OFFICIAL UNDERGRADUATE COURSE OUTLINE (page 1)

COURSE IMPLEMENTATION DATE: January 1994
COURSE REVISED IMPLEMENTATION DATE: September 2013
COURSE TO BE REVIEWED: May 2018
(six years after UEC approval) *(month, year)*

OFFICIAL UNDERGRADUATE COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.
Shaded headings are subject to change at the discretion of the department – see course syllabus available from instructor

MATH 322	Mathematics and Statistics	3
COURSE NAME/NUMBER	FACULTY/DEPARTMENT	UFV CREDITS

Complex Variables
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This course provides an introduction to complex analysis and its applications. Topics include the algebra of complex numbers, geometry of the complex plane, analytic functions, contour integration, complex power series, residue theory, and an introduction to conformal mapping.

PREREQUISITES: MATH 211, and either MATH 112 with at least a C or MATH 118 with at least a B.
COREQUISITES:
PRE or COREQUISITES:

SYNONYMOUS COURSE(S):
(a) Replaces:
(b) Cross-listed with:
(c) Cannot take: for further credit.

SERVICE COURSE TO: *(department/program)*

TOTAL HOURS PER TERM: **45**

STRUCTURE OF HOURS:

Lectures:	**45**	Hrs
Seminar:		Hrs
Laboratory:		Hrs
Field experience:		Hrs
Student directed learning:		Hrs
Other (specify):		Hrs

TRAINING DAY-BASED INSTRUCTION:
Length of course:
Hours per day:

OTHER:
Maximum enrolment: **36**
Expected frequency of course offerings: every other year
(every semester, annually, every other year, etc.)

WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only)	☐ Yes	☐ No
WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department)	☐ Yes	☒ No
TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE:	☐ Yes	☒ No

Course designer(s): **Mathematics Curriculum Committee**

Department Head:	**Greg Schlitt**	Date approved:	**March 5, 2012**
Supporting area consultation (Pre-UEC)		Date of meeting:	**March 23, 2012**
Curriculum Committee chair:	**Norm Taylor**	Date approved:	**April 20, 2012**
Dean/Associate VP:	**Ora Steyn**	Date approved:	**May 4, 2012**
Undergraduate Education Committee (UEC) approval		Date of meeting:	**May 23, 2012**

LEARNING OUTCOMES:

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

1. Perform arithmetic operations on complex numbers, solve equations, manipulate algebraic expressions, using Cartesian, polar, and exponential representations of those numbers
2. Use definitions to explore the limits, continuity, and analyticity of complex functions, and to develop results regarding the Cauchy-Reimann equations and harmonic functions, in both Cartesian and exponential form
3. Define the elementary complex functions (polynomial, rational, exponential, logarithmic, power, trigonometric, hyperbolic trigonometric, and the inverse trigonometric and hyperbolic trigonometric), reason about their properties and inter-relationships, and analyze their behavior on appropriate regions of the z-plane
4. Calculate integrals along contours, both from the definition and using the theorems; explain the independence of path theorem and its relationship to the Cauchy integral theorem; trace consequences of Cauchy's integral formula
5. Define Laurent series and use the Laurent expansion to calculate integrals
6. Develop the Residue Theorem and use it to evaluate certain real integrals, such as trigonometric and some improper integrals
7. Demonstrate the ability to formulate proofs of gradually increasing levels of sophistication
8. Read short segments of new material on their own and use what they learn to solve various applied problems

METHODS: *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Lectures are interspersed with in-class problem sessions. Evaluation includes assignments, term tests, and a three-hour final exam. Mathematical software may be used to help students explore concepts.

METHODS OF OBTAINING PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

☐ Examination(s) ☐ Portfolio assessment ☐ Interview(s)

☒ Other (specify): course challenge: http://www.ufv.ca/Assets/Secretariat/Policies/106.pdf

☐ PLAR cannot be awarded for this course for the following reason(s):

TEXTBOOKS, REFERENCES, MATERIALS: *[Textbook selection varies by instructor. Examples for this course might be:]*

Saff & Snider, Fundamentals of Complex Analysis with Applications to Engineering and Science, 3rd ed., Prentice Hall, 2003

STUDENT EVALUATION: *[An example of student evaluation for this course might be:]*

The weighting of components may vary amongst instructors and across years, but there must be at least two tests and the final exam must be comprehensive. Students must achieve at least 40% on the final exam in order to pass the course.

Assignments	25%
Term tests	35%
Final exam	40%

COURSE CONTENT: *[Course content varies by instructor. An example of course content might be:]*

1. complex arithmetic, basic geometry, algebra: definitions, modulus, conjugate, Cartesian, polar and exponential forms, powers and roots
2. limits, continuity, analyticity of functions; the Cauchy-Riemann equations, harmonic functions s
3. elementary functions: polynomial, rational, exponential, logarithmic, trigonometric and inverses, hyperbolic trigonometric and inverse
4. complex integration: contour integrals, Cauchy's integral theorem, Cauchy's integral formula
5. complex series: properties of power series, Taylor and Laurent series, singularities

6. residue theory: residues and poles, the residue theorem and applications
7. optional, as time permits: elementary properties of conformal mapping; the Riemann sphere and stereographic projection; Julia and Mandelbrot sets