MATH 282 – DIFFERENTIAL EQUATIONS | 4 CREDITS

SYLLABUS

CATALOG DESCRIPTION

A course which gives an in-depth introduction to ordinary differential equations. Theoretical questions such as existence and uniqueness will be addressed but emphasis will be on concepts and applications. Topics include first order techniques and applications, second order techniques and applications, Laplace Transform methods, Cauchy-Euler equations, infinite series techniques, systems, numerical techniques and qualitative aspects.

Prerequisites: MATH 268 (Calculus III) with a grade of "C" or better.

Semester Offered: Spring and On Demand

Common Student Learning Outcomes

Upon successful completion of San Juan College programs and degrees, the student will demonstrate competency in…

BROAD AND SPECIALIZED LEARNING

Students will actively and independently acquire, apply, and adapt skills and knowledge with an awareness of global contexts.

CRITICAL THINKING

Students will think analytically and creatively to explore ideas, make connections, draw conclusions and solve problems.

CULTURAL AND CIVIC ENGAGEMENT

Students will act purposefully, reflectively, and ethically in diverse and complex environments.

EFFECTIVE COMMUNICATION

Students will exchange ideas and information with clarity in multiple contexts.

INFORMATION LITERACY

Students will be able to recognize when information is needed and have the ability to locate, evaluate, and use it effectively.

INTEGRATING TECHNOLOGIES

Students will demonstrate fluency in the application and use of technologies in multiple contexts.

Student work from this class may be randomly selected and used anonymously for assessment of course, program, and/or institutional learning outcomes. For more information, please refer to the Dean of the appropriate School.

General Learning Outcomes

Upon successful completion of the course, the student will be able to…

A. Techniques for solving linear and nonlinear first order differential equations.
B. Techniques for solving constant coefficient, higher order linear differential equations.
C. Techniques for solving differential equations using Laplace Transforms.
D. Techniques for solving variable coefficient differential equations.
E. Techniques for solving systems of ordinary differential equations.
F. Applications of differential equations.

G. Numerical techniques for solving differential equations H. The use of technology in analyzing differential equations

Specific Learning Outcomes

Upon successful completion of the course, the student will be able to…

A. Techniques for solving linear and nonlinear first order differential equations.

A1. Understand the definition of differential equations and know how to identify their order and linearity.
A2. Be able to solve separable differential equations.
A3. Be able to solve homogeneous differential equations.
A4. Be able to solve exact differential equations.
A5. Be able to solve linear differential equations.
A6. Be able to solve Bernoulli equations.
A7. Be able to use initial conditions to find particular solutions to differential equations. A8. Understand existence and uniqueness questions involving differential equations.

B. Techniques for solving constant coefficient, higher order linear differential equations.

B1. Be able to find a second solution to a linear differential equation by reduction of order.
B2. Be able to solve higher order linear, constant coefficient, homogeneous differential equations.
B3. Be able to solve nonhomogeneous differential equations using the method of undetermined coefficients.
B4. Be able to solve nonhomogeneous differential equations using the method of variation of parameters.

C. Techniques for solving differential equations using Laplace Transforms.

C1. Be able to find Laplace Transforms of the standard functions.
C2. Be able to find Inverse Transforms involving the standard functions.
C3. Be able to find Laplace Transforms using the standard theorems including the First and Second translation theorems.
C4. Be able to solve differential equations using the Laplace Transform.
C5. Be able to solve differential equations involving unit step functions and the Dirac Delta function.

D. Techniques for solving variable coefficient equations.

D1. Be able to solve Cauchy-Euler equations.
D2. Be able to find series solutions to differential equations about ordinary points.
D3. Be able to find series solutions to differential equations about regular singular points.
D4. Be able to recognize Bessel's & Legendre's equations.

E. Techniques for solving systems of ordinary differential equations.

E1. Be able to solve systems of ordinary differential equations using operator techniques.
E2. Be able to solve systems of ordinary differential equations using Laplace Transforms.

F. Applications of differential equations.

F1. Be able to use first-order differential equations to model application problems from the physical sciences and geometry.
F2. Be able to use second-order equations to model application problems from the physical sciences.
F3. Be able to use Laplace Transform techniques to model application problems from the physical sciences.

G. Numerical techniques for solving differential equations

G1. Be able to analyze solutions to differential equations using slope fields.
G2. Be able to find numerical solutions to differential equations using Euler methods.

H. The use of technology in analyzing differential equations

H1. Be able to use a computer algebra system to aid in the solution of differential equations.
H2. Be able to use a computer algebra system as an aid in applications problems.

Other Requirements:

The TI-82, TI-83, TI-84, TI-85 or TI-86 graphing calculator is required for the course (TI-Nspire calculators that are equivalent to these are acceptable). A **TI-83 Plus or TI-84 Plus Graphing Calculator** is strongly recommended. Graphing calculators capable of symbolic manipulation (such as TI-89, TI-92, TI-Nspire CAS systems and other such calculators) will not be allowed on examinations, the final exam and where the instructor sees fit.