

MATH-222: DIFFERENTIAL EQUATIONS

Effective Term

Fall 2024

CC Approval

10/06/2023

AS Approval

10/10/2023

BOT Approval

10/19/2023

SECTION A - Course Data Elements

CB04 Credit Status

Credit - Degree Applicable

Discipline

| Minimum Qualifications | And/Or |
|-------------------------------|--------|
| Mathematics (Master's Degree) | |

Subject Code

MATH - Mathematics

Course Number

222

Department

Mathematics (MATH)

Division

Mathematics (MATH)

Full Course Title

Differential Equations

Short Title

Differential Equations

CB03 TOP Code

1701.00 - Mathematics, General

CB08 Basic Skills Status

NBS - Not Basic Skills

CB09 SAM Code

E - Non-Occupational

Rationale

Standard COR update, including SLO changes and book update.

SECTION B - Course Description

Catalog Course Description

This course is an introduction to ordinary differential equations including both quantitative and qualitative methods as well as applications from a variety of disciplines. Students are introduced to the theoretical aspects of differential equations, including establishing the existence of solutions, applying a variety of techniques for obtaining solutions, series solutions, and singular points. Laplace transforms and linear systems are also covered.

SECTION C - Conditions on Enrollment

Open Entry/Open Exit

No

Repeatability

Not Repeatable

Grading Options

Letter Grade Only

Allow Audit

Yes

Requisites

Prerequisite(s)

Completion of MATH-221 with a minimum grade of C.

Requisite Justification

Requisite Description

Course in a Sequence

Subject

MATH

Course

221

Level of Scrutiny

Content Review

Upon entering this course, students should be able to:

- A. Determine equations of lines and planes;
- B. Find the limit of a function at a point;
- C. Evaluate derivatives;
- D. Determine differentiability;
- E. Find local extrema and test for saddle points;
- F. Evaluate two and three dimensional integrals;

SECTION D - Course Standards

Is this course variable unit?

No

Units

3.00000

Lecture Hours

54.00

Outside of Class Hours

108

Total Contact Hours

54

Total Student Hours

162

Distance Education Approval

Is this course offered through Distance Education?

Yes

Online Delivery Methods

| DE Modalities | Permanent or Emergency Only? |
|-----------------------------|------------------------------|
| Entirely Online | Permanent |
| Hybrid | Permanent |
| Online with Proctored Exams | Permanent |

SECTION E - Course Content

Student Learning Outcomes

| Upon satisfactory completion of the course, students will be able to: | |
|---|---|
| 1. | Solve first order ordinary differential equations. |
| 2. | Solve higher order ordinary differential equations. |
| 3. | Use differential equations to solve applications. |
| 4. | Write mathematical proofs. |

Course Objectives

| Upon satisfactory completion of the course, students will be able to: | |
|---|---|
| 1. | Create and analyze mathematical models using ordinary differential equations to solve applications. |
| 2. | Identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order and selected higher order ordinary differential equations; |
| 3. | Apply the existence and uniqueness theorems for ordinary differential equations. |
| 4. | Find power series solutions to ordinary differential equations. |
| 5. | Determine the Laplace Transform and inverse Laplace Transform of functions. |
| 6. | Solve linear systems of ordinary differential equations. |
| 7. | Solve application of ordinary differential equations. |

Course Content

- Solutions of ordinary differential equations (find, verify and interpret);
- First order differential equations including separable, homogeneous, exact, linear, Bernoulli and those reducible to first order;
- Existence and uniqueness of solutions;
- Applications of first order differential equations such as circuits, mixture problems, population modeling, orthogonal trajectories, and slope fields;
- Second order and higher order non-reducible linear differential equations;
- Fundamental solutions, independence, Wronskian;
- Nonhomogeneous equations;
- Applications of higher order differential equations such as the harmonic oscillator and circuits;
- Variation of parameters;
- Laplace transforms;
- Series solutions; and
- Systems of ordinary differential equations

Methods of Instruction

Methods of Instruction

| Types | Examples of learning activities |
|------------|---------------------------------|
| Lecture | In class lecture |
| Discussion | Discussion of class topics |
| Other | Practice problems |

Instructor-Initiated Online Contact Types

Announcements/Bulletin Boards
 Discussion Boards
 E-mail Communication
 Video or Teleconferencing

Student-Initiated Online Contact Types

Discussions
 Group Work

Course design is accessible

Yes

Methods of Evaluation**Methods of Evaluation**

| Types | Examples of classroom assessments |
|-------------|--|
| Exams/Tests | Traditional exams including a final exam. Exams could include solving first order ordinary differential equations via substitution methods and mixture problem applications. Exams could include solving higher order ordinary differential equations by using Laplace transform and power series methods. |
| Quizzes | Quizzed on class material |
| Projects | Individual or group projects |
| Homework | Homework problems from book |
| Other | Additional assessment information: The Mathematics Department maintains a commitment to diverse teaching methods in courses emphasizing vital quantitative skills and qualitative reasoning ability. To that end, it is expected that sufficient formative assessments will be given to students that in frequency, length and rigor adequately assess both quantitative skills and qualitative reasoning. |

Assignments**Reading Assignments**

Read sections from the textbook, for example: 1. Read the section on first-order linear differential equations. 2. Read the section on Laplace transforms.

Writing Assignments

Homework assignments from the text, such as:

- Solve $y'' + 2y' + 3y = \cos(t)$
- A tank initially contains 60gal of pure water. Brine containing 1 lb of salt per gallon enters the tank at 2 gal/min, and the perfectly mixed solution leaves the tank at 3 gal/min; thus the tank is empty after exactly 1 hour. Find the amount of salt in the tank after t minutes.

Other Assignments

Other assignments such as research into applications or group projects assigned at instructor's discretion.

SECTION F - Textbooks and Instructional Materials**Material Type**

Textbook

Author

C. Henry Edwards, David Penney, David Calvis

Title

Differential Equations and Boundary Value Problems: Computing and Modeling (Tech Update)

Edition/Version

6th

Publisher

Pearson

Year

2022

ISBN #

9780134837390

Proposed General Education/Transfer Agreement

Do you wish to propose this course for a Local General Education Area?

Yes

Proposed Local General Education Area

| Local GE Area | Proposed To |
|-------------------------------|-------------|
| Local GE Area D2: Mathematics | Add |

Do you wish to propose this course for a CSU General Education Area?

Yes

Proposed CSU General Education Area

| CSU GE Area | Proposed To |
|--|-------------|
| CSU GE Area B4: Mathematics/Quantitative Reasoning | Add |

Do you wish to propose this course for a UC Transferable Course Agreement (UC-TCA)?

Yes

Do you wish to propose this course for an IGETC General Education Area?

Yes

Proposed IGETC General Education Area

| IGETC Area | Proposed To |
|--|-------------|
| IGETC Area 2: Mathematical Concepts and Quantitative Reasoning | Add |

Course Codes (Admin Only)**ASSIST Update**

No

CSU GE Approval Dates

| CSU GE Area | Approval Date |
|--|---------------|
| CSU GE Area B4: Mathematics/Quantitative Reasoning | Fall 1998 |

IGETC Approval Dates

| IGETC Area | Approval Date |
|--|---------------|
| IGETC Area 2: Mathematical Concepts and Quantitative Reasoning | Fall 1998 |

C-ID Approval Dates

| C-ID Descriptor | Approval Date |
|--|---------------|
| MATH 240 Ordinary Differential Equations | Spring 2012 |

CB00 State ID

CCC000311337

CB10 Cooperative Work Experience Status

N - Is Not Part of a Cooperative Work Experience Education Program

CB11 Course Classification Status

Y - Credit Course

CB13 Special Class Status

N - The Course is Not an Approved Special Class

CB23 Funding Agency Category

Y - Not Applicable (Funding Not Used)

CB24 Program Course Status

Program Applicable

Allow Pass/No Pass

No

Only Pass/No Pass

No

Reviewer Comments

Katherine Rhyno (krhyno) (Wed, 20 Sep 2023 20:41:00 GMT): Rollback: Enter in Course Codes (Admin Only) fields at the bottom of the form.

Stacey Howard (showard) (Thu, 21 Sep 2023 20:14:30 GMT): Added CSU GE, IGETC and C-ID approval dates. Local GE approval research needed. Filled in Effective Term as no rearticulation is needed.