ORIGINAL COURSE IMPLEMENTATION DATE:	September 1994
REVISED COURSE IMPLEMENTATION DATE:	September 2015
COURSE TO BE REVIEWED: (six years after UEC approval)	January 2021

Course outline form version: 09/15/14

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: PHYS 381	**Number of Credits:** 3 Course credit policy (105)
Course Full Title: Mathematical Physics **Course Short Title (if title exceeds 30 characters):**	
Faculty: Faculty of Science	**Department (or program if no department):** Physics

Calendar Description:

Partial and ordinary differential equations. Fourier series/transforms. Legendre polynomials. Laplace transforms. Applications to heat flow and waves. Laplace's equation in 1D, 2D, 3D using Cartesian, polar, and spherical co-ordinates. Special functions including Dirac Delta, Heaviside Theta, Si, Ci, Ei, Erf, Gamma.

Note: This course is offered as PHYS 381, MATH 381, and ENGR 257. Students may take only one of these for credit.

Prerequisites (or NONE):	MATH 211 and (one of the following: PHYS 221 or MATH 255) and (one of the following: PHYS 112 or any other MATH course 200-level or above).
Corequisites (if applicable, or NONE):	NONE
Pre/corequisites (if applicable, or NONE):	NONE

Equivalent Courses (cannot be taken for additional credit)

Former course code/number: **n/a**

Cross-listed with: MATH 381/ENGR 257

Equivalent course(s): MATH 381/ENGR 257

Note: Equivalent course(s) should be included in the calendar description by way of a note that students with credit for the equivalent course(s) cannot take this course for further credit.

Transfer Credit

Transfer credit already exists: ☐ Yes ☒ No

Transfer credit requested (OReg to submit to BCCAT):
☒ Yes ☐ No (if yes, fill in transfer credit form)

Resubmit revised outline for articulation: ☒ Yes ☐ No

To find out how this course transfers, see **bctransferguide.ca**.

Total Hours: 75

Typical structure of instructional hours:

Lecture hours	
Seminars/tutorials/workshops	75
Laboratory hours	
Field experience hours	
Experiential (practicum, internship, etc.)	
Online learning activities	
Other contact hours:	
Total	**75**

Special Topics

Will the course be offered with different topics?
☐ Yes ☒ No

If yes, different lettered courses may be taken for credit:
☐ No ☐ Yes, repeat(s) ☐ Yes, no limit

Note: The specific topic will be recorded when offered.

Maximum enrolment (for information only): 24

Expected frequency of course offerings (every semester, annually, every other year, etc.): annually

Department / Program Head or Director: Derek Harnett	**Date approved:**	Nov. 5, 2014
Faculty Council approval	**Date approved:**	Nov. 28, 2014
Campus-Wide Consultation (CWC)	**Date of posting:**	Jan. 23, 2015
Dean/Associate VP: Lucy Lee	**Date approved:**	Nov. 14, 2014
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	Jan. 30, 2015

Learning Outcomes

Upon successful completion of this course, students will be able to:

- Evaluate integrals involving sines, cosines, exponentials, powers, and certain special functions using Feynman's integration techniques.
- Solve ordinary linear differential equations using Laplace transforms, the D operator, power series, and substitutions (for Euler equations).
- Compute Fourier series expansions (real, complex, half-range sine and cosine) and Legendre polynomial expansions for sufficiently well-behaved functions.
- Model a variety of physical situations (such as diffusion, wave motion, and steady-state phenomena) as partial differential equations with appropriate initial and boundary conditions (such as Dirichlet and Neumann conditions).
- Describe qualitatively how heat flows through systems in one, two, and three dimensions.
- Apply separation of variables and/or the Fourier transform to solve a variety of initial/boundary value problems in Cartesian, cylindrical, and spherical coordinates.
- Define the special functions Ei, Ci, Si, Erf, Heaviside step, and Dirac delta.

Prior Learning Assessment and Recognition (PLAR)

☒ Yes ☐ No, PLAR cannot be awarded for this course because

Typical Instructional Methods (guest lecturers, presentations, online instruction, field trips, etc.; may vary at department's discretion)

Lectures, assignments

Grading system: Letter Grades: ☒ Credit/No Credit: ☐ Labs to be scheduled independent of lecture hours: Yes ☐ No ☒

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Text(s) and Resource Materials (if more space is required, download Supplemental Texts and Resource Materials form)

	Author (surname, initials)	Title (article, book, journal, etc.)	Current ed.	Publisher	Year
1.	Asmar, Nakhle H.	Partial Differential Equations	☒	Pearson	2005
2.			☐		
3.			☐		
4.			☐		
5.			☐		

Required Additional Supplies and Materials (software, hardware, tools, specialized clothing, etc.)

Typical Evaluation Methods and Weighting

Final exam:	50%	Assignments:	20%	Midterm exam:	30%	Practicum:	%
Quizzes/tests:	%	Lab work:	%	Field experience:	%	Shop work:	%
Other:	%	Other:	%	Other:	%	Total:	100%

Details (if necessary):

Typical Course Content and Topics

Feynman's integration techniques
Ordinary differential equations and the D operator
Basic Fourier series
Advanced Fourier Series
Waves on finite strings
Heat flow in 1 dimension, Laplaces equation for finite systems
Laplace's equation in polar co-ordinates.
Special Functions (Ei,Ci,Si, Erf,Heaviside and delta functions
Fourier & Laplace transforms, applications to integration and differential equations
Application of Fourier transfoms to infinite systems
Legendre polynomials
Laplace's equation in spherical co-ordinates