Learning Outcomes
ENGI 3424 - Engineering Mathematics

1. Ordinary Differential Equations:

1.1 Find general solutions of first order separable ordinary differential equations.
1.2 Find general solutions of first order linear ordinary differential equations.
1.3 Find complete solutions of first order initial value problems.
1.4 Use numerical methods to solve first order first degree ODEs.
1.5 Solve second order ODEs using reduction of order methods.
1.6 Determine the general or complete solution for second order linear ODEs with constant coefficients.
1.7 Determine the general or complete solution for higher order linear ODEs with constant coefficients.

2. Laplace Transforms:

2.1 Find the Laplace transform of a function from the definition of a Laplace transform.
2.2 Find the Laplace transform of the exponential, cosine and sine functions.
2.3 Find the Laplace transform of derivatives and integrals.
2.4 Use Laplace transforms to determine general or complete solutions to linear ODEs.
2.5 Determine Laplace transforms and inverse Laplace transforms of various functions.
2.6 Understand and recall the properties of the Heaviside (unit step) function and its applications.
2.7 Understand and recall the properties of the Dirac Delta function and its applications.
2.8 Apply the Convolution Theorem to obtain inverse Laplace transforms.
2.9 Apply the Convolution Theorem to solve integro-differential equations.

3. Complex Numbers:

3.1 Carry out arithmetic operations for complex numbers.
3.2 Convert complex numbers between Cartesian and exponential form.
3.3 Find the distinct nth roots of complex numbers.

4. Partial Differentiation:

4.1 Evaluate partial derivatives, including higher order derivatives.
4.2 Apply the chain rule to partial differentiation.
4.3 Apply gradient vectors to find directional derivatives.
4.4 Apply gradient vectors to find normal lines and tangent planes to surfaces.
4.5 Use differentials to approximate small changes in functions of two variables.
4.6 Apply gradient vectors to solve unconstrained optimization problems.
4.7 Use the Jacobian to convert differentials between orthogonal coordinate systems.
4.8 Use Lagrange multipliers to solve constrained optimization problems.

5. Series:

5.1 Check a sequence for convergence.
5.2 Identify the general term of a sequence or a series.
5.3 Use summation notation to specify a series.
5.4 Find the exact sum of telescoping series and geometric series.
5.5 Understand and recall the properties and applications of p-series.
5.6 Understand and apply the divergence, comparison, limit comparison, ratio and root tests.
5.7 Select and apply the appropriate test for series convergence.
5.8 Find the Maclaurin and Taylor series expansions of given functions.
5.9 Obtain the radius and interval of convergence for a power series.
5.10 Understand the properties and applications of the binomial series.
5.11 Understand and apply Fourier series.

Graduate Attributes
(Canadian Engineering Accreditation Board)

All learning outcomes above meet graduate attributes
KB-D (a knowledge base for engineering – developed)
and PA-D (problem analysis – developed)

The graduate attributes for Engineering courses are listed at
https://engineerscanada.ca/sites/default/files/Graduate-Attributes.pdf

The learning outcomes are assessed in quizzes, the mid-term test and the final examination.

Lecture hours per week: 4, Tutorial hours per week: 1,
Total Accreditation Units: 54 AU, Mathematics: 100%

Course outline: http://www.engr.mun.ca/~ggeorge/3424/handout/outline3C22.pdf

Course web site: http://www.engr.mun.ca/~ggeorge/3424/index.html