

Civil and Environmental Engineering Department, Carleton University

**IPIS 5520 - Engineering Primer for Master of Infrastructure Protection and
International Security Program** **Fall 2014**

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Office: Dunton Tower 1416
Office Hours: 2 Hours/week regular TBA, other times by appointment
Lectures: Tuesdays, 18:05 - 20:55, Location CB 2202.

Notes:

- 1- The main focus and goal of this course is to prepare you for your future courses in engineering field. Therefore, a wide variety of subjects are to be covered that require the students spend a sufficient amount of time for practice and further study.
- 2- At the end of this course, you are not engineers by any means. However, you are expected to gain the engineering insight and knowledge of the tools you require for further steps towards your degree and your career in IPIS.
- 3- The instructor will be happy to answer any questions by email, however please expect up to a 48 hours delay for your response especially in the weekends.
- 4- cuLearn will be used as the major means of communication and distribution of course material.
- 5- Textbooks that are introduced are very useful in the further studies, however in case of the online free e-books mentioned, the material should be studied with caution. Anything in contrast to the material presented in the lectures should be asked.
- 6- Assignments are due after 1 week, and will be followed by a single question as quiz in the beginning of the next session (last assignment excepted).
- 7- Plagiarism in any form will not be tolerated.
- 8- Accommodations for cases of students with disabilities, pregnancy or religious obligations can be provided. Since it will take time for considering the requests, please inform the instructor as soon as possible. The policies and detailed information are available in: <http://carleton.ca/equity/accommodation/>.

Assessment:

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| - Assignments and Quizzes: | 8 (6.25% each) | (50%) |
| - Final Exam: | Date TBA. | (50%) |

Course Outline:

1- Introductory Applied Mathematics

Week 1 & 2

Definition and important forms of functions, plotting different functions, roots of functions, definition of limits, basic geometry

2- Introductory Calculus of 1 Variable: Part I- Differentiation

Week 3

Definition of differentiation, rules of differentiation, graphical definitions, maximum and minimum of functions, second derivatives.

3- Introductory Calculus of 1 Variable: Part II- Integration

Week 4

Definition of integration, techniques of integration, graphical definitions, numerical integration.

4- Application of Calculus in Physics

Week 5

Kinematics: motion in a straight line, definitions and graphical presentations of motion parameters, curvilinear motion.

5- Basic Statistics and Probabilities

Week 6 & 7

Descriptive statistics, graphical presentation, random variables, probabilities, distribution types, Regression, conditional probabilities, random events, rate of occurrence, using spreadsheets.

6- Introduction to Engineering Reporting, Drawings and Maps

Week 8 & 9

Units in engineering calculations and communications, precision and errors, graphs and maps, different methods of projection, standard drawing layouts, CAD, urban and systemic maps.

7- Introductory Matrix and Vector Algebra and Applications

Week 10

Matrix and vectors definition and operations, Newtonian force vectors, 2D Statics.

8- Introductory Mechanics

Week 11 & 12

Stress, strain, stress-strain relationship, axial force, shear force, bending moment, beams and trusses, introduction to drawing diagrams in determinate structures.

Recommended Text:

- “Engineering Fundamentals: An Introduction to Engineering, SI Edition”, by Saeed Moaveni (2011), 4th Edition, ISBN: 978-1-4390- 6210-4, Cengage Learning.
- “Engineering Mechanics: Statics”, by Russell C. Hibbeler (2013), 13th Edition, ISBN: 9780132915540, Pearson (Prentice Hall) Publishing.
- “Mechanics of Materials”, by Russell C. Hibbeler (2013), 9th Edition, ISBN: 9780133254426, Pearson (Prentice Hall) Publishing.
- “Elementary Algebra and Calculus”, by Larissa Fradkin (2013), ISBN: 978-87-403-0151-9. Free EBook available at: <http://bookboon.com/en/elementary-algebra-and-calculus-ebook>.
- “Applied Mathematics by Examples: Theory”, by Jeremy Pickles (2010), ISBN: 978-87-7681-624-7. Free EBook available at: <http://bookboon.com/en/applied-mathematics-by-example-theory-ebook>.
- “Applied Mathematics by Examples: Exercises”, by Jeremy Pickles (2010), ISBN: 978-87-7681-626-1. Free EBook available at: <http://bookboon.com/en/applied-mathematics-by-example-exercises-ebook>.
- “Integration and differential equations”, by R.S. Johnson (2012), ISBN: 978-87-7681-970-5, Free EBook available at: <http://bookboon.com/en/integration-and-differential-equations-ebook>.
- “Essential Engineering Mathematics”, by Michael Batty (2011), ISBN: 978-87-7681-735-0. Free EBook available at: <http://bookboon.com/en/essential-engineering-mathematics-ebook>.
- “Applied Statistics”, by Mohammed A. Shayib (2013), ISBN: 978-87-403-0493-0, Free EBook available at: <http://bookboon.com/en/applied-statistics-ebook>.