STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

MATH 364 - DIFFERENTIAL EQUATIONS

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CANINO SCHOOL OF ENGINEERING TECHNOLOGY
MATHEMATICS DEPARTMENT
Fall 2018

A. TITLE: Differential Equations

B. COURSE NUMBER: MATH 364

C. CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)

 # Credit Hours: 4
 # Lecture Hours: 4 **per week**
 # Lab Hours: per week
Other: per week

Course Length: 15 **Weeks**

D. WRITING INTENSIVE COURSE: N/A

E. GER CATEGORY: 1

F. SEMESTER(S) OFFERED: Spring and fall semesters

G. COURSE DESCRIPTION: A course in Ordinary Differential Equations. Topics include: First-order differential equations, higher-order differential equations with constant and variable coefficients, applications of first and second-order linear equations, Laplace transforms, systems of linear differential equations and numerical methods for ordinary differential equations (optional).

H. PRE-REQUISITES/CO-REQUISITES:

a. Pre-requisite(s): Calculus II (MATH 162) with a grade of C or better or permission of instructor.
b. Co-requisite(s): N/A
c. Pre- or co-requisite(s): N/A

I. STUDENT LEARNING OUTCOMES:

Course Student Learning Outcome [SLO]	***PSLO***	***GER***	***ISLO***
a. Verify implicit and explicit solutions of ordinary differential equations (ODE's)	N/A	1	3. *Quantitative Lit,/Reasoning [QTR]*
b. Solve first-order ODE's and IVP's using separation of variables, integrating factors, substitutions, or numerical analysis	N/A	1	3. *Quantitative Lit,/Reasoning [QTR]*
c. Find the general solution of second-order ODE or higher order homogeneous or nonhomogeneous ODE's	N/A	1	3. *Quantitative Lit,/Reasoning [QTR]*
d. Solve ODE's using the Laplace transform	N/A	1	3. *Quantitative Lit,/Reasoning [QTR]*
e. Solve systems of ODE's	N/A	1	3. *Quantitative Lit,/Reasoning [QTR]*

KEY	Institutional Student Learning Outcomes [ISLO 1 – 5]
ISLO #	ISLO & Subsets
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit,/Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

J. APPLIED LEARNING COMPONENT: **Yes_____** **No___x___**

K. % TEXTS: Ordinary Differentil Equations from Calculus to Dynamical Systems, V.W. Noonburg, Mathematical Association of America (Incorporated), 2014

L. % REFERENCES: N/A

M. % EQUIPMENT: N/A

N. % GRADING METHOD: A-F

O. % SUGGESTED MEASUREMENT CRITERIA/METHODS: Instructors may use a combination of:

- Exams
- Assignments
- Participation

P. DETAILED COURSE OUTLINE:

I. Introduction to ordinary differential equations (ODE's)
- A. Multivariable functions and partial derivatives
- B. Classification of ODE's
- C. Verification of solutions
- D. Explicit and implicit solutions
- E. Initial value problems

II. First Order ODE's
- A. Separable variables
- B. Linear equations
- C. Exact equations
- D. Homogeneous ODE
- E. Bernoulli Equations
- F. Other miscellaneous substitutions (optional)
- G. Geometric characterization of solutions (direction fields)
- H. Numeric methods (Euler's method)

I. Applications of first order ODE

III. Second order ODE's
- A. Vectors in the plane
- B. Vectors in 3-space
- C. Linear dependence and independence
- D. Using the Wronskian
- E. Finding a second solution using reduction of order
- F. Homogeneous Second order linear ODE with constant coefficients
- G. Nonhomogeneous Second order linear ODE
  - a. Method of undetermined coefficients
  - b. Variation of parameter
- H. Solutions by power series (optional)
- I. Applications of second order ODE's

IV. Higher order ODE's (Optional)
- A. Use determinant to determine linear independence or dependence
- B. Solutions of higher order linear ODE
- C. Higher order linear ODE with constant coefficients
  - a. Method of undetermined coefficients
  - b. Variation of parameters
- D. Euler equations
- E. Solve ODE by power series
  - a. Series solutions about ordinary points
  - b. Series solutions about singular points

V. The Laplace Transform
- A. Laplace transform
- B. Inverse transform
- C. Translation theorems and the unit step function
- D. Transforms of derivatives, integrals, piecewise, and periodic functions
- E. Solutions of differential equations using the Laplace transform
- F. The convolution of two functions and the transform of a convolution (optional)

VI. Systems of Differential Equations

- A. Solutions of homogeneous linear systems using Eigenvalues and eigenvectors

Q. <u>LABORATORY OUTLINE</u>: N/A