indicators associated with some of the Learning Outcomes in this course.
The Graduate Attributes defined in this section are measured for Accreditation purposes only and will not be directly taken into consideration in determining a student's grade in the course.

Outcomes	Indicators
Capable of solving systems of equations and use a variety of matrix methods using computer algebra tools	1.1 - Competence in Mathematics
Combine analytical, CAS, and numeric tools to solve challenging mechanics problems	4.3 Develops models/prototypes; tests, evaluates, and iterates as appropriate.
Can examine an engineering problem in static mechanics and decide whether to optimally tackle it analytically, with a CAS like Maple, or with FEM like with FlexPDE	5.1 Evaluates engineering tools, identifies their limitations, and selects, adapts, or extends them appropriately.

For more information on Accreditation, please visit: https://www.engineerscanada.ca

LAB INFORMATION

Labs will alternate between support labs where TAs help you code and solve problems in the course, and interview labs where you answer questions on your lab problem writeup. Come to all labs with your computer with the course software ready to go, and have attempted at least some problems even for the practice labs. See the Assessment section for details.

COURSE SCHEDULE

Week #	Date	Major Topic	Lecture #	Lecture Topic	Readings	ILOs	Lab Topic
1	Wed 3 Sep	Static Equilibirum	1	Intro. and 1st year review	Notes (Static Eqm 0.1 - .4), H1, H2	• Understand the course structure and overall logistics • Be familiar with the course materials and resources, and how to access them • Review vector algebra basics	No Lab in First Week
	Fri 5 Sep		2	FBDs and Particle Equilibrium (2D + 3D)	H3, Notes (0.5.1 and Essential Maple)	• Review the principles of making FBDs • Use FBDs to setup particle eqm problems in 2D and 3D • Solve particle eqm problems (2D and 3D) using the equations of eqm.	
2	Mon 8 Sep		3	Force System Resultans, Simplification of a Force and Couple System	H4.1-4.8, Notes (Static Eqm 0.5, 0.6, 0.7.5.1)	• Be able to find net force and torque on things subject to arbitrary forces and moments	Intro & Practice (no demo)
	Wed 10 Sep		4	Equilibrium of a Rigid Body	H5.1-5.3, Notes (Static Eqm 0.7.1)	• Understand the differences b/w particles and rigid bodies • Apply all solution tools seen so far to rigid body eqm problems (e.g., FDBs, eqns of eqm) • Setup and solve rigid body eqm problems	
	Fri 12 Sep		5	Equilibrium of a Rigid Body (cont'd)	H5.4-5.7, Notes (Static Eqm 0.7.1)	• Perfection through practice! • Setting up a statically indeterminate problem, and understand why it cannot be solved (yet!)	
3	Mon 15 Sep		6	Equilibrium of a [statically determinate] Rigid Body	H5.7, Notes (Static Eqm 0.7.2 & 0.7.3)	• Understand the concept of statical determinancy conceptually and mathematicall (F. Thm of Lin. Algebra) • Setup rigid body eqm problems and recognize them as staticall determinate or indeterminate • Solve rigid body eqm problems that are statically determinate • Consider solutions to statically indeterminate problems (prelude to normal elasticity) • Introduce the varous types and features of joints	Demo Lab#1: lectures L3-5

Week #	Date	Major Topic	Lecture #	Lecture Topic	Readings	ILOs	Lab Topic
	Wed 17 Sep	Trusses, Machines, and Distributed Loads	7	Simple Trusses, Method of Joints	H6.1-6.2, Notes (TMD 1.1-1.2)	• Understand the concept of 2-force members and their grouping as trusses • Understand the various types of joints and their corresponding effects on truss eqm problems • Solve truss eqm problems using the method of joints	
	Fri 19 Sep		8	Zero-force Members, Method of Sections, *3D Space Trusses	H6.3-6.4, *H6.5 (TMD 1.2.2 & 1.2.3)	• Understand, recognize, and leverage 0-force members in truss systems • Understand and apply the Method of Sections to solve truss eqm problems • Consider the extension to 3D space trusses (vectors!)	
4	Mon 22 Sep		9	Frames and Machines (intro.)	H6.6, Notes (TMD 1.2.4)	• Understand the difference b/w 2-force memebers and multi-force members • Understand the difference between groupings of 2-force members (trusses) and multi-force members (frames) • Solve frame eqm problems	Practice Lab (no demo)
	Wed 24 Sep		10	Frames and Machines (cont'd)	H6.6, Notes (TMD 1.3)	• The ability to recognize systems as truss, frame, or machine systems. • Understand the characteristics of machines (as opposed to trusses or frames) • Solve machine problems	
	Fri 26 Sep		11	Distributed Loads	H4.9, Notes (TMD 1.4)	• Understand the concept of distributed loads • Reducing simple distributed loads into point forces • Solve truss, frame, and machines problems containing distributed loads	
5	Mon 29 Sep		12	Internal Loadings Developed in Structural Members	H7.1, Notes (IFM 5.1.1)	• Understand the "source" of internal forces and moments • Classify and assign a sign convention to internal loadings	Demo Lab 2 (L6-11)
	Wed 1 Oct	Internal Forces and Moments; Normal Elasticity	13	Internal Shear and Moment Equations and Diagrams	H7.2, Notes (IFM 5.1.2)	• Be able to read, interprete, and create internal force and moment diagrams • Understand the limitations of internal force and moment diagrams	

Week #	Date	Major Topic	Lecture #	Lecture Topic	Readings	ILOs	Lab Topic
						• Use internal force and moment diagrams to solve eqm problems	
	Fri 3 Oct		14	Relations b/w Distributed Load, Shear, and Moments.	H7.3, Notes (IFM 5.2)	• Understand the relationship between ditributed loads, shear, and moments coneptually and mathematically • Apply this relationship to solve problems involving distributed loads	
6	Mon 6 Oct		15	Uniform Axial Stress and Strain	Notes (NE 6.1-6.2, eg. 6.2.1.2&3).	Can incorporate elasticity of members under uniform axial loading to solve previously-indeterminate static equilibrium problems, including 1. Defining axial stress and relating it to tensile force & cross sectional area 2. Defining axial strain and relating it to fractional beam length change for uniform loading 3. Relating beam length change to displacement of endpoints 4. Relating stress & strain via Hooke's law 5. Determining spring constant for an axially-loaded beam 6. Using beam geometry to relate displacements of points along a beam 7. Using geometry & elasticity to generate additional equations relating tensile forces and displacements in static equilibrium problems	Practice Lab (no demo)
	Wed 8 Oct		16	Axially-Nonuniform Stress & Strain	Notes NE eg 6.2.1.1	Can determine displacement as a function of position along a beam subject to axially-nonuniform loading, including 1. Defining displacement due to strain in cartesian coordinates 2. Distinguishing between [local] strain and average strain 3. Relating [local] strain to displacement gradients 4. Applying axial distributed loads, and finding internal normal force equations vs. axial position 5. Using integrals of internal strain to determine displacement as a	

Week #	Date	Major Topic	Lecture #	Lecture Topic	Readings	ILOs	Lab Topic
						function of position relative to some reference displacement.	
	Fri 10 Oct		17	Poisson's Ratio and Transverse Normal Elasticity	Notes NE (6.2.2-3)	Can determine transverse displacements induced by axial loading on more than one axis, including: 1. Explaining Poisson's ratio, and how stresses in transverse directions contribute to strain 2. Using matrix forms of Hooke's law to determine strains given stresses in each axial direction. 3. Determining length and volume changes given strains 4. Showing how and when fractional volume change is the sum of the strains 5. Explaining bulk modulus and compressibility and relating them to Poisson's ratio & elastic modulus 6. Determining strain-induced displacement of points on an object and relating displacement differences to size changes	
7	*Mon 13 Oct*		*Reading Week (no classes)*				
	Wed 15 Oct						
	Fri 17 Oct						

Week #	Date	Major Topic	Lecture #	Lecture Topic	Readings	ILOs	Lab Topic
8	Mon 20 Oct		18	Stiffness and Compliance Matrices	Notes (NE 6.2.4-5)	Can solve axial loading stress & strain problems subject to arbitrary sets of uniform boundary conditions, including 1. Defining, relating, and determining stiffness & compliance matrices 2. Determining effective stiffness subject to arbitrary sets of fixed or free boundary conditions in transverse directions 3. Finding unknown stresses or strains (and/or corresponding forces or displacements) given an arbitrary set of uniform axial load and/or displacement boundary conditions for a rectangular prism 4. Explaining how plane stress and plane strain conditions lead to different effectiveness stiffnesses in 2d problems	Demo Lab 3 (L12-17)
	Wed 22 Oct		19	Shear Stress and Strain	Notes (Essential FlexPDE, 7.1)	Can determine displacement from shear stress in pure shear situations, including: 1. Determining shear stresses from shear forces 2. Proving that static equilibrium with nonzero applied shear forces and no applied moments requires symmetric applied shear stresses, and that this leads to uniform shear stress 3. Defining “pure shear static equilibrium” and determining required force loading to realize it 4. Determining shear modulus given elastic modulus and Poisson’s ratio 5. Determining shear strain in pure shear situations 6. Determining shear-induced displacements (relative to fixed points) of points in a rectangular prism in pure-shear static equilibrium	

Week #	Date	Major Topic	Lecture #	Lecture Topic	Readings	ILOs	Lab Topic
	Fri 24 Oct	Topic 4 Shear Stress & Strain, FEM Elasticity, and Thermal Expansion	20	Matrix methods for Uniform Combined Axial & Shear Stress & Strain, True Strain, and PDEs for Static Equilibrium	Notes (7.2-5)	Can determine combined axial and shear deformations in uniform loading, and derive the microscopic equations of equilibrium for an infinitesimal volume: 1. Proving why the microscopic shear stress must be symmetric at any location in an object, even in nonuniform external loading 2. Defining & relating engineering & true shear strain 3. Determining combined axial and shear deformations using the matrix method in loading situations that lead to uniform internal stress & strain 4. Can show how Newton's second law applied to static equilibrium of an infinitesimal volume subject to axial and shear loading, combined with shear symmetry, Hooke's law for axial and shear elasticity, and the strain definitions in terms of displacements, leads to a set of 3 coupled PDEs in displacements	
9	Mon 27 Oct		21	Lecture 21 FlexPDE Complete Elasticity	Notes (7.6)	Can setup and solve static equilibrium problems in FlexPDE involving rectangular prisms with simple axial & shear loading, including: 1. Inputting PDEs in FlexPDE, including defining relations to make inputting the PDEs simpler 2. Building a 3D geometry for a rectangular prism in FlexPDE 3. Applying boundary conditions in FlexPDE for constant stress or displacement on a surface 4. Exploring output displacement, stresses, and strains via reporting and contour plotting, and deformed shape plotting	Practice Lab (no demo)

Week #	Date	Major Topic	Lecture #	Lecture Topic	Readings	ILOs	Lab Topic
	Wed 29 Oct		22	Comparing Analytical and Numerical Solutions for Complete Elasticity	Notes (7.6)	Can compare Maple and FlexPDE results for axial & shear loading leading to [mostly] uniform stress distributions, including 1. Stating Saint-Venant's principle and exploring where it does and doesn't apply in results 2. Applying fixed stresses or strains on surfaces in a rectangular prism in FlexPDE, and determining resulting displacements 3. Solving uniform stress & strain displacement situations in Maple, and comparing to FlexPDE results 4. Explaining the difference between Maple and FlexPDE results, and where you expect each to be more valid	
	Fri 31 Oct		23	Thermal Expansion	Notes (NE 7.8-9)	Can modify static equilibrium equations to deal with thermal expansion and determine strain, and displacement for rectangular prisms subject to axial & shear loading in combination with temperature change, including 1. Explaining the source of thermal expansion, 2. Modifying vector elasticity equations to account for temperature change 3. Explaining the difference between "mechanical stress-induced strain", "thermal strain", and "true strain" 4. Using matrix methods to determine displacements in problems involving axial & shear loading and thermal expansion 5. Incorporating thermal expansion into FlexPDE and determining resulting stress, strain, and displacements	
10	Mon 3 Nov		24	Complete Elasticity with Thermal Expansion	Notes (NE 7.8-9)	Can solve combined thermal and physical stress elasticity problems in Maple & FlexPDE, and compare results, including 1. Determining required stresses & strains in situations with temperature change and a	Demo Lab 4 (L18-23)

Week #	Date	Major Topic	Lecture #	Lecture Topic	Readings	ILOs	Lab Topic
						combination of fixed surfaces and applied loads in Maple and FlexPDE 2. Explaining where Maple and FlexPDE should and shouldn't agree in these situations	
	Wed 5 Nov		25	Flexural Elasticity for Uniform Rectangular Beams	H10.1, 10.2, Notes 8.1	Solve bending problems for uniform rectangular beams subject to uniform bending moments, including: 1. Determining strain vs. transverse position for a beam bent into a circular arc of a given radius 2. Determining the bending moment applied by a linear axial stress distribution 3. Defining curvature and relating it to radius of curvature, bending angle, and transverse displacement (for small displacements) 4. Defining moment of inertia and flexural rigidity 5. Deriving how applied moment is related to resulting curvature in an initially straight uniform rectangular beam	
	Fri 7 Nov	Topic 5 Flexure	26	Bending in FlexPDE	Notes 8.4	Solve bending problems for uniform rectangular beams subject to uniform bending moments in FlexPDE, including 1. Writing a stress distribution that produces a pure bending moment 2. Determining displacement and calculating curvature in FlexPDE and comparing with analytical results 3. Plotting curvature, and exploring axial stress vs. position in pure bending	
11	Mon 10 Nov		27	Total Elasticity for Cantilevers in Maple and FlexPDE		Using superposition to determine transverse displacement vs. position relative to a fixed end for cantilevers subject to arbitrary 2D loading distributions, including 1. Using known IFM diagrams to determine axial and shear stress & strains and curvature-induced by internal bending moment, as well as resulting displacement (relative to a fixed end),	Practice Lab (no demo)

Week #	Date	Major Topic	Lecture #	Lecture Topic	Readings	ILOs	Lab Topic
						2. Using FlexPDE to produce results to compare with our analytical conditions (for cantilever beams subject to sufficiently simple loading that we can write it in FlexPDE by specifying surface stress distributions) 3. Appreciating the relative size of axial, shear, and bending deformations in typical transverse beam loading setups.	
	Wed 12 Nov		28	The Beam Equation	Notes (8.3)	Using the beam equation to determine transverse displacement vs. position for beams subject to distributed loads and arbitrary (i.e., not necessarily cantilever) boundary conditions, including 1. Deriving the beam equation, and appreciating when it's valid, 2. Explaining why beam boundary conditions lead to certain knowns & unknowns (e.g., why a free end requires a specific shear force and bending moment but unknown bending angle and displacement), 3. Setting up and solving the beam equation in Maple using dsolve, 4. Comparing beam equation and FlexPDE solutions	
	Fri 14 Nov		29	Flexural Rigidity of Multi-layer Beams	Notes (8.2)	Can solve bending problems with multilayer beams, including 1. Can distinguish between geometric and stiffness-weighted centroid 2. Can determine flexural rigidity for things that have non-rectangular cross sections and/or are made up of materials with different elasticities across the cross section, 3. Can locate a compound beam's neutral axis for bending 4. Can define a multilayer beam in FlexPDE by making a position-dependent stiffness, and compare FlexPDE results with Maple	

Week #	Date	Major Topic	Lecture #	Lecture Topic	Readings	ILOs	Lab Topic
12	Mon 17 Nov		30	Flexure Recap & Total Elasticity Involving Flexure	Notes (8.5)	Solve total elasticity problems involving Flexure, including: 1. Comparing beam equation and IFM-produced solutions for cantilevers 2. Comparing Maple and Flex solutions 3. Solving flexure problems in beams with multiple layers 4. Relating curvature and displacement for small deformations 5. Explaining when each approach is valid & necessary	
	Wed 19 Nov		31	Uniform Torsional stress & strain for Circular Cross-Sections	Notes (9.1.1-9.1.4)	Can determine twist angle and displacement & strain vs. position in Maple and FlexPDE in uniform twisting moment situations, including: 1. Determining torsion constant for a circular cross-section 2. Defining torsional rigidity and relating it to torsion constant and shear modulus 3. Explaining why shear modulus is relevant for torsion while elastic modulus was relevant for bending 4. Distinguishing between twisting moments and bending moments applied to a beam 5. Determining twisting moment corresponding to a stress distribution 6. Determining twisting angle as a function of length corresponding to a specific moment and torsion constant 7. Determining displacement of each point in a cross section corresponding to a given twist angle 8. Comparing displacement determined by FlexPDE to that produced by Maple	Demo Lab 5 (L24-29)

Week #	Date	Major Topic	Lecture #	Lecture Topic	Readings	ILOs	Lab Topic
	Fri 21 Nov	Topic 6 - Torsion and Combination Loading	32	Torsional Stress & Strain for Rectangular Cross-Sections	Notes (9.1.1-9.1.4)	Solving torsional problems involving more complicated cross-sections 1. Determining twisting angle from displacements in FlexPDE 2. Determining torsion constants using experiments in FlexPDE 3. Comparing maple and FlexPDE results for displacement distribution on a twisting surface 4. Can explain warping and why torsion constants are not second moments of area for non-circular cross sections	
13	Mon 24 Nov		33	Continuity	Notes (9.2)	Solving gear-system statics problems, including 1. Relating twist angle to gear displacement 2. Relating torque to force at gear contact surface 3. Determining peak stress in a twisting gear or rod	Practice Lab (no demo)
	Wed 26 Nov		34	Combined Elasticity	Notes (9.1.4 and 9.3.1.1-9.3.1.2)	Can determine displacements in combined elasticity problems involving axial, shear, bending, and torsional loading including: 1. Writing a stress distribution that corresponds to a twisting moment 2. Determining impact of a stress distribution in terms of equivalent axial, shear, bending, and twisting moments 3. Determine displacement corresponding to uniform combined loading setups using superposition 4. Use FlexPDE to apply loading and check results.	
	Fri 28 Nov		35	Stress Transformations and Mohr's Circle	Notes (7.7)	Can apply Mohr's circle to transform stresses, including 1. Explaining how a beam in pure axial loading can lead to internal shear stress and vice-versa 2. Deriving the transformation equation to determine stress at an angled internal surface 3. Determining the principal stresses and the angle they occur 4. Determining the maximum internal shear stress and the angle it occurs	

Week #	Date	Major Topic	Lecture #	Lecture Topic	Readings	ILOs	Lab Topic
						5. Considering principal stresses and maximum shear stress when assessing failure mechanisms	
14	Mon 1 Dec		36	Combined Elasticity (cont'd)	Notes (9.3.1.3-9.3.1.4)	• Perfection through pratice!	
	Wed 3 Dec		37	End of Course Q&A (review)	H + Notes	-	
	Fri 5 Dec			(No lecture - lectures are over)		-	

REQUIRED/OPTIONAL MATERIALS AND FEES

COMPUTER:

Students should have a laptop computer (needed for in-person practical test exercises) capable of simultaneously running FlexPDE, Maple, and Microsoft Word (Windows machines are recommended, price point of $500 or up should be fine). You will be required to use this for the in-class quizzes and lab demos.

SOFTWARE:

FlexPDE Student Version (free online), Maple (Version 15 or higher), MS Word (2007 or newer).

REFERENCE TEXTS:

-[Required] Course notes (free online via A2L)
-[Required] Engineering Mechanics: Statics & Dynamics by Hibbeler, 15th edition (same text as 2P04) → discount if you get it through the campus bookstore

COURSE ASSESSMENT DETAILS

Assessment Item	Each	Number	Total
Lab Interview Demos	12%	5	**60%**
Final Exam	40%	1	**40%**
Grand Total			**100%**

Note that there are 11 weeks of labs, but not all of them have an interview demo – see the schedule for details.

Note that the MSAF policy is as follows: MSAF'd lab interview demos reweight the grades associated with that component (if any) to the exam.

LAB INTERVIEW DEMOS

Half of the labs (see the schedule for which ones) will be "lab interview demos" wherein you'll first prepare and submit a write-up of your work on the lecture topics from the previous 2 weeks, then answer questions about it and the topics you covered on a one-on-one interview with the TA including a part where you use your laptop computer to solve a modification problem of one of the problems live.

1. Preparing the work write-up – earning "Potential Lab Grade":
    a. Find the Lab Assignment File for that lab in A2L and download it (don't view it on A2L because avenue often doesn't show equations correctly in the web viewer; what's actually x^{2+x} might appear to be $x^2 + x$).
    b. Prepare a writeup of solutions to the problems it contains (digitally in a word doc, while also providing code where applicable)
        i. In many cases we'll tackle these problems in lecture; in those cases, you still need to prepare your own writeup; try to change the variable names slightly or the code it some way that makes it still work but forces you to think a bit while running through it, and definitely put explanations in your own words.
    c. Note: You can work with and get help from others and the TAs, but your submitted work must be your own work that you understand. If you include portions of other resources (e.g., FBDs or code from the slides that were part of the solution but not the question, FBDs or code from others that you then adapt, writeups produced by ChatGPT, etc.) then you *must* reference where you got it or we'll see it as you claiming you did that work yourself and be forced to proceed with academic dishonesty charges (these are serious – 3 strikes total across your whole university career means expulsion, so don't claim others' work as your own!).
    d. If you only complete some of the questions (or parts of a question), divide the points for that item evenly between its questions, and then the points for each question between subquestions (i.e., part a., part b., etc.), etc., and be clear what fraction of the work you're claiming to have done.
        i. Potential Lab Grade = sqrt(The total points divided by the total available points)
            1. e.g., if you do & write up questions worth 4 marks out of 8 possible marks worth of questions then your potential grade = sqrt(4/8) = 71%
            2. Note that if the TA cannot easily understand your submission because it is disorganized or otherwise not presented clearly they cannot award you the marks for it.
    e. You must submit the writeup by 11 AM on the Monday of the week the demo lab takes place in (see the deadline in the drop box on A2L). Submitting late will incur a late penalty of 8% per hour (from your potential grade prior to the sqrt), possibly reducing it to 0 if submitted 13 or more hours late. Even in extenuating circumstances we cannot accept submissions beyond this time at all because it will not leave your TA with enough time to assess your work prior to your demo.
        i. This late penalty is multiplicative with potential grade prior to the sqrt function. e.g., if you submitted a complete and clear writeup for 67% of the work the lab covered, but submitted it 5 hours late (meaning a 40% deduction), your potential grade will be sqrt(67% * (1 - 40%)) = sqrt(67%*(60%)) = 63.4% instead of the $\sqrt{67\%} = 82\%$ you would have received if you submitted it on time.
2. During the interview:

a. During your interview, your TA will ask you several questions selected from the work you submitted:
    i. 2 simple "what does this mean?" style questions directly about your writeup. Could be referring to variables in equations, equations themselves, lines of code ("what does this do?"), figures, etc.
    ii. 1 concept question from one of the topics you submitted some work for
    iii. 1 modification question from the one of the questions that was eligible for it (forfeited if you did not submit any) – this will require you to solve a slightly different problem on the spot, which will usually require you to be able to modify & re-run your code, then interpret the result and whether it makes sense.
        1. Note that this means you must usually solve these problems using computer tools as-demonstrated in class.
b. The TA will assign you grades on each of these questions. Average grade across all 4 (i.e., sum of grades / 4, meaning they all count even if you didn't answer some) multiplied by your *potential grade* (see above) determines your *actual lab interview grade*.
c. The TA will make an audio recording of the interview. This will be used for quality control to help make sure all the TAs are marking you fairly, and in particular if you have a disagreement about what happened and how you were marked on it (bring any concerns with this which you cannot resolve with your TA to the attention of the Lead TA).

3. Coverage:
    a. See the Lab Assignment File for that lab.

FINAL EXAM

1. The final exam is a closed book written exam answered on paper, but does allow you to bring the McMaster Standard Calculator and a double-sided formula sheet
    a. Your formula sheet can include concepts, but shouldn't include questions & answers to question bank questions
2. The exam will have questions from or similar to the question bank (but modified to be doable without a computer; e.g., won't actually need you to code anything, but may include concept questions based on results of coding or in some cases syntax questions, but only where similar ones were included in the question bank)
    a. The exam will be multiple choice, but you will need to explain your reasoning to get credit for a question (e.g., if you select the right option, but don't explain why in a way that shows you understand, you won't get full marks for it, and might get zero marks if your explanation is bad enough or missing entirely).
    b. Part marks will typically be awarded in cases where your reasoning or answer is partially but not completely correct (e.g., multi-part questions)
        i. Note that writing an equation from the topic by itself usually won't get any marks if you can't also show you know how to use it in this situation.
3. See the sample exams on A2L for an example of the exam – these are identical in format, length, difficulty, and section coverage to the real exam.

GRADING SCALE

The McMaster 12 Point Grading Scale

Grade	Equivalent Grade Point	Equivalent Percentages
A+	12	90-100
A	11	85-89
A-	10	80-84
B+	9	77-79
B	8	73-76
B-	7	70-72
C+	6	67-69
C	5	63-66
C-	4	60-62
D+	3	57-59
D	2	53-56
D-	1	50-52
F	0	0-49

COURSE POLICY ON MISSED WORK, EXTENSIONS, AND LATE PENALTIES

It is your responsibility to regularly check both the course Teams page and A2L for updates and announcements. Policies for missed and late work are explained in the Assessment section:

You must submit the writeup by the deadline of the dropbox on A2L (Mondays at 11AM). Submitting late will incur a late penalty of 8% per hour (from your potential grade prior to the sqrt), possibly reducing it to 0 if submitted 13 or more hours late (as explained in the assessment section). Even in extenuating circumstances we cannot accept submissions beyond this time at all because it will not leave your TA with enough time to assess your work prior to your demo.
*This late penalty is multiplicative with potential grade prior to the sqrt. e.g., if you submitted a complete and clear writeup for 67% of the work the lab covered, but submitted it 5 hours late, your potential grade will be sqrt(67% * (1-5 hr late * 8%/hr late)) = sqrt(67%*(60%)) = 63.4%.*

Normal MSAF relief policy for this course is covered in the assessment section: Any MSAF'd labs would be reweighted to the final exam.
Note that if you will be unable to be on campus for your interview demo, it *may* be possible to conduct your demo remotely if you contact the lead TA and your interviewing TA prior to the start of the lab period and they agree to conduct the demo remotely. This demo will require solid enough internet that allows you to have your camera on and screen share so the TA can verify that you are answering the questions yourself. Any doubt that you are doing this genuinely can risk forfeiting your grades on the interview demo, so treat the remote option as a last resort. No MSAF is required to take this option.

GENERATIVE AI

Though it's not recommended, students may freely use generative AI in this course so long as the use of generative AI is referenced and cited following citation instructions given in the syllabus. Use of generative AI outside assessment guidelines or without citation will constitute academic dishonesty. It is the student's responsibility to be clear on the expectations for citation and reference and to do so appropriately.
The reason it's not recommended is that our objectives here are to learn the physics of the problems we're tackling (the writeup of the lab file is really just there for *you* to learn the key concepts by doing it! The writeup is not the goal, it's a means to the true end of learning mechanics). For that reason, we're providing a lot of support for you with problems in class and labs, and setting up assessments that encourage you to go through the steps of solving them yourself. Remember to think about what you've done and why each step works; if you hand in code that's totally different than how we've been solving things in class because you departed substantially from the course techniques with the help of generative AI, we may not be able to follow your solution enough to grant you marks.

APPROVED ADVISORY STATEMENTS

EQUITY, DIVERSITY, AND INCLUSION

Every registered student belongs in this course. Diversity of backgrounds and experiences is expected and welcome. You can expect your Instructor to be respectful of this diversity in all aspects of the course, and the same is expected of you.

The Department of Engineering Physics and the Faculty of Engineering are committed to creating an environment in which students of all genders, cultures, ethnicities, races, sexual orientations, abilities, and socioeconomic backgrounds have equal access to education and are welcomed and treated fairly. If you have any concerns regarding inclusion in our Department, in particular if you or one of your peers is experiencing harassment or discrimination, you are encouraged to contact the Chair, Associate Undergraduate Chair, Academic Advisor or to contact the Equity and Inclusion Office.

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the *Academic Integrity Policy*, located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/

The following illustrates only three forms of academic dishonesty:

1. plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. improper collaboration in group work.
3. copying or using unauthorized aids in tests and examinations.

AUTHENTICITY / PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

McMaster is committed to an inclusive and respectful community. These principles and expectations extend to online activities including electronic chat groups, video calls and other learning platforms.

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the *Code of Student Rights & Responsibilities* (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on

online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's *Academic Accommodation of Students with Disabilities* policy.

Academic Advising

Academic Advisors are available to assist you with any problems or questions you may have. This includes course selections, changes to your enrolment, McMaster Student Absence Form (MSAF), Religious, Indigenous, or Spiritual Observances (RISO) forms, exams, taking courses at another university (for credit at McMaster), Petitions for Special Consideration, and much more. Below is the contact information for the Office of the Associate Dean (Academic) in the Faculty of Engineering:

JHE-Hatch 301
https://www.eng.mcmaster.ca/programs/academic-advising
(905) 525-9140 ext. 24646

Physical and Mental Health

For a list of McMaster University's resources, please refer to the Student Wellness Centre.

Requests for Relief for Missed Academic Work

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work". An abbreviated version is provided below.

The University recognizes that students periodically require relief from academic work due to extenuating circumstances. Students seeking relief for missed academic term work are expected to read the ***McMaster Student Absence Form Policy***. The Policy aims to manage these requests by taking into account the needs and obligations of students, instructors and administrators. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in their course. Any concerns regarding the granting of relief should be directed to the Faculty Office.

1. **Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three (3) calendar days:**

    - Use the McMaster Student Absence Form (MSAF) on-line self-reporting tool. No further documentation is required.
    - Students may submit requests for relief using the MSAF once per term.
    - An automated email will be sent to the course instructor, who will determine the appropriate relief. Students must immediately follow up with their instructors. Failure to do so may negate the opportunity for relief.
    - The MSAF cannot be used to meet a religious obligation or to celebrate an important religious holiday.
    - The MSAF cannot be used for academic work that has already been completed or attempted.

- An MSAF applies only to work that is due within the period for which the MSAF applies, i.e. the 3-day period that is specified in the MSAF; however, all work due in that period can be covered by one MSAF.
- The MSAF cannot be used to apply for relief for any final examination or its equivalent. See *Petitions for Special Consideration* above.

2. **For medical or personal situations lasting more than three (3) calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has been used previously in that term:**

   - Students must report to their Faculty Office to discuss their situation and will be required to provide appropriate **supporting documentation**.
   - If warranted, the Faculty Office will approve the absence, and the instructor will determine appropriate relief.

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office ***normally within 10 working days*** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.