**Navajo Technical University**  http://www.navajotech.edu

PO Box 849, Crownpoint, NM 87313  Tel: (505) 387-7401

**Course Title: Differential Equations-Synchronous**
**Course #: MATH 2410**

**Credit Hours: 4**
**Semester: spring**
**Cap: 15**

**Faculty**: Shasha Han  **E-mail**: shan@navajotech.edu
**Office: MOD 9**  **Office Phone**: 505-387-7381
**Office Hours** (face-to-face or online): online: Email anytime but will respond within 24 hours
Monday-Thursday, will respond within 48 hours Friday-Sunday
Face to face (by appointment only): T/R 1-3, Friday 8-11.
**Preferred Communication** (email and/or text; will respond within 24 hours): email

**Modality** (face-to-face, hybrid, or online): online Synchronous zoom, WebAssign
**Class Location and Meeting Times** (Synchronous): Zoom/Blackboard/WebAssign T/R 10:00-11:40
**Meeting Hours and Online Hours** (if hybrid):

**Required Materials:**
**Required Materials: (WebAssign access code)**
**Texts:  (not required) Differential Equations with boundary-Value Problems, 9th Edition**
       **Dennis G. Zill & Warren S. Wright**
       **ISBN-13: 978-1-111-82706-9**
       **ISBN-10: 1-111-82706-0**
**Tools:  Scientific Calculator / Graphing Calculator**
**Laptop and Internet Access:** Every student is required to own a laptop and have internet access.
**Lab Fee: (access code fee)**
**Mission, Vision, and Philosophy**
*Mission:* Navajo Technical University honors Diné culture and language, while educating for the future.

*Vision:* Navajo Technical University provides an excellent educational experience in a supportive, culturally diverse environment, enabling all community members to grow intellectually, culturally, and economically.

*Philosophy:* Through the teachings of Nitsáhákees (thinking), Nahátá (planning), Íína (implementing), and Siihasin (reflection), students acquire quality education in diverse fields, while preserving cultural values and gaining economic opportunities.

**Course Description**

An introduction to differential equations. Students will be able to classify, construct, and solve different types of equations. Systems of equations, Laplace transforms, series solutions, and numerical methods are introduced. At times, the learning process relating to the Navajo culture in

the areas of Nitsahakees, Nahatah, Iina, and Sihasin will be covered as well as other cultures (multi-cultural studies).

| COURSE OUTCOMES | COURSE ASSESSMENTS |
|---|---|
| Students will learn to verify solutions to differential equations, be able to classify differential equations by order, linearity, and homogeneity, and be able to identify an appropriate technique to solve the differential equation as outlined below. | Formative assessment, Summative assessment, Applications<br>Complete reading assignments, homework assignments, exams. |
| **1. First-order equations**<br>a. Solve linear, separable, exact, and Bernoulli equations.<br>b. Use phase lines and direction fields to analyze the behavior of first-order equations. | |
| **2. Higher-order, constant-coefficient, linear equations**<br>a. Solve linear, constant-coefficient homogeneous equations.<br>b. Solve linear, constant-coefficient non-homogeneous equations using undetermined coefficients and variation of parameters.<br>c. Demonstrate that a set of solutions is a fundamental one.<br>d. Determine a solution to an equation through reduction of order. | |
| **3. Laplace transforms**<br>a. Compute Laplace transforms and inverse-Laplace transforms of basic functions.<br>b. Solve initial-value problems using the Laplace transform.<br>c. Solve linear equations with discontinuous forcing functions involving the unit step function and the Dirac delta function.<br>d. Apply convolutions with Laplace transforms. | |
| **4. Systems of equations**<br>a. Solve systems of linear, constant-coefficient, homogeneous equations.<br>b. Use a phase plot to analyze the behavior of a system of equations. | |
| **5. Series solutions and non-constant-coefficient linear equations**<br>a. Determine a series solution of an equation about an ordinary point.<br>b. Determine a series solution of an equation about a regular singular point.<br>c. Determine the radius of convergence of a series solution. | |
| **6. Numerical methods**<br>a. Use a computational program to approximate solutions to an equation.<br>b. Identify limitations of numerical methods.<br>c. Use a computational program to analyze the behavior an equation or system of equations. | |
| **7. Applications** | |

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|---|---|
| a. Create a differential equation or system of equations that models a given application.<br>b. Analyze a differential equation the models a given application to determine the behavior of the model. | |

**Connections to Program Assessment (Course-Embedded Measures)**
SLO 2: Perform computations.
**Topics:**
Chapter 1: Introduction to Differential Equations

Chapter 2: First-Order Differential Equations

Chapter 3: Modeling with First-Order Differential Equations

Chapter 4: Higher-Order Differential Equations

Chapter 5: Modeling with Higher-Order Differential Equations

Chapter 6: Series Solutions of Linear Equations

Chapter 7: The Laplace Transform

**Course Activities**

| Week | Date | Chapters | Assignments |
|---|---|---|---|
| 1 | | Chapter 1 | Reading/Homework Assignments |
| 2 | | Chapter 2 | Reading/Homework Assignments |
| 3 | | Chapter 2 | Quiz |
| 4 | | Chapter 2 | Reading/Homework Assignments |
| 5 | | Chapter 3 | Reading/Homework Assignments |
| 6 | | Chapter 3 | Quiz |
| 7 | | Chapter 3 | Reading/Homework Assignments |
| 8 | | Mid term | Exam |
| 9 | | Chapter 4 | Reading/Homework Assignments |
| 10 | | Chapter 4 | Reading/Homework Assignments |
| 11 | | Chapter 4 | Quiz |
| 12 | | Chapter 6 | Reading/Homework Assignments |
| 13 | | Chapter 6 | Reading/Homework Assignments |
| 14 | | Chapter 7 | Reading/Homework Assignments |
| 15 | | Chapter 7 | Quiz |
| 16 | | Chapter 7 | Reading/Homework Assignments |
| 17 | | Final | Exam |

# Spring Semester 2022

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|---|---|
| Pre-Registration Begins | Oct 25 |
| HOLIDAY - New Year's Day | Dec 31 |
| Faculty Return | Jan 10 |
| New Student Orientation | Jan 13 |
| On-Site Registration | Jan 14 |
| HOLIDAY - Martin Luther King Day | Jan 17 |
| Instruction Begins | Jan 18 |
| Late Registration w/ fee | Jan 19-20 |
| Last Day Add/ Drop Classes w/out W | Jan 21 |
| HOLIDAY - President's Day | Feb 21 |
| Spring Graduation Petitions due | Feb 25 |
| Mid Term Exams | Mar 7-11 |
| Spring Break | Mar 14-18 |
| Last Day to Withdraw With a W | Mar 31 |
| Final Exams | May 9-12 |
| Final Grades due | May 12 |
| SPRING GRADUATION | May 13 |
| Memorial Day | May 30 |

**Grading Plan**
Homework:       50%
Class Participation: 5%
Project(s): 5%
Quizzes: 20%
Mid-term/final: 20%
Portfolio:

A = 100-90%
B = 89-80%
C = 79-70%
D = 69-60%
F = 59% or less

**Grading Policy**
Students must do their own work. Cheating and plagiarism are strictly forbidden. Cheating includes (but is not limited to) plagiarism, submission of work that is not one's own, submission or use of falsified data, unauthorized access to exams or assignments, use of unauthorized material during an exam, or supplying or communicating unauthorized information for assignments or exams.

**Participation**
Students are expected to attend and participate in all class activities. Points will be given to students who actively participate in class activities including guest speakers, field trips, laboratories, and all other classroom events. (For online class, students are expected to log in blackboard and WebAssign each week to read and do assigned work on time, for Synchronous, students are expected to attend assigned zoom classes)

**Cell phone and headphone use**
Please turn cell phones off **before** coming to class. Cell phone courtesy is essential to quality classroom learning. Headphones must be removed before coming to class. (Not applied to online classes)

**Attendance Policy**
Students are expected to attend all class sessions. If more than ten minutes late, students will be counted as absent. A percentage of the student's grade will be based on class attendance and participation. Absence from class, regardless of the reason, does not relieve the student of responsibility to complete all course work by required deadlines. Furthermore, it is the student's responsibility to obtain notes, handouts, and any other information covered when absent from class and to arrange to make up any in-class assignments or tests if permitted by the instructor. Incomplete or missing assignments will necessarily affect the student's grades. Instructors will report excessive and/or unexplained absences to the Counseling Department for investigation and potential intervention. **Instructors may drop students from the class after three (3) absences or 3 assignments unless prior arrangements are made with the instructor to make up work and the instructor deems any excuse acceptable.**
**(For Online classes, 3 absences means 3 missing assignments)**

**Study Time Outside of Class for Face-to-Face Courses**
**For every credit hour in class, a student is expected to spend two hours outside of class studying course materials**.

**Study Time for Hybrid or Blended Courses**
**For a hybrid or blended course of one credit hour, a student is expected to spend three hours per week studying course materials.**

**Study Time for Online Courses**
**For an online course of one credit hour, a student is expected to spend four hours per week studying course materials.**

**Academic Integrity**
Integrity (honesty) is expected of every student in all academic work. The guiding principle of academic integrity is that a student's submitted work must be the student's own. Students who engage in academic dishonesty diminish their education and bring discredit to the University community. Avoid situations likely to compromise academic integrity such as: cheating, facilitating academic dishonesty, and plagiarism; modifying academic work to obtain additional credit in the same class unless approved in advance by the instructor, failure to observe rules of academic integrity established by the instructor**. The use of another person's ideas or work claimed as your own without acknowledging the original source is known as plagiarism and is prohibited**.

**Diné Philosophy of Education**
The Diné Philosophy of Education (DPE) is incorporated into every class for students to become aware of and to understand the significance of the four Diné philosophical elements, including its affiliation with the four directions, four sacred mountains, the four set of thought processes and so forth: Nitsáhákees,

Nahát'á, Íína and Siih Hasin which are essential and relevant to self-identity, respect and wisdom to achieve career goals successfully.

At NTU's Zuni Campus, the A:shiwi Philosophy of Education offers essential elements for helping students develop Indigenous and Western understandings. Yam de bena: dap haydoshna: akkya hon detsemak a:wannikwa da: hon de:tsemak a:ts'umme. *Our language and ceremonies allow our people to maintain strength and knowledge.* A:shiwi core values of hon i:yyułashik'yanna:wa (respect), hon delank'oha:willa:wa (kindness and empathy), hon i:yyayumoła:wa (honesty and trustworthiness), and hon kohoł lewuna:wediyahnan, wan hon kela i:tsemanna (think critically) are central to attaining strength and knowledge. They help learners develop positive self-identity, respect, kindness, and critical thinking skills to achieve life goals successfully.

**Students with Disabilities**
Navajo Technical University is committed to serving all students in a non-discriminatory and accommodating manner. Any student who feels that she or he may need special accommodations should contact the Accommodations Office (http://www.navajotech.edu/student-services#accomodations-services) in accordance with the university's Disability Accommodations Policy (see http://www.navajotech.edu/images/about/policiesDocs/Disability_Exhibit-A_6-26-2018.pdf).

**Email Address**
Students are required to use NTU's email address for all communications with faculty and staff.

**Final Exam Date: 05/10**