

Fall 2021 Course Offering

Honors Elementary Differential Equations

MATH 2584H-001

Instructor: Dennis W. Brewer

MTWF 8:35-9:25am

Text: *Exploring ODEs*, Trefethen, Birkisson, and Driscoll, SIAM Publishing, 2018

Free Download:

<http://people.maths.ox.ac.uk/trefethen/Exploring.pdf>

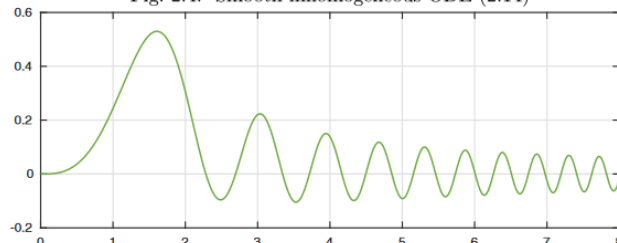
Prerequisite: MATH 2564 with a grade of A, or MATH 2564H with a grade of A or B, or a score of 5 on the AP BC Calculus exam. (Students with a grade of B in MATH 2564 may be admitted by special permission.)

Applications (partial list)

- Elimination of drugs from the bloodstream
- Electrical Circuits
- Competition in the Environment
- Modeling Epidemics
- Nonlinear Pendulum

```
L = chebop(0,8); L.op = @(t,y) diff(y) + y; L.lbc = 0;
t = chebfun('t',[0 8]); g = sin(t^2);
y = L\g; plot(y)
```

Fig. 2.4. Smooth inhomogeneous ODE (2.14)



Topics

- 1st and 2nd order linear and nonlinear ODEs
- Systems of ODEs
- Boundary-value Problems
- Eigenstates
- Resonance
- Stability
- Phase Plane
- Laplace Transform

Technology: An open-source MATLAB package will be used to solve, plot, and investigate the properties of linear and nonlinear ODE models

Assessment: homework, 3 exams, final presentation, final paper